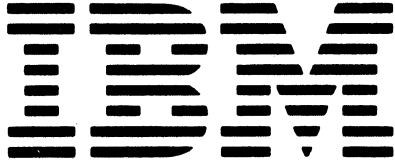


SC21-7663-5

File No. S34-32

**IBM System/34  
Work Station Utility  
Reference Manual**

Program Number 5726-UT1



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Work Station Utility  
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### **Sixth Edition (January 1982)**

This is a major revision of, and obsoletes, SC21-7663-4. Changes or additions to the text and illustrations are indicated by a vertical line to the left of the change or addition.

This edition applies to release 08, modification level 00 of the IBM System/34 Utilities Program Product (Program 5726-UT1) and to all subsequent releases and modification levels until otherwise indicated in new editions or technical newsletters.

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This reference manual is for WSU programmers' use to code and debug WSU programs. Use this manual to:

- Understand how WSU works
- Define files used by WSU programs
- Code WSU source programs
- Understand how operators can use WSU programs
- Debug WSU programs

The WSU program provides ideographic support when used with the ideographic version of the SSP and the ideographic hardware devices that version supports.

The main audience for this reference manual is the account programmer. The secondary audience includes third-party programmers and IBM personnel.

**Note:** This manual follows the convention that *he* means *he or she*.

## How This Manual is Organized

This manual has 17 chapters, 2 appendixes, a glossary, and an index. The topics described in the chapters and appendixes are:

Chapter	Topic
1	WSU features The transaction file Master files Job, session, and mode level fields Modes of operation WSU program cycle Display sequences Data dictionary WSU source specifications Coding rules and common entries How to generate WSU programs How to use WSU programs
2	RPG F specification
3	RPG I specification
4	WSU J specification
5	WSU T specification
6	WSU M specification
7	WSU S specification
8	WSU D specification
9	WSU C specification
10	Subroutines
11	Indicators
12	Review, insert, and delete modes
13	Additional topics and programming considerations
14	WSU command keys, function keys, and menu
15	Sample programs
16	WSU error messages
17	WSU file processing utilities

## Appendix Topic

A	Summary of specification entries
B	Contents of trailers



## System Requirements

Refer to the *IBM System/34 Planning Guide*, GC21-5154, for a list of system requirements.

## Prerequisite System/34 Publications

- *IBM System/34 Introduction*, GC21-5153
- *IBM System/34 Planning Guide*, GC21-5154
- *IBM System/34 System Support Reference Manual*, SC21-5155

## Related Publications

- *IBM System/34 RPG II Reference Manual*, SC21-7667
- *IBM System/34 Displayed Messages Guide*, SC21-5159
- *IBM System/34 Source Entry Utility Reference Manual*, SC21-7657
- *IBM System/34 Program Product Installation and Modification Reference Manual*, SC21-7689
- *IBM System/34 Operator's Guide*, SC21-5158
- *IBM System/34 Screen Design Aid Programmer's Guide and Reference Manual*, SC21-7716
- *IBM System/34 Master Index*, SC21-7739
- *IBM 5292 Color Display Station Programmer's Guide to Using Color*, GA21-9413
- *IBM 5292 Color Display Station Operator's Guide*, GA21-9416
- *IBM 5291 Display Station Operator's Guide*, GA21-9409

IBM publications are available that describe the IBM-supplied ideographic characters and list their corresponding IBM codes. Contact your country representative for further information.

## Coding and Debugging Material

- *IBM 5251 Display Station Keyboard Template Assignment Sheet and Display Screen Layout Sheet*, GX21-9271
- *RPG Control and File Description Specifications*, GX21-9092
- *RPG Input Specifications*, GX21-9094
- *WSU J, T, and M Specifications*, GX21-9252
- *System/34 Display Screen Format Specifications*, GX21-9253
- *WSU C Specifications*, GX21-9254
- *WSU Debugging Template*, GX21-7697
- *IBM System/34 Keyboard Template*, GX21-7660
- *IBM System/34 Bibliography*, GH30-0231

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## Chapter 1. Introduction

WSU (the work station utility), a program of the Utilities Program Product, provides a way to code data entry programs.

WSU is designed to generate a program that creates a single file, called a transaction file, from data entered from one or more display stations. A WSU data entry program can be front-end entry for RPG II programs that do final editing, processing, updating, and printing (WSU does not provide printed output).

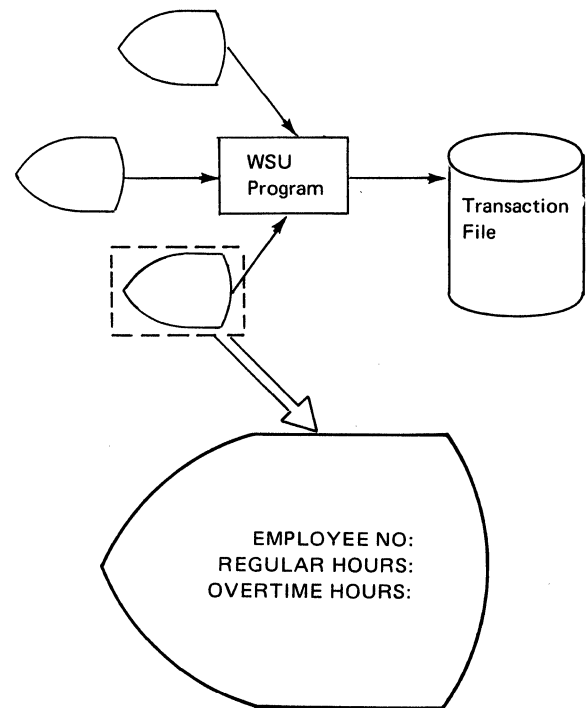
A WSU program can be used by multiple operators (requestors) at once (the program is a multiple-requestor-terminal program). When an operator uses a WSU program, he is assigned a work session that is identified by the identifier of the display station he is using. Only one operator can use a given work session at a time. When an operator adds records to a transaction file, the identifier of the work session is saved in the records so that WSU can protect the records from being accessed from other work sessions.

Each program can use input from operators, from master files, and from results of processing within the program to create and maintain the transaction file (a direct file). A program can also randomly read, update, and add records to master files that are used by the program.

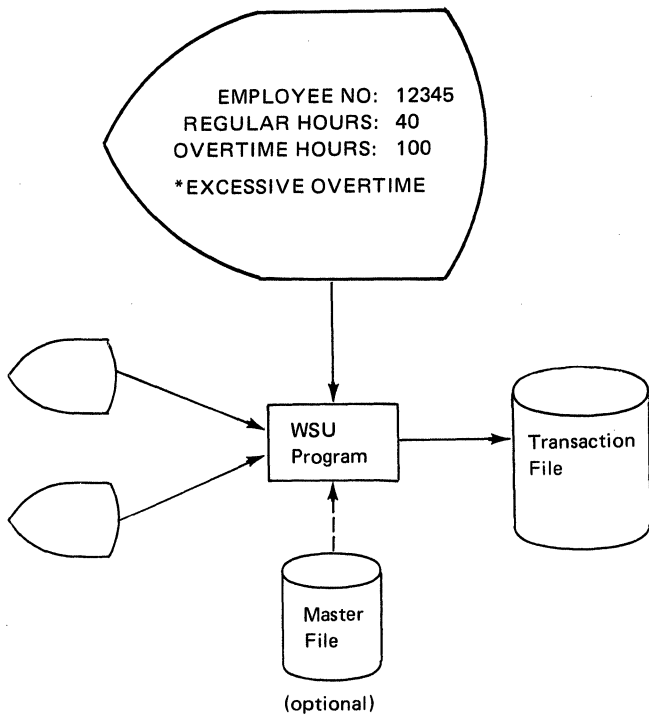
Two or more different WSU programs can be running at the same time. For example, payroll input, job costing input, and accounts payable input may be handled by three separate WSU programs that run at the same time. Each of these programs would probably use a separate transaction file; however, two or more programs can share the same master file.

WSU programs can do:

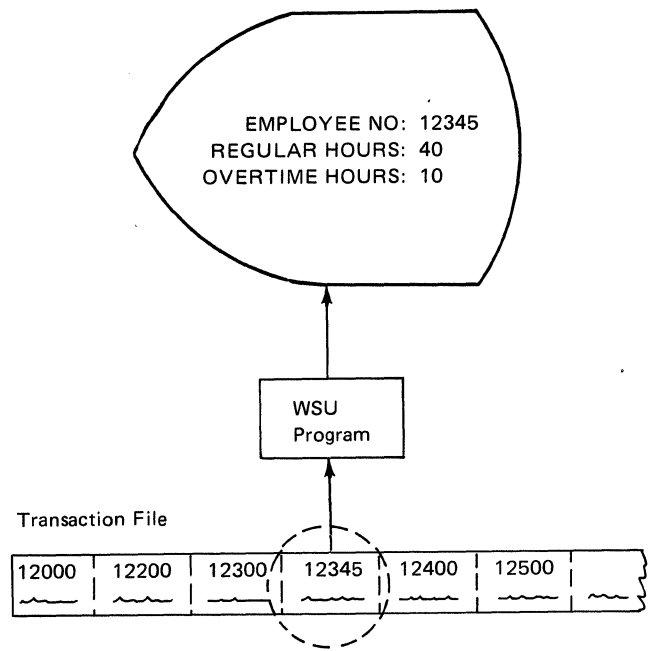
1. Simple data entry



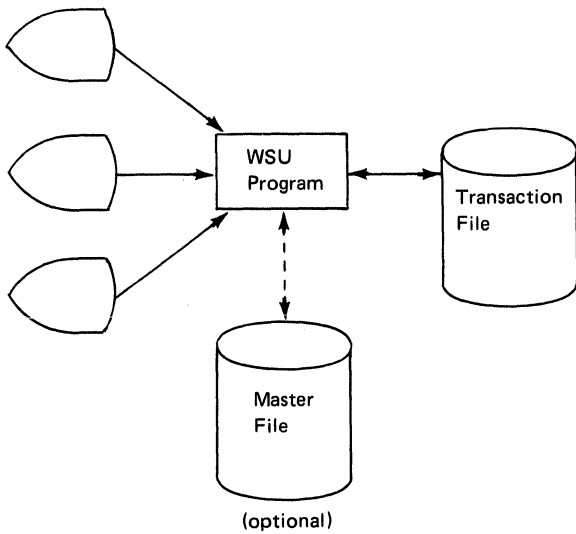
2. Data entry with edit



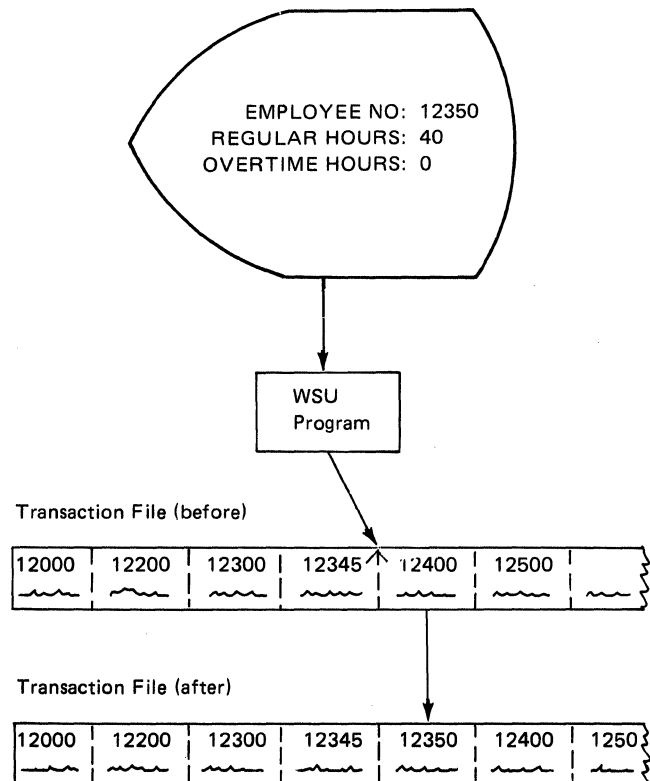
4. Review of records in the transaction file



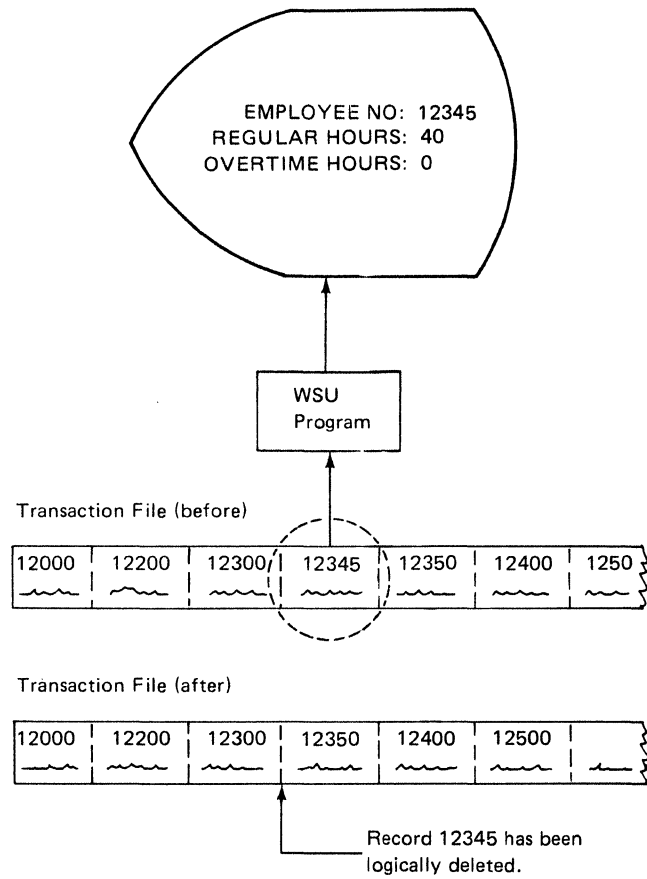
3. Data entry with update



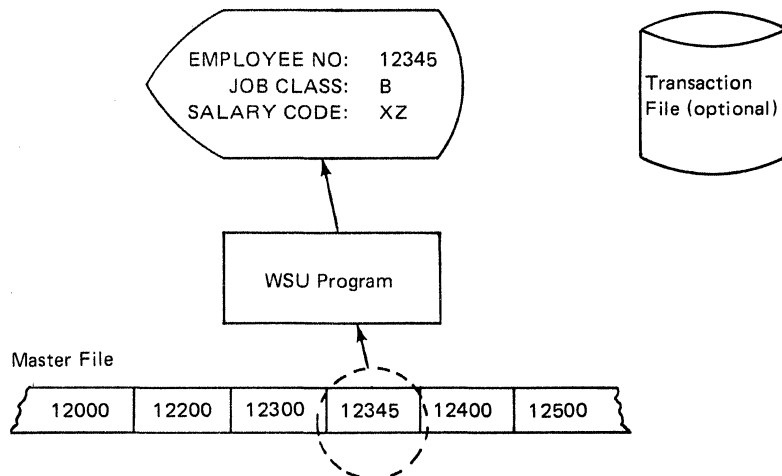
5. Logical insertion of records into the transaction file



6. Logical deletion of records from the transaction file

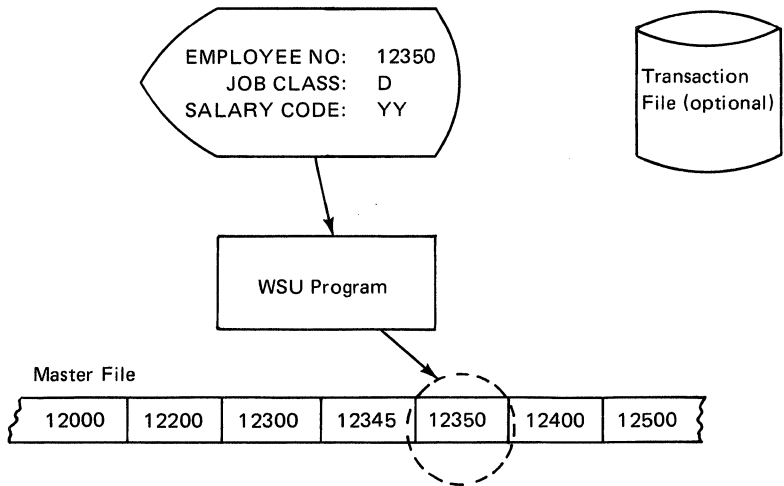


7. Inquiry into a master file





8. Master file maintenance (additions, deletions, changes)



## WSU FEATURES

WSU has many features that simplify how you code, and how operators run WSU programs. Figure 1-1 lists these features and indicates where in this manual you can find further information about them.

Features	Chapter (Topic)
<p>A WSU program can be run in enter mode, review mode, delete mode, or insert mode.</p>	<p>Chapter 1, <i>Introduction (Modes of Operation)</i> Chapter 12, <i>Review, Insert, and Delete Modes</i></p>
<p>You can explicitly control the operator's use of the program:</p> <ul style="list-style-type: none"> <li>• The display sequence(s)</li> <li>• Displays that are required</li> <li>• Displays that should repeat</li> <li>• Displays that do or do not allow operator input</li> <li>• Displays (if any) for review and delete modes</li> <li>• Displays (if any) for insert mode</li> <li>• Fields that are protected (an operator cannot update them)</li> <li>• Fields that an operator must enter</li> <li>• Self-check fields (for validating operator entries)</li> <li>• Nondisplayed fields (for sign-on passwords, for example)</li> </ul>	<p>Chapter 7, <i>S Specification</i> Chapter 14, <i>WSU Command Keys, Function Keys, and Menu</i> Chapter 8, <i>D Specification</i></p>
<p>WSU executes in a fixed cycle and allows you to specify displays and/or processing that occur at certain steps in the cycle:</p> <ul style="list-style-type: none"> <li>• When the first operator calls the program</li> <li>• When subsequent operators (including the first) call the program or when an operator restarts a session</li> <li>• When an operator ends his session</li> <li>• When the last operator ends the program</li> <li>• When a primary display sequence ends</li> </ul> <p>These steps are called processing levels</p>	<p>Chapter 1, <i>Introduction (Enter Mode Program Cycle)</i></p>
<p>WSU automatically generates a procedure to run the program. You can modify the procedure if you want, thus allowing changes to a program without regenerating it.</p>	<p>Chapter 1, <i>Introduction (How to Generate WSU Programs)</i> Chapter 13, <i>Additional Topics and Programming Considerations</i></p>

Figure 1-1 (Part 1 of 3). WSU Features

<b>Features</b>	<b>Chapter (Topic)</b>
WSU programs automatically adjust to a larger or smaller region size.	Chapter 13, <i>Additional Topics and Programming Considerations (Determining the Optimum Region Size)</i>
WSU provides a menu for operators to select a specific display, end a session, review a record by entering its relative record number, or start a new session.	Chapter 14, <i>WSU Command Keys, Function Keys, and Menu</i>
WSU provides command keys and function keys for such things as reviewing records and displaying the WSU menu.	Chapter 14, <i>WSU Command Keys, Function Keys, and Menu</i>
You can provide displays of help information that the operator can select at any time. After the operator has seen the help information, he can resume the interrupted processing.	Chapter 14, <i>WSU Command Keys, Function Keys, and Menu</i>
WSU allows operators to end and later resume their session.	Chapter 1, <i>Introduction (How to Restart WSU Programs)</i>
WSU maintains the transaction file so that operators' entries are logically separate from one another.	Chapter 1, <i>Introduction (The Transaction File)</i>
The transaction file need not be defined in a WSU program. The program can be coded to access only master files.	Chapter 1, <i>Introduction (The Transaction File)</i>
Review, delete, and insert modes are optional and simplify the reviewing, updating, insertion, and deletion of records in the transaction file.	Chapter 12, <i>Review, Insert, and Delete Modes</i>
Multiple operators can use the same WSU program concurrently with no additional program code needed.	Chapter 4, <i>J Specification (Columns 39-40, Maximum Number of Work Stations)</i> Chapter 13, <i>Additional Topics and Programming Considerations (Modifying the WSU Generated Procedure)</i>
WSU provides data integrity. An operator can review, delete, or update only transaction file records that were entered for the work session currently assigned to the display station.	Chapter 12, <i>Review, Insert, and Delete Modes</i> Chapter 13, <i>Additional Topics and Programming Considerations (Modifying the WSU Generated Procedure)</i>
As many as 20 master files can be used with a WSU program.	Chapter 1, <i>Introduction (Master File)</i>
Input/output operations, which allow changes and additions of records in files, can be coded to read and write transaction file records and master file records.	Chapter 1, <i>Introduction (The Transaction File and Master Files)</i> Chapter 9, <i>C Specification (Input and Output Operations)</i>

Figure 1-1 (Part 2 of 3). WSU Features

Features	Chapter (Topic)
WSU maintains one copy of certain fields for an entire program and one copy of certain fields for each display station using a program.	Chapter 1, <i>Introduction (Job; Session; and Mode-Level Fields)</i>
Fields can be defined that retain their values when the operating mode changes; fields not so defined are cleared when the operating mode changes.	Chapter 1, <i>Introduction (Job; Session; and Mode-Level Fields)</i>
WSU provides a comprehensive set of indicators for use in a WSU program. WSU maintains one copy of certain indicators for an entire program and one copy of certain indicators for each display station using a program.	Chapter 11, <i>Indicators</i>
Certain indicators retain their settings when the operating mode changes; certain indicators are set on or off by WSU when the operating mode changes.	Chapter 11, <i>Indicators</i>
A WSU program can read and update the display station local data area.	Chapter 1, <i>Introduction (Local Data Area)</i>
WSU provides the DEBUG operation for interactively detecting errors in programs.	Chapter 9, <i>C Specification (DEBUG)</i>
WSU can access an RPG II source program that describes the files and fields used by the WSU program.	Chapter 1, <i>Introduction (Data Dictionary)</i>
<p>You can code a WSU program on preprinted specifications in a logical order:</p> <ul style="list-style-type: none"> <li>• Job information</li> <li>• File information</li> <li>• Display information</li> <li>• Processing information</li> </ul>	Chapter 1, <i>Introduction (WSU Source Specifications)</i>
WSU provides and maintains reserved fields that record the date, relative record numbers, starting line number, display station ID, and session ID. These fields can be used by your program.	Chapter 13, <i>Additional Topics and Programming Considerations</i>
WSU programs support both the 960-character display and the 1920-character display.	Chapter 7, <i>S Specification</i> Chapter 8, <i>D Specification</i>

Figure 1-1 (Part 3 of 3). WSU Features

## THE TRANSACTION FILE

One of the main functions of a WSU program is to allow records to be added to or updated in a transaction file. WSU manages the transaction file automatically so that records can be added or updated easily. The transaction file is always a direct file, and its records are separated *logically* according to the work session for which they were entered. WSU protects the file so that records entered for one work session cannot be read or modified from another work session.

The transaction file should be unique to each WSU program; two or more WSU programs should not share the same transaction file.

WSU requires an RPG File Description (F) specification and Input (I) specifications that describe the transaction file. Refer to *Data Dictionary* in this chapter for ways that these specifications can be stored. Chapters 2 and 3 explain the entries that WSU requires on these specifications.

The transaction file is a direct file to WSU, regardless of your entries on the F specifications. The format of records written to the transaction file is defined on the RPG I specifications.

Figure 1-2 shows the logical organization of the transaction file. Because several display stations can enter input to a program at the same time, records from the various work sessions become mixed in the file. WSU uses the last 13 bytes of each record for control information (this information is called a trailer). Trailers allow WSU to access the transaction file as separate chains of records, one chain per work session. The record length on the F specification that describes the transaction file must include 13 bytes for the trailer.

Each display station has a 2-character symbolic identifier (such as W1). When an operator runs a WSU program, this identifier is used as a work session identifier and is included in the trailer of each record added to the transaction file during the work session. If the display station is authorized (by the WSU program) to allow the operator to select a different work session after the WSU program has started, the work session identifier of records added to the transaction file can be different than the work station identifier. This is because the work session identifier in the trailer always matches the identifier of the work session the operator is using.

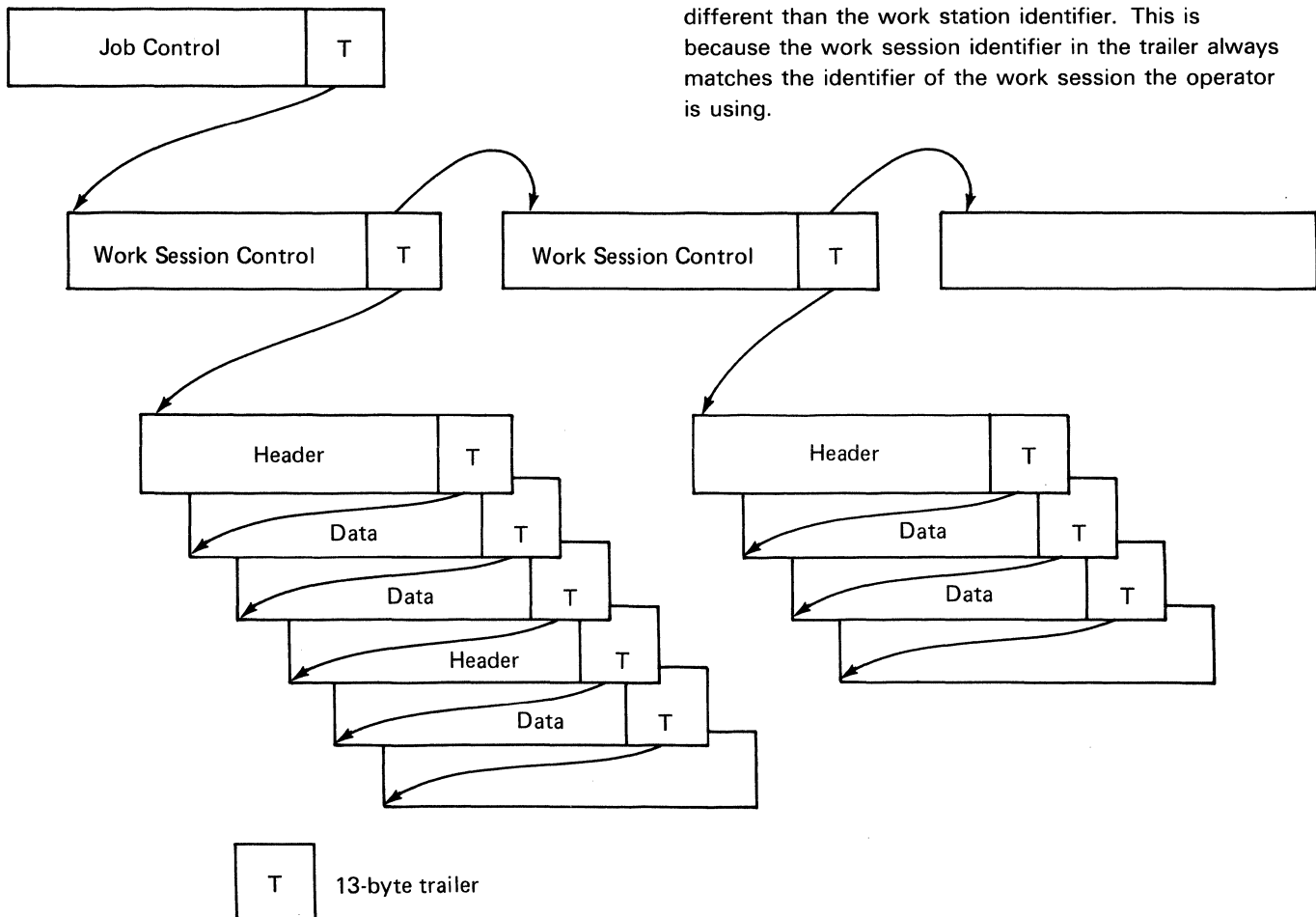


Figure 1-2. Logical Organization of the Transaction File



Initially, the transaction file contains blank records. The first record in the file is a job-control record. WSU creates this record before creating the first session chain. The first record in each session chain is a work-session-control record. Appendix B, *Contents of Trailers*, shows the contents of the trailer in a job-control, work-session-control, and data record. As operators enter data, WSU replaces blank records with data. As it writes a record to the file, WSU reserves an area for the next record in the chain (either the chain of work session control records or the chain of header and data records for a work session). The last record entered in the chain points to the area where the next record will be written.

WSU maintains a reserved field, \*RLNO, that keeps track of records in the transaction file. \*RLNO contains the relative record number of the next record to be written to the transaction file. You can reference this field in your program if you need the information that it contains. If the transaction file is not defined in a WSU program, \*RLNO is zero during the program's execution. Refer to *Using Reserved Fields* in Chapter 13 for further explanation of \*RLNO.

## Writing Records To and Reading Records From the Transaction File

WSU does not automatically write records to the transaction file. You can code operation codes to write to and read from the transaction file. These operations (described in Chapter 9) are:

Operation	Explanation
PUT	Either adds a record to the transaction file or updates the record just read.
GETPR	Reads the previous logical record from the transaction file.
GETPH	Reads the previous logical header record from the transaction file.
GETNR	Reads the next logical record from the transaction file.
GETNH	Reads the next logical header record from the transaction file.

### Notes:

1. Next record and previous record in the descriptions of the operations are relative to the last record that was read for the session. Get operations in a program are not always related to the record on the display.
2. WSU will not read beyond the beginning or end of the chain of records for the current work session. Instead, a record-not-found condition occurs.
3. If a transaction file is not defined in a WSU program, the GETPR, GETPH, GETNR, and GETNH operations cause terminal errors during program generation.

## Removing Trailers and Control Records from the Transaction File

One way to remove trailers and control records from a transaction file is to use the WSU Extract procedure. This procedure is described in Chapter 17.

Another way to remove trailers and control records is to use SUBR22, a subroutine that is provided by RPG II. Refer to the *RPG II Reference Manual* for a description of SUBR22.

## Recovering a Transaction File

The WSU Recover procedure can be used to recover a transaction file. This recovery is usually necessary after a WSU session or WSU program ends abnormally. The procedure can be used to drop problem-causing records from the file or to recover records that were lost when the abnormal end occurred. Refer to Chapter 17 for further information.

## MASTER FILES

A WSU program can read from and write to as many as 20 master files. These files can be direct or indexed. WSU requires an RPG F specification and I specifications that describe each master file. Refer to *Data Dictionary* in this chapter for ways that these specifications can be stored. Chapters 2 and 3 explain the entries that WSU requires on these specifications.

The F specification indicates the physical characteristics of the file (for example, record length and key length) as well as the type of file organization (indexed or direct). The I specifications describe the format of the input records from and output records to a master file.

The GET operation is provided for reading records from a master file; the PUT operation is provided for updating records in a master file; and the PUTN operation is provided for adding records to an indexed master file. Refer to Chapter 9, *C Specification*, for descriptions of these operations.

## Sharing Master Files

A master file can be shared by two or more WSU programs. *Modifying a WSU Generated Procedure* in Chapter 13 describes how you indicate a shared master file.

A WSU program that updates a shared master file should not have any of the following operations coded between reading a record and updating that record:

- PUTS
- MSG
- IMSG
- GET from another file

When one of the preceding operations occurs, protection is removed from the original record read. Another program might read and update the record before this program updates it.

A master file can be updated by two or more display stations using the same WSU program. In this situation, WSU protects the records so that they are updated correctly.

## EXTRACT/CREATE UTILITY AND TRANSACTION FILE CREATE/RECOVER UTILITY

The Extract/Create utility (#TXEX) and the Transaction File Create/Recover utility (#TXCR) are utilities supplied with WSU that offer useful file processing capabilities. The utilities can process WSU transaction files and non-WSU files. The functions of these utilities can be requested by the following procedures. Each procedure has a procedure command that you can use to request the procedure.

Procedure	Procedure Command	Utilities Called
Rebuild	REBLD	#TXEX
Extract	EXTRACT	#TXEX
WSU Extract	WSUTXEX	#TXEX and \$COPY
WSU Create	WSUTXCR	#TXEX, #TXCR, and \$COPY
WSU Recover	WSUTXRV	#TXCR

These procedures can be used to:

- Prepare a WSU transaction file for use by a non-WSU program
- Change file organization
- Create one record chain from several record chains
- Print records with their relative record numbers
- Create a WSU file from a non-WSU file
- Concatenate several transaction files

Chapter 17 describes the procedures and contains examples of using them.

## DISPLAY STATION- AND JOB-LEVEL FIELDS

A WSU program, because it is an MRT (multiple requestor terminal) program, can accept input from many display stations, one display station at a time. The current display station is the one from which the WSU program is accepting input. Only one display station can be current at one time.

WSU uses a field area in main storage that contains all of the fields defined in a WSU program. WSU classifies these fields in the following ways:

- Display station fields
  - Mode level
  - Session level
- Job level fields

Each display station has a set of mode-level and session-level fields that are initialized when a work session is started at the display station. These fields are moved into the field area in main storage when their display station becomes current and moved out of the field area when that display station is no longer current. (See Figure 1-3.)

Session-level fields retain their values when the operating mode changes; mode-level fields are saved and then cleared to blanks and zeros for use during the new operating mode.

Each WSU program has one set of job-level fields. (See Figure 1-3.) These fields do not move to and from the field area in main storage. Instead, they remain in the field area and are available to any active display station.

You can define mode, session, and job-level fields in your WSU program as follows:

Field	Defined On
Mode level	Not explicitly defined on a specification. By default, all fields that are neither session level nor job level become mode level fields.
Session level	RPG I specifications  WSU M specification
Job level	WSU C specification. Job level field names must begin with &.

## LOCAL DATA AREA

A WSU program can read and update the display station local data area. If this data area is defined in the WSU program (via RPG I specifications and an M specification), WSU will automatically read a display station's local data area when the display station signs on and will update this data area when the display station signs off.

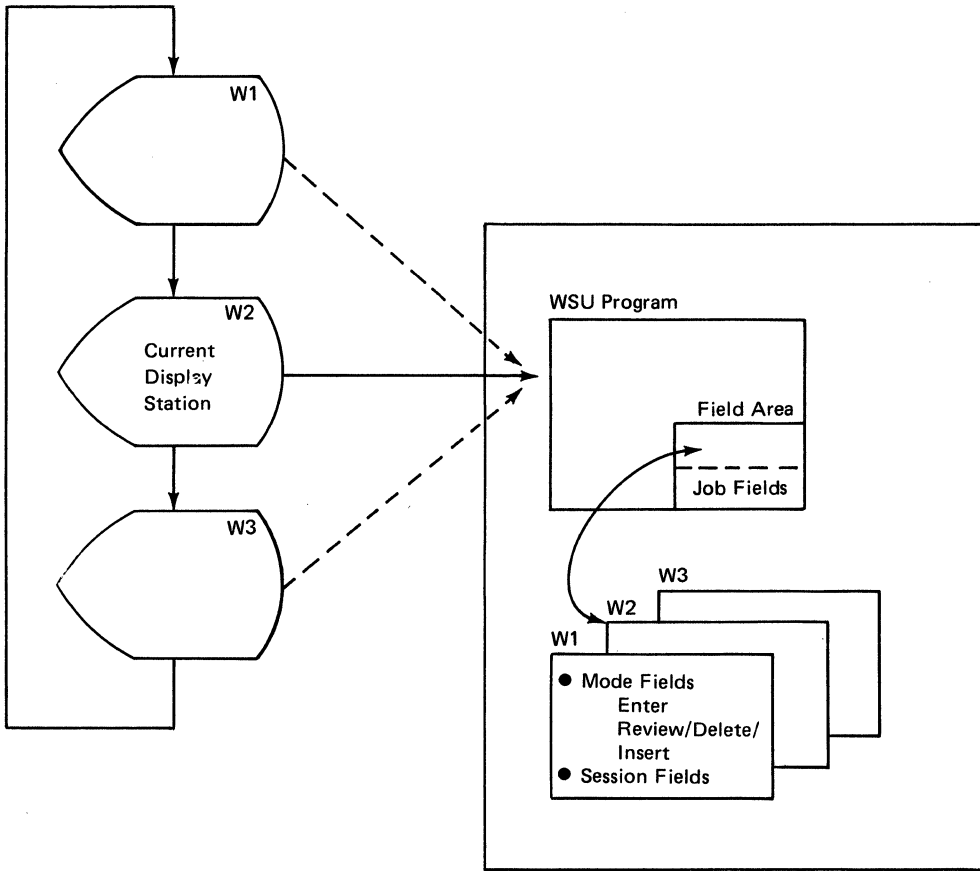


Figure 1-3. Field Area

## MODES OF OPERATION

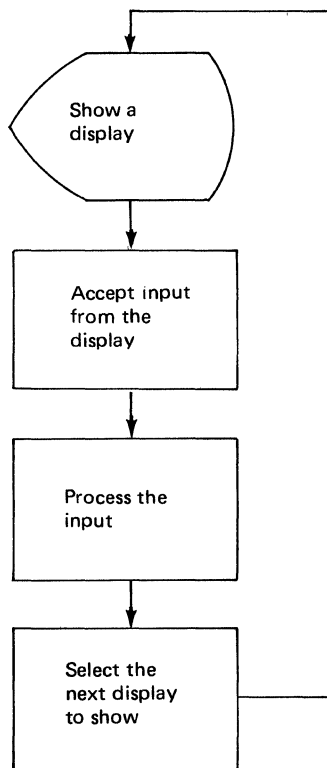
A WSU program can be run in one of four modes: enter, review, insert or delete. In enter mode, the operator adds records to the transaction file. In review mode, records in the transaction file may be viewed and updated by the operator. In insert mode, records can be logically inserted between existing records in the transaction file. In delete mode, records can be logically deleted from the transaction file.

Enter mode is the initial mode of operation. The operator can select alternative modes if the program is coded to allow these modes.

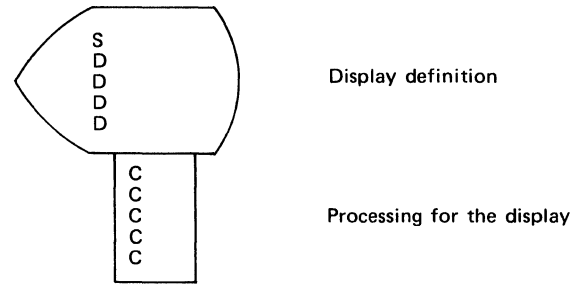
The following explanation of the WSU program cycle and display sequences applies to enter mode. Refer to Chapter 12 for an explanation of review, insert, and delete modes.

## WSU PROGRAM CYCLE

The following diagram shows the basic WSU program cycle:



WSU programming logically fits this cycle because you define a display (via WSU S and D specifications) and then follow this definition with the processing that should occur for the display (via WSU C specifications).



Also, you define the displays and processing in your program in the order that you want the displays to appear.



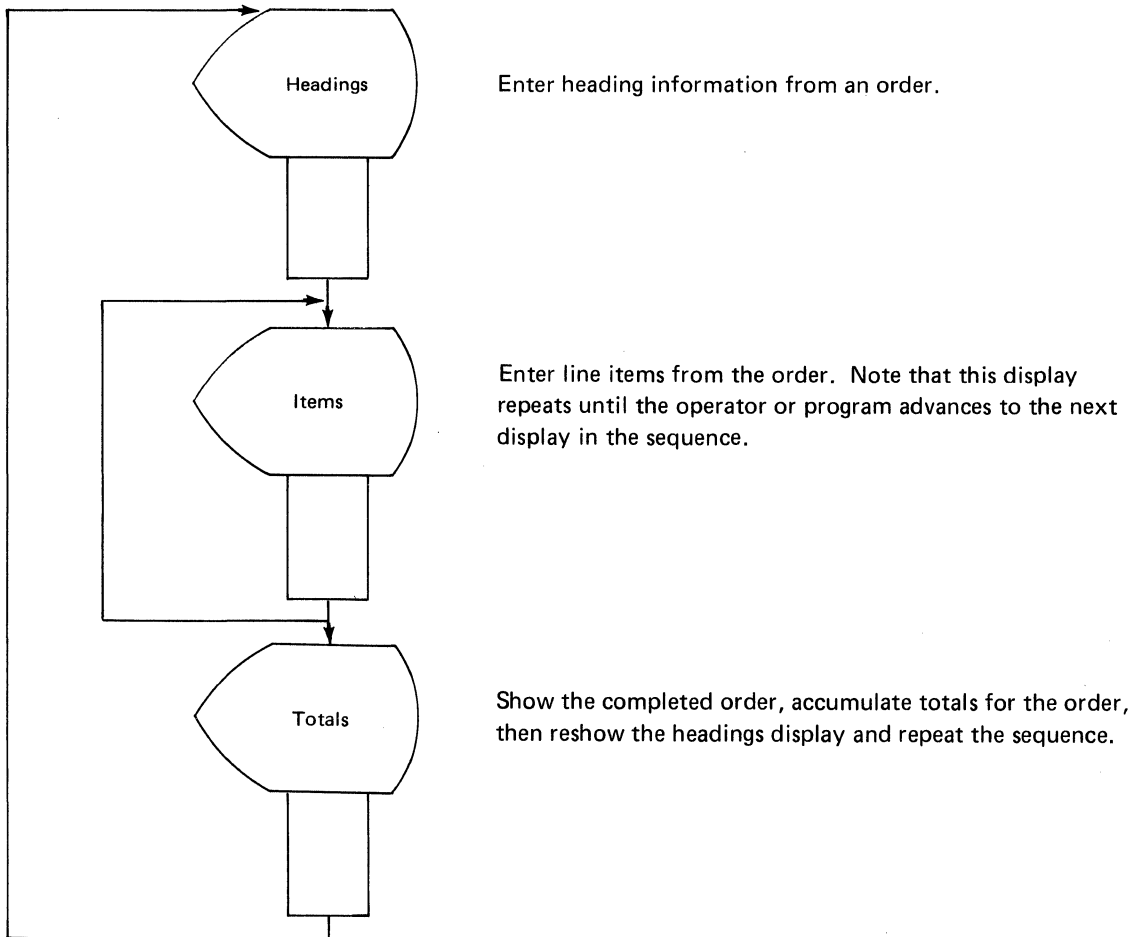
## DISPLAY SEQUENCES

As many as 32 displays are allowed in a WSU program. Displays can be sequenced (grouped in a particular order) so that when one display completes, the next one in sequence is automatically selected. When the last display of the sequence completes, the first display is automatically selected. This automatic selection of displays pertains only to enter mode.

Once in a sequence, a display station stays in that sequence until the operator or the program selects a display that is out of the sequence.

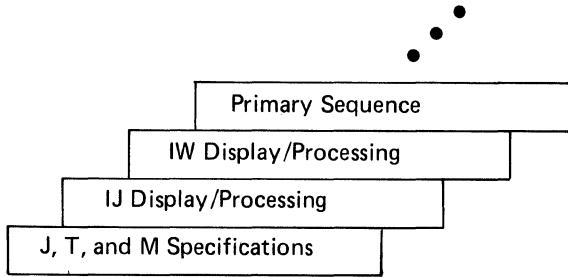
The basic WSU logic cycle does not change when display sequences are used. The cycle is still; show a display, accept input from it, and do the processing associated with the display.

Figure 1-4 shows the three types of display sequences: primary, secondary, and nonsequenced. Columns 41 and 42 of the S specification are used to define these sequences. Refer to the explanation of these columns in Chapter 7 for further coding information.



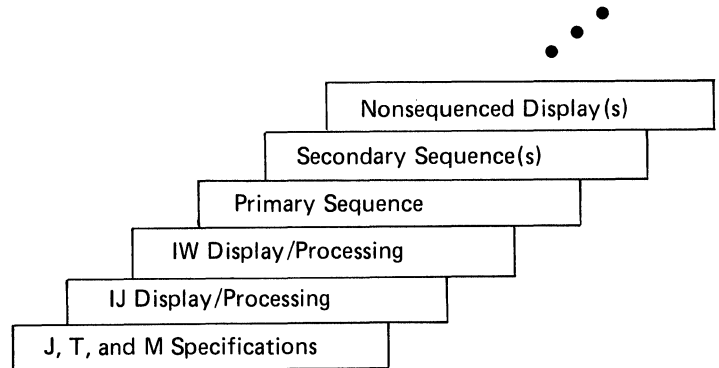
## Primary Sequence

The display sequence that is placed first in the WSU source program becomes the primary sequence. WSU requires one primary sequence per program; this sequence can be as brief as one display. (IJ, IW, EW, and EJ displays, which are explained in *Enter Mode Program Cycle* in this chapter, cannot be included in any sequence of displays.)



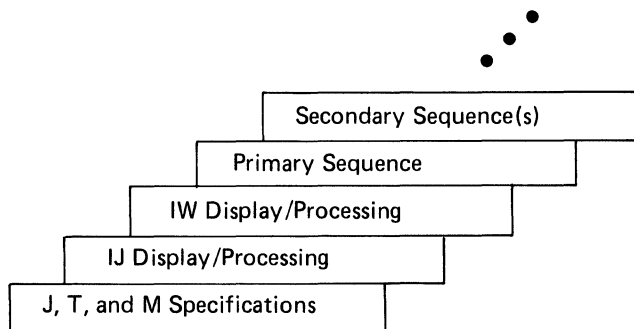
## Nonsequenced Displays

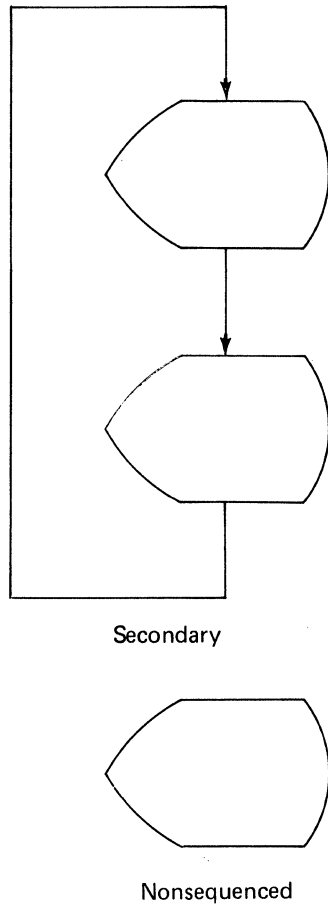
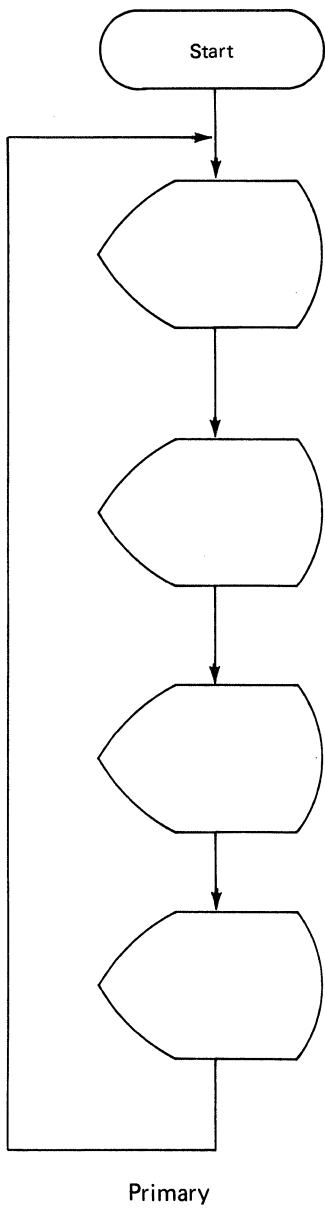
Displays that are not included in the primary sequence or in any of the secondary sequences in a WSU source program are called nonsequenced displays. Nonsequenced displays must follow all sequenced displays in the source program. A program can have a primary sequence and nonsequenced displays with no intervening secondary sequences.



## Secondary Sequences

Sequenced displays that follow the primary sequence in the WSU source program are called secondary sequences. These sequences are optional. Multiple secondary sequences are allowed per program. Secondary sequences must immediately follow the primary sequence in the source program.





*Note:* A display station continues to go through a sequence until the operator or the program requests another sequence.

Figure 1-4. Types of Display Sequences

## ENTER MODE PROGRAM CYCLE

Figure 1-5 shows the enter mode program cycle for one display station. In this figure, IJ, IW, ES, EW, and EJ refer to *WSU processing levels*, which are steps in the cycle that occur automatically at specific times.

IJ (job initiation) occurs once, when the first display station calls the program.

IW (work session initiation) occurs once for each display station, including the first, before processing for that display station begins.

EW (end of work session) occurs when a display station, including the last, ends use of the program.

EJ (end of job) occurs when the last display station ends use of the program.

ES (end of sequence set) occurs when a primary display sequence ends.

For the IJ, IW, EW, and EJ processing levels, the following can be coded:

- One display and associated processing
- One display with no associated processing
- Processing with no associated display

For the ES processing level, only processing can be specified.

Refer to Columns 15-16 (Format ID) in Chapter 7, *S Specification* for an explanation of how to associate a display with a processing level. Refer to Columns 7-8 (Processing Level) in Chapter 9, *C Specification* for an explanation of how to associate processing with a processing level.

**Note:** Coding for each processing level is optional; you need not specify displays or processing for any of them.

The sequence of display selection and processing in enter mode can be modified in two ways: program modification and operator modification.

## Program's Modification of Display Sequences

The program can modify display sequences by using PUTS, MSG, and IMSG operations. Refer to Chapter 9, *C Specification* for explanations of these operations.

Since WSU display selection occurs only after any specified processing completes, the programmer can modify WSU-defined processing by setting the ES, EW, or EJ indicator on.

Setting these indicators on will modify processing in the following ways:

- If the ES indicator is on and it is not ES, EW, or EJ time, ES processing is selected and done.
- If the EW indicator is on and it is not ES, EW, or EJ time, ES processing is selected and done. Upon completion of ES processing, if the EW indicator is on, EW processing is selected and done. Upon completion of EW processing, the work session ends (if the current work session is not the last work session) or EJ processing is selected and done (if the current work session is the last work session).
- If the EJ indicator is on and it is not ES, EW, or EJ time, ES processing is selected and done. Upon completion of ES processing, EW processing is selected and done regardless of the EW indicator setting. Upon completion of EW processing, the following occur:
  - EJ processing is selected and done if the current work session is the last work session.
  - The work session ends if the current work session is not the last work session.

**Note:** The EJ indicator is a job-level indicator. A display station that sets this indicator on and leaves it on until its processing ends affects all other display stations using the same program.

## Operator's Modification of Display Sequences

The operator can modify display sequences by using the Bypass Display command key (command key 2) or by responding to the WSU menu. Refer to Chapter 14, *WSU Command Keys, Function Keys, and Menu*, for descriptions of the keys and WSU menu.

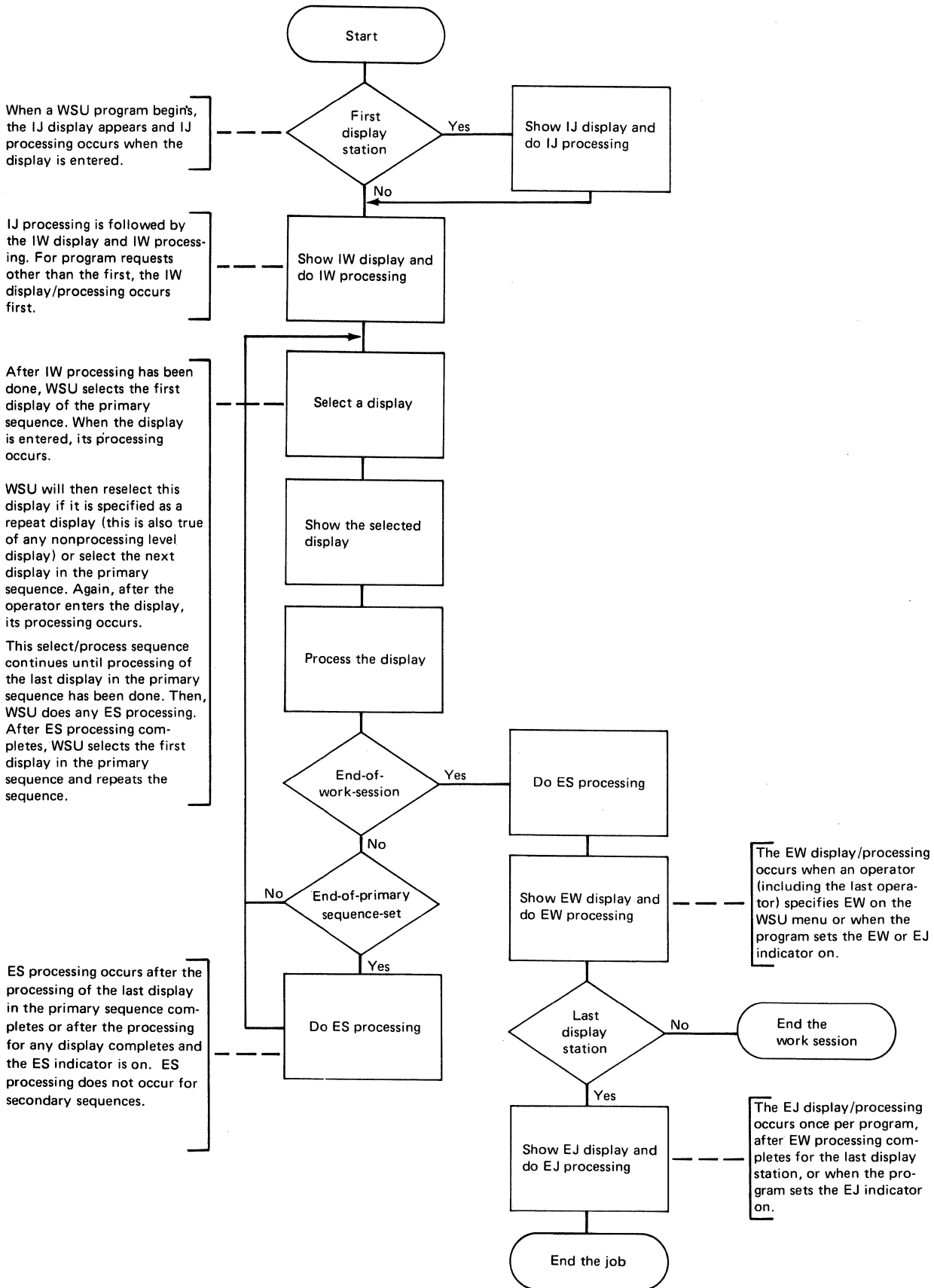


Figure 1-5. Enter Mode Program Cycle

## DATA DICTIONARY

A data dictionary for a WSU program consists of:

- The RPG F specification and I specifications that describe the transaction file
- The RPG F specification and I specifications that describe each master file
- The RPG I specifications that describe local data area fields
- The RPG I specifications that describe session level fields

The T specification in the WSU program is used to indicate which source member contains the F and I specifications for the transaction file. The M specifications in the WSU program are used to indicate which source members contain:

- The F and I specifications for each master file
- The I specifications that describe local data area fields
- The I specifications that describe session level fields

These RPG specifications must be stored in one or more source members that are different from the member that contains the WSU source program. One way to store a data dictionary, as Figure 1-6 shows, is to have one source member that corresponds to each T specification and M specification in the WSU program.

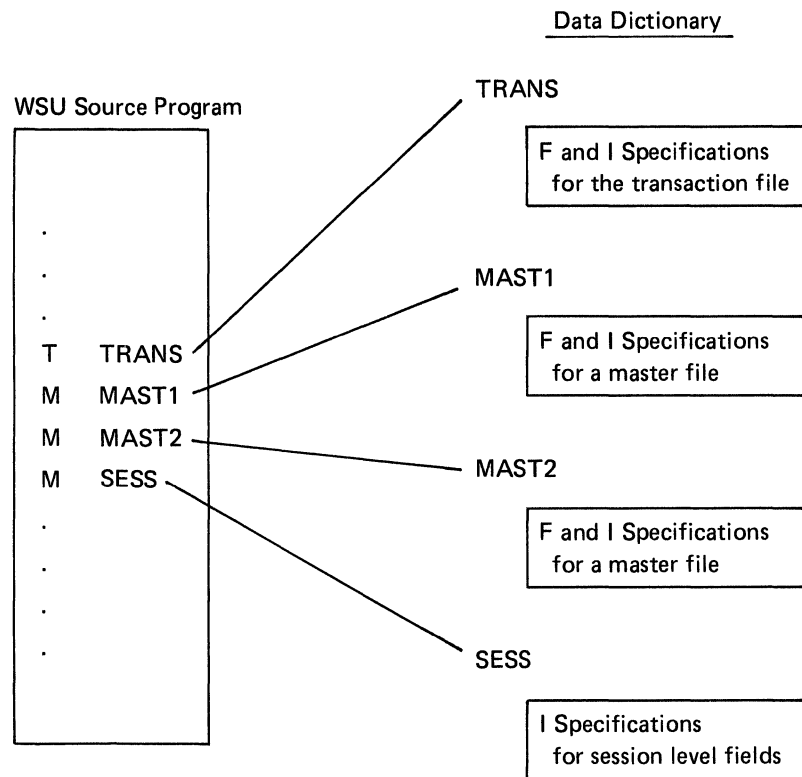


Figure 1-6. A Method of Storing a Data Dictionary

Another way to store a data dictionary is to have one source member contain all of the necessary F and I specifications and be referenced by all of the T specifications and M specifications in the WSU program.

Another way to store a data dictionary is to use two or more source members and have some members contain the F and I specifications for two or more items in the WSU program.

A source member can be an entire RPG II source program. WSU uses only the F and I specifications from that source member.

Refer to Chapter 2, *RPG F Specification* and Chapter 3, *RPG I Specification* for an explanation of entries on F and I specifications.

# WSU SOURCE SPECIFICATIONS

Figure 1-7 shows the required order of WSU specifications in a WSU source program.

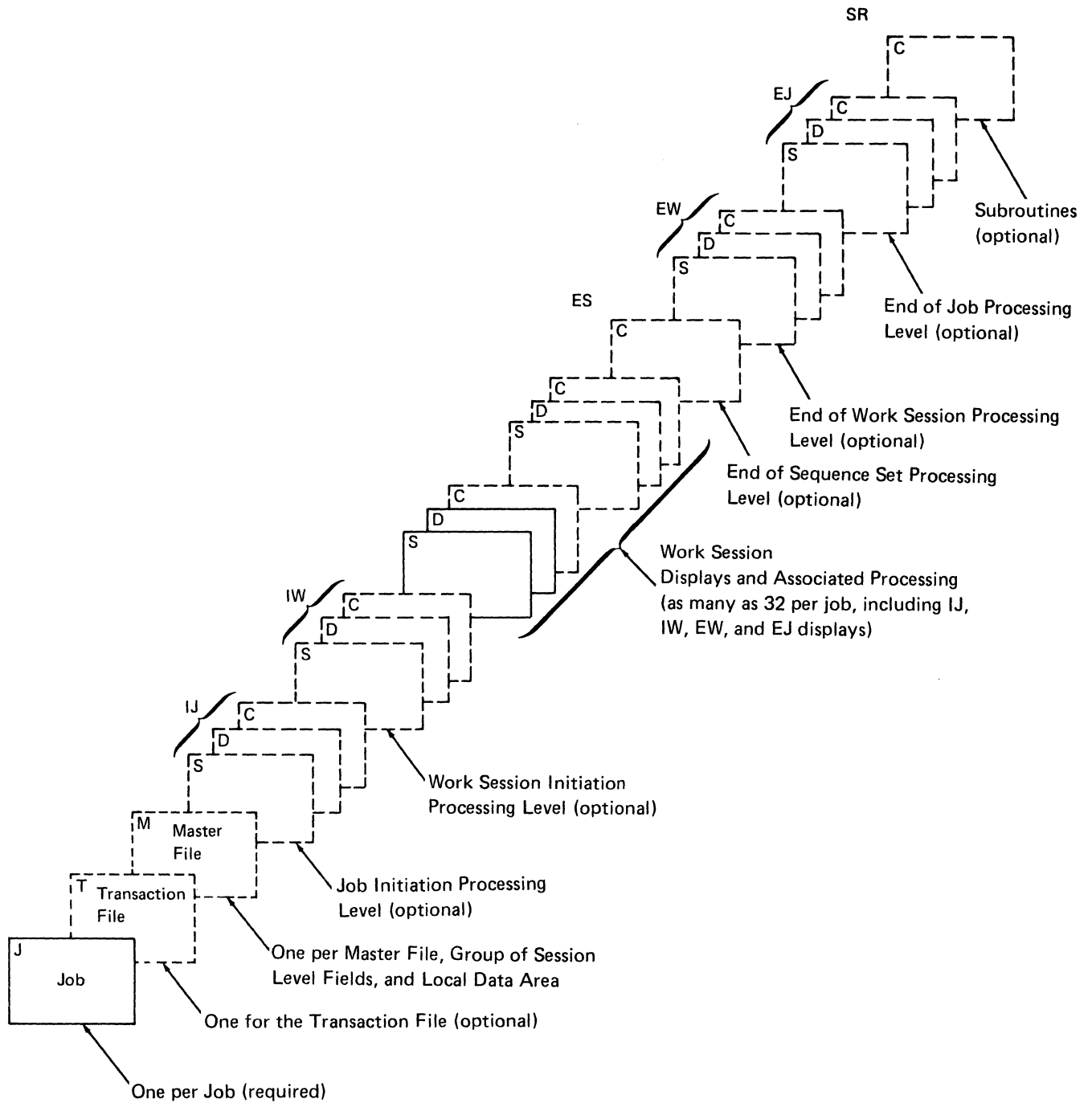


Figure 1-7. WSU Source Program



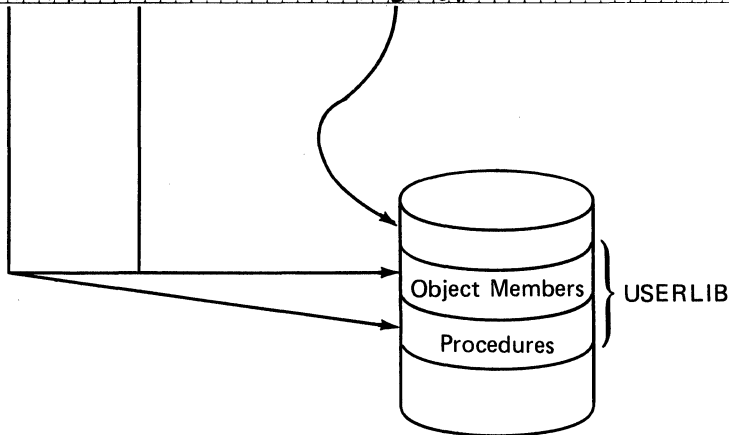
## J (Job) Specification

The J specification, which must be the first in the program, provides the following information that WSU needs during program generation:

- Name of the WSU program and procedure that WSU will generate from the source program
- Name of the load member that will contain display screen formats
- Name of the message member that contains any messages or prompts you reference from your program
- Name of the library that will contain output from program generation
- Maximum number of display stations that you expect will concurrently use the program
- Region size for the program
- Format of the program date
- Editing information for numeric output fields

Chapter 4 explains the entries on the J specification.

Sequence Number	Form Type	Execution Program Name	Format Member Name	Message Member Name	Library Name	Maximum Number of Work Stations	Region Size	Date Edit	Language	White	Reserved
1	J	RAENTRY	RAENTRI		USERLIB	04	10				







### S (Display Screen) Specification

The S specification indicates attributes that apply to the entire display, whereas D specifications that follow an S specification provide detailed information about the data on the display.

The S specification indicates:

- The name of the display, which you can reference via a PUTS operation to cause the display to appear. Refer to the explanation of the PUTS operation in Chapter 9, *C Specification*.
- A processing level for which the display automatically appears or an ID that operators can use to select the display. If you do not code an ID, operators cannot select the display from the WSU menu.
- The starting line number of the display, and number of lines that WSU should clear before the display appears. The starting line number can be variable, which means that its value can be calculated by your program before the display is shown.
- Uppercase or lowercase letters.
- Whether or not processing is specified, the cursor blinks, or the audible alarm sounds.
- The first and last displays in a sequence of displays.
- Whether or not operators can bypass a display.
- Whether or not a display should repeatedly appear.
- The expected frequency of a display.
- If preprocessing should occur for the display. Preprocessing means that WSU begins by doing the processing for a display rather than showing the display to the operators.
- Which records can be shown using the display during review mode and insert mode.
- The command keys and function keys that operators can press for the display.

Chapter 7 explains the entries on the S specification.

Sequence Number	Format Name	Format ID (WSU Only)	Start Line Number	Number of Lines to Clear	Lowercase	Return Input	Reset Keyboard (WSU Only)	Sound Alarm	Enable Function Keys	Enable Command Keys	Blink Cursor	Erase Input Fields	Override Fields	Suppress Input	Reserved	WSU Only												Reserved	Key Mask	Reserved																									
																Enter Mode Sequence						Review Mode Record Identifying Indicators			Insert Mode Record Identifying Indicators																														
																Start	End	Entry Required	Repeat	Reserved	Priority	Preprocess	1	2	3	1	2				3																								
1																41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
S																																																							



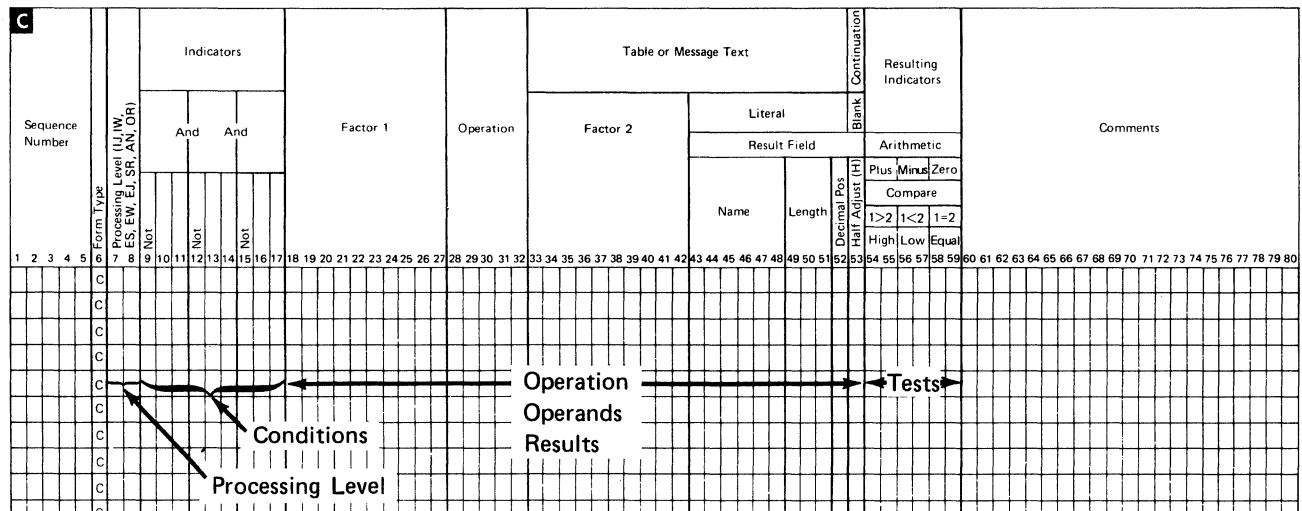
### C (Calculation) Specification

C specifications allow you to code processing for displays, subroutines, and processing levels.

Each C specification has four areas:

- Columns 7-8 specify a processing level for which operations should occur.
- Columns 9-17 specify conditions for which operations occur.
- Columns 18-53 specify operations, operands, and results.
- Columns 54-59 specify the tests made on the results of the operations, and which indicators reflect the results of the tests.

Chapter 9 explains the entries on the C specification.



## CODING RULES AND COMMON ENTRIES

Chapters 2 and 3 describe entries on the RPG F specification and I specification; Chapters 4 through 9 describe entries on the J, T, M, S, D, and C specifications respectively. This section provides coding rules that apply to all of these chapters. See Figure 1-8 for an example of how these coding rules are presented.

Unless indicated otherwise in an explanation:

- Alphameric entries should be left-adjusted, numeric entries should be right-adjusted, and leading zeros are not required.
- An invalid or illogical entry results in a diagnostic message.

### Columns 1-2 (Page) and Columns 3-5 (Line)—RPG II Specifications Only

Page and Line are entries on RPG II coding forms that you can use to number forms and lines. WSU prints but ignores both entries. If you need to make corrections, numbered lines are easier to find and update in a source member.

Use Page to number coding forms from 01 to 99. Use Line to number the lines in ascending order. F specifications have 9 preprinted lines (from 020 to 100 in increments of 10); I specifications have 20 preprinted lines (from 010 to 200 in increments of 10). Therefore, you may not have to code additional line numbers. Use the unnumbered lines at the bottom of a coding form to add or insert lines.

### Columns 1-5 (Sequence Number)—WSU Specifications Only

You can use the sequence number to number lines in a WSU program. WSU prints but ignores sequence numbers. Numbered lines are easier to find and update in a source member if you need to make corrections.

### Column 6 (Form Type)—RPG and WSU Specifications

Column 6 contains a preprinted letter that identifies the type of specification.

F	File description specification
I	Input specification
J	J (job) specification
T	T (transaction file) specification
M	M (master file) specification
S	S (display screen) specification
D	D (display data) specification
C	C (calculation) specification

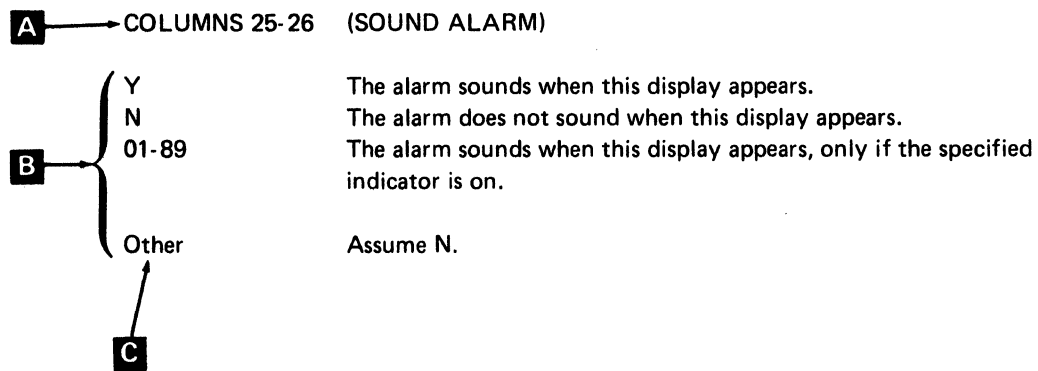
### Column 7 (Comments)—RPG and WSU Specifications

If you want to use entire lines (columns 8–80) to contain comments about sections of your program, code an \* in column 7 of each comment line. Comments can continue to the end of the record in the source member, which may be beyond column 80.

WSU prints but ignores comments. Large numbers of comments however, can downgrade the performance of program generation. Comments do not affect the performance of program execution.

### Columns that Require Y, N, or Indicator Entries—WSU S and D Specifications

The S specification and D specification have two-column entries that can contain Y, N, or a two-digit indicator (for example, the Blink-Field entry in columns 41–42 of the D specification). When you code either Y or N for these entries, the Y or N can be in either column, but WSU moves the Y or N to the leftmost column during program generation.



**A** For each entry, the column or columns are indicated, followed by the name of the entry on the coding form.

**B** Possible entries and their explanations are listed.

**C** Other means all possible entries (including blanks) that are not listed above *Other*.

**Figure 1-8. Sample Description**



## HOW TO GENERATE WSU PROGRAMS

WSU generation begins when the WSU procedure command or the WSU procedure's OCL is entered.

### WSU Procedure Command

Following is the procedure command that begins WSU generation:

WSU source program name,  $\left[ \begin{array}{c} \text{library name} \\ \# \text{LIBRARY} \end{array} \right]$ ,  $\left[ \begin{array}{c} \text{number of blocks} \\ 50 \end{array} \right]$ ,  $\left[ \begin{array}{c} \text{HALT} \\ \text{NOHALT} \\ \text{NOSTOP} \\ \text{REPLACE} \end{array} \right]$ ,

$\left[ \begin{array}{c} \text{LIST} \\ \text{NOLIST} \\ \text{NOLISTS} \\ \text{NOLISTW} \end{array} \right]$ ,  $\left[ \begin{array}{c} \text{PROC} \\ \text{NOPROC} \\ \text{PGM} \end{array} \right]$ ,  $\left[ \begin{array}{c} \text{N} \\ \text{Y} \end{array} \right]$ ,  $\left[ \begin{array}{c} 0 \\ 1 \\ 2 \end{array} \right]$

*source program name:* The name of the member that contains your source program. This name is a required parameter. If you omit it, WSU prompts for it.

*Note:* The T and M specifications in the source program indicate where RPG F and I specifications are stored. The RPG specifications and the WSU program cannot be in the same source member.

*library name:* The name of the library that contains your source program. If the source program is not found in the named library, an error message is issued and generation does not occur.

If the library name is omitted, the system library (#LIBRARY) is used.

*number of blocks:* A number from 1 through 9999 that indicates the number of blocks allocated for a work file. If you omit the number of blocks, WSU allocates 50 blocks for a work file.

*HALT:* If a program-generation terminal error occurs, stop processing and issue a message that requires an operator's reply.

*NOHALT:* If a program-generation terminal error occurs, do not stop processing and do not issue a message to the operator.

*NOSTOP:* A combination of the functions indicated by NOHALT and REPLACE. Processing does not stop for terminal errors, and existing members are replaced automatically with any newly-generated members. If neither NOSTOP nor REPLACE is specified, a message appears for the operator each time a member with a duplicate name is found.

*REPLACE:* Any existing members that have the same name as the generated program, procedure, \$SFGR source member, or \$SFGR object member are automatically replaced by the member created during this generation. If neither REPLACE nor NOSTOP is specified, a message appears for the operator each time a member with a duplicate name is found.

*LIST:* A complete WSU program generation listing is printed. This listing includes heading information, source information, diagnostic information, and \$SFGR information. Figure 1-10 shows all possible contents of a complete listing. The actual contents depend on the values that are specified for the PROC/NOPROC parameter, the value specified for the 0/1/2 parameter, and any errors that occur during program generation.

*NOLIST:* Only diagnostic information (main storage requirements, disk storage requirements, procedure contents if the procedure is newly generated, and diagnostic text) is printed.

*NOLISTS*: Omit \$SFGR information, but include all other information that is printed for the LIST parameter.

*NOLISTW*: Only diagnostic information (main storage requirements, disk storage requirements, procedure contents if the procedure is newly generated, and diagnostic text) and \$SFGR information are printed.

*PROC*: A procedure that calls the WSU program is generated. PROC is the default value when the parameter is omitted.

*NOPROC*: A procedure that calls the WSU program is not generated.

*PGM*: Only the WSU program is generated. A procedure, display screen source, and display screen formats are not generated.

*N*: Do not place the WSU job on the input job queue. N is the default value when the parameter is omitted.

*Y*: Place the WSU job on the input job queue.

*0*: The following sections, if included in program generation output, are printed:

- Heading information
- Source information
- Extended diagnostics
- Undefined indicators
- Multiply-defined field names
- Undefined field names
- Main storage requirements
- Disk storage requirements
- Procedure generated for WSU program execution
- Diagnostic text

Refer to Figure 1-10 for further explanation of this information.

*1*: The following sections, if included in program generation output, are printed:

- All sections listed for option 0
- Indicators used
- Unreferenced indicators
- User message member MICs used
- Mode-level data field names used
- Session-level data field names used
- Job-level data field names used
- Program label names used
- Unreferenced field names

Refer to Figure 1-10 for further explanation of this information.

When the 0/1/2 parameter is omitted, the default value is 1.

*2*: The following sections, if included in program generation output, are printed:

- All sections listed for option 0
- All sections listed for option 1
- Indicator name usage
- Field name and label usages

Refer to Figure 1-10 for further explanation of this information.

## Using the WSU Prompt Display

System/34 provides a prompt display as an alternative means of entering the WSU procedure command and its parameters. This display appears when the WSU procedure command is entered and the first parameter (source program name) is missing or when the HELP WSU command is entered. Those parameters that have been specified on the WSU procedure command are shown on the display. Default values are shown for parameters that have not been specified.

The fourth line of the prompt display allows a WSU job to be placed on the input job queue. This can also be done via the JOBQ operator control command, the JOBQ OCL statement, or the WSU procedure command. (Refer to the *SSP Reference Manual* for descriptions of the JOBQ control command and the JOBQ OCL statement.)

Following are examples of the WSU prompt display:

Procedure Command

Prompt Display

WSU

```
WORK STATION UTILITY
  Allows Creation And Operation Of Interactive Data
  Entry, Data Edit and Data Correction Programs.
Source Program Name ..... _
Library Name ..... #LIBRARY
Stop Option (HALT/NOHALT/NOSTOP/REPLACE/blank) ..... HALT
Place On Input Job Queue (Y/N) ..... N
Print WSU Source (LIST/NOLIST/NOLISTW/NOLISTS) ..... LIST
Number Of Blocks For Work File (1-9999) ..... 50
Generation Option (PROC/NOPROC/PGM) ..... PPOC
Cross Reference Level (0/1/2) ..... 1
```

WSU, TESTLIBR

```
WORK STATION UTILITY
  Allows Creation And Operation Of Interactive Data
  Entry, Data Edit and Data Correction Programs.
Source Program Name ..... _
Library Name ..... TESTLIBR
Stop Option (HALT/NOHALT/NOSTOP/REPLACE/blank) ..... HALT
Place On Input Job Queue (Y/N) ..... N
Print WSU Source (LIST/NOLIST/NOLISTW/NOLISTS) ..... LIST
Number Of Blocks For Work File (1-9999) ..... 50
Generation Option (PROC/NOPROC/PGM) ..... PROC
Cross Reference Level (0/1/2) ..... 1
```

WSU, TESTLIBR,,, NOLIST

```
WORK STATION UTILITY
  Allows Creation And Operation Of Interactive Data
  Entry, Data Edit and Data Correction Programs.
Source Program Name ..... _
Library Name ..... TESTLIBR
Stop Option (HALT/NOHALT/NOSTOP/REPLACE/blank) ..... HALT
Place On Input Job Queue (Y/N) ..... N
Print WSU Source (LIST/NOLIST/NOLISTW/NOLISTS) ..... NOLIST
Number Of Blocks For Work File (1-9999) ..... 50
Generation Option (PROC/NOPROC/PGM) ..... PROC
Cross Reference Level (0/1/2) ..... 1
```

## Output from WSU Program Generation

During program generation, WSU uses the last 18 bytes of the display station's local data area for communicating with \$SFGR. Any user data in these 18 bytes will be lost during generation.

Output from generation consists of:

- A WSU program (subroutine member).
- A procedure that calls the WSU program (unless NOPROC or PGM is specified on the WSU procedure command). This procedure is a multiple-requestor-terminal (MRT) procedure. The first operator that calls it causes the WSU program to run; subsequent operators that call the procedure use the already running procedure. Figure 1-9 shows the contents of this procedure. Refer to *Modifying a WSU Generated Procedure* in Chapter 13, *Additional Topics and Programming Considerations*, for an explanation of changes you can make to a procedure.

Both a WSU program and the procedure that calls the program have the same name that you specify in your source program.

- As many as 32 display screen formats. If PGM is specified on the WSU procedure command, display screen formats are *not* generated.
- A program generation listing. This listing can include heading information, source information, diagnostic information, and \$SFGR information. Figure 1-10 shows all possible contents of a complete listing. The actual contents of this listing depend on the values specified for the LIST/NOLIST/NOLISTS/NOLISTW parameter, the PROC/NOPROC/PGM parameter, the 0/1/2 parameter, and the types of program generation errors that occur.

Chapter 15, *Sample WSU Programs*, contains examples of the output printed during program generation.

Generation output (except printed information) is stored in the library that has been specified on the J specification. If the J specification does not name a library, output is stored in the system library (#LIBRARY).

```

// ATTR NEP-NO, MRTMAX- A
// REGION SIZE- B
// LOAD #WSXII
// FILE NAME- C
// IF DATAFL- C, DISP-OLD
// ELSE DISP-NEW, RECORDS- D
// FILE NAME- E, DISP-OLD ← One FILE statement
// RUN                                     for each master file
// WSX OBJLIBR- F, OBJMBR- G, MSGLIBR- H, MSGMBR- I, FMTLIBR- J, FMTMBR- K, DEBUG- L,
// UNIV- M
// END

```

- A** Maximum number of work stations.
- B** Region size to execute.
- C** Transaction file name.
- D** Number of records for the transaction file.
- E** Master file name.
- F** Name of the library that contains the WSU program (optional).
- G** WSU program name.
- H** Name of the library that contains your message member (optional).
- I** Name of the load member that contains your message member (optional).
- J** Name of the library that contains the display screen formats (optional).
- K** Name of the load member that contains the display screen formats.
- L** Debugging option. DEBUG=YES indicates that debugging operations are done; DEBUG=NO or no DEBUG parameter indicates that debugging operations are ignored (optional).
- M** Universal work session selection authorization. This authorization allows the operator to select a work session ID that is different than the symbolic ID of the display station being used. UNIV=ALL specifies that all display stations are authorized for such unrestricted session selection. UNIV=id specifies the symbolic ID of the only display station from which unrestricted session selection can occur; or it specifies a 2-character alphabetic authorization ID the operator can enter (on the WSU menu EW line) to allow unrestricted session selection from the display station the operator is using.

Figure 1-9. Procedure Generated for a WSU Program

## HEADING INFORMATION

- Release level of WSU
- Date of program generation
- Time of program generation
- Name of the library that contains the WSU source program
- WSU program name (the name of the source member that contains the WSU source program)

## SOURCE PROGRAM INFORMATION

- WSU source statements and data dictionary
  - J specification
  - T, F, and I specifications for the transaction file
  - M, F, and I specifications for each master file
  - M and I specifications for the local data area fields
  - M and I specifications for session level fields
  - S specification
  - D specifications
  - C specifications
  - C specifications in each subroutine in the program

One group of these statements per display

WSU prints a four-digit statement number in front of each source statement. These numbers are referenced in the diagnostic information that follows the source statements. Comment lines, continued lines, F specifications, and unrecognized or out-of-sequence specifications do not have statement numbers.

WSU error message numbers print beneath those source statements that contain errors.

## DIAGNOSTIC INFORMATION

*Note:* All possible diagnostic information is described here. The actual information that is printed is affected by the parameters specified on the WSU command and the types of errors that occur during program generation.

*Extended Diagnostics:* A cross reference list of WSU message numbers and the statement number at which each error occurred. More than one set of extended diagnostics might be included in one listing.

*Indicator Name Usage:* An alphabetical, cross-reference list of indicators used in the program and the statement number at which each indicator appears. An asterisk to the left of a statement number means that the indicator has been defined in one of the following ways:

- The indicator is either set on or set off.
- The indicator is used to define a record type in columns 19-20 of an I specification.
- The indicator is used to define a processing level in columns 7-8 of a C specification.

An asterisk to the right of a statement number means that a record-identifying indicator has been referenced in one of the following ways:

- The indicator is used in columns 54-55 for a put operation on a C specification.
- The indicator is used in columns 48-53 (review mode record identifying indicator) or columns 54-59 (insert mode record identifying indicator) on an S specification.

*Indicators Used:* A list of indicators that have been defined and referenced.

Figure 1-10 (Part 1 of 3). Output Printed during WSU Program Generation

**DIAGNOSTIC INFORMATION (Continued)**

*Unreferenced Indicators:* A list of indicators that have been defined but not referenced.

*Undefined Indicators:* A list of indicators that have been referenced but not defined.

*User Message Member MICs Used:* A list of the MICs that are used in the program.

*Field Name and Label Usages:* An alphabetical, cross-reference list of field names and labels that are used in the program and the statement number at which each name or label appears. An asterisk to the left of a statement number means that the field or label is defined at that statement. An asterisk to the right of a statement number indicates a possible update to a field, and has one of the following meanings:

- The field is a result field on a C specification.
- The field is an input field on a D specification.
- The field is on a field-type I specification for the transaction file.
- The field is on a field-type I specification for a master file that allows record additions.

**DIAGNOSTIC INFORMATION (Continued)**

*Mode-level Data Field Names Used:* An alphabetical list of all the mode-level fields used in the program. For each field, WSU lists the following information:

Column Heading	Field Information
NAME	Field name.
STMT#	The statement number in which the field is first defined, or RSVD if the field is a WSU reserved field.
LNG	The decimal length of the field. An asterisk to the right of the length indicates that WSU assumed an unpacked length for a packed field.
DEC	If the field is numeric, the number of decimal positions; if the field is alphameric, the letter A.
DISP	The hexadecimal displacement of the field into the data area.
LCL	The character U if the field is a local data area field.
F/ICNT	The number of times the field is referenced on all I specifications except session-level and local-data-area I specifications.
SCR	The character D indicates an input or output field on a D specification.
CHN	The character M indicates a chain field.

*Session-level Data Field Names Used:* An alphabetical list of all the session-level fields used in the program. For each field, WSU lists the same type of information that was described previously for mode-level fields.

*Job-level Data Field Names Used:* An alphabetical list of all the job-level fields used in the program. For each field, WSU lists the same type of information that was described previously for mode-level fields.

*Program Label Names Used:* Program labels are those labels defined in columns 18-27 of the TAG, BEGSR, and ENDSR operations. For each label, WSU lists the statement number where the label is initially defined, and the operation, either TAG, BEGSR, or ENDSR, that is used to define the label.

Figure 1-10 (Part 2 of 3). Output Printed during WSU Program Generation



## DIAGNOSTIC INFORMATION (Continued)

*Unreferenced Field Names:* A list of field names that are defined on I specifications or C specifications but not used on M, D, or C specifications.

*Multiply Defined Field Names:* A list of field names that are defined differently on multiple I specifications or C specifications.

*Undefined Field Names:* A list of field names that are referenced on M, D, or C specifications but are not defined on an I specification or a C specification.

*Extended Diagnostics:* A cross reference list of WSU message numbers and the statement number at which each error occurred.

*Main Storage Requirements:* The main storage requirements for WSU program execution.

*Disk Storage Requirements:* The disk storage requirements for the WSU execution program workfile.

*Generated Procedure:* The procedure generated for calling the WSU execution program.

*Diagnostic Text:* The message number, severity, and text for each program generation message.

*Program Generation Completion Message:* A message that indicates whether or not program generation was successful.

## \$\$FGR INFORMATION

*Display Information:*

- S and D specifications generated for \$\$FGR input
- Name of the source member that contains the S and D specifications
- Execution time output buffer for the WSU program
- Execution time input buffer for the WSU program
- Input library name
- Output library name
- Format load member name
- Amount of main storage required for each display screen format

**Figure 1-10 (Part 3 of 3). Output Printed during WSU Program Generation**

## HOW TO USE WSU PROGRAMS

To use a WSU program, an operator enters the name of the program's procedure, which starts a work session for that display station. This work session ends when the operator signs off or selects a different session via the WSU menu, or when the EW or EJ indicator is set on by the program.

During one WSU program execution, several work sessions can be started at different display stations. If this occurs, the WSU program does not end until the last operator using the program signs off.

When the maximum number of operators is using a program, no additional display stations can be attached. If another operator attempts to start a work session, he can do one of the following:

- Wait until one of the attached display stations is released from the program so that his work session can start.
- Press the Attn key, then cancel his request via the Inquiry display.

The first operator who requests a WSU program will wait longer than other operators who request the same program. This is because, for the first request of a program, WSU spends additional time building a work file, opening files, and initializing data areas.

## HOW TO RESTART A WORK SESSION

An operator can restart a session to do additional entry or to review, insert, or delete records in the transaction file. A session can be restarted:

- After an operator successfully ends his work session; this restart is called *resume*.
- After a System/34 error or WSU error occurs that does not allow the operator to successfully end his work session; this restart is called *resume with recovery*.

The resuming and recovering capabilities of WSU programs apply only to WSU programs that define a transaction file.

When a work session ends abnormally, all other work sessions using the program need not end before that work session can resume with recovery.

When an operator restarts a session, WSU sets the RS indicator on for resume and the RC indicator on for resume with recovery. Refer to Chapter 11, *Indicators* for an explanation of these indicators.

For both resume and resume with recovery, internal totals accumulated during a previous execution are not available. Totals may be saved by regularly writing them to a master file. Refer to Chapter 13 for an explanation of saving totals.

When an operator resumes a session, output to the transaction file continues from the point of interruption.

## HOW TO END A WSU PROGRAM

### With the WSU Menu Display

To end a WSU program, you can display the WSU menu by pressing command key 1; then take the EW option as shown in the following:

```
X1          ***** WORK STATION UTILITY MENU DISPLAY *****
ENTER DISPLAY SELECTION IDENTIFIER -----
ENTER EW TO END WORK SESSION ----- EW
ENTER SESSION SELECTION IDENTIFIER FOR RESTART -----
ENTER REVIEW RECORD NUMBER ----- 000000
OR USE COMMAND KEY 1 to RESUME...
X1          000000 --
```

### With the Inquiry Display

Ordinarily, you should not use the inquiry display to end a WSU program because the last records in a chain in the transaction file might not be updated. However, a WSU program can be terminated by pressing the Sys Req/Attn key. This method of ending a WSU program causes the system to display the inquiry display prompt:

```
INQUIRY OPTIONS          INTERRUPTED JOB: X1084332          X1
0. RESUME INTERRUPTED JOB.
1. REQUEST COMMAND DISPLAY.
2. RELEASE DISPLAY STATION AND CONTINUE WITH NEXT JOB STEP.
3. RELEASE DISPLAY STATION AND CANCEL REMAINING JOB STEPS.
5. DISPLAY SESSION STATUS.

ENTER NUMBER TO SELECT OPTION OR ENTER MSG CONTROL COMMAND.
```

When you select option 2 or 3, processing of a WSU program is suspended. A termination message (SYS-0803) is then sent to the system console.

## Chapter 2. RPG F Specification

A WSU program's data dictionary must contain RPG File Description (F) specifications that describe the transaction file and master files used. Refer to *Data Dictionary* in Chapter 1, *Introduction*, for a description of how to supply the F specifications.

This chapter describes only the F specification entries used during generation. For a description of all entries you can code on F specifications, refer to the *RPG II Reference Manual*.

Chapter 15 contains sample programs for which F specifications have been coded, and Appendix A provides a summary of entries required by WSU on an F specification.

### FILE DESCRIPTION (F) SPECIFICATION ENTRIES REQUIRED FOR WSU

Figure 2-1 shows the F specification coding form.

For a transaction file, WSU checks:

- Columns 7-14 (File Name)
- Column 15 (File Type)
- Columns 24-27 (Record Length)

Other F specification entries are ignored.

For a master file, WSU checks:

- Columns 7-14 (File Name)\*
- Columns 15 (File Type)\*
- Columns 24-27 (Record Length)\*
- Columns 29-30 (Length of Key Field)\*\*
- Column 31 (Record Address Type)\*\*
- Column 32 (Type of File Organization)\*
- Columns 35-38 (Key Field Starting Location)\*\*

\*Required for all master files

\*\*Required only for indexed master files



## COLUMNS 7-14 (FILENAME)

### Transaction File

The file name is a required entry and specifies the name of the transaction file. No two files in the program can have the same name. The file name can be from one to eight characters, and must be left-adjusted. The first character must be alphabetic; the remaining characters must be alphameric. Embedded blanks are not allowed.

### Master File

The file name is a required entry and specifies the name of a master file. No two files in the program can have the same name. The file name can be from one to eight characters, and must be left-adjusted. The first character must be alphabetic; the remaining characters must be alphameric. Embedded blanks are not allowed.

## COLUMN 15 (FILE TYPE)

I	Input file. (Ignored by WSU)
U	Update file. (Ignored by WSU)
Other	WSU ignores other entries, issues a terminal-error message, and does not produce an execution program.

### Transaction File

Because WSU treats the transaction file as a direct output file, you are not required to code an entry for the file type. If you use the F specifications from existing RPG II programs that contain a file type entry, WSU ignores this entry. But if you plan to use the F specifications written for a WSU program in a future RPG II program, you can code the file type entry now. In this case, when the WSU program is used, WSU will ignore the column 15 entry.

### Master File

WSU uses either an I or U when you define a master file. To WSU, a master file is an update file if a PUT operation occurs for the file or an input file if a PUT operation does not occur for the file. Should these same specifications be used in an RPG II program, the I or U will have meaning to that program.

## COLUMNS 16-23

Entries in columns 16-23 are not required. WSU ignores these entries.

## COLUMNS 24-27 (RECORD LENGTH)

### Transaction File

14 to n Length (in bytes) of the records in the file. The maximum record length (n) is 4096. This entry must be right-adjusted. Leading blanks or zeros are allowed. The record length for a transaction file must include 13 bytes for the trailer. However, data cannot be specified in these last 13 bytes of the records.

Blank WSU assumes a 256-byte record length, continues processing the specifications, issues a terminal-error message for the blank record length, and does not produce an execution program because of the error.

### Master File

1 to n Length (in bytes) of the records in the file. The maximum record length (n) is 4096. This entry must be right-adjusted. Leading blanks or zeros are allowed.

Blank WSU assumes a 256-byte record length, continues processing the specifications, issues a terminal error for the blank record length, and does not produce an execution program because of the error.

## COLUMN 28

An entry in column 28 is not required. WSU ignores an entry in this column.

**COLUMNS 29-30 (LENGTH OF KEY FIELD)**

This entry applies only to indexed master files.

- 1 to n Length (in bytes) of the record key. For a packed key, the maximum length (n) is 8. For all other keys, the maximum length (n) is 29. The key length must be right-adjusted. Leading blanks or zeros are allowed.
- Blank Columns 29-30 must be blank for a direct file.
- Other WSU assumes 3, issues a terminal-error message, and does not generate a program.

**COLUMN 31 (RECORD ADDRESS TYPE)**

This entry applies only to indexed master files.

- P Packed decimal record key.
- A Alphameric record key.
- Other WSU assumes A.

**COLUMN 32 (TYPE OF FILE ORGANIZATION)**

This entry applies only to master files.

- I Indexed file organization.
- Other Assume a direct file organization.

**COLUMNS 33-34**

An entry in columns 33-34 is not required. WSU ignores an entry in these columns.

**COLUMNS 35-38 (KEY FIELD STARTING LOCATION)**

This entry applies only to indexed master files.

- 1 to n Starting position of the key in each record of an indexed master file. The entry must be right-adjusted. Leading blanks or zeros are allowed. The maximum value (n) is the record length. The key's starting location plus the key's length minus one cannot exceed the record length.
- Other WSU assumes 1, issues a terminal-error message for the invalid starting location, and does not generate a program because of the error.

Note: This entry must be blank for a direct file.

**COLUMNS 39-80**

Entries in columns 39-80 are not required. WSU ignores entries in these columns.

## Chapter 3. RPG I Specification

A WSU program's data dictionary must contain RPG Input (I) specifications for the transaction-file fields, master-file fields, local-data-area fields, and session-level fields that are used in the program.

Figure 3-1 shows the I specification. An I specification can have two types of lines: record lines and field lines. Record lines use columns 7-42. Columns 43-58 must be blank. Field lines use columns 43-58. Columns 7-42 must be blank.

This chapter explains the entries on the I specification. Examples of coded I specifications are at the end of this chapter and in Chapter 15. Appendix A provides a summary of the entries on the I specification.

WSU checks the following entries for transaction files and master files:

- Columns 7-14 (File Name)
- Columns 14-16 (AND/OR)
- Columns 19-20 (Record Identifying Indicator)
- Columns 21-41 (Record Identification Codes)
- Column 43 (P/B/L/R)
- Columns 44-51 (Field Location)
- Column 52 (Decimal Positions)
- Columns 53-58 (Field Name)

WSU checks the following entries for session-level fields and local-data-area fields:

- Columns 7-14 (File Name)
- Column 43 (P/B/L/R)
- Columns 44-51 (Field Location)
- Column 52 (Decimal Positions)
- Columns 53-58 (Field Name)

This section explains these entries. For an explanation of other valid RPG entries on the I specification, refer to the *RPG II Reference Manual*.





## COLUMNS 7-14 (FILENAME)

This entry specifies a unique name for a file or data area. The name must begin in column 7 with an alphabetic character, which can be followed by zero to seven alphanumeric characters.

An entry in columns 7-14:

- Must be the same name that is in columns 7-14 of an F specification (unless the I specifications describe session-level fields or local-data-area fields)
- Must be the same name that is in columns 7-14 of an M or T specification
- Must precede the associated field lines
- Can be omitted when multiple record types are defined for the same file, but must be coded for the first record type (This restriction does not apply to I specifications that describe session-level fields or local-data-area fields.)

## COLUMNS 14-16 (AND/OR)

**AND/OR** Use AND/OR lines to indicate a relationship between record types. For a further explanation of this entry, see the description of columns 21-41 and 53-58 of the I specification in this chapter.

**Other** WSU ignores entries other than AND or OR. For example, if you are using I specifications from an RPG II program, or if you code the I specifications so that a follow-on RPG II program can use them, columns 15-16 can contain characters or numbers that sequence record types. Refer to the *RPG II Reference Manual* for a description of the sequence entry.

## COLUMNS 17-18

Entries in columns 17-18 are not required. WSU ignores entries in columns 17-18.

## COLUMNS 19-20 (RECORD IDENTIFYING INDICATOR)

**01-89** Record type indicator. This two-digit entry assigns an indicator to a record type. Record type indicators must be unique within a file. The indicator turns on when WSU reads the record type. *The indicator turns off when WSU reads a record from the same file with a different record type.*

When WSU cannot match the type of the record read with any of the record types on the I specifications for the file, or when WSU tries to read beyond the start or the end of a chain of records, a not-found condition occurs.

You can code not-found indicators in columns 49-50 of the T specification and M specifications and columns 54-55 of the GET, GETNH, GETNR, GETPH, and GETPR operations.

WSU does not allow entries of 90-99 in columns 19-20. These indicators are reserved for use by WSU.

Columns 19-20 must be blank on a continued I specification (line 02 of the I specification in Figure 3-4).

To distinguish an unidentified record from an end-of-chain condition, you can specify a catchall record line. The catchall indicator should be on the last record line on the I specification. This indicator turns on if a record is read that cannot be identified by any of the preceding record identification codes. Figure 3-2 shows an example of a catchall indicator.

### COLUMNS 21-27, 28-34, AND 35-41 (RECORD IDENTIFICATION CODES)

These entries describe a record type. Each I specification record line contains one, two, or three sets of record identification codes, each with the following subentries:

- Position (columns 21-24, 28-31, and 35-38)
- Not (columns 25, 32, and 39)
- C/Z/D (columns 26, 33, and 40)
- Character (columns 27, 34, and 41)

**Notes:**

1. WSU does not automatically place a record identification code into a record when you write the record with a PUT operation. If you want to write a code in each record, define a field for the code on the I specification, then move a value into this field before each PUT operation or have the operator enter a value into this field.
2. The last set of record identification codes should be the last information coded on that line (columns 42-80 should be blank).
3. Columns 14-16 and 21-41 should be blank if there is only one record type in the file, or if you want all record types processed the same way.
4. If the program is to be used with the WSU Create Procedure (WSUTXCR) to build a transaction file, at least one test for each record type in the transaction file must *not* be satisfied by a blank record.

Line	Form Type	Filename	Sequence		Number (I/N)	Option (O/U)	Record Identifying Indicator ... or DS	Record Identification Codes																																
			O	R				1			2																													
								Position	Not (N)	C/Z/D	Character	Position	Not (N)	C/Z/D	Character																									
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41		
0 1	I	TRANS			AA	01		96	C1																															
0 2	I																																							
0 3	I																																							
0 4	I				BB	02		96	C2																															
0 5	I																																							
0 6	I																																							
0 7	I																																							
0 8	I				CC	03		96	C3																															
0 9	I																																							
1 0	I																																							
1 1	I				DD	04																																		
1 2	I																																							
1 3	T																																							

Figure 3-2. Example of a Catchall Indicator

**Columns 21-24, 28-31, 35-38 (Position)**

- 1 to n      Location in the record of the record identification character. Entries must be numeric and right adjusted. The maximum enterable position, n, is the length of the records for a master file and the length of the records minus 13 for the transaction file. If this entry exceeds the maximum length, WSU assumes that the record identification character is the last character in the record.
- Blank      Record identification character not specified.

**Columns 25, 32, 39 (Not)**

- N            The specified position in the record does not contain the character in column 27, 34, or 41.
- Blank      The specified position in the record does contain the character in column 27, 34, or 41.
- Other      Assume N.

**Columns 26, 33, 40 (C/Z/D)**

- C            The entire character in column 27, 34, or 41 is the record identification character.
- Z            The zone portion of the character in column 27, 34, or 41 is the record identification character.
- D            The digit portion of the character in column 27, 34, or 41 is the record identification character.
- Other      Assume C.

This entry indicates which portion of the character in column 27, 34, or 41 is used as the record identification character. Many characters have either the same zone portion or digit portion. Figure 3-3 shows characters that have identical zone portions or digit portions.

**Columns 27, 34, 41 (Character)**

This entry specifies an alphabetic character, special character, or digit as the record identification character.

Character Grouping by Zone or Digit: When selecting characters for record identification by a digit or zone only, WSU selects all characters having the same zone or digit. When reading characters, WSU converts each character into an 8-bit code and then tests this 8-bit code to see if the character meets the requirements of the record identification character in the I specification. Figure 3-3 lists the character groupings by zone and by digit.

As an example, a digit-only entry (D) in column 26 and an A in column 27 cause WSU to select all records with a / (slash), A, a, J, j, or 1 in the specified column. Using the same letter A but now selecting records on a zone-only basis (a Z entry in column 26), WSU selects all records with & and letters A through I in the specified column.

Character Grouping by Zone (Z)	
Zone = 4  blank ¢ . < ( + 	Zone = 8 a b c d e f g h i
Zone = 5  ↑  \$ * ) ; ]	Zone = 9 j k l m n o p q r
Zone = 6  / (comma) % (underscore) > ?	Zone = A s t u v w x y z
Zone = 7  : # @ (apostrophe) = ≠	Zone = C & A B C D E F G H I

Character Grouping by Zone (Z)
Zone = D - (minus) } J K L M N O P Q R
Zone = E S T U V W X Y Z
Zone = F 0 1 2 3 4 5 6 7 8 9

Character Grouping by Digit (D)	
Digit = 0 blank & - (minus) ] 0	Digit = 8 H h Q q Y y 8
Digit = 1 / A a J j 1	Digit = 9 l i R r Z z 9
Digit = 2 B b K k S s 2	Digit = A ¢ ↑ :
Digit = 3 C c L l T t 3	Digit = B . \$ , #
Digit = 4 D d M m U u 4	Digit = C < * % @
Digit = 5 E e N n V v 5	Digit = D ( ) (underscore) (apostrophe)
Digit = 6 F f O o W w 6	Digit = E + ; > =
Digit = 7 G g P p X x 7	Digit = F   ] ? ≠

Figure 3-3. Characters with the Same Zone and Digit Portions

### AND Relationship

You can code a maximum of three record identification characters on one specification line. If the identification code consists of more than three characters, you can use an AND line. This means that the first three identification characters are described on the first line. Additional identification characters are described on following lines by coding AND in columns 14-16 to indicate the continued lines.

Figure 3-4 shows a record identification code consisting of five characters. The first character is in position 1, the other four characters are in positions 93, 94, 95, and 96. Since you can code only three identifying characters on one line, code the word AND on the next line to indicate that the last two characters of the code are part of the preceding record identification entries.

You can code a maximum of 20 AND lines to describe the record identification code for a record, if you code no OR lines. The record must contain all the characters indicated as record identification characters before the record identifying indicator turns on.

### OR Relationship

A particular record type can be identified by two or more different codes. You can code OR lines to indicate which of the codes can be present to identify the record. You can code a maximum of 20 OR lines for each record, if you code no AND lines. Also, you can use OR lines to specify a second type of record that has different record identification codes, but the same fields.

Figure 3-5 shows the use of an OR line to describe record identification codes. The type-12 record is identified by either of two different codes: a code consisting of a 5 in position 1 and a 6 in position 2, or a code consisting of a 6 in position 1.

Note: If AND lines and OR lines are combined, the total number of such lines for one record type cannot exceed 20.

### COLUMN 42

An entry in column 42 is not required. WSU ignores an entry in this column.

Line	Form Type	Filename	Record Identification Codes			Field Location		Field Name	Field Indicators		
			Position	Character	Position	Character	From		To	Plus	Minus
01	I	PAYROLL BC	12	1	93	5					
02	I	AND		95	96	94					

Figure 3-4. Example of AND Line

Line	Form Type	Filename	Record Identification Codes			Field Location		Field Name	Field Indicators		
			Position	Character	Position	Character	From		To	Plus	Minus
01	I	PAYROLL BC	12	1	93	5					
02	I	OR		1	93	6					

Figure 3-5. Example of OR Line

## COLUMN 43 (P/B/L/R)

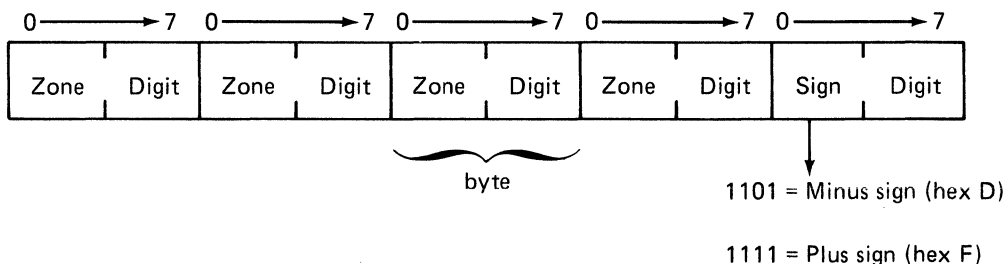
- P Packed decimal numeric field. The maximum length of a packed decimal numeric field is 8 bytes.
- B Binary field. The field must have a length of either 2 or 4 bytes.
- L/R WSU issues a warning message, and does no further checking of this specification's entries.
- Blank Zoned decimal numeric field, or alphameric field.
- Other WSU issues a terminal-error message and assumes blank.

Use column 43 to indicate that a numeric field is in packed decimal or binary format. Only disk files support packed decimal or binary fields. Numeric data fields in packed decimal or binary format are converted by the system to the zoned decimal format before they are processed. This conversion ignores decimal points.

Note: If P or B is specified for a local data area field or a session-level field, WSU issues a terminal-error message and assumes blank.

### Zoned Decimal Format (Blank)

In zoned decimal format each byte of storage contains 1 decimal number. In the zoned decimal format, each byte of storage is divided into a 4-bit zone portion and a 4-bit digit portion. The zoned decimal format looks like this:



Note: WSU does not perform data verification on numeric data. The value of the digit portion of a character is assumed to be the numeric value of that character.

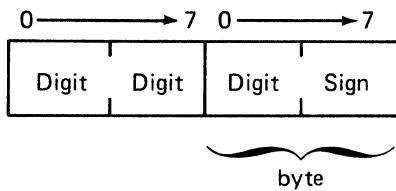
The zone portion of the low-order byte indicates whether the decimal number is positive or negative. In zoned decimal format, each digit in a decimal number includes a zone portion; however, only the low-order zone portion serves as the sign. Figure 3-6 shows the zoned decimal format of a number in storage.

Once data is read into the computer, it must be represented in the zoned decimal format before it can be processed. Thus, data can be stored on disk and read into the computer in the zoned decimal format, thereby eliminating the need to convert the field. However, storing numeric data (decimal numbers) on disk in either the packed decimal or the binary format provides more efficient use of disk storage space.

### Packed Decimal Format (P)

In packed decimal format each byte of disk storage (except for the low-order byte) contains two decimal numbers. Because many of the fields in a disk file contain decimal numbers, you can conserve disk space by storing these fields in the packed decimal format.

In the packed decimal format, each byte of disk storage, except the low-order byte, is divided into two 4-bit digit portions. The rightmost portion of the low-order byte contains the sign (plus or minus) for that field. The packed decimal format looks like this:



The sign portion of the low-order byte indicates whether the numeric value represented in the digit portions is positive or negative. In the packed decimal format, the sign is included for each decimal number; however, the zone portion is not given for each digit in the number. Compare how the decimal number 8191 is represented in packed decimal format with its zoned decimal representation shown in Figure 3-6.

Because data must be represented in zoned decimal format to be processed by the computer, you must give the WSU program an indication when input fields are in another format. Entering a P in column 43 indicates that the input field is in the packed decimal format and that the system must convert this field to the required zoned decimal format.

When a packed decimal field is converted to a zoned decimal field, the zoned decimal field always contains an odd number of bytes. If a zoned decimal field with an even number of bytes is converted to a packed decimal field and then converted back to a zoned decimal field, the resulting zoned decimal field also contains an odd number of bytes.

Packed fields can be up to 8 bytes long. The following chart shows the packed equivalents for zoned decimal fields up to 15 bytes long:

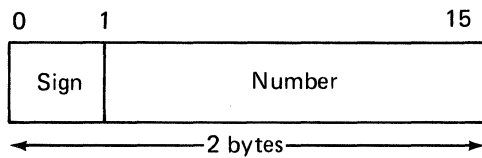
Zoned Decimal Length in Bytes	Packed Length in Bytes
15	
14	8
13	
12	7
11	
10	6
9	
8	5
7	
6	4
5	
4	3
3	
2	2
1	1



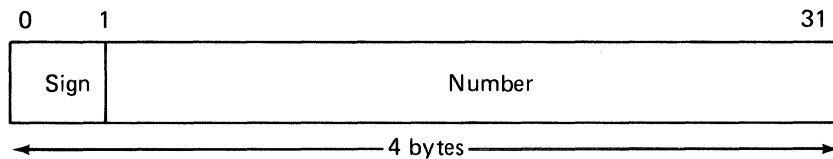
## Binary Format (B)

The binary format allows you to save even more disk storage space than you can save using the packed decimal format. In the binary format, each field on disk must be either 2 or 4 bytes long.

Each 2-byte binary field consists of a 1-bit sign followed by a 15-bit numeric value. In binary format, a decimal number as high as 9,999 requires only 2 bytes of disk storage. For each 2-byte binary field stored on disk, the WSU compiler automatically sets aside 4 bytes of storage to accommodate the field when it is converted to zoned decimal format. A 2-byte field in binary format looks like this:



Each 4-byte binary field consists of a 1-bit sign followed by a 21-bit numeric value. In binary format, a decimal number as high as 999,999,999 requires only 4 bytes of disk storage. For each 4-byte binary field stored on disk, the WSU compiler automatically sets aside 9 bytes of storage to accommodate the field when it is converted to a zoned decimal format. A 4-byte field in binary format looks like this:

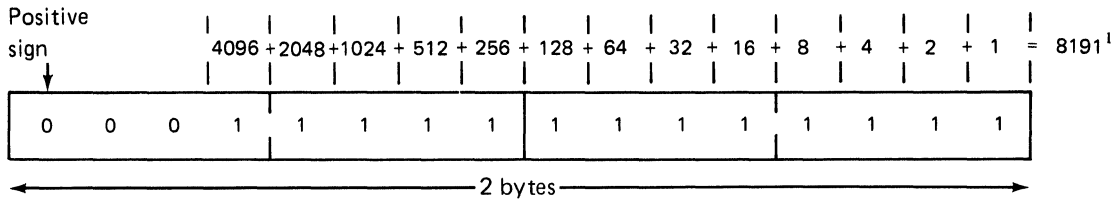


In each case, the sign portion of the high-order byte indicates whether the numeric value is positive (sign bit off) or negative (sign bit on). Positive numbers are represented in true binary notation with a zero sign bit. Negative numbers are represented in two's complement notation with a one sign bit. The bits between the sign position and the leftmost significant bit of the integer are always the same as the sign bit. When the number is positive, these bits are zeros; when the number is negative, all these bits are ones.

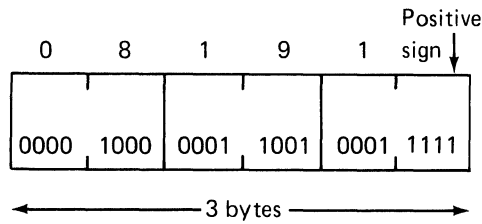
Notice that, in the binary format, the zone position of the decimal number is not given. Compare how the decimal number 8191 is represented in binary format with packed and zoned decimal representation (see Figure 3-6).

Because data must be represented in zoned decimal format to be processed by the computer, you must give the WSU program an indication when input fields are in another format. Entering a B in column 43 indicates that the input field is in the binary format and that the system must convert this field to the required zoned decimal format.

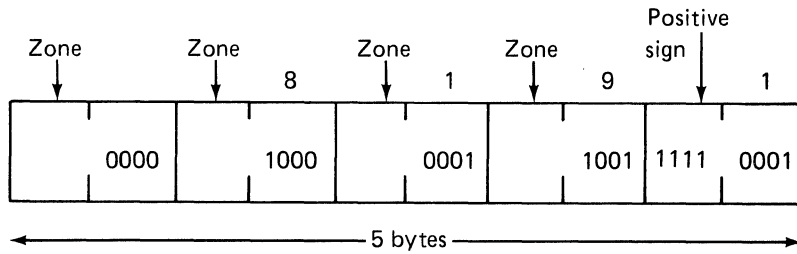
**Binary Format:**



**Packed Decimal Format:**



**Zoned Decimal Format<sup>2</sup>**



To obtain the numeric value of a positive binary number, add the values of the bits that are on (1); the sign bit is not included. To obtain the numeric value of a negative binary number, add the values of the bits that are off (0) plus one; the sign bit is not included.

If 8191 is read into storage as a zoned decimal field, it occupies 4 bytes. However, if it is converted to packed decimal format, it occupies 3 bytes; then when it is converted back to zoned decimal format, it occupies 5 bytes.

**Figure 3-6. Binary, Packed Decimal, and Zoned Decimal Representation of 8191**

## COLUMNS 44-51 (FIELD LOCATION)

This entry has two subentries:

- Columns 44-47 (From) contain the position in which the field named in columns 53-58 begins.
- Columns 48-51 (To) contain the position in which the field named in columns 53-58 ends.

Two fields in the same record type may occupy the same area in the record. Since WSU moves data to the output area in the same order that the data was defined on input specifications, fields that define the same location will overlay one another. When an output operation occurs for that record type, the record will have the value of the last field.

For a master file, if the To entry exceeds the record length, WSU assumes that the To entry is the record length. For the transaction file, if the To entry exceeds the record length minus 13, WSU assumes that the To entry is the record length minus 13 (13 positions are reserved for the trailer).

The From and To entries must be right-adjusted. The From entry must be less than or equal to the To entry. If the From or To entry is not numeric or is not right-adjusted, WSU assumes 1 for both entries.

Maximum field lengths are as follows:

- 15 for a zoned decimal numeric field. If the field is longer than 15 digits, WSU assumes 15.
- 8 for a packed numeric field. If the field is longer than 8 digits, WSU assumes 8.
- 4 for a binary field. If the field is longer than 4 bytes, WSU assumes 2.
- 256 for an alphameric field. If the field is longer than 256 characters, WSU assumes 256.

**Note:** The field location entry (columns 44-51) is required for a field line on an I specification.

## Columns 44-47 (From)

1 to n Starting position of the field. For a file, the maximum entry, n, is the length of the record. For the transaction file, fields can neither begin nor end in the last 13 bytes of the record. For local data area fields, n is 256. For session-level fields, this entry is used by WSU only to determine the field length.

## Columns 48-51 (To)

1 to n Ending position of the field. For a file, the maximum entry, n, is the length of the record. For the transaction file, fields can neither begin nor end in the last 13 bytes of the record. For local data area fields, n is 256. For session-level fields, this entry is used by WSU only to determine the field length.

## COLUMN 52 (DECIMAL POSITIONS)

0-9 Number of positions to the right of the decimal point in the numeric field named in columns 53-58. Column 52 must contain an entry when the field named in columns 53-58 is numeric. To define a numeric field with no decimal positions, column 52 must be 0.

Fields that WSU edits or uses in arithmetic operations must be numeric. If the number of decimal positions exceeds the field length, WSU assumes that the number of decimal positions is the same as the field length. WSU cannot process numbers that have more than nine decimal places.

Blank Field named in columns 53-58 is an alphameric field.

Other Assume 0.

**Note:** Column 52 must not be blank for a packed or binary field.

## COLUMNS 53-58 (FIELD NAME)

This entry specifies the name of a field. Field names can be duplicates of other field names in the program's data dictionary if the length and number of decimal positions match.

A field name can be from 1 to 6 characters long and must be left-adjusted. The first character must be alphabetic. The remaining characters can be alphameric. Embedded blanks are not allowed. Reserved field names cannot be used. (Refer to *Using Reserved Fields* in Chapter 13 for a list of reserved field names.)

Numeric fields have a maximum length of 15 characters. Alphameric fields have a maximum length of 256 characters. Fields that WSU uses in arithmetic operations or fields that WSU edits or zero suppresses must be numeric. For such fields, column 52 must have a decimal position entry (0-9 or blank).

*Note:* The field name is required in columns 53-58 for a field line on an I specification.

## COLUMNS 59-80

Entries in columns 59-80 are not required. WSU ignores entries in columns 59-80.

## SAMPLE CODING OF THE F AND I SPECIFICATIONS

Figure 3-7 shows an example of coding F and I specifications for a transaction file.

This F specification defines a transaction file named TRANS that has a 525-byte record length (512 bytes plus 13 bytes for each trailer). WSU ignores the circled entries.

Regardless of the F specification entries, WSU creates the transaction file as a direct output file. In order to use the transaction file as described by an F specification for an indexed file, an RPG II program must change the file to an indexed file.

These I specifications further define the transaction file. TRANS has two record types: type 01 and type 02.

A type-01 record has all of the following characteristics:

- Character C in position 80
- The absence of the following characters in position 91:

&  
A through I

- One of the following characters in position 92:

C  
L  
T  
3

- Character D in position 93

Record type 01 has three fields: FIELD1 is alphameric and begins in position 20, FIELD2 is numeric with two decimal positions and begins in position 25, and FIELD3 is packed decimal numeric with two decimal positions and begins in position 31.

Record type 02 is identified by the character D in position 80. It has two fields: FIELD4 is an alphameric field that begins in position 20, and FIELD5 is a numeric field with two decimal positions that begins in position 31.

Figure 3-8 shows an example of coding F and I specifications for a direct master file. Figure 3-9 shows an example of these specifications for an indexed master file.

Line	Form Type	File Type										Mode of Processing										Device	Symbolic Device	Extent Exit for DAM										File Addition/Unordered																																													
		File Designation					End of File					Sequence					File Format							Block Length					Record Length					L/R					APPHK					FX/DTR/2?					Overflow Indicator					Key Field Starting Location					Extension Code E/L					Name of Label Exit					Storage Index					Number of Tracks for Cylinder Overflow					Number of Extents
02	F	TRANS										IP										525										SPECIAL										SUBR22										KARR																											

**Note:** Regardless of the F specification entries, WSU creates the transaction file as a direct output file. In order to use this file as described by an F specification for an *indexed* file, an RPG II program must change the file to an indexed file.

Line	Form Type	Filename	Record Identification Codes										Field Location		Field Name	Field Indicators
			1			2			3			From	To			
01	I	TRANS	01	80	CC	91	NZA	92	D3							
02	I	AND		93	CD					20	22	FIELD1				
03	I									25	30	FIELD2				
04	I									31	33	FIELD3				
05	I															
06	I		02	80	CD											
07	I									20	30	FIELD4				
08	I									31	34	FIELD5				

Figure 3-7. Sample F Specification and I Specifications

Line	Form Type	Filename	File Type														Mode of Processing														Device																								
			File Designation														Length of Key Field or of Record Address Field																																						
0 2	F	DIRMSTR	IC														256 256R														DISK																								
			Sequence														Record Address Type																																						
			File Format														Type of File Organization or Additional Area																																						
														Overflow Indicator														Key Field Starting Location														Extension Code E/L													

Line	Form Type	Filename	Sequence	Number (I/N)	Option (O/U)	Record Identifying Indicator	Record Identification Codes									Field Location		Field Name						
							1			2			3			From	To							
							Position	Not (N)	C/Z/D	Character	Position	Not (N)	C/Z/D	Character	Position	Not (N)	C/Z/D	Character	Stacker Select	P/B/L/R	Decimal Positions			
0 1	I	DIRMSTR	NS	02	1	CO																		
0 2	I																							1 1 RCDCD
0 3	I																							2 26 NAME
0 4	I																							27 51 ADDR1
0 5	I																							.
0 6	I																							.
0 7	I																							.
0 8	I																							.
0 9	T																							.

Figure 3-8. Sample F and I Specifications for a Direct Master File

Line	Form Type	Filename	File Type														Mode of Processing														Device																								
			File Designation														Length of Key Field or of Record Address Field																																						
0 2	F	IDXMRSTR	IC														256 256R 4AT														DISK																								
			Sequence														Record Address Type																																						
			File Format														Type of File Organization or Additional Area																																						
														Overflow Indicator														Key Field Starting Location														Extension Code E/L													

Line	Form Type	Filename	Sequence	Number (I/N)	Option (O/U)	Record Identifying Indicator	Record Identification Codes									Field Location		Field Name						
							1			2			3			From	To							
							Position	Not (N)	C/Z/D	Character	Position	Not (N)	C/Z/D	Character	Position	Not (N)	C/Z/D	Character	Stacker Select	P/B/L/R	Decimal Positions			
0 1	I	IDXMRSTR	NS	01	1	CX																		1 1 RCDCD
0 2	I																							2 5 KEY
0 3	I																							6 30 NAME
0 4	I																							31 55 ADDR1
0 5	I																							.
0 6	I																							.
0 7	I																							.
0 8	I																							.
0 9	I																							.
1 0	T																							.

Figure 3-9. Sample F and I Specifications for an Indexed Master File



## Chapter 4. J Specification

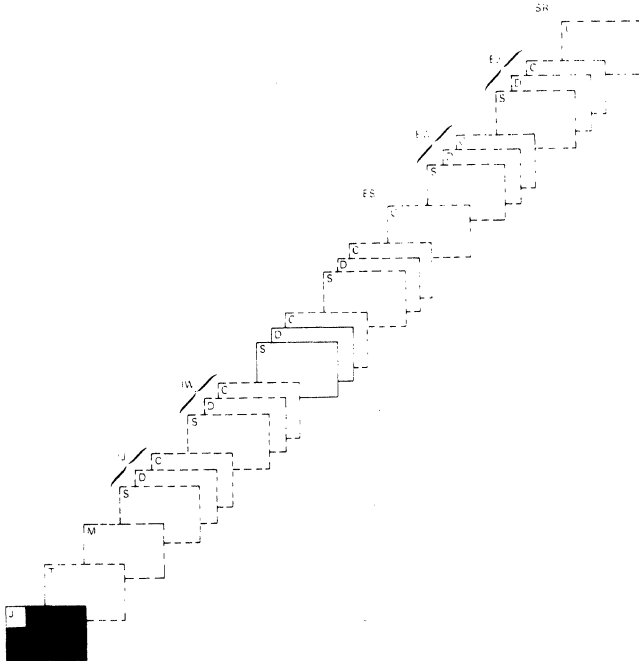


Figure 4-1 shows the J specification coding form. Note the numbered columns along the bottom of the form. You can turn the coding form around and use it for coding OCL or the command that runs your program.

This chapter describes J specification entries. Chapter 15 contains sample programs for which J specifications have been coded, and Appendix A provides a summary of entries on the J specification.

### COLUMNS 7-14 (EXECUTION PROGRAM NAME)

This required entry is the name that is assigned to the WSU program *and* to the WSU generated procedure. The name must begin in column 7 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, hyphens, and periods are not allowed.

### COLUMNS 15-22 (FORMAT MEMBER NAME)

This required entry indicates the name of the load member in which as many as 32 display screen formats are stored during generation. The format member name must begin in column 15 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, hyphens, and periods are not allowed.

The format member name must not be the same as the message member name in columns 23-30. Also, the format member name must not be the same as the WSU source program name when the format member and the source program are in the same library.





# WSU J, T, and M Specifications

GX21-9252 U/M/050\*  
Printed in U.S.A.

Sequence Number	Form Type	Execution Program Name	Format Member Name	Message Member Name	Library Name	Maximum Number of Work Stations	Region Size	Date/Edit Geographic Mode	Reserved
1									
2									
3									
4									
5									
6	J								

Third Edition  
Use this coding sheet only with WSU programs. This coding sheet could contain typographical errors.

Sequence Number	Form Type	File Name	Data Dictionary		Chain Field Names			Not Found Indicator	Master Track Index	Header Record Identifying Indicator	Number of Records	Error Indicator Type Level	Reserved
			Library Name	Member Name	Name 1	Name 2	Name 3						
1													
2													
3													
4													
5	T												
6	M												
7	M												
8	M												
9	M												
10	M												
11	M												
12	M												
13	M												
14	M												
15	M												
16	M												
17	M												
18	M												
19	M												
20	M												
21	M												
22	M												
23	M												
24	M												
25	M												
26	M												
27	M												
28	M												
29	M												
30	M												
31	M												
32	M												
33	M												
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35	M												
36	M												
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67	M												
68	M												
69	M												
70	M												
71	M												
72	M												
73	M												
74	M												
75	M												
76	M												
77	M												
78	M												
79	M												
80	M												

Number of sheets per pad may vary slightly.

22  
M  
Lines

Figure 4-1. Coding Form for the J Specification

### COLUMNS 23-30 (MESSAGE MEMBER NAME)

This entry indicates the name of your first-level message member that contains any messages you reference by MIC on a D specification or C specification. If specified, the message member name must begin in column 23 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, hyphens, and periods are not allowed. The message member name cannot be the same as the format member name (columns 15-22).

If columns 23-30 are blank, WSU assumes that if user messages are issued in your program, either you or the operator will modify the WSU generated procedure and specify the message member to use before calling the program. Refer to *Modifying a WSU Generated Procedure* in Chapter 13 for a description of how to change the user procedure. Refer to the *System Support Reference Manual* for an explanation of how to create a message member.

### COLUMNS 31-38 (LIBRARY NAME)

This entry indicates:

- The name of the library that will contain output produced during WSU generation. This output consists of the WSU program, a generated procedure that calls the program, and display screen formats.
- The name of the library that contains the program's user message member, if columns 23-30 of the J specification contain a message member name.

The library name must begin in column 31 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, and hyphens are not allowed. If columns 31-38 are blank, the system library (#LIBRARY) is used for generation output and WSU looks for the message member in the system library.

### COLUMNS 39-40 (MAXIMUM NUMBER OF WORK STATIONS)

1 to n      Maximum number of display stations that can use the WSU program concurrently. The maximum number of display stations that you can specify in two columns on the J specification is 99. If your program allows more than 99 display stations or if for other reasons you want to modify the maximum number of display stations, you can change the value of the MRTMAX parameter on the ATTR OCL statement in the generated WSU procedure. Refer to *Modifying a WSU Generated Procedure* in Chapter 13 for an explanation of how to change the procedure.

Other      Assume 01.

*Note:* When more than the maximum number of operators try to use a program, extra operators are not able to sign on. These operators receive no indication that they cannot sign on; they must wait until one or more active sessions end before their session can begin, or they can cancel their request via the Inquiry display.

### COLUMNS 41-42 (REGION SIZE)

8 to 32      Amount of main storage (in 2 K-byte increments) in which the WSU program runs. The region size does not affect the minimum size of the program that WSU generates. The entry should be an even number from 8 to 32, and must be right-adjusted. If you code an odd number, WSU uses the next higher even number as the region size.

If the region size specified in columns 41-42 is less than the minimum region size in which the program can execute, the minimum region size is used.

Other      Assume the minimum region size in which the program can execute.

*Note:* The minimum region size in which the program can execute is printed. Refer to *How to Generate WSU Programs* in Chapter 1 for an explanation of output printed during generation. You can modify the region size in the WSU generated procedure before calling the procedure. Refer to *Modifying a WSU Generated Procedure* and *Determining the Optimum Region Size* in Chapter 13 for further information.

## COLUMN 43 (DATE/EDIT)

M The format of the program date is month (MM), day (DD), year (YY); and a Y edit code in column 25 of a D specification edits these dates as MM/DD/YY.

This entry, along with a J edit code in column 25 of a D specification, edits a numeric output field as follows:

1,234.56<sup>†</sup> (Format of a positive number)  
1,234.56- (Format of a negative number)  
0.00 (Format of a zero balance)

D The format of the program date is day (DD), month (MM), year (YY); and a Y edit code in column 25 of a D specification edits these dates as DD/MM/YY.

This entry, along with a J edit code in column 25 of a D specification, edits a numeric output field as follows:

1.234,56<sup>†</sup> (Format of a positive number)  
1.234,56- (Format of a negative number)  
0,00 (Format of a zero balance)

Y The format of the program date is year (YY), month (MM), day (DD); and a Y edit code in column 25 of a D specification edits these dates as YY/MM/DD.

This entry, along with a J edit code in column 25 of a D specification, edits a numeric output field as follows:

1.234,56<sup>†</sup> (Format of a positive number)  
1.234,56- (Format of a negative number)  
0,00 (Format of a zero balance)

Other Assume M.

Code numeric literals on C specifications or D specifications according to the edit code you specify for this entry.

Refer to *Column 25 (Edit Code)* in Chapter 8 for examples of editing fields.

## COLUMN 44 (IDEOGRAPHIC MODE)

Y This WSU program can be run only from a display station that is in ideographic mode. A display station is placed in ideographic mode by specifying Y for the IGC session prompt on the sign on display.

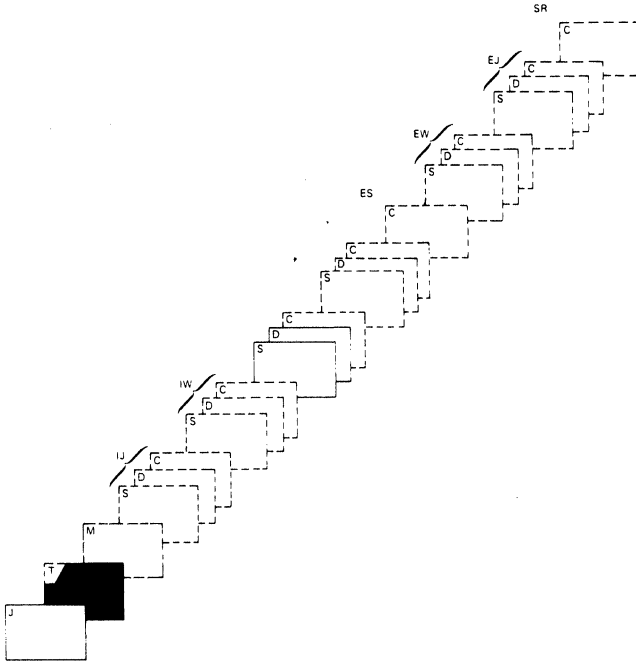
N This WSU program cannot be run from a display station that is in ideographic mode.

Other Assume N.

## COLUMNS 45-80

These columns are reserved. WSU ignores entries in them.

## Chapter 5. T Specification



The T specification defines characteristics of the transaction file (a direct file). If the T specification is not specified in the WSU source program, WSU assumes that the program does not use a transaction file. As shown in Figure 5-1, the T specification is on the same form as the M specifications, because these specifications share common entries. The shaded columns indicate entries that you do *not* code for the particular specification.

This chapter describes entries that you can code on the T specification. Chapter 15 contains sample programs for which this specification has been coded. Appendix A provides a summary of entries on the T specification.

### COLUMNS 7-14 (FILE NAME)

This required entry indicates the name of the transaction file. The file name must begin in column 7 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, hyphens, and periods are not allowed. The transaction file name cannot be the same as any of the master file names in this program. The transaction file name also appears in columns 7-14 of the F specification and I specifications for that file.

### COLUMNS 15-22 (LIBRARY NAME)

This entry indicates the name of the library that contains the F specification and I specifications for the transaction file.

The library name must begin in column 15 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, and hyphens are not allowed. If columns 15-22 are blank, the system library is used.

### COLUMNS 23-30 (MEMBER NAME)

This required entry indicates the name of the source member that contains the F specification and I specifications for the transaction file. The F specification and I specifications that describe the transaction file must not be in the source member that contains the WSU program.

The member name must begin in column 23 with an alphabetic character followed by zero to seven alphanumeric characters.



## COLUMNS 49-50 (NOT-FOUND INDICATOR)

- 01-89 Indicator that turns on when:
- WSU cannot determine the record type of the record read from the transaction file.
  - WSU has tried to retrieve a record that is beyond the logical end of the transaction file chain for that work station.

You can also code a not-found indicator in columns 54-55 of C specifications for the GETNH, GETNR, GETPH, and GETPR operations. If you code different not-found indicators on the T specification and C specification, the indicator on the C specification turns on for a not-found condition. This indicator remains on until you turn it off (via a SETOF operation), or until WSU turns it off (when the indicator, used as a resulting indicator in columns 54-59 of the C specification, reflects a not-true condition or when a valid record is read).

## COLUMNS 51-54

This entry applies only to M specifications and is not valid on the T specification. If these columns contain entries, WSU ignores them and prints a warning message.

## COLUMNS 55-56 (HEADER RECORD IDENTIFYING INDICATOR)

- 01-89 Record identifying indicator coded on the I specification for the header record in the transaction file. Code this indicator if the transaction file consists of header records followed by groups of detail records (for example, customer orders in an order-entry application). This entry allows operators to use the Page Backward Group and Page Forward Group command keys during review mode to page from one header record to the next, and allows the programmer to code GETNH and GETPH operations.

Blank Assume no grouping by header record and detail records. The Page Backward Group command key and Page Forward Group command key are not valid. If pressed, either key causes an error message to appear for the operator. Also, either of the GETPH or GETNH operations causes a terminal error to occur.

*Note:* Refer to Chapter 14 for a description of how the Page Backward Group and Page Forward Group command keys work. Refer to *Columns 28-32 (Operation)* in Chapter 9 for a description of the GETNH and GETPH operations.

## COLUMNS 57-60 (NUMBER OF RECORDS)

- 1 to 9999 Number of records that operators can enter in the transaction file. WSU uses the number of records to allocate sufficient disk storage for the transaction file. The entry must be right-adjusted.

Blank Allocate disk storage for 1000 records for the transaction file.

*Note:* Disk space is allocated in blocks of 2560 characters. For this reason, more space for records may be allocated than you requested.

## COLUMNS 61-62 (ERROR INDICATOR)

01-89 Indicator that turns on when either of the following conditions occurs:

- An input/output error occurs for a transaction file operation (GETNH, GETNR, GETPH, GETPR, or PUT)
- A record-not-found condition occurs for the transaction file and an indicator has not been coded in columns 49-50 (Not Found Indicator) of the T specification

A code for the error that occurred is placed in \*ERROR, a WSU reserved field. (Refer to Chapter 13 for a description of \*ERROR and its error codes.) If an error does not occur, this indicator is not set on.

Blank No error indicator is specified for the transaction file.

Other WSU issues a warning message during program generation and assumes blank.

## COLUMN 63

This entry applies only to an M specification and is not valid on the T specification. If this column contains an entry, WSU ignores it and prints a warning message.

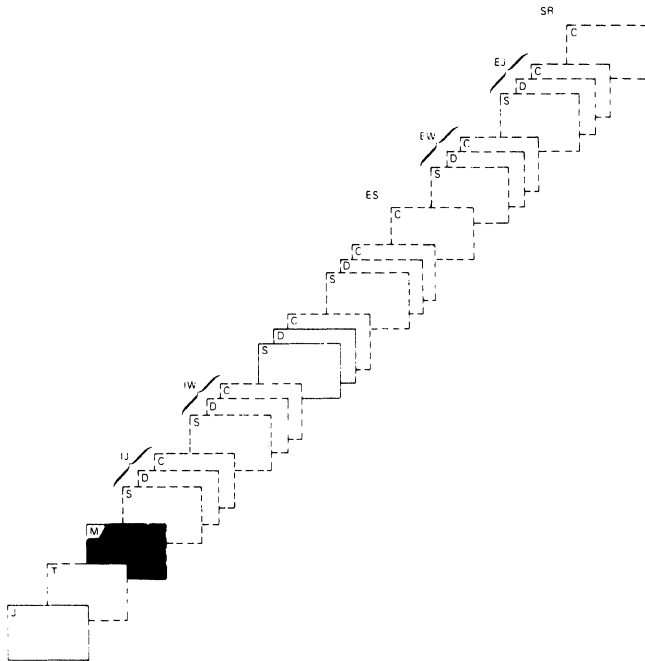
## COLUMN 64

This entry applies only to an M specification and is not valid on the T specification. If this column contains an entry, WSU ignores it and prints a warning message.

## COLUMNS 65-80

These columns are reserved. If they contain entries, WSU ignores them and prints a warning message.

## Chapter 6. M Specification



An M specification provides information about a master file, session-level fields, or local-data-area fields. As many as 20 master files, one group of session-level fields, and one group of local-data-area fields can be used in a WSU program. Refer to Chapter 1 for descriptions of the preceding items.

As shown in Figure 6-1, M specifications are on the same form as the T specification. The shaded columns indicate entries that you do not code on M specifications.

This chapter describes entries that you can code on the M specification. Chapter 15 contains sample programs for which this specification has been coded. Appendix A provides a summary of entries on the M specification.

### COLUMNS 7-14 (FILE NAME)

This entry is the name of a master file, a group of session-level fields, or a local data area.

The name must begin in column 7 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, hyphens, and periods are not allowed.

The master file name cannot be the same as the transaction file name or another master file in this program. The master file name also appears in columns 7-14 of the F specification and I specifications for that file.

The name of session-level fields or the name of a local data area also is in columns 7-14 of an I specification in the program's data dictionary.



Sequence Number	Form Type	Execution Program Name	Format Member Name	Message Member Name	Library Name	Maximum Number of Work Stations	Region Size	Date Edit	Alphanumeric Mode	Reserved																																																																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

Sequence Number	Form Type	File Name	Data Dictionary		Chain Field Names			Not Found Indicator	Master Link Index	Header Record Identifying Indicator	Number of Records	Error Indicator	Type Level	Reserved																																																																	
			Library Name	Member Name	Name 1	Name 2	Name 3																																																																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

22 M Lines

Figure 6-1. Coding Form for the M Specification

**COLUMNS 15-22 (LIBRARY NAME)**

This entry indicates the name of the library that contains the source member named in columns 23-30.

The library name must begin in column 15 with an alphabetic character, which can be followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, and hyphens are not allowed. If columns 15-22 are blank, the system library is used.

**COLUMNS 23-30 (MEMBER NAME)**

This entry indicates the name of the source member that contains:

- RPG F and I specifications that describe the master file named in columns 7-14.
- RPG I specifications that describe session level fields.
- RPG I specifications that describe local data area fields.

These RPG specifications must not be in the same source member as the WSU program.

The member name must begin in column 23 with an alphabetic character, followed by zero to seven alphanumeric characters. Commas, single quotes, blanks, question marks, slashes, hyphens, and periods are not allowed.

### **COLUMNS 31-36, 37-42, 43-48 (CHAIN FIELD NAMES)**

These entries specify from one to three fields that, when placed end-to-end, correspond to the key field of the master file. An M specification requires at least one chain field name in columns 31-48. Each name must be left-adjusted. The chain fields must have been defined on I specifications or C specifications in the program.

Direct files and files with packed keys can have only one chain field. If the master file is a direct file, the record key is the relative record number.

For GET operations to a master file, WSU forms a single field by combining the chain field(s) (in the order coded on the M specification) and then uses the newly formed field to access records in the master file. For indexed files, the combined length of the chain fields must be the same as the length of the key field in the master file.

Example:

I specification defines: FIELD A and FIELD B

C specification defines (in a result field): FIELD C

M specification, columns 31-48:  
FIELD C FIELD B FIELD A

When a GET is issued, assume the contents of these fields are:

FIELD C: A124

FIELD B: 123

FIELD A: ABC

The field that is formed to access the record is:  
A124123ABC

### **COLUMNS 49-50 (NOT-FOUND INDICATOR)**

01-89 Indicator that turns on when WSU cannot determine the record type of the record read from the master file or when there is no record that has the specified key. This indicator remains on until you turn it off (via a SETOF operation), or WSU turns it off (when the indicator, used as a resulting indicator in columns 54-59 of the C specification, reflects a not-true condition or when a valid record is read).

You can also code a not-found indicator in columns 54-55 of C specifications for a GET operation to a master file. If you code different not-found indicators for the same file on the M specification and C specification, the indicator on the C specification turns on for a not-found condition.

### **COLUMNS 51-54 (MASTER TRACK INDEX)**

This entry indicates the number of bytes of main storage used to maintain a master track index. A master-track-index entry is valid only for an M specification that describes an indexed master file, and must be right adjusted. If columns 51 through 54 are blank, WSU does not use a master track index. Refer to *Using a Master Track Index* in Chapter 13, *Additional Topics and Programming Considerations* for information on how to use the master track index.

### **COLUMNS 55-60**

These columns apply only to the T specification and are not valid on an M specification. If these columns contain entries, WSU ignores them and prints a warning message.

## COLUMNS 61-62 (ERROR INDICATOR)

01-89	<p>Indicator that turns on when either of the following conditions occurs:</p> <ul style="list-style-type: none"><li>• An input/output error occurs for a master file operation (GET, PUT, or PUTN)</li><li>• A record-not-found condition occurs for the master file and an indicator has not been coded in columns 49-50 (Not Found Indicator) of the M specification</li></ul> <p>A code for the error that occurred is placed in *ERROR, a WSU reserved field. (Refer to Chapter 13 for a description of *ERROR and its error codes.) If an error does not occur, this indicator is not set on.</p>
Blank	No error indicator is specified for the master file.
Other	WSU issues a warning message during program generation and assumes blank.

## COLUMN 63 (TYPE)

U	This M specification specifies use of the local data area. Columns 7-14 of this M specification name the local data area and columns 23-30 name the source member that contains the RPG I specifications that describe the local data area.
F	This M specification specifies use of fields by the WSU program rather than use of a master file or of the local data area. Columns 7-14 of this M specification name the group of fields and columns 23-30 name the source member that contains the RPG I specifications that describe the fields.
Blank	This specification specifies use of a master file. Columns 7-14 of this M specification name the master file and columns 23-30 name the source member that contain the RPG F specification and I specifications that describe the master file.
Other	WSU issues a terminal-error message and does not generate a program because of the error.

Note: Figure 6-2 shows possible combinations of entries in columns 63 and 64.

**COLUMN 64 (LEVEL)**

- S** If the entry in column 63 is U, indicates that the local-data-area fields named by this M specification are session level.  
If the entry in column 63 is F, indicates that the group of fields named by this M specification are session level.  
If the entry in column 63 is blank, WSU issues a terminal-error message and does not generate a program because of the error.
  
- Blank** If the entry in column 63 is U, indicates that the local-data-area fields named by this M specification are mode level.  
If the entry in column 63 is F, WSU issues a terminal-error message and does not generate a program because of the error.  
If the entry in column 63 is blank, indicates that the fields in the master file named by this M specification are mode-level fields.
  
- Other** WSU issues a terminal-error message and does not generate a program because of the error.

Note: Figure 6-2 shows possible combinations of entries in columns 63 and 64.

		Column 64	
		blank	S
Column 63	blank	Master file fields. These fields are mode-level.	Invalid combination. WSU issues a terminal error message.
	U	Local data area fields. These fields are mode-level.	Local data area fields. These fields are session-level.
	F	Invalid combination. WSU issues a terminal error message.	Session level fields.

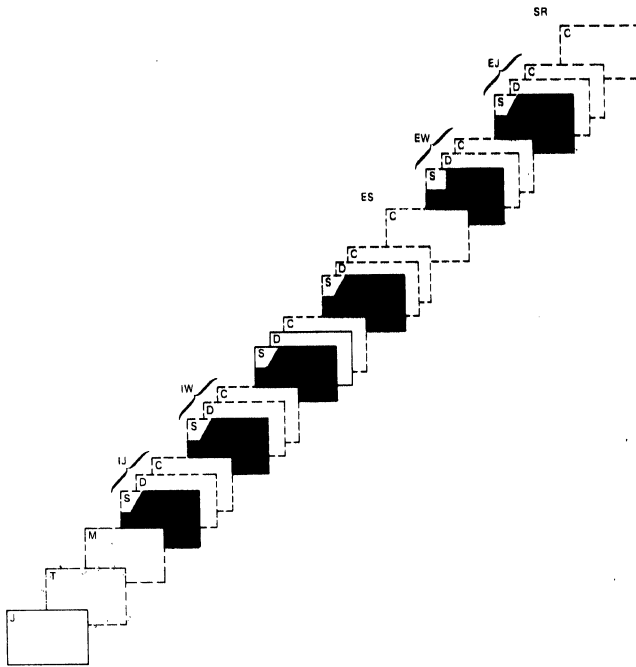
Figure 6-2. Possible Combinations of Columns 63 and 64 on an M Specification.

**COLUMNS 65-80**

These columns are reserved. If they contain entries, WSU ignores them and prints a warning message.



## Chapter 7. S Specification



The S specification indicates attributes that apply to the entire display, whereas D specifications that follow an S specification provide detailed information about the data on the display.

WSU supports both 960-character displays and 1920-character displays. Unless noted otherwise, the information in this chapter applies to both display sizes.

Figure 7-1 shows the S specification. It is on the same form as the D specification, since you code one S line and one or more D lines to describe a single display. WSU creates one display screen format from each set of S and D specifications. WSU allows 32 display screen formats.

This chapter describes the entries that you can code on the S specification. Where *this display* occurs, the term refers to the display that you are currently describing on the S and D specifications. For examples of how to code an S specification, refer to Chapter 15, *Sample WSU Programs*. For a summary of the entries on the S specification, refer to Appendix A, *Summary of Specification Entries*.



## COLUMNS 7-14 (FORMAT NAME)

Name of the display screen format that WSU creates from these S and D specifications. The format name must begin in column 7 with an alphabetic character, which must be followed by zero to seven alphanumeric characters. WSU does not allow duplicate format names within one source program. The format name, a required entry, is the name you can specify on a PUTS operation to cause the display to appear. Refer to Chapter 9, *C Specification* for an explanation of PUTS.

## COLUMNS 15-16 (FORMAT ID)

Format ID Two alphanumeric characters, other than IJ, IW, EW, EJ, or ES, that are the format ID (for example, A1, 01, or BB). Operators can select this display any time that WSU is ready for operator input by selecting the WSU menu via the WSU menu command key, and then entering the ID. Refer to *WSU Menu* in Chapter 14 for an explanation of how to select displays by ID. Two or more displays in one WSU program cannot have the same ID.

IJ Display that occurs only when the first operator calls a WSU generated procedure. This display is optional, and you can specify only one per program. Operators cannot select this display from the WSU menu.

IW Display that occurs once for each operator (including the first operator), when that operator calls a WSU generated procedure. This display is optional, and you can specify only one per program. Operators cannot select this display from the WSU menu.

EW Display that occurs after each operator selects the end-of-work-session option on the WSU menu or when the program has set on the EW indicator and completed processing for the display. This display is optional, and you can specify only one per program. Operators cannot select this display from the WSU menu.

EJ Display that occurs only when the last operator selects the end-of-work-session option on the WSU menu or when the program has set on the EJ indicator and completed processing for the display. This display is optional, and you can specify only one per program. Operators cannot select this display from the WSU menu.

Blank Operators cannot select this display by entering a format ID on the WSU menu.

### Notes:

1. Columns 41 (Start), 42 (End), 44 (Repeat), 46 (Priority), 48-53 (Review Mode Record Identifying Indicators), and 54-59 (Insert Mode Record Identifying Indicators) must be blank if you code IJ, IW, EW, or EJ in columns 15-16.
2. ES cannot be a format ID; however, you can code a PUTS operation in ES processing to show a display. Refer to Chapter 9, *C Specification* for an explanation of the PUTS operation.



## COLUMNS 17-18 (START LINE NUMBER)

1 to n Number of the line at which this display begins. Any data on the display that is above the starting line can neither be modified by the operator nor transmitted to your program. Single-digit entries (1-9) must be right adjusted.

For a 1920-character display, the maximum starting line number, n, is 24. For a 960-character display, the maximum starting line number is 12.

Line numbers that you code in columns 19-20 of D specifications that follow this S specification are *relative* to this starting line number. For example, if the starting line number is 10 on the S specification and 2 on the D specification, the actual starting line number is 11 (10 + 2 - 1).

V Variable starting line number. The contents of the reserved field \*SLNO at the time the display is shown become the starting line number. (Refer to *Using Reserved Fields* in Chapter 13 for a description of \*SLNO.) This entry must be left-adjusted.

For a MSG operation or IMSG operation, the contents of \*SLNO at the time the display was initially shown become the starting line number.

Other Assume 1.

Note: WSU uses the bottom line of the display for displaying messages.

## COLUMNS 19-20 (NUMBER OF LINES TO CLEAR)

0 to n Number of lines to clear (including and following the starting line specified in columns 17-18) before this display appears. For example, if the start line number is 6, and if 12 lines are cleared, lines 6 through 17 are cleared before the format is displayed. Single-digit entries (0-9) must be right-adjusted.

For a 1920-character display, the allowed maximum number, n, is 25 minus the starting line number of the display.

For example, if the starting line number is 6, the maximum number of lines to clear in columns 19-20 is 19 (25 - 6).

For a 960-character display, the allowed maximum number, n, is 13 minus the starting line number of the display or 24, which clears the entire display.

If column 17 contains v (variable starting line number), the maximum number of lines to clear is 24 for a 1920-character display and 12 for a 960-character display.

Blank or 24 Clear the entire display.

Other If a number greater than 24 is specified for a 1920-character display or if a number 13 through 23 is specified for a 960-character display, a terminal error occurs. If an invalid character is specified, the entire display is cleared.

Note: In enter mode, WSU clears only the specified number of lines beginning at the display's starting line number.

When the WSU menu appears, the entire display is cleared. The contents of \*SLNO carry over from enter mode to review/insert mode. Upon return to enter mode, \*SLNO will be restored to the value it had when review mode began.

Upon return to enter mode from review mode or insert mode, the display and data that were present when review mode was selected will appear.

Upon return from the WSU menu where no function was selected from the menu, the display and data that were present when the WSU menu was selected will appear.

### COLUMN 21 (LOWERCASE)

- Y While operators press the Shift key, all alphabetic characters are entered in uppercase. Without the Shift key, the alphabetic characters are entered in lowercase.
- N All alphabetic characters are entered in uppercase.
- Other Assume N.

### COLUMN 22 (RETURN INPUT)

- Y Return *all* input fields to the program (including input fields in which data has not been keyed) when the operator presses Enter/Rec Adv, a user command key, or a WSU command key.
- An exception to this rule occurs when *all* input fields are mandatory enter and the operator presses Enter/Rec Adv, a user command key, or a WSU command key before keying data into any of the input fields. In this exception situation, *no* input fields are returned to the program and the current field values are retained in the WSU program. *The fields are not cleared.*
- N Either return no input fields or return all input fields.
- If the operator has not keyed data into any of the input fields before he presses Enter/Rec Adv, a user command key, or a WSU command key, none of the input fields are returned to the program and the current field values are retained in the WSU program. *The fields are not cleared.* In this situation, the operator bypasses mandatory-enter fields.
- If the operator has keyed data into one or more of the input fields before he presses Enter/Rec Adv, a user command key, or a WSU command key, all input fields are returned to the program whether data was entered into them or not.
- Other Assume N.

**Note:** If you specify Y for the Return Input entry, the display should have input or output/input fields.

### COLUMNS 23-24 (RESET KEYBOARD)

- Y Allow processing for this display.
- N Do not allow processing to be done for the display. Displays that have a reset-keyboard entry of N must be nonsequenced and their S and D specifications must follow the S and D specifications for all sequenced displays.
- Refer to the PUTS operation in Chapter 9, *C Specification* for an example of a display that does not allow processing.
- Other Assume Y.

**Note:** The reset-keyboard entry must be Y if:

- Positions 15-16, 21-22, or 41-59 are not blank
- The display is in a sequence of displays
- The display has associated processing
- The display has input or output/input fields

### COLUMNS 25-26 (SOUND ALARM)

- Y The alarm sounds when this display appears.
- N The alarm does not sound when this display appears.
- 01-89 The alarm sounds when this display appears, only if the specified indicator is on.
- Other Assume N.

## COLUMN 27 (ENABLE FUNCTION KEYS)

- Y** Enable (allow) the function keys specified in columns 64-79. If columns 64-79 contain no valid functions keys, the Roll↑ (Roll Up) and Roll↓ (Roll Down) keys are disabled.
- N** Disable the function keys specified in columns 64-79. If columns 64-79 contain no valid function keys, the Roll↑ (Roll Up) and Roll↓ (Roll Down) keys are enabled.
- R** Use the function key mask that was used for the previous display.
- Blank** Enable the Roll↑ (Roll Up) and Roll↓ (Roll Down) keys.
- Other** Issue a warning message and assume blank.

The function keys controlled by this entry and the numbers that identify them are:

<i>Function Key</i>	<i>Number</i>
Roll↑ (Roll Up)	2
Roll↓ (Roll Down)	3

If an operator presses the Roll Up or Roll Down key when it is enabled, the requested function is done.

If an operator presses the Roll Up or Roll Down key when it is disabled, the system issues a message to the operator that indicates the key is not allowed at that time. No function is done for the disabled key, and the program receives no notification that the key was pressed.

Function keys other than Roll Up and Roll Down are disabled. When a disabled key is pressed, the program does not receive notification that the key was pressed. The system, however, either does the requested function or issues a message to the operator that says the key is not allowed at that time.

*Note:* Refer to *Columns 64-79 (Key Mask)* in this chapter for an explanation of how to specify the key mask.

## COLUMN 28 (ENABLE COMMAND KEYS)

- Y** Enable (allow) the command keys specified in columns 64-79. If columns 64-79 contain no valid command keys, all command keys are disabled.
- N** Disable the command keys specified in columns 64-79. If columns 64-79 contain no valid command keys, all command keys are enabled.
- R** Use the command key mask that was used for the previous display.
- Blank** Enable all command keys.
- Other** Issue a warning message and assume blank.

*Note:* Refer to *Columns 64-79 (Key Mask)* in this chapter for an explanation of how to specify the key mask.

The command keys controlled by this entry, and the alphabetic characters that identify them are:

<i>Command Key</i>	<i>Alphabetic Character</i>
1-14	A-N
15-24	P-Y

When an operator presses an enabled command key, the WSU program either does the function (for example, displays the WSU menu) or sets on the indicator that corresponds to the command key. When an operator presses a disabled command key, the system issues a message to the operator that indicates the key is not allowed at that time. No function is done for the disabled key and the program receives no notification that the key was pressed.

### COLUMNS 29-30 (BLINK CURSOR)

Y	The cursor blinks when this display appears.
N	The cursor does not blink when this display appears.
01-89	The cursor blinks when this display appears only if the specified indicator is on.
Other	Assume N.

### COLUMNS 31-32 (ERASE INPUT FIELDS)

These columns should be blank. If they are not blank, WSU prints a warning message and then continues as though they were blank.

### COLUMNS 33-34 (OVERRIDE FIELDS)

These columns should be blank. If they are not blank, WSU prints a warning message and then continues as though they were blank.

### COLUMNS 35-36 (SUPPRESS INPUT)

These columns should be blank. If they are not blank, WSU prints a warning message and then continues as though they were blank.

### COLUMNS 37-40 (RESERVED)

Columns 37-40 should be blank. WSU ignores these columns.

### COLUMNS 41-44 (ENTER-MODE SEQUENCE)

This entry consists of four subentries:

- Column 41 (Start)
- Column 42 (End)
- Column 43 (Entry Required)
- Column 44 (Repeat)

**Note:** When in review or insert mode, WSU ignores these entries.

### Column 41 (Start)

Y	This display is the first in a primary sequence or secondary sequence of displays.
N	This display is not the first in a primary sequence or secondary sequence of displays.
Other	Assume Y if this display is the first display (other than IJ or IW) in the program.  Assume N if this display is not the first display (other than IJ) in the program.

#### Notes:

1. This column must be blank if columns 15-16 contain IJ, IW, EW, or EJ, or if the reset keyboard entry (columns 23-24) is N.
2. A start display can also be an end display.

### Column 42 (End)

Y	This display is the last in a primary sequence or secondary sequence of displays.
N	This display is not the last in a primary sequence or secondary sequence of displays.
Other	Assume N.

#### Notes:

1. This column must be blank if columns 15-16 contain IJ, IW, EW, or EJ, or if the reset keyboard entry (columns 23-24) is N.
2. A start display can also be an end display.

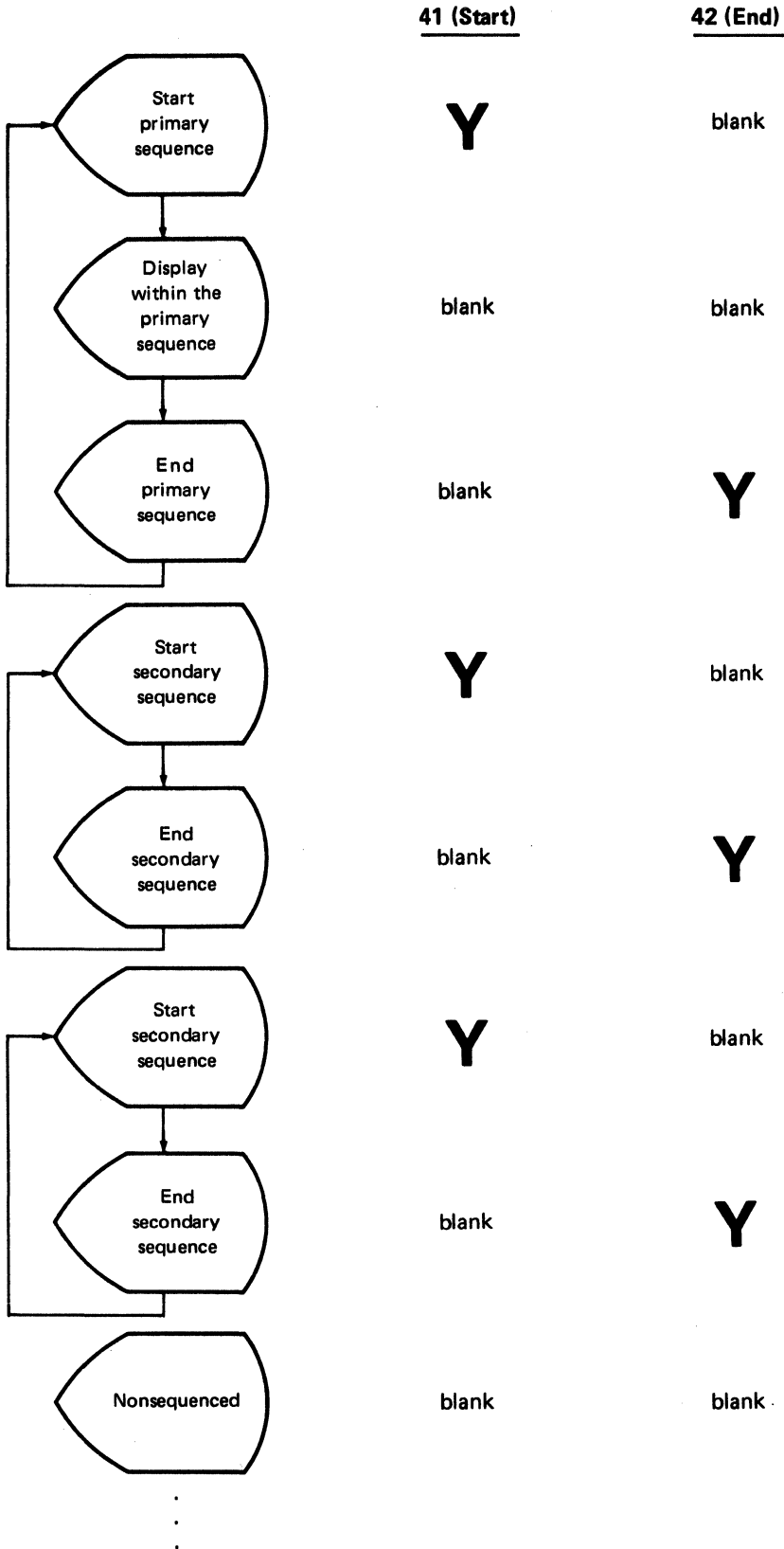


Figure 7-2. Entries in Columns 41-42 for Sequenced and Nonsequenced Displays

### Using Columns 41-42 to Specify a Sequence of Displays

A sequence of displays consists of one or more displays for which you code the first, middle, and last displays in the order that they should appear during an enter mode sequence cycle. The first display in a sequence must have Y in column 41 (Start) of its S specification; the last display in a sequence must have Y in column 42 (End); and middle displays must have NN or blanks in columns 41-42.

You can code YY in columns 41-42, which specifies a sequence of only one display. IJ, IW, EW, and EJ displays cannot be sequenced. Figure 7-2 shows the entries in columns 41-42 on the S specifications for sequenced and nonsequenced displays.

You should have an end display for each start display in a sequence. If the first display that follows the IJ and IW displays is not a start display, WSU assumes that this display is the start of the primary sequence.

If you code two start displays without an end display between them, WSU ignores the Start entry for the second display.

If you code two end displays without a start display between them, WSU ignores the second end display and treats the displays that follow the first end display as nonsequenced displays.

If you code neither a start display nor an end display in your program, WSU assumes that the first display that follows the IJ and IW displays is the start of a primary sequence and that the last display that precedes the EW and EJ displays is the end of the primary sequence.

If you code a start display but do not code an end display, WSU assumes that the last display in the program (other than the EW and EJ displays) is an end display.

### Column 43 (Entry Required)

Y	During an enter mode sequence cycle, operators must press the Enter/Rec Adv key or a user command key for this display. Operators cannot use the Bypass Display command key nor select another display by ID from the WSU menu to skip this display without causing a sequence error.
N	Operators can use the Bypass Display command key or select another display by ID from the WSU menu to skip this display.
Other	Assume N.

### Column 44 (Repeat)

Y	Repeat this display during an enter mode sequence cycle and accept input until: <ul style="list-style-type: none"><li>• An operator presses the Bypass Display command key.</li><li>• An operator presses the WSU Menu command key and selects a display by keying a format ID.</li><li>• A PUTS operation causes another display to appear.</li></ul> You can repeat any display: a display in a primary sequence, a display in a secondary sequence, or a nonsequenced display.
N	Do not repeat this display.
Other	Assume N.

Note: Column 44 must be blank for an IJ, IW, EW, and EJ display.

### COLUMN 45 (RESERVED)

Column 45 should be blank. WSU ignores this column.

**COLUMN 46 (PRIORITY)**

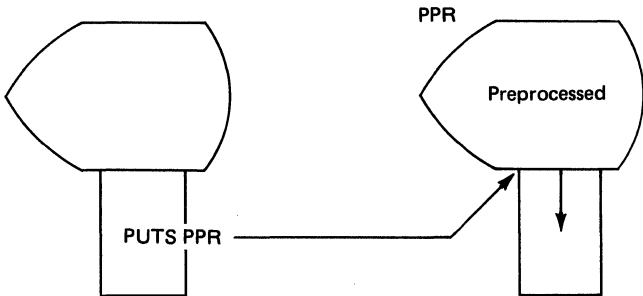
0 to 3 Relative expected frequency of this display. 3 indicates a display that you expect to use most frequently; 2 or 1 indicates a display that you expect to use less frequently, and 0 indicates a display that you expect to use least frequently.

Other Assume 0.

**COLUMN 47 (PREPROCESS)**

Y WSU begins by executing the C specifications for this display rather than showing the display. A preprocessed display must have associated C specifications.

As the following shows, a PUTS to a preprocessed display from another display causes the processing to begin.



A PUTS or MSG operation within the preprocessed display causes the display to appear **A**. An IMSG operation does not cause the display to appear; each operation only adds a message to the bottom line of the current display.

If an operator selects a preprocessed display via the WSU menu, or if a preprocessed display is selected by WSU for review mode or insert mode, C specification processing begins and a PUTS operation is required to show the display.

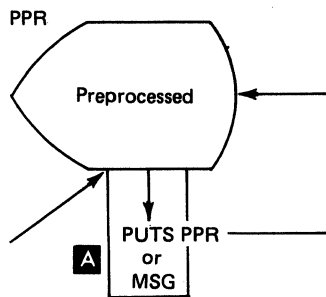


Figure 7-3 shows the logic of a display with preprocessing. Refer to the explanation of the PUTS operation Chapter 9, C Specification for examples of a preprocessed display.

N Do not preprocess this display.

Other Assume N.

S Specification

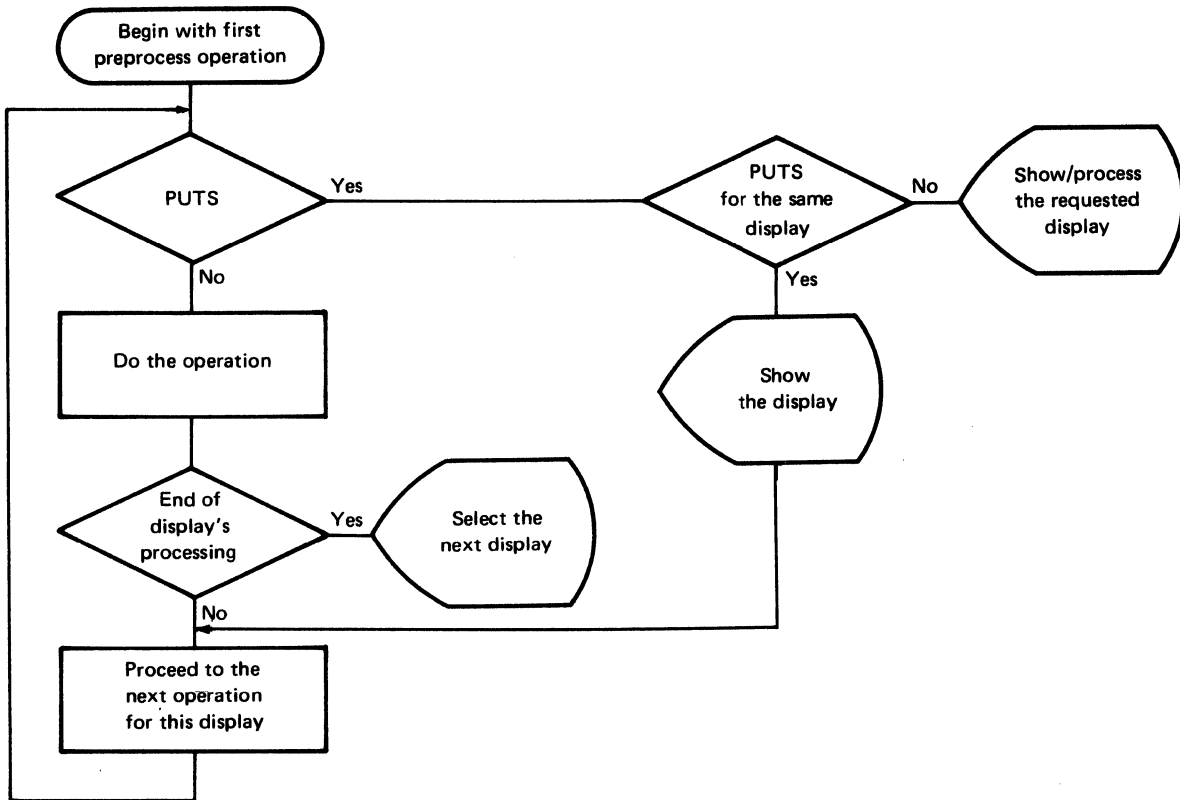


Figure 7-3. Preprocessing Logic



**COLUMNS 48-49, 50-51, 52-53 (REVIEW MODE  
RECORD IDENTIFYING INDICATORS)**

01-89 Type of record in the transaction file that operators can review with this display. This entry should match the record identifying indicator on the I specification of the type of record to review.

You can specify as many as three types of records than can be reviewed with this display. If you leave columns 48-53 blank, operators cannot use this display to review records.

Refer to Chapter 12, *Review, Insert, and Delete Modes*, for an explanation of review mode.

blank If columns 48-53 are blank, operators cannot select this display in review mode. This display can, however, be shown in review mode via a PUTS operation.

**COLUMNS 54-55, 56-57, 58-59 (INSERT MODE  
RECORD IDENTIFYING INDICATORS)**

01-89 Type of record in the transaction file after which operators can use this display to insert a record. This entry should match the record identifying indicator on the I specification for that type of record.

These insert mode indicators must also be used as review mode indicators (columns 48-53) in the program.

You can specify as many as three types of records on one S specification. If you leave columns 54-59 blank, operators cannot use this display to insert records.

Refer to Chapter 12, *Review, Insert, and Delete Modes*, for an explanation of insert mode.

blank If columns 54-59 are blank, operators cannot select this display in insert mode. This display can, however, be shown in insert mode via a PUTS operation.

**COLUMNS 60-63 (RESERVED)**

Columns 60-63 should be blank. WSU ignores these columns.

**COLUMNS 64-79 (KEY MASK)**

Key mask Identifies the command and function keys that are enabled or disabled when this display appears. The mask is a string of one to 16 letters and numbers from the following list:

Mask ID	Command Key Symbol	
A	1	WSU Menu command key
B	2	Bypass Display command key
C	3	Resume Entry command key
D	4	Insert Mode command key
E	5	Page Backward Group command key
F	6	Page Forward Group command key
G	7	User command key 7
H	8	User command key 8
I	9	User command key 9
J	0	User command key 10
K	-	User command key 11
L	=	User command key 12
M		Accept Sequence Error command key
N	@	Delete command key
P	#	Resume Review command key
Q	\$	User command key 16
R	%	User command key 17
S	-	User command key 18
T	&	User command key 19
U	*	User command key 20
V	(	User command key 21
W	)	User command key 22
X	_	User command key 23
Y	+	User command key 24
Mask ID	Function Key	
2	Roll↑	Page Forward record key
3	Roll↓	Page Backward record key

In this list, A-F and M-P correspond to WSU command keys; G-L and Q-Y correspond to user command keys (KG-KL and KQ- KY); and 2-3 correspond to the Roll Up and Roll Down function keys respectively. The mask must be left-adjusted and must not have embedded blanks. The letters and numbers in the mask can be in any order; however, duplicate entries cause a warning message to be printed.

Column 27 (Enable Function Keys) specifies whether the function keys in the mask are enabled or disabled when this display appears. Column 28 (Enable Command Keys) specifies whether the command keys in the mask are enabled or disabled when this display appears.

If you code a digit in the mask, column 27 must not be blank or R. If you code a letter in the mask, column 28 must not be blank or R. If columns 27 and 28 are both blank, columns 64-79 are ignored.

If the mask contains embedded blanks, a warning message is issued and WSU ignores all entries that follow the first blank.

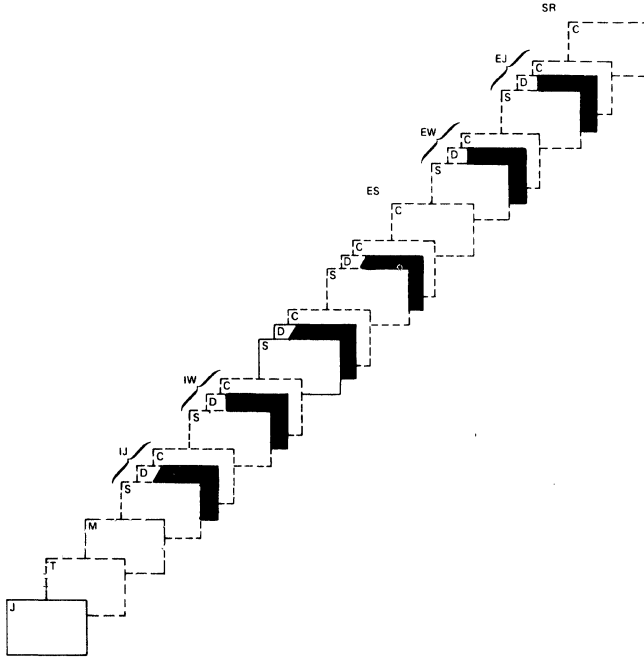
If any WSU command Keys (A-F and M-P) or the Roll↑ (Roll Up) and Roll↓ (Roll Down) function keys are disabled or not enabled, WSU issues a warning message. If any of these keys are disabled, problems may occur during program operation. For example, if you disable the WSU Menu command key, an operator could not use that key to display the WSU menu. Therefore, he could not end his session and the WSU program would have to end the session by setting on the EW or EJ indicator.

**COLUMN 80 (RESERVED)**

Column 80 should be blank. WSU ignores this column.



## Chapter 8. D Specification



The D specification indicates the position and attributes of data on a display. Figure 8-1 shows the D specification. It is on the same form as the S specification, since you code one S line and one or more D lines to describe one display. During generation, WSU creates one display screen format from each set of S and D specifications. WSU allows 32 displays per program. You must code at least one D line after each S line.

Each D line can define a variable data field (an input field, output field, or an output/input field), a constant (prompt or constant field value), or both. The following describes these items.





- A maximum of 256 fields are allowed in a display. Of those fields, the maximum number of input fields is 127. However, if you do not specify input fields in ascending screen sequence order, or if you have operator ID fields, if you specify modulus 10 or modulus 11 self-check fields, or if fields can contain ideographic characters, the maximum number of input fields is less. Use the following equation to determine the maximum number of input fields:

$$\text{Maximum number of input fields} = \frac{255 - R - \text{Number of modulus 10 and modulus 11 fields (T or E in column 30)} - \text{Number of secure operator ID fields} - \frac{1}{2} \text{ length of the longest operator ID fields}}{2} - \text{Number of fields that can contain ideographic characters}$$

where R is equal to zero if no input fields are out of order. If one or more fields are out of sequence, R is equal to the number of out-of-sequence fields plus one.

For example, if 20 fields are specified out of sequence and 10 modulus 10 and modulus 11 fields are specified, the maximum number of input fields is  $\frac{255 - 21 - 10}{2} = 112$  input fields.

Refer to *Column 30 (Self Check)* in this chapter and *Using Self Check Fields* in Chapter 13 for further information about self check fields.







## CONSTANT DATA

Constant data includes prompts and constant values for fields.

### Prompts

Prompts are words on a display that can:

- Provide headings for a display
- Provide descriptive names for fields
- Provide operator instruction

Prompts can be specified in quotes on the D specification or stored in your message member and referenced on the D specification by a 4-digit number. Also, field names from a program's data dictionary can be used as prompts. Refer to *Column 56 (Constant Type)* and *Columns 57-79 (Constant Data)* in this chapter for further information on coding prompts.

```
INVENTORY RECEIPTS  
  
TRANSACTION QUANTITY  U|  
ITEM NUMBER           |||||  
P.O./MEMO REFERENCE   U|  
  
PRESS REC ADV TO CONTINUE  
CMD KEY 1 TO END SESSION
```

### Constant Values

Constant values are initial values for input fields that can be specified on the D specification. For example, a weekly-hours-worked field might be initialized to 40. The constant value is returned to the WSU program when the display is entered. Refer to *Column 56 (Constant Type)* and *Columns 57-79 (Constant Data)* in this chapter for further information on coding constant values.

## GUIDELINES FOR PLANNING A DISPLAY

One of two methods can be used to plan displays and create S and D specifications for them. One method is to use the System/34 Screen Design Aid (SDA); the other method is to use the display layout sheets shown in Figure 8-5 for drawing displays before coding them on S and D specifications.

Using SDA may be faster and more accurate than using the display layout sheets, since S and D specifications do not have to be coded and entered; but SDA must be run on a System/34.

Refer to the *SDA Reference Manual* for an explanation of how to use SDA for WSU. In the following explanation of how to plan a display, **A** through **G** reference the sample display layout sheet in Figure 8-6.

WSU supports both 960-character displays and 1920-character displays. The following guidelines apply to both display sizes unless noted otherwise:

- For a 1920-character display, data can be coded on lines one through twenty-four **A**. For a 960-character display, data can be coded on lines one through twelve **B**.
- The first position on line one is reserved **C**. Do not place data in this position.
- The number of lines to clear (columns 19–20 of the S specification) must be 24 or less for a 1920-character display. This entry must be 12 or less (or 24) for a 960-character display.
- Leave at least one blank between data on the display **D**. If data ends in the last position of a line, the first position of the line that follows must be blank. If data begins in the first position of a line, the last position of the preceding line must be blank.
- You can code a prompt and a field on one D specification line. The starting location that you specify indicates the starting position of the prompt. WSU puts one blank between the end of the prompt and the beginning of the field. The prompt can be a field name. Regardless of the length of the field name, WSU reserves six positions on the display for it.
- For prompts issued from your message member, allow enough positions for the *actual length* of the prompt, unless the actual length is less than six positions. In that case, allow six positions for the prompt.
- One display can contain a total of 256 fields.
- For signed numeric data, *allow an extra position for the sign*. The sign occupies one position on the display, following the last digit in the data. Numeric fields default to signed numeric fields when they appear on a display.
- For edited data; a comma, decimal point, sign, and slash each occupy one position on the display. Refer to *Column 25 (Edit Code)* in this chapter for a description of edited data.
- Column separators ( | ) do not occupy positions on the display **E**.
- Data appears on the line and horizontal position that you specify. The order that you describe data on D specifications does not affect the order of data on the display.
- A field that is longer than one display line can occupy more than one display line. Also, a field that is longer than the space remaining on a given display line can continue onto another display line. However, a field must not extend beyond the bottom line of a display screen.
- When a display appears, the cursor is at the first (uppermost and leftmost) unprotected field on the display, **F** or at the field you specify in columns 32–33 (Position Cursor) on a D specification.
- Data can be placed on the bottom line of the display **G**. However, messages shown by the MSG or IMSG operation will overlay the data.
- Operators can press Field Advance, Field Exit, Field+, or Field-, to enter or skip a field, and Enter or a user command key to enter a display.
- Operators can press the Print key to print the current display.
- As operators enter data, the cursor moves from left to right across a line and then down to the leftmost position of the next lower line. The cursor skips protected fields, output fields, and prompts.
- The cursor can move from the last field to the first field (wraps around).
- When operators enter a display, all input fields and output/input fields on the display are entered unless the Return Input entry is N and data was not entered on the display.

This chapter explains the entries that you can code on D specifications. Refer to Chapter 15 for examples of coded D specifications. Appendix A provides a summary of the entries that you can code on D specifications.



**5251 Display Station Keyboard Template Assignment Sheet  
and Display Screen Layout Sheet**

Format Name _____	Description _____
Job Name _____	Sheet _____ of _____
Originated by _____	Date _____

Display Mode	13	14	15	16	17	18	19	20	21	22	23	24	Clear
	1	2	3	4	5	6	7	8	9	10	11	12	Test Request

**Keyboard Template Assignments**

1	
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22	
23	
24	

Address comments concerning this form to IBM Corporation, Department 245, Rochester, Minnesota 55901.

File No. S5250/S34-89

GX21-9271 UM/050\*  
Printed in U.S.A.

\*Number of forms per pad could vary slightly.

**Note:** This side of the form can be used as a work sheet for describing command key functions in your program.

**Display Screen Layout Sheet**

		COLUMN							
		1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
		1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
ROW	01								
	02								
	03								
	04								
	05								
	06								
	07								
	08								
	09								
	10								
	11								
	12								
	13								
	14								
	15								
	16								
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								
		1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
		1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0

**Figure 8-5. Display Layout Sheet**

Display Screen Layout Sheet

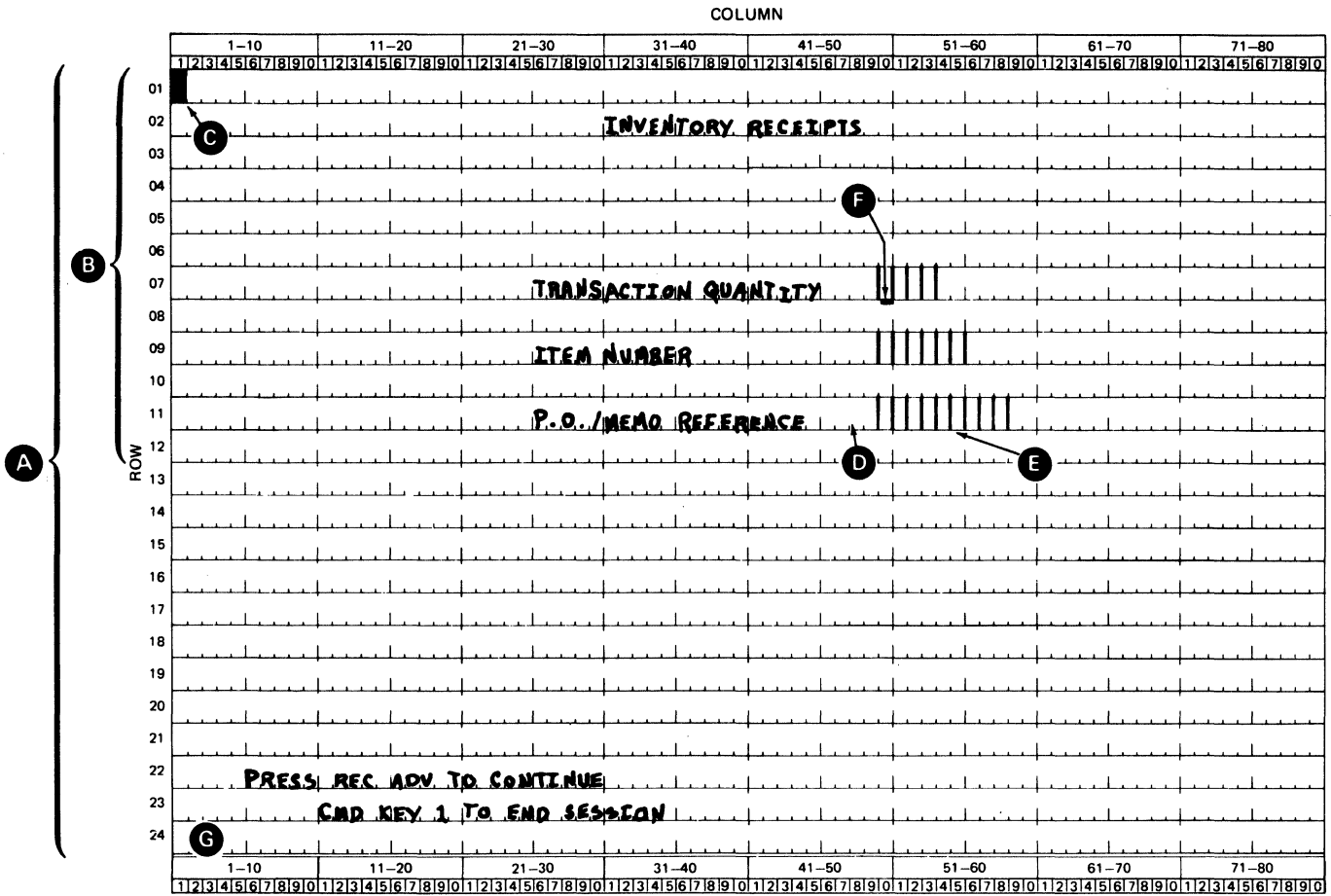


Figure 8-6. Sample Display Layout Sheet

### COLUMNS 7-12 (FIELD NAME)

**Name** Name of an input field, output field, or output/input field. The name must begin in column 7 with an alphabetic character or an &, and can be followed by zero to five alphanumeric characters. Embedded blanks are not allowed. This entry can be a field name from an I specification; a result field name on a C specification; or UDATE, UYEAR, UDAY, or UMONTH.

**Blank** This D specification line defines only constant data.

#### Notes:

1. If the field name begins with an &, the character following the & must be alphabetic.
2. You can code the same field name on more than one D specification line; however, you cannot overlap data on the display. Refer to the description of columns 21-22 (Horizontal Position) in this chapter for a description of overlapping data.
3. A field name that begins with \* should not be coded on the D specification. WSU assumes that the line contains a comment.

### COLUMNS 13-14 (RESERVED)

Columns 13-14 must be blank.

### COLUMNS 15-18 (FIELD LENGTH)

Columns 15-18 must be blank. WSU provides the field length for you.

### COLUMNS 19-22 (STARTING LOCATION)

The starting location consists of a line number in columns 19-20 and a horizontal position in columns 21-22.

### Columns 19-20 (Line Number)

**1 to n** Line number, in relation to the starting line of the display, on which the data begins. WSU calculates the actual line number for the data by adding the display's starting line number to this line number minus one.

The maximum entry, n, is:

- 25 minus the display's starting line number (for a 1920-character display)
- 13 minus the display's starting line number (for a 960-character display)

During program execution, when a display that has a variable starting line number is shown, the sum of \*SLNO and the number of the last line used for that display cannot exceed 24 for a 1920-character display screen or 12 for a 960-character display. A terminal error appears if this situation occurs.

If the ideographic version of WSU is being used and if ideographic fields or output data are defined for this format, the line number cannot be greater than 12.

WSU issues a warning message during program generation if data is coded on an uncleared portion of the display.

If the line number is 1, the horizontal position cannot be 1.

A line number is a required entry. Single-digit entries must be right-adjusted.

### Columns 21-22 (Horizontal Position)

1-80 Position of the data within a line. If this D specification line specifies a prompt and a field, this entry specifies the beginning position of the prompt. One blank separates the last position of the prompt and the first position of the field. Single-digit entries must be right-adjusted.

#### Notes:

1. You cannot use position 01 of line 01.
2. Data cannot overlap (occupy the same position) on the display. You must not code the same line number and horizontal position for two or more fields or prompts, or a line number and horizontal position that is within another field or prompt.
3. At least one blank must separate fields or a field and prompt.
4. The horizontal position must be an even number if ideographic data can be entered in the field and if the data can overflow from the end of a line to the beginning of the next line.

### COLUMNS 23-24 (OUTPUT DATA)

Y Display data from the field named in columns 7-12.

N Do not display data from the field named in columns 7-12.

01-89 Display data from the field named in columns 7-12 only if the specified indicator is on. If the D specification indicates a prompt in positions 57-79 for the field named in positions 7-12, the prompt is displayed whether the indicator is on or off.

Other Assume N.

Note: This entry applies only to a field named in columns 7-12. Therefore, this entry should be blank or N if column 56 is M, C, or D.

### COLUMN 25 (EDIT CODE)

J Insert commas, decimal points, and a minus sign (for a negative field) in the numeric output field. Figure 8-7 shows how you can use this entry with the Date/Edit entry in column 43 of the J specification.

Y Omit leading zeros of a numeric output field and insert slashes (/) for each pair of digits from left to right (if column 43 of the J specification is M or D) or from right to left (if column 43 of the J specification is Y).

This entry applies to numeric output fields that are three to fifteen digits long. Figure 8-8 shows how this entry and the Date Edit entry in column 43 can be used to edit fields that are from three to six digits long. For fields that are seven to fifteen digits long, WSU edits the lower order six digits and truncates the remaining digits. For example, the unedited field 09111479 would be edited as 11/14/79 if column 25 contained Y.

Z Suppress leading zeros from the numeric output field. An all-zero field is displayed with all blanks.

Other Do not edit the output field.

Note: Edit codes are valid only for numeric output fields. An edited output field cannot be an input field. Column 26 (Input Allowed) must not be Y.

### COLUMN 26 (INPUT ALLOWED)

Y The field named in columns 7-12 is an input field.

N This D specification line does not describe an input field. Columns 27-38 must be blank.

Other Assume N.

## COLUMN 27 (DATA TYPE)

- A** Operators can enter only alphabetic data in the input field.
- B** Operators can enter only alphameric data in the input field.
- E** Operators can enter alphanumeric (A/N) and Katakana characters or ideographic characters, but not both. The field is initially filled with zeros. The E entry is valid only if column 44 of the J specification contains Y.
- F** Operators can enter alphanumeric (A/N) and Katakana characters or ideographic characters, but not both. The field is initially filled with ideographic nulls (shift-out, followed by zeros, followed by shift-in). The F entry is valid only if column 44 of the J specification contains Y.
- K** Operators can enter Katakana characters in this input field.
- N** Operators can enter numbers 0 through 9, plus and minus signs, commas, periods, and blanks in this input field.
- S** An operator can enter numbers 0 through 9. He must press a field exit key after entering the field, regardless of the entry in column 35 (Controlled Field Exit).

When you design your displays, allow one extra position for each signed numeric field. For example, a 4-digit field occupies five positions on the display. An operator cannot enter data into the fifth position; that position indicates the sign when the field is displayed.

Field+ or Field Exit enters a field with a plus sign in the zone portion of the rightmost digit; Field- enters a field with a minus sign in the zone portion of the rightmost digit. Operators, therefore, do not key the sign, and the sign does not occupy an extra position in the field. When a field exit key is pressed, the data is right-adjusted and unused positions appear as blanks, and transmit as zeros regardless of the entry in column 31 (Adjust/Fill).

## S (Continued)

If you display a negative signed numeric field with a J edit code, a minus sign occupies a separate position on the display at the end of the number: (for example 123-).

If you display this field without a J edit code, the rightmost digit contains the sign. (For example, 5- is displayed as the character N. The zone portion contains the minus sign and the digit contains 5.)

If you display a positive signed numeric field with a J edit code, a blank follows the rightmost digit. If you display this field without a J edit code, the last digit is not followed by a blank.

- X** Operators can enter only ideographic data in the field. The X entry is valid only if column 44 of the J specification contains Y.

**Other** Assume B for an alphameric field. Assume S for a numeric field (you must allow for an extra position for a sign on the display).

This data-type entry overrides the data type specified on the C specification or the I specification, if the data types are not the same. If you specify constant data in columns 57-79, ensure that data is the type you specify in the data-type entry.

When processing numeric fields, your program might produce unpredictable results for fields that have data types other than S. These data types can allow nonnumeric input such as blanks, commas, and periods. Your program is responsible for checking that only numeric data is entered into those numeric fields.



Date/Edit Entry (Column 43 J Specification)	3-Digit Negative Field No Decimal Positions		5-Digit Field 2 Decimal Positions		7-Digit Negative Field 2 Decimal Positions	
	Unedited	Edited	Unedited	Edited	Unedited	Edited
M	12 N	125-	12345	123.45	123454N	12,345.45-
D	12 N	125-	12345	123.45	123454N	12.345,45-
Y	12 N	125-	12345	123.45	123454N	12.345,45-

**Notes:**

1. Edited refers to an edit code of J in column 25 of the D specification. Unedited refers to a blank edit code.
2. If a field is an output/input field and its data type is S, an unedited negative value appears with the minus sign as shown in the edited examples.

**Figure 8-7. Examples of a J Edit Code Used to Edit Numeric Output Fields**

Date/Edit Entry (Column 43 J Specification)	3-Digit Field		4-Digit Field		5-Digit Field		6-Digit Field	
	Unedited	Edited	Unedited	Edited	Unedited	Edited	Unedited	Edited
M	119	11/9	1179	11/79	11149	11/14/9	111479	11/14/79
D	119	11/9	1179	11/79	14119	14/11/9	141179	14/11/79
Y	911	9/11	7911	79/11	91114	9/11/14	791114	79/11/14

Note: Edited refers to an edit code of U in column 25 of the D specification. Unedited refers to a blank edit code.

**Figure 8-8. Example of a Y Edit Code Used to Edit Numeric Output Fields**

**COLUMN 28 (MANDATORY FILL)**

Y	Operators must enter all or none of the input field.
N	Operators can enter all, part, or none of the input field.
Other	Assume N.

**COLUMN 29 (MANDATORY ENTRY)**

Y	Operators must enter at least one character or blank in the input field.
N	Operators can bypass the input field.
Other	Assume N.

**Notes:**

1. This entry applies during enter, review, and insert modes.
2. A mandatory-enter field that is blank when a display is entered causes a keyboard error to appear. The operator must press the Error Reset key and then press the Field Backspace key to return the cursor to the beginning of the mandatory-enter field.

An operator can bypass a mandatory-enter field if:

- All input fields on the display are mandatory-enter fields, the Return Input entry on the S specification is Y, and the operator does not enter data in any of the input fields.
- The Return Input entry on the S specification is N and the operator does not enter data in any of the input fields.

Refer to *Column 22 (Return Input)* in Chapter 7 for a description of how mandatory-enter fields affect the returned input.

**COLUMN 30 (SELF CHECK)**

T	The input field is a modulus 10 self-check field.
E	The input field is a modulus 11 self-check field.
Other	The input field is not a self-check field.

When a check digit error occurs, a four-digit message number flashes on line 24. When the operator presses Error Reset, the cursor returns to the start of the field in error (the field is not changed) and the operator can reenter the data.

Refer to *Using Self-Check Fields* in Chapter 13, *Additional Topics and Programming Considerations* for an explanation of self-check fields.

## COLUMN 31 (ADJUST/FILL)

**Z** Right-adjust and zero fill. WSU right adjusts data that operators enter into the field; unused positions appear and transmit as zeros.

This entry causes the field to have controlled field exit regardless of the entry in column 35 of this D specification. The operator must press one of the field exit keys after entering the data in order to enter the field.

**B** Right-adjust and blank fill. WSU right adjusts data that operators enter into the field; unused positions appear and transmit as blanks.

If the field is signed-numeric, unused positions appear as blanks but transmit as zeros.

This entry causes the field to have controlled field exit regardless of the entry in column 35 of this D specification. The operator must press one of the field exit keys after entering the data in order to enter the field.

**Other** Assume B for a signed numeric field. Adjust/fill is not done for other fields.

*Note:* Operators can press Field+ (for numeric or signed numeric fields), Field- (for signed numeric fields), or Field Exit to enter adjust/fill fields. Operators can press Field Advance to enter an adjust/fill field, but the adjust/fill will not occur.

## COLUMNS 32-33 (POSITION CURSOR)

**Y** The cursor is at the beginning of the input field when this display appears. If you code Y for more than one field, the cursor positions itself at the beginning of the field on the first D specification for which you coded Y.

**N** The cursor is not at the beginning of the input field when this display appears.

**01-89** The cursor is at the beginning of the input field when this display appears, only if the specified indicator is on.

You can use indicators to position the cursor for all, some, or none of the fields on a D specification.

If two or more indicators that position the cursor are on when this display appears, the cursor is at the beginning of the field on the first D specification for which you specified the indicator that is on.

**Other** Assume N.

*Note:* If you do not position the cursor at any field on the display, the cursor appears at the beginning of the first unprotected field on the D specification, or the cursor remains in its current position if the display contains no unprotected fields.

## COLUMN 34

This column should be blank. If it is not blank, WSU prints a warning message and continues as though it were blank.

### COLUMN 35 (CONTROLLED FIELD EXIT)

- Y** One of the field exits keys (Field Adv, Enter, Field Exit, Field+, Field- [if the field is a signed-numeric field], Field Backspace, Home, or Erase Input) must be pressed before the cursor will leave the field.
- N** The cursor automatically exits from the field when the field is filled, unless adjust/fill is specified for the field in column 31 or an S data type is specified in column 27.
- Other** Assume Y if adjust/fill or an S data type is specified for the field. Assume N if adjust/fill or an S data type is not specified for the field.

**Note:** An entry of N does not cause an automatic skip from the last field of this display to the first field of the next display. Instead, the cursor returns to the first unprotected field on this display. The auto-record-advance entry in column 36 can cause an automatic advance to the next display.

### COLUMN 36 (AUTO RECORD ADVANCE)

- Y** All input fields on this display automatically enter when:
- Operators enter the last character of the input field.
  - The cursor is in the input field and operators press Field Exit, Field+, or Field- (for a signed numeric field).
- N** Specifies that automatic-record-advance does not occur for this field.
- Other** Assume N.

### COLUMNS 37-38 (PROTECT FIELD)

- Y** The cursor skips the field. Operators cannot enter data in protected fields. You can protect any field on a display.
- N** Do not skip the field. This field, called an unprotected field, allows operator input.
- 01-89** The cursor skips the field only if the specified indicator is on.
- Other** Assume N for an input field; assume Y for an output-only field.

#### Notes:

1. WSU automatically protects output-only fields.
2. If you protect the following fields, WSU sets these fields to blank or zero when the display is entered:
  - Input-only fields
  - Output/input fields that have output conditioned by an indicator that was off when the display appearedYou may inadvertently lose data by protecting these fields.
3. The cursor may appear in a protected field if:
  - The field is protected by an indicator that is on when the display appears, and
  - The field is the first field defined on the D specifications, and
  - The cursor is not positioned via an indicator to any other field (columns 32-33 for all other fields are blank or contain indicators that are off).To avoid this cursor positioning, use the same indicator to protect this field and to position the cursor in the next field on the display.
4. When a display is reshown via a MSG operation, fields protected on the display remain protected; fields not protected on the display remain unprotected.

### COLUMNS 39-40 (HIGH INTENSITY)

- Y Intensify the data (make it brighter than the normal intensity).
- N Do not intensify the data.
- 01-89 Intensify the data only if the specified indicator is on.
- Other Assume N.

If this format is displayed on a 5292 Color Display Station and high intensity is specified, the field is displayed with white characters of normal intensity. If other field attributes are specified, the color result is different. For the result of specific attribute combinations, see Figure 8-8.1. For additional information about the control of color, see the *IBM 5292 Color Display Station Programmer's Guide to Using Color*, GA21-9413.

### COLUMNS 41-42 (BLINK FIELD)

- Y Blink the field when the display appears. An operator cannot stop this blinking.
- N Do not blink the field when the display appears.
- 01-89 Blink the field only if the specified indicator is on. An operator cannot stop this blinking.
- Other Assume N.

If this format is displayed on a 5292 Color Display Station and blink field is specified, the field is displayed with red characters and does not blink. To cause the characters in the field to actually blink, you must also specify high intensity (columns 39-40). If other field attributes are specified, the color result may be different. For the result of specific attribute combinations, see Figure 8-8.1. For additional information about the control of color, see the *IBM 5292 Color Display Station Programmer's Guide to Using Color*, GA21-9413.

### COLUMNS 43-44 (NONDISPLAY)

- Y Do not display data from the field when the display appears or do not display the data that the operator enters into the field.
- N Display the data.
- 01-89 Do not display data only if the specified indicator is on.
- Other Assume N.

### COLUMNS 45-46 (REVERSE IMAGE)

- Y Reverse the data image (characters are dark on a light green background).
- N Do not reverse the data image (characters are light green on a dark background).
- 01-89 Reverse the data image only if the specified indicator is on.
- Other Assume N.

If this format is displayed on a 5292 Color Display Station and reverse image is specified, the characters appear dark on a colored background. The background color depends on the other field attributes that are specified. For the result of specific attribute combinations, see Figure 8-8.1. For additional information about control of color, see the *IBM 5292 Color Display Station Programmer's Guide to Using Color*, GA21-9413.

**COLUMNS 47-48 (UNDERLINE)**

- Y Underline data on the display.
- N Do not underline data.
- 01-89 Underline data only if the specified indicator is on.
- Other Assume N.

If this format is displayed on a 5292 Color Display Station and underline is specified, the field is displayed with a blue line beneath the character positions in the field. The color of the characters displayed in the field depends on the other field attributes that are specified. For the result of specific attribute combinations, see Figure 8-8.1. For additional information about the control of color, see the *IBM 5292 Color Display Station Programmer's Guide to Using Color*, GA21-9413.

**COLUMN 49 (COLUMN SEPARATOR)**

- Y Show a vertical line (|) before and after each character position. The vertical lines do not occupy a character position. For example:  
 Before operator data entry: |\_\_| | |  
 After operator data entry: |1|3|5|
- N Do not use column separators.
- Other Assume N.

If this format is displayed on the 5250 series of Display Stations, the column separators appear as vertical green lines on either side of each character position in the field.

If this format is displayed on the 5291 Display Station, the column separators appear as two vertical green dots on either side of each character position in the field.

If this format is displayed on a 5292 Color Display Station and column separators are specified, the column separators appear as blue dots at the bottom corners of each character position in the field. If blink field is also specified, the column separators do not appear on the display. The color of the characters displayed in the field depends on the other field attributes that are specified. For the result of specific attribute combinations, see Figure 8-8.1. For additional information about the control of color, see the *IBM 5292 Color Display Station Programmer's Guide to Using Color*, GA21-9413.

**INVALID COMBINATIONS OF ATTRIBUTES**

The following summarizes invalid combinations of attributes for a field. These situations can occur when you code Y for the attributes or when you code the same indicator for the attributes.

WSU allows reverse image, underline, and high intensity to be conditioned by different indicators. If all indicators are on when the display appears, the field is nondisplayed.

Attributes	WSU Action
Mandatory fill and adjust/fill	Mandatory fill only
High intensity and nondisplay	Nondisplay only
Blink field and nondisplay	Nondisplay only
Reverse image and nondisplay	Nondisplay only
Underline and nondisplay	Nondisplay only
Reverse image, underline, and high intensity	Terminal error-message
Mandatory enter and protect field	Protect field only

**COLUMNS 50-55 (RESERVED)**

Columns 50-55 should be blank.

**COLOR ATTRIBUTES FOR  
 5292 COLOR DISPLAY STATION**

The 5292 Color Display Station provides color attributes that can be used to highlight fields on the display.

High Intensity, column separators, and blink attributes are used for color selection in combination with other attributes as shown in Figure 8-8.1.

Color	Display Result	Attributes Specified				
		Blink	Column Separators	High Intensity	Reverse Image	Underline*
Green	Green					
	Green, Reverse Image				X	
	Green, Underline					X
	Green, Reverse Image, Underline				X	X
White	White			X		
	White, Reverse Image			X	X	
	White, Underline			X		X
Red	Red	X <sup>1</sup>				
	Red, Reverse Image	X <sup>1</sup>			X	
	Red, Blink	X		X		
	Red, Blink, Reverse Image	X		X	X	
	Red, Underline	X <sup>1</sup>				X
	Red, Reverse Image, Underline	X <sup>1</sup>			X	X
	Red, Blink, Underline	X		X		X
Turquoise	Turquoise, Column Separators		X <sup>2</sup>			
	Turquoise, Column Separators, Reverse Image		X <sup>2</sup>		X	
	Turquoise, Column Separators, Underline		X <sup>2</sup>			X
	Turquoise, Column Separators, Reverse Image, Underline		X <sup>2</sup>		X	X
Pink	Pink	X <sup>1</sup>	X <sup>3</sup>			
	Pink, Reverse Image	X <sup>1</sup>	X <sup>3</sup>		X	
	Pink, Underline	X <sup>1</sup>	X <sup>3</sup>			X
	Pink, Reverse Image, Underline	X <sup>1</sup>	X <sup>3</sup>		X	X
Yellow	Yellow, Column Separators		X <sup>2</sup>	X		
	Yellow, Column Separators, Reverse Image		X <sup>2</sup>	X	X	
	Yellow, Column Separators, Underline		X <sup>2</sup>	X		X
Blue	Blue	X <sup>1</sup>	X <sup>3</sup>	X		
	Blue, Reverse Image	X <sup>1</sup>	X <sup>3</sup>	X	X	
	Blue, Underline	X <sup>1</sup>	X <sup>3</sup>	X		X
Nondisplay	Data in fields with these combinations of attributes are not displayed when indicators are specified.	X		X	X	X
		X	X	X	X	X

<sup>1</sup> Blink is suppressed.  
<sup>2</sup> Column separators are suppressed when reduced line spacing is used.  
<sup>3</sup> Column separators are suppressed.

- Underlines and column separators are always blue.
- Underlines do not blink if blink field is also specified.
- Column separators do not appear if blink field is also specified.
- Use the *limited color* select option of the 5292 Color Display Station to see how a display format designed for color appears on a single color\*\* display. The procedure for selecting this option is explained in the *IBM 5292 Color Display Station Operator's Guide, GA21-9416*.

\*May be referred to as underscore.  
 \*\*May be referred to as monochrome.

Figure 8-8.1. Controlling Color on a 5292 Color Display Station

## USING COLOR FOR INFORMATION DISPLAY

The proper use of color in a display helps you to:

- Make headings stand out from text
- Break up large blocks of text
- Easily identify related information
- Emphasize fields or words for operator recognition
- Identify error conditions

When you use color, decide early which highlighting technique you will use. If you are programming for a combination of full color and single color displays, keep in mind the results you will get in both cases. For example, a field that is red on a full color display will only blink in a single color display. By selecting the limited color display you can preview most of the results of your color choices as they will appear on a single color display. More information can be found in the *IBM 5292 Color Display Station Programmer's Guide to Using Color*, GA21-9413.

Figure 8-8.2 illustrates the relationship between full color, limited color, and single color formats when generated with the same attribute controls.

Color Attributes Displayed			
5292 Color Display Station Full Color Mode	5292 Color Display Station Limited Color Mode	5250 Series Display Stations Single Color Mode	5291 Display Station Single Color Mode
green	green	green	green
white	white	high intensity green	high intensity green
red red, blinking	blinking green blinking white	blinking green blinking high intensity green	blinking green blinking high intensity green
turquoise with column separators	green column separators	green with vertical line column separators	green with vertical dot column separators
pink	blinking green with column separators	blinking green with vertical line column separators	blinking green with vertical dot column separators
yellow with column separators	white with column separators	high intensity green with vertical line column separators	high intensity green with vertical dot column separators
blue  blue underline	blinking white with column separators  green or white underline	blinking, high intensity green with vertical line column separators  green underline	blinking, high intensity green with vertical dot column separators  green underline

Figure 8-8.2. Full Color, Limited Color, and Single Color Screen Display Formats

Column separators on the 5292 Color Display Station appear as a blue dot at each lower corner of the character position. On the 5250 series of display stations, the column separators are displayed as vertical green lines on either side of each character position in the format. On the 5291 Display Station, the column separators appear as two vertical green dots on either side of each character position.



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## COLUMNS 56 (CONSTANT TYPE) AND COLUMNS 57-79 (CONSTANT DATA)

C Columns 57-79 specify a constant initial value for the input field named in columns 7-12. Required entries are:

- The input field name in columns 7-12.
- The starting location of the constant in columns 19-22.
- A Y in column 26 (Input Allowed).
- The constant in columns 57-79. This constant, which must not be enclosed with apostrophes, can be continued to columns 7-79 of the following D specification line.

Columns 23-24 (Output Data) must be N or blank.

WSU displays the constant when the display appears. If a data type is specified in column 27, WSU does not verify that the constant is of the same type. An alphanumeric field that has a constant initial value is replaced with the value, beginning with the leftmost position. Positions that are not entered remain unchanged.

The constant in columns 57-79 can contain ideographic data if the data begins with a shift-out character and ends with a shift-in character. The shift-out character is hexadecimal 0E; the shift-in character is hexadecimal 0F.

Figure 8-9 (line 6) shows the D specification entries for coding an input field with a constant initial value. Figure 8-10 shows an example of using the C entry in column 56 on a D specification.

D

Columns 57-79 specify a constant initial value for the input field named in columns 7-12, and the field's name is used as the prompt for the field. Required entries are:

- The input field name in columns 7-12.
- The starting location of the prompt (field name) in columns 19-22.

Regardless of the length of the field name in columns 7-12, WSU reserves six positions on the display for the name. In addition, one blank separates the last position for the field name from the first position of the constant initial value.

- A Y in column 26 (Input Allowed).
- The constant in columns 57-79. This constant, which must not be enclosed with apostrophes, can be continued to columns 7-79 of the following D specification line.

Columns 23-24 (Output Data) must be N or blank.

WSU displays the constant and the field name when the display appears. The cursor will skip over the field name during data entry and position itself at the beginning of the constant.

If a data type is specified in column 27, WSU does not verify that the constant is of the same type. An alphanumeric field that has a constant initial value is replaced with the value beginning with the leftmost position. Positions that are not entered remain unchanged.

The initial value in columns 57-79 can contain ideographic data if the data begins with a shift-out character and ends with a shift-in character. The shift-out character is hexadecimal 0E; the shift-in character is hexadecimal 0F.

Figure 8-9 (line 7) shows the D specification entries for coding an input field with a constant initial value and a field name prompt. Figure 8-10 shows an example of using the D entry in column 56 on a D specification.

P

Columns 57-79 specify a prompt that appears in the position specified in columns 19-22. Required entries are:

- The starting location of the prompt in columns 19-22.
- The prompt, enclosed in apostrophes, in columns 57-79. This prompt can be continued to columns 7-79 of the following D specification line.

To define a variable data field and an associated prompt, either one or two D specification lines can be used. When one line is coded (line 4, 9, or 12 in Figure 8-9), the starting location specifies the location of the prompt. One blank separates the last position of the prompt and the first position of the field.

When two lines are used to specify a variable data field and an associated prompt (line 1 or 2 with line 3, 6, 8, or 11 in Figure 8-9), each line specifies a starting location.

The cursor skips over each prompt on a display during data entry and positions itself only at the beginning of input fields.

The prompt in columns 57-79 can contain ideographic data. It must be enclosed in apostrophes, begin with a shift-out character, and end with a shift-in character. The shift-out character is hexadecimal OE; the shift-in character is hexadecimal OF. Figure 8-10 shows examples of using the P entry in column 56 on a D specification.

F

The field name in columns 7-12 becomes the prompt for the field. Required entries are:

- The name of an input field, output field, or output/input field in columns 7-12.
- The starting location of the field-name prompt in columns 19-22.

Regardless of the length of the field name in columns 7-12, WSU reserves six positions on the display for the name. In addition, one blank separates the last position for the field name from the first position of the field.

The cursor skips over each prompt on a display during data entry and positions itself only at the beginning of input fields.

Figure 8-9 (lines 5, 10, and 13) shows the D specification entries for coding field-name prompts. Figure 8-10 shows examples of using the F entry in column 56 on a D specification.

M

Columns 57-60 specify a four-digit message identification code (MIC) that references a prompt in your message member. Required entries are:

- The starting location of the prompt in columns 19-22.
- The four-digit MIC in columns 57-60.

Columns 7-12 (Field Name) must be blank.

Columns 23-30 of the J specification name the message member to use.

WSU determines the number of positions between the start of this prompt and the start of the next field or constant on this display. If you do not leave enough room for your prompt, the extra rightmost characters will be truncated. You must allow at least 6 positions for the prompt on the display.

## M (continued)

The cursor skips over each prompt on a display during data entry and positions itself only at the beginning of input fields.

Figure 8-9 (line 2) shows the D specification entries for coding a four-digit MIC. Figure 8-10 shows an example of using the M entry in column 56 on a D specification.

## COLUMN 80 (CONTINUATION)

This entry can be any nonblank character, which allows you to continue coding constant data (columns 57-79) in columns 7-79 of the following D specification line. You are allowed one continuation of any D specification line that has C, P, or D in column 56. The continuation line should not contain \* in column 7, since WSU will assume that the line contains a comment rather than a continuation of the previous line.

When continuing constant data that contains ideographic characters, you should consider the following:

1. If a shift-in character is in column 78 or column 79 and if the constant is continued with a shift-out character in column 7 of the continuation line, the shift-in/shift-out pair and the intervening blank (if one exists) are deleted when the constant is concatenated.
2. If a shift-out character is in column 78 and a shift-in character is in column 79, the shift-out/shift-in pair is deleted when the constant is concatenated.

Figure 8-11 shows examples of how to continue constant data.







Second Edition

GX21-9253 U/M 050\*

# System/34 Display Screen Format Specifications

Use this coding sheet only to define display screen formats for WSU and \$SFGR. This coding sheet could contain typographical errors.

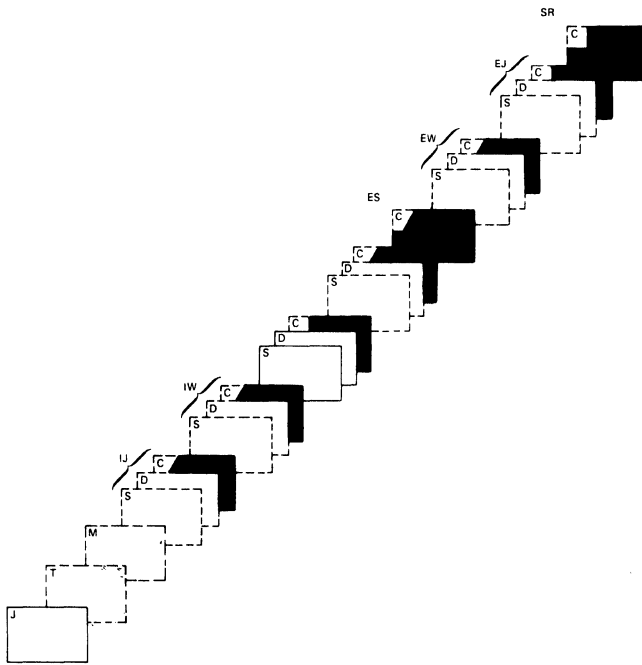
Printed in U.S.A.  
\*No. of sheets per pad may vary slightly.

Sequence Number	Form Type	Format Name	Format ID (WSU Only)		Start Line Number	Number of Lines to Clear	Lowercase Return Input	Reset Keyboard (WSU Only)	Sound Alarm	Enable Function Keys	Enable Command Keys	Blink Cursor	Erase Input Fields	Override Fields	Suppress Input	Reserved	Reserved	Reserved	Reserved	Key Mask	Reserved	
			1	2																		3
1	S																					

Sequence Number	Form Type	Field Name		Field Length	Starting Location		Output Data	Edit Code (WSU Only)	Input Allowed	Data Type	Mandatory Fill	Mandatory Entry	Self Check	Adjust/Fill	Position Cursor	Enable Dup	Controlled Field Exit	Auto Record Advance	Protect Field	High Intensity	Blink Field	Nondisplay	Reverse Image	Underline	Column Separators	Reserved	Constant Type	Constant Data	Continuation
		WSU Field Name	Not Used by WSU		Line Number	Horizontal Position																							
1	D				21	05																					P	PRESS COMMAND KEY 8 TOX	
2	D	CONTINUE			10	06																					P	REKEY CUSTOMER'S NAMEX	
3	D																										C	%	1/2 X
4	D																										P	1/2	1/2 X

Figure 8-11. Examples of Continued Constant Data

## Chapter 9. C Specification



This chapter describes the entries that you can code on the C specification and provides coding examples. You can find additional information about coding C specifications in the following:

- Chapter 1 describes the WSU program cycle and processing levels.
- Chapter 11 explains the indicators you can use on the C specification.
- Chapter 15 contains sample programs for which C specifications have been coded.
- Appendix A provides a summary of the C specification entries.

C specifications allow you to code processing for displays, subroutines, and processing levels. Figure 9-1 shows the C specification coding form.

Each C specification has four areas:

- Columns 7-8 specify operations to occur during a specified processing level.
- Columns 9-17 specify conditions for which operations occur.
- Columns 18-53 specify operations, operands, and results.
- Columns 54-59 specify the tests made on the results of the operations, and which indicators reflect the results of the tests.



# WSU C Specifications

GX21-9254-  
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Sequence Number	Form Type	Indicators		Factor 1	Operation	Table or Message Text			Blank	Continuation	Resulting Indicators	Comments	
		And	And			Factor 2	Literal						Arithmetic
							Name	Length					
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
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77													
78													
79													
80													

**Conditions**

**Operation**

**Operands**

**Results**

**Tests**

**Processing Level**

**Figure 9-1. Coding Forms for C Specifications**

**COLUMNS 7-8 (PROCESSING LEVEL)**

IJ	Operation that occurs only during the job-initiation processing level.
IW	Operation that occurs only during the work-session-initiation processing level.
ES	Operation that occurs only during the end-of-sequence-set processing level. ES processing occurs only for the primary display sequence.
EW	Operation that occurs only during the end-of-work-session processing level.
EJ	Operation that occurs only during the end-of-job processing level.
Blank	Operation for the display defined by the S and D specifications that precede these C specifications, or operation in a subroutine.
SR	Operation in a subroutine. SR in columns 7-8 is an optional entry for a subroutine operation, including BEGSR, PRTY, and ENDSR.
AN or OR	AND/OR relationship line. Use the AN and OR entries to group as many as seven OR lines, seven AND lines, or seven lines with any combination of the two to condition an operation. The first line of the group can have blanks, IJ, IW, ES, EW, EJ, or SR in columns 7-8. All lines after the first must have AN or OR in columns 7-8. The last line of the group contains the operation and the necessary operands. All lines in the group except the last line must have blanks in columns 18-59, and must have one or more indicators in columns 9-17.

Figure 9-2 shows examples of using AN and OR entries.

*Note:* If you code a processing-level indicator in columns 15-16 of an S specification, all C specifications associated with that S specification must have the same processing-level indicator in columns 7-8.

Refer to Chapter 11, *Indicators* for more information about when the indicators you code in columns 7-8 turn on and how to use these indicators. Refer to *Enter Mode Program Cycle* in Chapter 1, *Introduction* for a description of processing levels.

**COLUMNS 9-17 (INDICATORS)**

Blank	The operation coded in columns 28-32 occurs each time the C specification is processed.
AE	Operation done when the AE (accept sequence error) indicator is on.
CG	Operation done when the CG (current group) indicator is on.
DL	Operation done when the DL (delete) indicator is on.
EJ	Operation done when the EJ indicator is on. This operation can occur outside of the EJ processing level if the EJ indicator has been set on via a SETON operation.
ES	Operation done when the ES indicator is on. This operation can occur outside of the ES processing level if the ES indicator has been set on via a SETON operation.
EW	Operation done when the EW indicator is on. This operation can occur outside of the EW processing level if the EW indicator has been set on via a SETON operation.
IJ	Operation done when the IJ indicator is on.
IN	Operation done only in insert mode.
IW	Operation done when the IW indicator is on.
JA-JN, JP-JY	Operation done when the specified job indicator is on.
KG-KL, KQ-KY	Operation done if the corresponding command key was enabled and pressed.
RC	Operation done when an operator restarts a work session after a system or program error. The program must have a transaction file in order to use this indicator.
RP	Operation done for a display that has been redisplayed via the MSG operation.
RS	Operation done when an operator restarts a work session after signing off. The program must have a transaction file in order to use this indicator.
RV	Operation done only in review mode or insert mode.

- SA-SN, SP-SY    Operation done when the specified session-level indicator is on.
- U1-U8    Operation done if the specified indicator was set on via the SWITCH OCL statement before the program ran or via a SETON operation.
- 01-89    Operation done only if the specified indicator is on.

Use columns 9-17 to assign indicators that specify the conditions for doing the operation. You can code from one to three indicators in columns 10-11, 13-14, and 16-17 on each line. If an indicator must be off before the operation is done, code an N before the indicator in column 9, 12, or 15.

The indicators in columns 9-17 operate in an *and* relationship with one another. By coding an AN or OR entry in columns 7-8, you can use more than three indicators to condition a single operation. You can include as many as seven OR lines, seven AND lines, or seven lines with any combination of the two.

For more information about indicators, refer to Chapter 11, *Indicators*.

### WSU C Specifications

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Sequence Number	Form Type Processing Level (U, L, W, ES, EW, E, J, SR, AN, OR)	Indicators			Factor 1	Operation	Table or Message Text		Blank Continuation	Resulting Indicators			Comments	
		And	And	And			Factor 2	Literal		Arithmetic				
		Not	Not	Not				Result Field		Plus	Minus	Zero		
		Name	Length	Decimal Pos				High		Low	Equal			
1														
2	C		01	02	03									
3	C	AN	04											
4	C	OR	01	02	03									
5	C	AN	05		FIELD A	SUB	FIELD B	QTY	52	23				
6	C													
7	C													
8	C	ES	01	02	N03									
9	C	OR	01	N02	03									
10	C	OR	N01	02	03	SUM	ADD	SUMTOT	SUMTOT	82H				
11	C													

This example shows the use of AN and OR lines to group lines of indicators. When indicators 01, 02, 03, and 04 are on, *or* when indicators 01, 02, 03, and 05 are on, the SUB operation is done.

This example shows that any one of three conditions can cause the ADD operation to be done at the end of sequence set (ES) processing level. The three conditions are:

- Indicators 01 and 02 on; indicator 03 off
- Indicators 01 and 03 on; indicator 02 off
- Indicators 02 and 03 on; indicator 01 off

Figure 9-2. Sample AN and OR Entries

**COLUMNS 18-27 (FACTOR 1) AND COLUMNS 33-42 (FACTOR 2)**

These entries name fields or specify data (literals) for an operation in columns 28-32. Valid entries depend upon the operation. Figure 9-3 shows the possible entries for factor 1 and factor 2 for each operation.

**Literals**

A literal is the actual data used in an operation, rather than the field name representing that data. A literal can be numeric, alphanumeric (A/N), or ideographic.

The following rules apply to each alphanumeric literal:

- Any combination of characters and blanks can be used.
- The maximum length is eight characters including blanks.
- It must be enclosed with apostrophes (').
- An apostrophe in the literal is represented by two apostrophes. For example, the literal O'CLOCK is coded as 'O''CLOCK'.
- It cannot be used for arithmetic operations.

The following rules apply to each numeric literal:

- It consists of any combination of the digits 0-9. A decimal point, comma, or a sign can also be included, depending on the edit code specified in column 43 of the J specification.
- It must be left-adjusted.
- The sign (+ or -), if present, must be the leftmost character. WSU treats an unsigned numeric literal as a positive number.
- The maximum total length is 10 digits including sign and decimal point.
- Embedded blanks are not allowed.
- It must not be enclosed in apostrophes (').
- It is used in the same way as a numeric field.

Figure 9-4 shows examples of alphanumeric and numeric literals.

The format of an ideographic literal is:

apostrophe (')	S/O character	1-3 ideographic characters	S/I character	apostrophe (')
----------------	---------------	----------------------------	---------------	----------------

	<b>Operation</b>	<b>Factor 1</b>	<b>Factor 2</b>
Arithmetic	ADD	Numeric field or literal	Numeric field or literal
	DIV	Numeric field or literal	Numeric field or literal
	MULT	Numeric field or literal	Numeric field or literal
	MVR	Blank	Blank
	SUB	Numeric field or literal	Numeric field or literal
	Z-ADD	Blank	Numeric field or literal
	Z-SUB	Blank	Numeric field or literal
Branching	GOTO	Blank	Label of a TAG operation or ENDSR operation
	EXSR	Blank	Subroutine name
	TAG	Label	Blank
Comparing and Testing	COMP	Field or literal	Field, literal, table of fields, or table of literals
	RANGE	Field or literal	Field or literal
Debugging	DEBUG	Field, literal, or blank	Blank
Indicator	SETOF	Blank	Blank
	SETON	Blank	Blank
Input/Output	GET	Blank	Master file name
	GETNH	Blank	Transaction file name or blank
	GETNR	Blank	Transaction file name or blank
	GETPH	Blank	Transaction file name or blank
	GETPR	Blank	Transaction file name or blank
	IMSG	Blank	MIC or message text
	MSG	Blank	MIC or message text
	PUT	Blank	Transaction file name or master file name
	PUTN	Blank	Master file name
	PUTS	Blank	Display screen format name
	TIME	Blank	Blank
Move	MOVE	Blank	Field, literal, or *BLANK
	MOVEL	Blank	Field or literal
Subroutine	BEGSR	Subroutine name	Blank
	ENDSR	Label	Blank
	PRTY	Blank	0, 1, 2, or 3

Figure 9-3. Entries for Factor 1 and Factor 2



Type of Operation	Operation Code (28-32)	Processing Level (7-8)	Indicators (9-17)	Factor 1 (18-27)	Factor 2 (33-42)	Result Field (43-48)	Field Length (49-51)	Decimal Position (52)	Half Adjust (53)	Resulting Indicators <sup>1</sup> (54-59)
Arithmetic	ADD	O	O	R	R	R	O	O	O	O
	DIV	O	O	R	R	R	O	O	O <sup>2</sup>	O
	MULT	O	O	R	R	R	O	O	O	O
	MVR	O	O	B	B	R	O	O	B	O
	SUB	O	O	R	R	R	O	O	O	O
	Z-ADD	O	O	B	R	R	O	O	O	O
	Z-SUB	O	O	B	R	R	O	O	O	O
Branching	GOTO	O	O	B	R	B	B	B	B	B
	EXSR	O	O	B	R	B	B	B	B	B
	TAG	O	B	R	B	B	B	B	B	B
Comparing and Testing	COMP	O	O	R	R <sup>3</sup>					R
	RANGE	O	O	R	R	R	O	O	B	R
Debugging	DEBUG	O	O	O	B	O	B	B	B	B
Indicators	SETOF	O	O	B	B	B	B	B	B	R
	SETON	O	O	B	B	B	B	B	B	R
Input/Output	GET	O	O	B	R	B	B	B	B	O <sup>4</sup>
	GETNH	O	O	B	O <sup>5</sup>	B	B	B	B	O <sup>4</sup>
	GETNR	O	O	B	O <sup>5</sup>	B	B	B	B	O <sup>4</sup>
	GETPH	O	O	B	O <sup>5</sup>	B	B	B	B	O <sup>4</sup>
	GETPR	O	O	B	O <sup>5</sup>	B	B	B	B	O <sup>4</sup>
	IMSG	O	O	B	R <sup>6</sup>					O
	MSG	O	O	B	R <sup>6</sup>					O
	PUT	O	O	B	R	B	B	B	B	O <sup>7</sup>
	PUTN	O	O	B	R	B	B	B	B	R <sup>8</sup>
	PUTS	O	O	B	R	B	B	B	B	B
Move	MOVE	O	O	B	R	R	O	O	B	B
	MOVEL	O	O	B	R	R	O	O	B	B
Subroutine	BEGSR	O	B	R	B	B	B	B	B	B
	ENDSR	O	B	O	B	B	B	B	B	B
	PRTY	O	B	B	R <sup>9</sup>	B	B	B	B	B

O = optional; R = required; B = blank

<sup>1</sup> Resulting indicators must not be coded on a line that does not have an operation code.

<sup>2</sup> MVR cannot follow a DIV operation that specifies half adjust.

<sup>3</sup> Factor 2 can be a field, literal, or table of values. Column 53 is used to indicate continuation of a table.

<sup>4</sup> You can code an indicator in columns 54-55 that turns on when WSU cannot find a record to read or cannot identify a record. Columns 56-59 must be blank.

<sup>5</sup> Factor 2 can be blank or the name of the transaction file. If factor 2 is blank, WSU assumes the name of the transaction file.

<sup>6</sup> Factor 2 can be as many as 64 characters of message text or a four-digit MIC. Column 53 is used to indicate continuation of message text.

<sup>7</sup> You can code the type of record to be written to the transaction file in columns 54-55; columns 56-59 must be blank.

<sup>8</sup> You must code the type of record to be added to the master file in columns 54-55; columns 56-59 must be blank.

<sup>9</sup> Factor 2 must be 0, 1, 2, or 3, and must be left-adjusted.

Figure 9-5. Operation Codes

## Arithmetic Operations

The arithmetic operations are:

- ADD
- DIV (divide)
- MULT (multiply)
- MVR (move remainder)
- SUB (subtract)
- Z-ADD (zero and add)
- Z-SUB (zero and subtract)

For these operations, factor 1 and factor 2 (if not blank) must be numeric fields or numeric literals, and the result field must be numeric.

All arithmetic operations do decimal alignment. Even though truncation may occur, the position of the decimal point in the result field does not change. For arithmetic operations that use all three fields: of factor 1, factor 2, and the result field, two or all can be the same field, or all can be different fields.

The length of any field in an arithmetic operation cannot exceed 15 characters. If the result exceeds 15 characters, characters may drop from either or both ends depending on the location of the decimal point. The results of all operations are signed (+ or -), and the sign is in the zone portion of the rightmost digit.

Arithmetic operations cannot result in negative zero. A zero has a plus zone. You can code the following indicators in columns 54-59 that signal whether the results of an arithmetic operation are plus (columns 54-55), minus (columns 56-57), or zero (columns 58-59):

AE  
EJ  
ES  
EW  
JA-JN, JP-JY  
KG-KL, KQ-KY  
SA-SN, SP-SY  
U1-U8  
01-89

Refer to Chapter 11, *Indicators* for an explanation of these indicators.

## Branching Operations

Operations execute in the order in which you code them on the C specifications. Sometimes, however, the operations should not execute in the order that you code them. For example, you might want to skip several operations when certain conditions occur or do several operations repeatedly. The GOTO and TAG operations allow branching within C specifications for a display, for a subroutine, or for a processing level; the EXSR operation allows branching to a subroutine.

## Comparing and Testing Operations

The operations for comparing and testing are COMP and RANGE. Fields do not change because of these operations.

The COMP operation allows a field or literal to be compared with one or more fields or literals. The RANGE operation can be used to test if a field or literal has a value that is between two other values.

## Debugging Operation

The operation for debugging a WSU program while it executes is DEBUG. If DEBUG-YES is specified in the procedure that calls the program, WSU shows a display of debugging information when the DEBUG operation is encountered.

## Indicator Operations (Setting On and Off)

The SETON and SETOF operations set the following indicators on or off:

AE  
EJ  
ES  
EW  
JA-JN, JP-JY  
KG-KL, KQ-KY  
RC (SETOF only)  
RS (SETOF only)  
SA-SN, SP-SY  
U1-U8  
01-89



## Input and Output Operations

WSU provides the following operations to explicitly control input and output for files, to show messages on a display, to show a display, and to retrieve the system time of day and system date:

- GET (Get a master file record.)
- GETNH (Get the next header record from the transaction file.)
- GETNR (Get the next record from the transaction file.)
- GETPH (Get the previous header record from the transaction file.)
- GETPR (Get the previous record from the transaction file.)
- IMMSG (Display an information message.)
- MSG (Display a diagnostic message.)
- PUT (Write a transaction file or master file record.)
- PUTN (Add a record to a master file.)
- PUTS (Show a display.)
- TIME (Get the time of day and date.)

If a transaction file is not specified in a WSU program, the GETNR, GETNH, GETPR, and GETPH operations cannot be coded. These operations cause terminal errors during program generation.

## Move Operations

The move operations are MOVE and MOVEL (move left). These operations move (copy) part or all of factor 2 to the result field. Factor 2 does not change, and factor 1 and columns 54-59 must be blank.

## Subroutine Operations

WSU provides the following operations for defining the beginning, end, and priority of subroutines in a WSU program:

- BEGSR (Begin subroutine)
- ENDSR (End subroutine)
- PRTY (Priority)

Subroutines must be coded at the end of a WSU program. Each line in a subroutine that specifies an operation code must have SR coded in columns 7-8 of that line. Any WSU operation except EXSR can be coded in a subroutine. For information on how to code subroutines, refer to Chapter 10, *Subroutines*.

## ADD (ADD)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Required	ADD	Required	Required	Optional

This operation adds factor 2 to factor 1 and places the sum in the result field. Factor 1 and factor 2 do not change, unless either factor 1 or factor 2 is the result field.

## BEGSR (BEGIN SUBROUTINE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Blank	Required	BEGSR	Blank	Blank	Blank

This operation labels the beginning of the subroutine. Factor 1 contains the subroutine name beginning in column 18. This name can be from one to six characters long and must begin with an alphabetic character. Remaining characters must be alphameric. No two subroutines can have the same name. Factor 2 must be blank.

Refer to *Chapter 10, Subroutines*, for an example of coding the BEGSR operation.

### Notes:

1. You must code ENDSR after BEGSR before you can code another BEGSR operation.
2. The BEGSR operation cannot have indicators in columns 9-17.
3. The subroutine name in factor 1 must not be the same as the name in factor 1 of a TAG or ENDSR operation or any field name defined in the program.

## COMP (COMPARE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Required	COMP	Required	Required	Required

This operation compares factor 1 with factor 2. Factor 1 can be a field or literal; factor 2 can be a field, literal or table. You can code conditioning indicators in columns 7-17.

### Comparing Factor 1 to a Field or Literal

The COMP operation compares factor 1 and factor 2. As a result of the compare, indicators turn on as follows:

High: Factor 1 is greater than factor 2

Low: Factor 1 is less than factor 2

Equal: Factor 1 equals factor 2

Factor 1 and factor 2 must be either both alphameric or both numeric.

The data automatically aligns before the compare. If the data is alphameric, it aligns to the leftmost character. If one factor is shorter, the unused positions fill with blanks (Figure 9-6). The maximum length for compared alphameric data is 256 characters.

If the data is numeric, it aligns according to the decimal point. Any missing digits fill with zeros (Figure 9-7). The maximum length of compared numeric data is 15 digits.

Figure 9-8 shows C specifications for compare operations.

Line 00010: The contents of the field SLS76 (1976 sales) are compared with the contents of SLS75. Indicators 21, 26, and 30 are set off. If 1976 sales exceed 1975 sales, resulting indicator 21 turns on; if 1976 sales are less than 1975 sales, indicator 26 turns on; if the two years had equal sales, indicator 30 turns on.

Line 00020: The alphameric constant OCTOBER is compared with the contents of the field named MONTH (which must also be defined as alphameric). Indicators 13 and 15 are set off. If the MONTH field does not contain the word OCTOBER, indicator 13 turns on; if it does, indicator 15 turns on after the compare operation.

Line 00030: The contents of the field named GRSPAY (which must be numeric) decimal-aligns with numeric constant 1250.00. Indicators 04 and 05 are set off. If the value in field GRSPAY is greater than or equal to 1250.00, indicator 04 turns on; if the value in field GRSPAY is less than 1250.00, indicator 05 turns on.

Line 00040: The contents of the field NETPAY (which must be numeric) is decimal aligned with numeric constant 0, and then compared to it. Indicator 10 is set off. If NETPAY is greater than 0 or equal to 0, indicator 10 turns on.

Line 00050: The contents of the field MONTH (which must be alphameric) is compared with a blank. Indicator 20 is set off. If MONTH is blank, indicator 20 turns on.





## DEBUG

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Optional	DEBUG	Blank	Optional	Blank

The DEBUG operation provides a means of detecting errors in a WSU program.

Factor 1 must be blank, a literal, or a field name. The length of a field name must not exceed eight characters. Factor 2 must be blank. You can code indicators in columns 7-17 and a result field in columns 43-48. All other entries must be blank.

During program generation, WSU adds a DEBUG-YES parameter to the WSX statement in the WSU generated procedure if one or more DEBUG operations occur in the program. You can modify the WSU-generated procedure to set the debugging function on or off before the WSU program runs by specifying YES (on) or NO (off) for the DEBUG parameter.

If DEBUG-YES is specified in the procedure that calls the program, WSU saves the current display and shows a debugging display each time a DEBUG operation is encountered during program execution. The debugging display contains:

- The display station ID
- The contents of the field or literal in factor 1, or the statement number of the DEBUG operation if factor 1 is blank
- A list of indicators that are on or the word NONE if no indicators are on
- The contents of the result field, if a result is specified

The Print function key can be pressed to print the display. When the Enter Rec Adv key is pressed, the saved display is reshown and processing resumes at the operation following the DEBUG operation.

DEBUG operations occupy main storage. Therefore, after the program is debugged, removing the DEBUG operations and regenerating the program might improve program performance.

## DIV (DIVIDE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Required	DIV	Required	Required	Optional

This operation divides factor 1 (dividend) by factor 2 (divisor) and places the result (quotient) in the result field. Factor 1 and factor 2 do not change unless either factor 1 or factor 2 is the result field. If factor 1 is zero, the result of the divide operation is zero. If factor 2 is zero, WSU issues a message and abnormally ends the work session. Any remainder resulting from the divide operation is lost unless you code the move remainder operation (MVR) as the next operation.

## ENDSR (END SUBROUTINE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Blank	Optional	ENDSR	Blank	Blank	Blank

ENDSR defines the end of a subroutine and causes control to return to the instruction after the EXSR operation that called the subroutine. BEGSR and ENDSR operations must be coded in pairs.

Factor 1 can contain a label from one to six characters long. The label must begin with an alphabetic character. Remaining characters must be alphanumeric. This label serves as a point which you can branch to by a GOTO statement within the subroutine and therefore cannot be the same as any of the following:

- Factor 1 of a TAG operation
- Factor 1 of another ENDSR operation
- Any other field name defined in the program

Conditioning indicators (columns 9-17) and factor 2 cannot be coded for an ENDSR operation.

Refer to *Chapter 10, Subroutines*, for an example of coding the ENDSR operation.

## EXSR (EXECUTE SUBROUTINE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	EXSR	Required	Blank	Blank

This operation branches to and executes the subroutine named in factor 2. EXSR can appear anywhere in the program except within a subroutine. This means that a subroutine cannot call itself or another subroutine. Whenever EXSR appears, the subroutine executes. After operations in the subroutine execute, control returns to the operation following the EXSR operation.

Indicators in columns 9-17 can condition EXSR. Factor 2 must contain the name of the subroutine. This same name must appear on a BEGSR instruction.

Refer to *Chapter 10, Subroutines* for an example of coding the EXSR operation.

## GET (GET A MASTER FILE RECORD)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	GET	Required	Blank	Optional

Master file input is allowed for a WSU program. The master file data can also be updated by the program. WSU provides a GET operation for reading a record from a master file. WSU forms the key to read a master file record from the chain fields coded in columns 31-48 of the M specification. WSU turns on the indicator for the type of record read and turns off all other record identifying indicators for the master file. A record-not-found condition occurs when WSU cannot recognize the record type. If WSU can recognize the record type, WSU places those fields for that record type into the field area.

Factor 1 of a GET operation must be blank, and factor 2 must contain the name of a master file. You can code conditioning indicators in columns 7-17. Also, you can code a record-not-found indicator in columns 54-55. This indicator turns on when WSU cannot recognize the type of record read. Columns 43-53 and 56-59 must be blank.

WSU provides a way to detect input/output errors that occur during a GET operation by allowing you to code an error indicator in columns 61-62 of the M specification for the master file. Each time WSU does a GET operation, that error indicator is set off and the \*ERROR reserved field is set to zero. If an error occurs during the GET operation, the error indicator is set on and an error code is placed in \*ERROR. Refer to Chapter 13 for information about \*ERROR and the error codes that this field can contain. Refer to Chapter 6 for a description of the Error Indicator entry on the M specification.

WSU also provides ways to detect record-not-found conditions that might occur during a GET operation by allowing you to code a not-found indicator in columns 54-55 of the C specification for the operation or in columns 49-50 of the M specification for the master file.

If you code different not-found indicators on the M specification and C specification, the indicator on the C specification is used for the GET operation. The not-found indicator on the M specification does not change and might reflect the result of a previous GET operation. Refer to Chapter 6 for a description of the Not Found Indicator entry on the M specification.

A record-not-found condition is treated as an error only if not-found indicators are omitted from the GET operation and from the M specification. Therefore, any error indicator in columns 61-62 of the M specification is used when a not-found condition occurs and columns 54-55 of the GET operation and columns 49-50 of the M specification for the master file are blank.

If a not-found condition or input/output error occurs and indicators have not been coded in the program to reflect their occurrence, the system operator receives WSU message 803 and an error code. The operator should refer to the Displayed Messages Guide for a description of the error.

## Protection of Master File Records

WSU automatically protects the last record read from an update master file so that another display station using the same WSU program cannot read (GET) the record until the original display station writes the record back to the file or reads another record. While waiting for the record to be written to the file, other display stations show a message that the record is temporarily unavailable. WSU retries to read the record automatically, but the operator must press Error Reset to continue.

WSU does not protect records in files that are shared between programs. The protection is only for display stations that run the same program with DISP-OLD in the WSU procedure.

GET and PUT operations to a master file do not have to be in the same processing level. These instructions do however have to occur in the same mode. A WSU program cannot read a record in one mode and write that record in another mode.

## GETNH (GET THE NEXT HEADER RECORD IN THE TRANSACTION FILE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	GETNH	Optional	Blank	Optional

This operation reads the next logical header record from the transaction file up to the end of a chain of records. The record is read only; it is not displayed. A record-not-found condition occurs when WSU, trying to read the next header record in the chain would read beyond the last record in the chain. WSU turns on the indicator for the type of record read and turns off all other record identifying indicators for the transaction file. A record-not-found condition also occurs when WSU cannot recognize the record type. If WSU can recognize the record type, WSU places those fields for that record type into the field area and places the relative record number of the record in the \*RLRU reserved field.

Factor 1 of a GETNH operation must be blank, and factor 2 must be blank or the name of the transaction file. (If factor 2 is blank, WSU assumes the transaction file name.) You can code conditioning indicators in columns 7-17. Also, you can code a record-not-found indicator in columns 54-55. This indicator turns on when WSU tries to read beyond the last record in the chain or when WSU cannot recognize the type of record read.

WSU provides a way to detect input/output errors that might occur during a GETNH operation by allowing you to code an error indicator in columns 61-62 of the T specification. Each time WSU does the GETNH operation, that error indicator is set off and the \*ERROR reserved field is set to zero. If an error occurs during the GETNH operation, the error indicator is set on and an error code is placed in \*ERROR. Refer to Chapter 13 for information about \*ERROR and the error codes that this field can contain. Refer to Chapter 5 for a description of the Error Indicator entry on the T specification.

WSU also provides ways to detect record-not-found conditions that might occur during a GETNH operation by allowing you to code a not-found indicator in columns 54-55 of the C specification for the operation or in columns 49-50 of the T specification.

If you code different not-found indicators on the T specification and C specification, the indicator on the C specification will be used for the GETNH operation. The not-found indicator on the T specification does not change and might reflect the result of a previous GETNH operation. Refer to Chapter 5 for a description of the Not Found Indicator entry on the T specification.

A record-not-found condition is treated as an error only if not-found indicators are omitted from the GETNH operation and from the T specification. Therefore, any error indicator in columns 61-62 of the T specification is used when a not-found condition occurs and columns 54-55 of the GETNH operation and columns 49-50 of the T specification are blank.

If a not-found condition or input/output error occurs and indicators have not been coded in the program to reflect their occurrence, the system operator receives WSU message 803 and an error code. The operator should refer to the Displayed Messages Guide for a description of the error.

The GETNH operation causes a terminal error during program generation if the WSU program does not specify a transaction file.

If you code GETNH in your program and there are no header records in the file (columns 55-56 of the T specification are blank), WSU issues a terminal message during program generation.

**GETNR (GET THE NEXT RECORD IN THE TRANSACTION FILE)**

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	GETNR	Optional	Blank	Optional

This operation reads the next logical record from the transaction file up to the end of a chain of records. The record is read only; it is not displayed. A record-not-found condition occurs when WSU, trying to read the next record in the chain would read beyond the last record in the chain. WSU turns on the indicator for the type of record read and turns off all other record identifying indicators for the transaction file. A record-not-found condition also occurs when WSU cannot recognize the record type. If WSU can recognize the record type, WSU places those fields for that record type into the field area and places the relative record number of the record in the \*RLRU reserved field.

Factor 1 of a GETNR operation must be blank, and factor 2 must be blank or the name of the transaction file. (If factor 2 is blank, WSU assumes the transaction file name.) You can code conditioning indicators in columns 7-17. Also, you can code a record-not-found indicator in columns 54-55. This indicator turns on when WSU tries to read beyond the last record in a chain or when WSU cannot recognize the type of record read.

WSU provides a way to detect input/output errors that might occur during a GETNR operation by allowing you to code an error indicator in columns 61-62 of the T specification. Each time WSU does the GETNR operation, that error indicator is set off and the \*ERROR reserved field is set to zero. If an error occurs during the GETNR operation, the error indicator is set on and an error code is placed in \*ERROR. Refer to Chapter 13 for information about \*ERROR and the error codes that this field can contain. Refer to Chapter 5 for a description of the Error Indicator entry on the T specification.

WSU also provides ways to detect record-not-found conditions that might occur during a GETNR operation by allowing you to code a not-found indicator in columns 54-55 of the C specification for the operation or in columns 49-50 of the T specification.

If you code different not-found indicators on the T specification and C specification, the indicator on the C specification will be used for the GETNR operation. The not-found indicator on the T specification does not change and might reflect the result of a previous GETNR operation. Refer to Chapter 5 for a description of the Not Found Indicator entry on the T specification.

A record-not-found condition is treated as an error only if not-found indicators are omitted from the GETNR operation and from the T specification. Therefore, any error indicator in columns 61-62 of the T specification is used when a not-found condition occurs and columns 54-55 of the GETNR operation and columns 49-50 of the T specification are blank.

If a not-found condition or input/output error occurs and indicators have not been coded in the program to reflect their occurrence, the system operator receives WSU message 803 and an error code. The operator should refer to the *Displayed Messages Guide* for a description of the error.

The GETNR operation causes a terminal error during program generation if the WSU program does not specify a transaction file.

The GETNR operation cannot read records that are being inserted in the transaction file until the processing of the insert display ends.



**GETPH (GET THE PREVIOUS HEADER RECORD IN THE TRANSACTION FILE)**

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	GETPH	Optional	Blank	Optional

This operation reads the previous logical header record from the transaction file up to the beginning of a chain of records. The record is read only; it is not displayed. A record-not-found condition occurs when WSU, trying to read the previous header record in the chain would read ahead of the first record in the chain. WSU turns on the indicator for the type of record read and turns off all other record identifying indicators for the transaction file. A record-not-found condition also occurs when WSU cannot recognize the record type. If WSU can recognize the record type, WSU places those fields for that record type into the field area and places the relative record number of the record in the \*RLRU reserved field.

Factor 1 of a GETPH operation must be blank, and factor 2 must be blank or the name of the transaction file. (If factor 2 is blank, WSU assumes the transaction file name.) You can code conditioning indicators in columns 7-17. Also, you can code a record-not-found indicator in columns 54-55. This indicator turns on when WSU tries to read ahead of the first record in a chain or when WSU cannot recognize the type of record read.

WSU provides a way to detect input/output errors that might occur during a GETPH operation by allowing you to code an error indicator in columns 61-62 of the T specification. Each time WSU does the GETPH operation, that error indicator is set off and the \*ERROR reserved field is set to zero. If an error occurs during the GETPH operation, the error indicator is set on and an error code is placed in \*ERROR. Refer to Chapter 13 for information about \*ERROR and the error codes that this field can contain. Refer to Chapter 5 for a description of the Error Indicator entry on the T specification.

WSU also provides ways to detect record-not-found conditions that might occur during a GETPH operation by allowing you to code a not-found indicator in columns 54-55 of the C specification for the operation or in columns 49-50 of the T specification.

If you code different not-found indicators on the T specification and C specification, the indicator on the C specification will be used for the GETPH operation. The not-found indicator on the T specification does not change and might reflect the result of a previous GETPH operation. Refer to Chapter 5 for a description of the Not Found Indicator entry on the T specification.

A record-not-found condition is treated as an error only if not-found indicators are omitted from the GETPH operation and from the T specification. Therefore, any error indicator in columns 61-62 of the T specification is used when a not-found condition occurs and columns 54-55 of the GETPH operation and columns 49-50 of the T specification are blank.

If a not-found condition or input/output error occurs and indicators have not been coded in the program to reflect their occurrence, the system operator receives WSU message 803 and an error code. The operator should refer to the *Displayed Messages Guide* for a description of the error.

The GETPH operation causes a terminal error during program generation if the WSU program does not specify a transaction file.

If you code GETPH in your program and there are no header records in the file (columns 55-56 of the T specification are blank), WSU issues a terminal message during program generation.

## GETPR (GET THE PREVIOUS RECORD IN THE TRANSACTION FILE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	GETPR	Optional	Blank	Optional

This operation reads the previous logical record from the transaction file up to the beginning of a chain of records. The record is read only; it is not displayed. A record-not-found condition occurs when WSU, trying to read the previous record in the chain would read ahead of the first record in the chain. WSU turns on the indicator for the type of record read and turns off all other record identifying indicators for the transaction file. A record-not-found condition also occurs when WSU cannot recognize the record type. If WSU can recognize the record type, WSU places those fields for that record type into the field area and places the relative record number of the record in the \*RLRU reserved field.

Factor 1 of a GETPR operation must be blank, and factor 2 must be blank or the name of the transaction file. (If factor 2 is blank, WSU assumes the transaction file name.) You can code conditioning indicators in columns 7-17. Also, you can code a record-not-found indicator in columns 54-55. This indicator turns on when WSU tries to read ahead of the first record in the chain or when WSU cannot recognize the type of record read.

WSU provides a way to detect input/output errors that occur during a GETPR operation by allowing you to code an error indicator in columns 61-62 of the T specification. Each time WSU does the GETPR operation, that error indicator is set off and the \*ERROR reserved field is set to zero. If an error occurs during the GETPR operation, the error indicator is set on and an error code is placed in \*ERROR. Refer to Chapter 13 for information about \*ERROR and the error codes that this field can contain. Refer to Chapter 5 for a description of the Error Indicator entry on the T specification.

WSU also provides ways to detect record-not-found conditions that might occur during a GETPR operation by allowing you to code a not-found indicator in columns 54-55 of the C specification for the operation or in columns 49-50 of the T specification.

If you code different not-found indicators on the T specification and C specification, the indicator on the C specification will be used for the GETPR operation. The not-found indicator on the T specification does not change and might reflect the result of a previous GETPR operation. Refer to Chapter 5 for a description of the Not Found Indicator entry on the T specification.

A record-not-found condition is treated as an error only if not-found indicators are omitted from the GETPR operation and from the T specification. Therefore, any error indicator in columns 61-62 of the T specification is used when a not-found condition occurs and columns 54-55 of the GETPR operation and columns 49-50 of the T specification are blank.

If a not-found condition or input/output error occurs and indicators have not been coded in the program to reflect their occurrence, the system operator receives WSU message 803 and an error code. The operator should refer to the *Displayed Messages Guide* for a description of the error.

The GETPR operation causes a terminal error during program generation if the WSU program does not specify a transaction file.

The GETPR operation cannot read records that are being inserted in the transaction file until the processing of the insert display ends.



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## IMSG (DISPLAY AN INFORMATION MESSAGE)

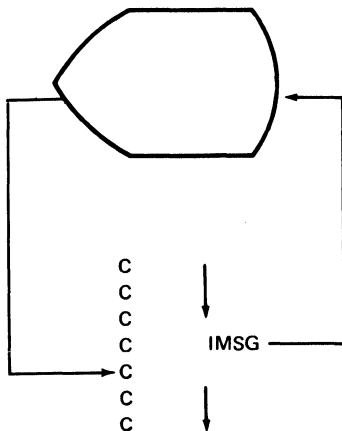
Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	IMSG	Required	Required	Optional

The IMSG operation causes a user-defined message to be shown on the bottom line of the current display. If data is on the bottom line, the message overlays it. If resulting indicators are specified by the operation, those indicators turn on. The current display is not reissued; the only change to it is the message. The execution of the C specifications stops and the operator cannot key data into any field on the display.

To clear the message, the operator must press the Error Reset key. To resume processing at the C specification that follows the IMSG operation, the operator must press the Enter/Rec Adv key, an enabled function key, or an enabled user command key.

If an IMSG operation is executed in processing that has no associated display (ES processing, for example), the message is shown on the bottom line of the current display. The operator cannot key data into any field on the display. If an IMSG operation is executed while the WSU menu is displayed, the screen is cleared before the message is displayed.

If an IMSG is executed in preprocessing before a PUTS for the display occurs, the entire display is shown and the message is put on its bottom line.



Factor 1 must be blank. You can code indicators in columns 7-17 and columns 54-59. The indicators in columns 54-59 turn on when IMSG executes, and you can use these indicators to condition subsequent operations. These indicators cannot be used to condition display attributes or field attributes.

Columns 33-52 can contain message text or a MIC. Message text must be enclosed in apostrophes. Code two consecutive apostrophes to represent one apostrophe in text. The message text appears on the bottom line of the display.

Columns 33-52 can contain ideographic message text. This text must be enclosed in apostrophes.

A MIC is four digits that reference the appropriate message in your message member. Code the MIC in columns 33-36. Columns 23-30 of the J specification contain the name of your message member.

When continuing a message that contains ideographic characters, you should consider the following:

1. If a shift-in character is in column 51 or column 52 and if the message is continued with a shift-out character in column 7 of the continuation line, the shift-in/shift-out pair and the intervening blank (if one exists) are deleted when the message is concatenated.
2. If a shift-out character is in column 51 and a shift-in character is in column 52, the shift-out/shift-in pair is deleted when the message is concatenated.

Figure 9-11 shows examples of the IMSG operation.

You can continue text to columns 7-52 of the following C specification line by coding any nonblank character in column 53 of the line you want to continue. Column 7 of the continuation line must not be an \*. WSU allows 64 characters of message text.



**Factor 2 and Result Field Same Length**

	<b>Factor 2</b>		<b>Result Field</b>	
Alphameric	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Before MOVE	<u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>4</u>	Alphameric
	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	After MOVE	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	
Alphameric	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Before MOVE	<u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>4</u>	Numeric
	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	After MOVE	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	
Numeric	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	Before MOVE	<u>A</u> <u>L</u> <u>T</u> <u>5</u> <u>F</u>	Numeric
	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	After MOVE	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	
Numeric	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	Before MOVE	<u>A</u> <u>L</u> <u>T</u> <u>5</u> <u>F</u>	Alphameric
	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	After MOVE	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	

**Factor 2 Shorter Than Result Field**

	<b>Factor 2</b>		<b>Result Field</b>	
Alphameric	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Before MOVE	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>4</u> <sup>+</sup>	Alphameric
	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	After MOVE	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	
Alphameric	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Before MOVE	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>4</u> <sup>+</sup>	Numeric (5 = letter N)
	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	After MOVE	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	
Numeric	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	Before MOVE	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>9</u> <sup>+</sup>	Numeric
	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	After MOVE	<u>1</u> <u>2</u> <u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u> <sup>+</sup>	
Numeric	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	Before MOVE	<u>A</u> <u>C</u> <u>F</u> <u>G</u> <u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Alphameric
	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	After MOVE	<u>A</u> <u>C</u> <u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	

**Factor 2 Longer Than Result Field**

	<b>Factor 2</b>		<b>Result Field</b>	
Alphameric	<u>A</u> <u>C</u> <u>E</u> <u>G</u> <u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Before MOVE	<u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>4</u>	Alphameric
	<u>A</u> <u>C</u> <u>E</u> <u>G</u> <u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	After MOVE	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	
Alphameric	<u>A</u> <u>C</u> <u>E</u> <u>G</u> <u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Before MOVE	<u>5</u> <u>6</u> <u>7</u> <u>8</u> <u>4</u> <sup>+</sup>	Numeric
	<u>A</u> <u>C</u> <u>E</u> <u>G</u> <u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	After MOVE	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	
Numeric	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	Before MOVE	<u>5</u> <u>6</u> <u>7</u> <u>4</u> <u>8</u>	Numeric
	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	After MOVE	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	
Numeric	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	Before MOVE	<u>P</u> <u>H</u> <u>4</u> <u>S</u> <u>N</u>	Alphameric
	<u>1</u> <u>2</u> <u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	After MOVE	<u>7</u> <u>8</u> <u>4</u> <u>2</u> <u>5</u>	

+  
4 = letter D  
5 = letter N

Figure 9-12. MOVE Operations

## MOVE (MOVE LEFT)

Indicators	Factor	Operation	Factor	Result	Resulting
9-17	1		2	Field	Indicators
Optional	Blank	MOVE	Required	Required	Blank

This operation moves all or part of factor 2 into the result field. Moving begins with the leftmost character of factor 2, which moves into the leftmost character of the result field. Factor 2 does not change. Factor 1 and columns 54-59 must be blank.

If factor 2 is longer than the result field, the extra rightmost characters of factor 2 do not move. If factor 2 is shorter than the result field, the extra rightmost characters of the result field do not change.

The MOVE operation can be used to change numeric data into alphameric data and alphameric data into numeric data. To change numeric data into alphameric data, code the name of the numeric field in factor 2 and name of an alphameric field in the result field. To change alphameric data into numeric data, code the name of the alphameric field in factor 2 and the name of a numeric field in the result field.

When an alphameric field is moved into a numeric result field, the digit portion of each character is converted to its corresponding numeric character and then moved to the result field. Blanks are transferred as zeros. When factor 2 is longer than the result field or the same length as the result field, the zone portion of the rightmost character of factor 2 is converted and used as the sign of the result field, whether or not the rightmost character is included in the move.

When the MOVE operation is used to move data into a numeric field, the decimal positions specified for the field in factor 2 are ignored. For example, if 1.00 is moved into a numeric field that has one decimal position, the result is 10.0.

Figure 9-13 summarizes the MOVE operation. A summary of the rules for MOVE operations for three conditions based on field lengths is as follows:

1. Factor 2 is the same length as the result field:
  - a. If factor 2 and the result field are numeric, the sign is moved with the rightmost position.
  - b. If factor 2 is numeric and the result field is alphameric, the sign is moved with the rightmost position.
  - c. If factor 2 is alphameric and the result field is numeric, a minus zone is moved into the rightmost position of the result field if the zone from the rightmost position of factor 2 is a D (minus zone). However, if the zone from the rightmost position of factor 2 is not a D, a positive zone is moved into the rightmost position of the result field. Digit portions are converted to their corresponding numeric characters.
  - d. If factor 2 and the result field are alphameric, all characters are moved.
2. Factor 2 is longer than the result field:
  - a. If factor 2 and the result field are numeric, the sign from the rightmost position of factor 2 is moved into the rightmost position of the result field.
  - b. If factor 2 is numeric and the result field is alphameric, the result field contains only numeric characters.
  - c. If factor 2 is alphameric and the result field is numeric, a minus zone is moved into the rightmost position of the result field if the zone from the rightmost position of factor 2 is a D (minus zone). However, if the zone from the rightmost position of factor 2 is not a D, a positive zone is moved into the rightmost position of the result field. Other result field positions contain only numeric characters.
  - d. If factor 2 and the result field are alphameric, only the number of characters needed to fill the result field are moved.
3. Factor 2 is shorter than the result field:
  - a. If factor 2 is either numeric or alphameric and the result field is numeric, the digit portion of factor 2 replaces the contents of the leftmost positions of the result field. The sign in the rightmost position of the result field is not changed.
  - b. If factor 2 is either numeric or alphameric and the result field is alphameric, the characters in factor 2 replace the equivalent number of leftmost positions in the result field. No change is made in the zone of the rightmost position of the result field.



**Factor 2 and Result Field Same Length**

	<b>Factor 2</b>		<b>Result Field</b>	
a. Numeric	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	Before MOVE	<u>5</u>   <u>6</u>   <u>7</u>   <u>8</u>   <u>4</u>	Numeric
	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	After MOVE	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	
b. Numeric	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	Before MOVE	<u>A</u>   <u>K</u>   <u>T</u>   <u>4</u>   <u>D</u>	Alphameric
	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u> (5=letter N)	After MOVE	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>N</u>	
c. Alphameric	<u>P</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	Before MOVE	<u>5</u>   <u>6</u>   <u>7</u>   <u>8</u>   <u>4</u>	Numeric
	<u>P</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	After MOVE	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	
d. Alphameric	<u>P</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	Before MOVE	<u>A</u>   <u>K</u>   <u>T</u>   <u>4</u>   <u>D</u>	Alphameric
	<u>P</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	After MOVE	<u>P</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	

**Factor 2 Longer Than Result Field**

	<b>Factor 2</b>		<b>Result Field</b>	
a. Numeric	<u>0</u>   <u>0</u>   <u>0</u>   <u>0</u>   <u>1</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	Before MOVE	<u>5</u>   <u>6</u>   <u>7</u>   <u>8</u>   <u>4</u>	Numeric
	<u>0</u>   <u>0</u>   <u>0</u>   <u>0</u>   <u>1</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	After MOVE	<u>0</u>   <u>0</u>   <u>0</u>   <u>0</u>   <u>1</u>	
b. Numeric	<u>9</u>   <u>0</u>   <u>3</u>   <u>1</u>   <u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	Before MOVE	<u>A</u>   <u>K</u>   <u>T</u>   <u>4</u>   <u>D</u>	Alphameric
	<u>9</u>   <u>0</u>   <u>3</u>   <u>1</u>   <u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	After MOVE	<u>9</u>   <u>0</u>   <u>3</u>   <u>1</u>   <u>7</u>	
c. Alphameric	<u>B</u>   <u>R</u>   <u>W</u>   <u>C</u>   <u>X</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	Before MOVE	<u>5</u>   <u>6</u>   <u>7</u>   <u>8</u>   <u>4</u>	Numeric
	<u>B</u>   <u>R</u>   <u>W</u>   <u>C</u>   <u>X</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	After MOVE	<u>2</u>   <u>9</u>   <u>6</u>   <u>3</u>   <u>7</u>	
d. Alphameric	<u>B</u>   <u>R</u>   <u>W</u>   <u>C</u>   <u>X</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	Before MOVE	<u>A</u>   <u>K</u>   <u>T</u>   <u>4</u>   <u>D</u>	Alphameric
	<u>B</u>   <u>R</u>   <u>W</u>   <u>C</u>   <u>X</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>N</u>	After MOVE	<u>B</u>   <u>R</u>   <u>W</u>   <u>C</u>   <u>X</u>	

**Factor 2 Shorter Than Result Field**

	<b>Factor 2</b>		<b>Result Field</b>	
a. {	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	Before MOVE	<u>1</u>   <u>3</u>   <u>0</u>   <u>9</u>   <u>4</u>   <u>3</u>   <u>2</u>   <u>1</u>   <u>0</u>	Numeric
	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	After MOVE	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>   <u>3</u>   <u>2</u>   <u>1</u>   <u>0</u>	
b. {	<u>C</u>   <u>P</u>   <u>T</u>   <u>5</u>   <u>N</u>	Before MOVE	<u>1</u>   <u>3</u>   <u>0</u>   <u>9</u>   <u>4</u>   <u>3</u>   <u>2</u>   <u>1</u>   <u>3</u>	Numeric
	<u>C</u>   <u>P</u>   <u>T</u>   <u>5</u>   <u>N</u>	After MOVE	<u>3</u>   <u>7</u>   <u>3</u>   <u>5</u>   <u>5</u>   <u>3</u>   <u>2</u>   <u>1</u>   <u>3</u>	
b. {	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	Before MOVE	<u>B</u>   <u>R</u>   <u>W</u>   <u>C</u>   <u>X</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>A</u>	Alphameric
	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>5</u>	After MOVE	<u>7</u>   <u>8</u>   <u>4</u>   <u>2</u>   <u>N</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>A</u>	
b. {	<u>C</u>   <u>P</u>   <u>T</u>   <u>5</u>   <u>N</u>	Before MOVE	<u>B</u>   <u>R</u>   <u>W</u>   <u>C</u>   <u>X</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>A</u>	Alphameric
	<u>C</u>   <u>P</u>   <u>T</u>   <u>5</u>   <u>N</u>	After MOVE	<u>C</u>   <u>P</u>   <u>T</u>   <u>5</u>   <u>N</u>   <u>H</u>   <u>4</u>   <u>S</u>   <u>A</u>	

The arrow ↓ between numbers indicates a decimal point.

Figure 9-13. MOVE Operations

## MSG (DISPLAY A DIAGNOSTIC MESSAGE)

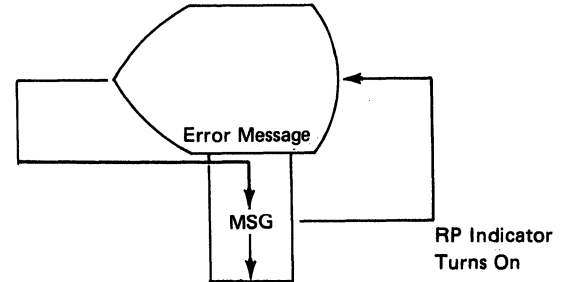
Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	MSG	Required	Required	Optional

During the processing of a display, you can interrupt the programmed processing via the MSG operation. This operation causes the current display to be immediately shown with a user message on the bottom line of the display. The message overlays any data that is on the bottom line of the display. Output fields that are conditioned by indicators that are on will be updated. The cursor, unless repositioned via an indicator on a D specification, remains where it was when the MSG operation occurred. Fields that were protected remain protected; fields that were unprotected remain unprotected, even if the indicator that controls these attributes changes.

If an MSG operation is executed in processing that has no associated display (ES processing, for example), the message is shown on the bottom line of the current display. The operator cannot key data into any field on the display. If an MSG operation is executed while the WSU menu is displayed, the screen is cleared before the message is displayed.

The execution of C specifications stops and the operator must press the Error Reset key before continuing. The operator, after pressing Error Reset, can enter data into any unprotected input field. When the operator responds by pressing the Enter/Rec Adv key or a user command key, execution resumes with the first operation for the display. The RP indicator turns on and can be used to condition operations that should or should not repeat. The message is cleared when Error Reset is pressed.

The MSG operation performs the same, whether or not the display has preprocessing. The display is shown with the message, the operator responds, and then the display's processing begins.





## MULT (MULTIPLY)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Required	MULT	Required	Required	Optional

This operation multiplies factor 1 by factor 2 and places the product in the result field. Factor 1 and factor 2 do not change unless either factor 1 or factor 2 is the result field. The result field should be large enough to hold the product. The maximum product length equals the length of factor 1 plus the length of factor 2.

## MVR (MOVE REMAINDER)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	MVR	Blank	Required	Optional

This operation moves the remainder from the previous divide operation to the result field. Factor 1 and factor 2 must be blank. The MVR operation must immediately follow the divide operation.

The maximum length of the remainder (including decimal positions) is 15. The number of significant decimal positions is the greater of:

- The number of decimal positions in factor 1 of the previous divide operation
- The sum of the decimal positions in factor 2 and the result field of the previous divide operation

The maximum whole number positions in the remainder is equal to the whole number positions in factor 2 of the previous divide operation.

You cannot code the move remainder operation after a divide operation that you half adjusted (column 53).

## PRTY (PRIORITY)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Blank	Blank	PRTY	Required	Blank	Blank

This operation assigns an execution priority (expected frequency of use) to the subroutine. When specified, PRTY must immediately follow a BEGSR operation. Factor 2 must contain 0, 1, 2, or 3. The highest priority is 3, the lowest priority is 0. If the PRTY operation is not specified in a subroutine, WSU assigns priority 0 to that subroutine.

Refer to *Assigning Priority to Display Screen Formats and Subroutines* in Chapter 13 for an explanation of the use of the PRTY operation.

## PUT (WRITE A RECORD)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	PUT	Required	Blank	Optional

This operation writes one record to the transaction file or a master file. A PUT operation is required in a WSU program only if records are added, updated, or inserted.

Factor 1 must be blank and factor 2 must be the name of the file. For a PUT to a master file, columns 54-55 must be blank. For a PUT to the transaction file, columns 54-55 can indicate the type of record to be written or they can be left blank. You can code indicators in columns 7-17; however, columns 43-53 and columns 56-59 must be blank.

When a PUT operation executes, WSU extracts fields of the indicated record type from the field area and adds, updates, or inserts the record in the file. However, the indicated record type is *not* necessarily the type that is recognized when the added, updated, or inserted record is subsequently retrieved for a GET operation.

If the PUT operation does not specify a record type, WSU refers to the most recent get operation that occurred for the file since the most recent mode change and assumes that the record type recognized and saved from this operation is the record type for the PUT operation.

The following summarizes the PUT operation:

### Transaction File Record PUT

Mode	Record Type in Columns 54-55	Blanks in Columns 54-55 (see notes)
Enter	Adds a record to the file	Updates the last record read via GETNR, GETNH, GETPR, GETPH
Review	Updates the displayed record	Updates the last record read via GETNR, GETNH, GETPR, GETPH
Insert	Inserts a record after the displayed record	Updates the last record read via GETNR, GETNH, GETPR, GETPH

#### Notes:

1. If a PUT operation without a record type executes and a get operation has not occurred for a record since the most recent mode change, WSU does one of the following:
  - Sets on the error indicator coded on the T specification and places an error code in \*ERROR.
  - Displays WSU message 803 and an error code at the system console if an error indicator has not been coded on the T specification.
2. If the PUT operation occurs after a Roll or Page Record or Group command key is used to start a review function and a record type is specified, the transaction file record that was initially retrieved to satisfy the request is the record that is updated by the review mode PUT operation.

### Master File Record Put

Mode	Blanks in Columns 54-55 (see note)
Enter	Updates the last record read via GET
Review	Updates the last record read via GET
Insert	Updates the last record read via GET

Note: If a PUT operation without an ID executes and a get operation has not occurred for a record since the most recent mode change, WSU does one of the following:

- Sets on the error indicator coded on the M specification and places an error code in \*ERROR.
- Displays WSU message 803 and an error code at the system console if an error indicator has not been coded on the M specification.

### PUTN (ADD TO A MASTER FILE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	PUTN	Required	Blank	Required

This operation adds one record to a master file.

Factor 1 must be blank and factor 2 must be the name of an indexed master file. You can code indicators in columns 7-17; however, columns 43-53 and columns 56-69 must be blank. Columns 54-55 must contain the type (ID) of the record to be added.

When a PUTN operation executes, WSU extracts fields of the indicated record type from the field area and adds the record to the file.

The key of the added record will be the contents of the key field (indicated on the F specification) at the time the PUTN operation executes. The contents of the chain field(s) specified on the M specification do *not* indicate the key of the added record. The record key must not be hexadecimal FFs.

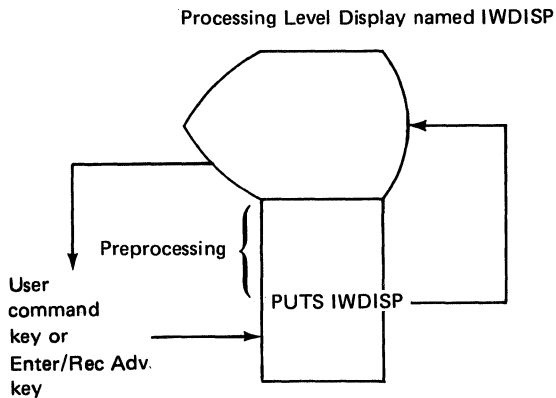
**PUTS (SHOW A DISPLAY)**

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	PUTS	Required	Blank	Blank

During the processing of a display, the programmed processing can be modified via the PUTS operation. PUTS causes the display named in factor 2 to be selected for processing. Factor 1 and columns 43-59 must be blank. Columns 7-17 can contain indicators.

Factor 2 can be the name of another display in the program or the name of the current display (which causes the display to be reshown).

Factor 2 can name a processing level display only if a PUTS operation occurs in the processing for that preprocessed display.



The operator can interrupt normal processing to bypass the current display, to view a help display for the program, or to do alternative processing after the PUTS operation.

Figure 9-15 shows how WSU typically selects the display that follows a display shown by a PUTS operation during an enter mode sequence:

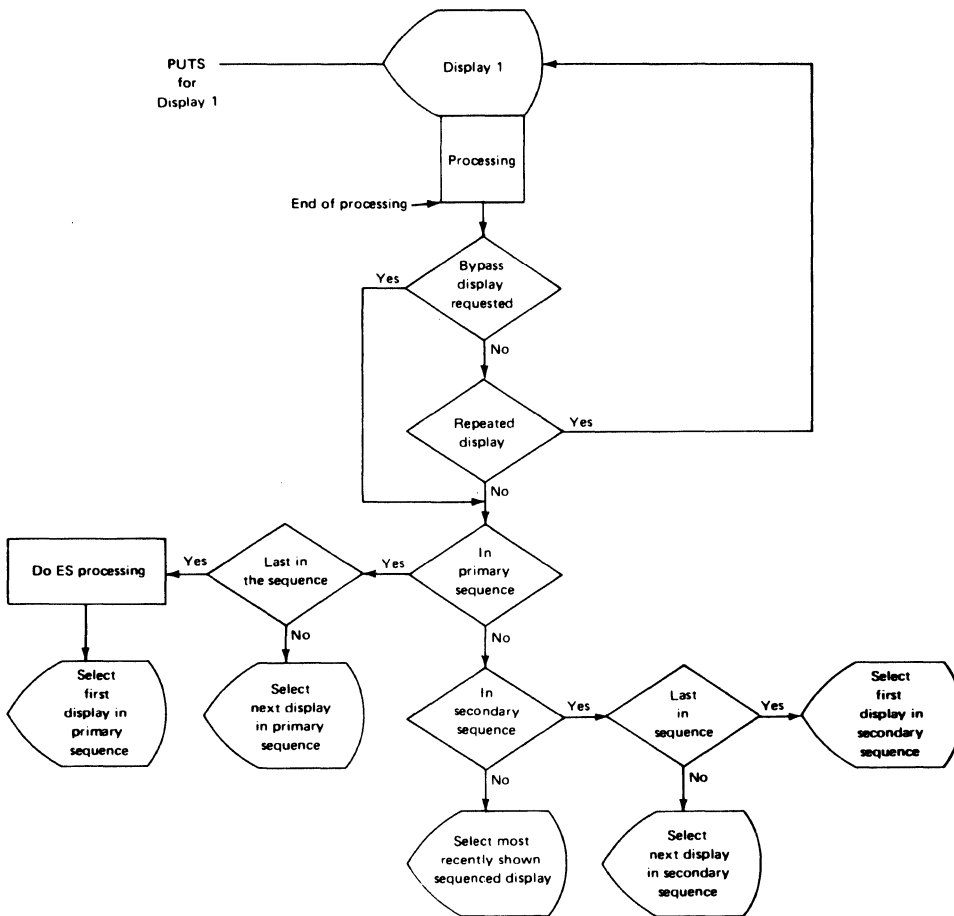


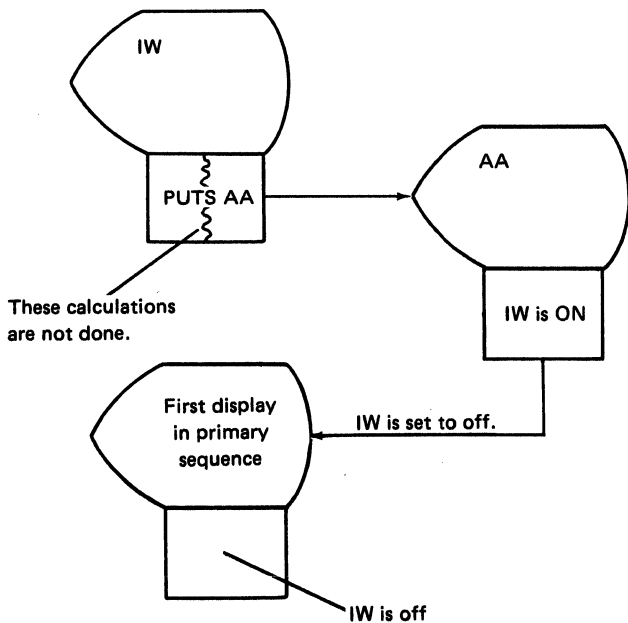
Figure 9-15. Display Selection Following PUTS



## Using PUTS in Special Processing Level Calculations

If you issue a PUTS operation from a special processing level (IJ, IW, ES, EW, or EJ) the processing level indicator remains on during the processing of the PUTS display. When the calculations for the PUTS display have all been done, WSU sets the indicator off and selects the next processing level display or the first display in the primary sequence. All calculations that followed the PUTS operation in the processing level are not done. If the display shown by the PUTS operation is normally part of a sequence of displays, the other displays in the sequence are ignored. Only the processing for the display shown by the PUTS operation is performed before the next processing level display or the first display of the primary sequence is selected. If the Bypass Display command key is pressed while the display shown by the PUTS operation is displayed, any processing for the display is ignored and the next processing level display or the first display of the primary sequence is selected.

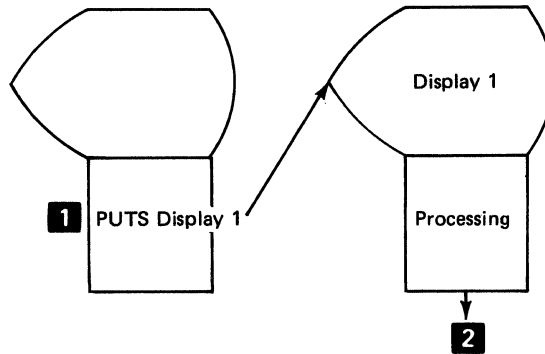
The following chart shows what happens when a PUTS operation is used in IW processing.



## Examples Using PUTS

The following examples, 1 through 8, illustrate various uses of the PUTS operation during an enter mode sequence.

*Example 1:* Use PUTS to show a display for which processing has been specified.



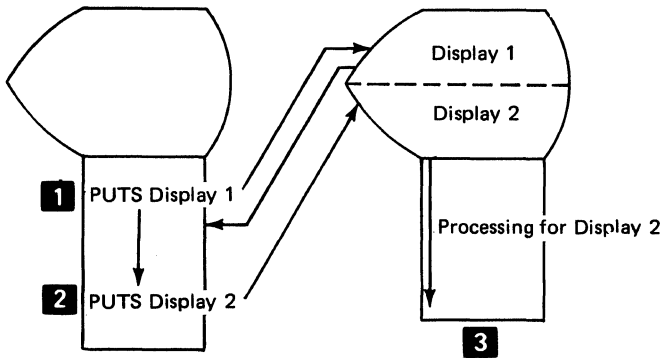
**1** The PUTS operation causes Display 1 to appear.

When the operator enters Display 1, processing begins with its first C specification.

**2** Assume that Display 1 is in a sequence of displays. When the processing for Display 1 ends, WSU selects the next display in the sequence.

**Example 2:** Use PUTS to show a display (Display 1), for which processing has not been specified, on the top half of the display screen. Assume that the Reset Keyboard entry on the S specification is N for this display. (Because the Reset Keyboard entry is N, Display 1 must be a nonsequenced display, which means that its S and D specifications must follow those S and D specifications that describe the sequenced displays in the WSU program.)

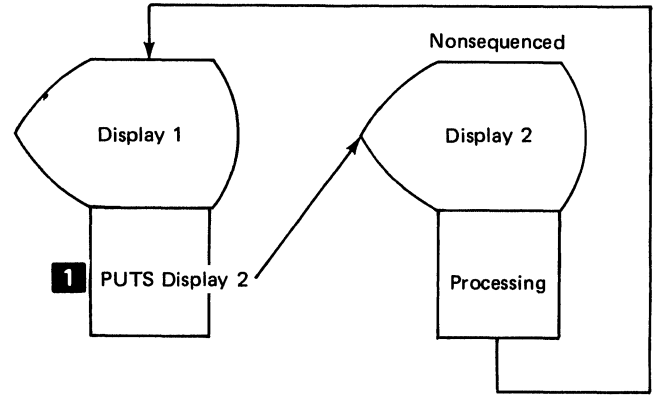
Use a second PUTS to show a display (Display 2) on the bottom half of the display screen. Assume that Display 2 has processing, does not have preprocessing, does not clear the display, and is in an enter mode sequence of displays.



- 1** The first PUTS operation causes Display 1 to appear. Because Display 1 has neither processing nor Reset Keyboard specified, control returns immediately to the operation that follows the PUTS for Display 1.
- 2** The second PUTS operation causes Display 2 to appear. Display 1 remains on the display screen. When the operator enters Display 2, processing begins with its first C specification.
- 3** When the processing for Display 2 ends, WSU selects the next display in the sequence.

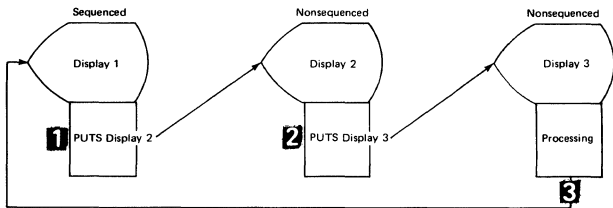
**Note:** If a level indicator (such as ES, EW, or EJ) is on when processing for Display 2 ends, the display for that processing level appears next.

**Example 3:** Use PUTS to show a nonsequenced display (Display 2) from a sequenced display (Display 1). Assume that neither Display 1 nor Display 2 has preprocessing and that both displays occur during an enter mode sequence.



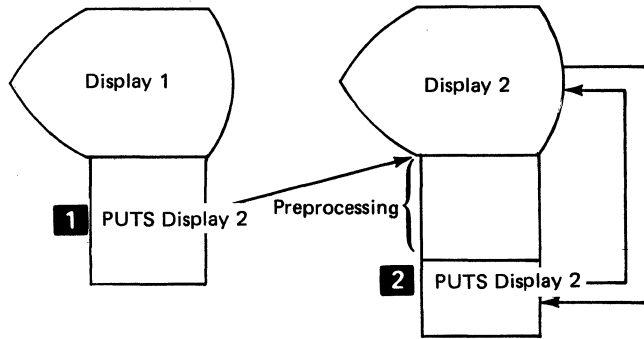
- 1** The PUTS operation causes Display 2 to appear. When the operator enters Display 2, processing begins with its first C specification.
- 2** When the processing for Display 2 ends, WSU shows Display 1.

**Example 4:** Use PUTS to show a nonsequenced display (Display 3) from a nonsequenced display (Display 2). Assume that Display 1 is in an enter mode sequence of displays and that these three displays do not have preprocessing.



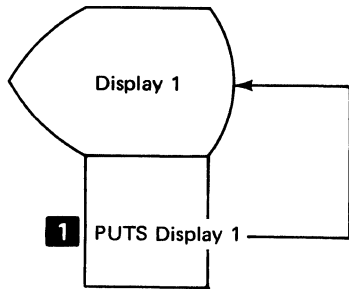
- 1** The PUTS operation causes Display 2 to appear. When the operator enters this display, processing begins with its first C specification.
- 2** This PUTS operation causes Display 3 to appear. When the operator enters this display, processing begins with its first C specification.
- 3** When the processing for Display 3 ends, WSU shows Display 1 (the most recent sequenced display).

**Example 5:** Use PUTS to show a display that has preprocessing.



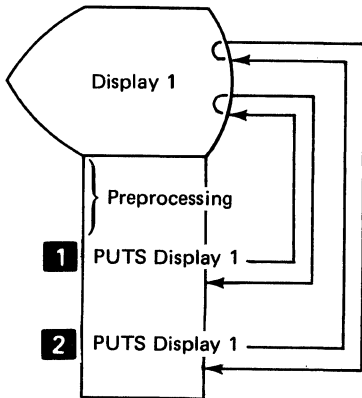
- 1** Processing begins immediately for Display 2 when PUTS Display 2 occurs. Display 1 can be a processing level display.
- 2** Display 2 appears when this PUTS occurs. After Display 2 appears, the operation that follows the PUTS operation executes. During review, insert, or delete modes, Display 2 does not have to support review, insert, or delete mode for the current record type. Also, during one of these modes, if the operator presses command key 2 in response to Display 2, the search for a display that supports review, insert, or delete mode for the current record type begins at the display following Display 2.

*Example 6:* Use PUTS to reshow a display that does not have preprocessing.



- 1** The PUTS operation causes Display 1 to reappear. When the operator enters Display 1, processing begins with its first C specification.

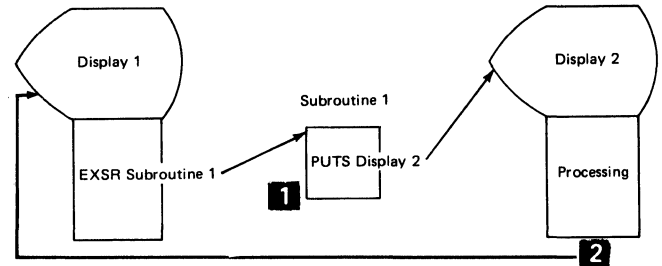
*Example 7:* Use PUTS to show a display that has preprocessing.



- 1** The first PUTS operation marks the end of the preprocessing and causes Display 1 to appear. When the operator enters Display 1, processing begins with the operation that follows the PUTS.
- 2** The second PUTS operation causes Display 1 to appear. When the operator enters Display 1, processing begins with the operation that follows this PUTS.

*Note:* If an MSG operation occurs between **1** and **2**, the preprocessing starts over. Consequently, the operator might have to respond to the display twice.

*Example 8:* Use PUTS in a subroutine to show a display that does not have preprocessing and does not repeat. Assume that Display 1 is in an enter mode sequence of displays and that Display 2 is not in a sequence of displays.



- 1** The PUTS operation causes Display 2 to appear. When the operator enters Display 2, processing begins with its first C specification.
- 2** When the processing for Display 2 ends, WSU selects Display 1, the most recently shown sequenced display.

## RANGE (RANGE CHECK)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Required	RANGE	Required	Required	Required

This operation compares factor 1 with both factor 2 and the result field. As a result of the comparison, indicators turn on as follows:

High: Factor 1 is greater than the higher value.

Low: Factor 1 is less than the lower value.

Equal: Factor 1 is equal to one of the values or between the two values.

Factor 1, factor 2, and the result field must all be the same type; either alphameric or numeric. Figure 9-16 shows examples of the RANGE operation.

### WSU C Specifications

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C	Sequence Number	Form Type	Processing Level (U, J, W, or ES, EW, EJ, SH, AN, OR)	Indicators			Factor 1	Operation	Table or Message Text			Blank Continuation	Resulting Indicators	Comments
				And	And				Factor 2	Literal	Result Field			
				9	10	11			Name	Length	Decimal Pos. High Adjust (H)		Arithmetic	
				Not	Not	Not							Plus Minus Zero	
													Compare	
													1>2 1<2 1=2	
													High Low Equal	
		C					FLDA	RANGE	FLDB				20	EXAMPLE 1
		C					FLDA	RANGE	'AAAAAAAA'	'FFFFFFF'			1010	EXAMPLE 2
		C					FLDD	RANGE	-1234.5678	+1234.5678			102030	EXAMPLE 3
		C					FLDF	RANGE	100	20			152535	EXAMPLE 4

Figure 9-16. Examples of the RANGE Operation

**SETOF (SET OFF)**

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	SETOF	Blank	Blank	Required

This operation turns off the indicators in columns 54-59.

The indicators that can be set off with this operation are:

AE  
EJ  
ES  
EW  
JA-JN, JP-JY  
KG-KL, KQ-KY  
RC  
RS  
SA-SN, SP-SY  
U1-U8  
01-89

Code these indicators in columns 54-59. The headings for columns 54-59 (plus or high, minus or low, zero or equal) have no meaning. Refer to Chapter 11, *Indicators* for a description of each of the indicators.

Note: Indicators CG, DL, IJ, IN, IW, RP, and RV cannot be set off by the SETOF operation.

**SETON (SET ON)**

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	SETON	Blank	Blank	Required

This operation turns on the indicators in columns 54-59.

The indicators that can be set on with this operation are:

AE  
EJ  
ES  
EW  
JA-JN, JP-JY  
KG-KL, KQ-KY  
SA-SN, SP-SY  
U1-U8  
01-89

Code these indicators in columns 54-59. The heading for columns 54-59 (plus or high, minus or low, zero or equal) have no meaning. Refer to Chapter 11, *Indicators* for a description of each of the indicators.

Note: Indicators CG, DL, IJ, IN, IW, RC, RP, RS, and RV cannot be set on by the SETON operation.

**SUB (SUBTRACT)**

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Required	SUB	Required	Required	Optional

This operation subtracts factor 2 from factor 1 and places the difference in the result field. Factor 1 and factor 2 do not change, unless either factor 1 or factor 2 is the result field.

Note: Subtracting a field from itself is a method of setting the result field to zero.

## TAG (TAG)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Blank	Required	TAG	Blank	Blank	Blank

This operation names the line that a GOTO operation can branch to. Factor 1 contains the label, which must begin in column 18 with an alphabetic character and must be from one to six characters long.

Factor 1 cannot be the same as:

- Factor 1 of a BEGSR operation
- Factor 1 of an ENDSR operation
- Any other field name defined in the program

The TAG operation does not use factor 2 and the result field, and does not allow indicators in columns 9-17.

Refer to the GOTO operation in this chapter for an example of coding the TAG operation.

## TIME (TIME OF DAY AND DATE)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	TIME	Blank	Required	Blank

This operation moves the system time of day or the system time of day and the system date into the result field.

If the result field specifies a 6-digit numeric field with zero decimal positions, the time of day is placed in the field. If the result field specifies a 12-digit numeric field with zero decimal positions, the time of day is placed in the first six positions and the system date is placed in the last six positions.

Entries in factor 1 (columns 18-27), factor 2 (columns 33-42), half-adjust (column 53), and resulting indicators (columns 54-59) are not allowed.

The format of the time of day is hhmmss, where hh specifies hours of the 24-hour clock, mm specifies minutes, and ss specifies seconds.

The format of the system date is determined by the system configuration. This format can be mmddy, ddmmy, or yymmdd, where mm specifies the month, dd specifies the day, and yy specifies the last two digits of the year.

The system date placed in the result field might not match the program date that the UDATE field contains.

Refer to the *SSP Reference Manual* for a description of the system date, program date, and system time of day.

## Z-ADD (ZERO AND ADD)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	Z-ADD	Required	Required	Optional

This operation adds factor 2 to a field of zeros and places the sum in the result field. Factor 1 must be blank. Factor 2 does not change, unless either factor 1 or factor 2 is the result field.

## Z-SUB (ZERO AND SUBTRACT)

Indicators (9-17)	Factor 1	Operation	Factor 2	Result Field	Resulting Indicators
Optional	Blank	Z-SUB	Required	Required	Optional

This operation subtracts factor 2 from a field of zeros and places the difference in the result field. Factor 1 must be blank. Factor 2 does not change, unless it is also the result field.

## COLUMNS 33-42 (FACTOR 2)

Refer to *Columns 18-27 (Factor 1) and Columns 33-42 (Factor 2)* in this chapter for a description of factor 2.

## COLUMNS 43-48 (RESULT FIELD)

This entry names either the field that will contain the results of the operation coded in columns 28-32, or (as for the RANGE operation) the field or literal upon which the operation is done. You can define a field by coding a new field name, or you can use the name of a field that you have defined elsewhere in the program. During program generation, WSU reserves storage in a field area for copies of any field that you define. For a field defined elsewhere in a program, columns 49-52 can be blank; however, any entries in columns 49-52 must agree with all other definitions of the field in the program.

A result field is the only place in your program that can define a job field. Only one copy of a job field is generated per program, rather than one copy per each display station that uses the program. Job field names must begin with & in column 43 followed by an alphabetic character (A-Z, #, \$, or @) in column 44, which can be followed by zero to four alphameric characters. Job field names cannot contain blanks.

## COLUMNS 49-51 (RESULT FIELD LENGTH)

1 to n	Length of a result field. The maximum length, n, is 15 for a numeric field and 256 for an alphameric field. This entry is not required for a field that is defined elsewhere in the program. The length must be right-adjusted.
Blank	The field is defined elsewhere in this program (on the I specifications in this program's data dictionary or on another C specification in the program).
Other	Assume blank.

Code the field length for a result field long enough to hold the longest possible result. If the result field is too short, significant digits can be lost, or the result can be unpredictable depending on the contents of the fields at the time of execution. For example, to add field A (8 positions long with four decimal places) to field B (10 positions long with six decimal places), field C (the result field) must allow at least five positions to the left and six positions to the right of the decimal.

9999.0000	Field A
0001.111111	Field B
10000.111111	Field C (result field)

In this case, field C was defined as 11 positions long with six decimal places. Some of the numbers to the right of the decimal could be lost without significantly changing the meaning of the result. However, if field C was defined as 10 positions long with six decimal positions, a significant digit to the left of the decimal would be lost. Field C in this case would be 0000.111111; the meaning of the result has significantly changed.

Those result fields defined as packed fields on I specifications can have their lengths redefined by this entry. The result field length must allow for the unpacked length of a field.

For example, assume FIELD3 is a packed field, four positions long. If FIELD3 is used as a result field on a C specification, the length can be specified either as 6 or as 7. If a length is not specified, WSU assumes the greater of the two possibilities, which in this example is 7.



**COLUMN 52 (DECIMAL POSITIONS)**

0-9 The number of positions to the right of the decimal in a numeric result field. If the numeric result field contains no decimal positions, enter a 0 (zero).

The number of decimal positions must never be greater than the length of the field. The number can, however, be larger or smaller than the number of decimal positions that actually result from an operation. If the number of decimal positions specified is greater than the number of decimal places that actually result from an operation, zeros fill in to the right. If the number specified is smaller than the number that results from the operation, the rightmost digits drop.

Figure 9-17 shows how the contents of a result field after a multiplication operation can change according to the decimal positions (column 52) and field length (columns 49-51) specifications.

- Blank Alphameric result field, or numeric result field defined by an I specification or C specification elsewhere in the program. The decimal-positions entry must be blank if the field-length entry (columns 49-51) is blank.
- Other Assume zero if the field length (columns 49-51) is not blank; assume blank if the field length is blank.

Multiplication:  $98.76 \times 1.234 = 121.86984$

Decimal Positions for Result Field (column 52)	Result Field Length (columns 49-51)									
	10	9	8	7	6	5	4	3	2	1
9	1.869840000	.869840000								
8	21.86984000	1.86984000	.86984000							
7	121.8698400	21.8698400	1.8698400	.8698400						
6	0121.869840	121.869840	21.869840	1.869840	.869840					
5	00121.86984	0121.86984	121.86984	21.86984	1.86984	.86984				
4	000121.8698	00121.8698	0121.8698	121.8698	21.8698	1.8698	.8698			
3	0000121.869	000121.869	00121.869	0121.869	121.869	21.869	1.869	.869		
2	00000121.86	0000121.86	000121.86	00121.86	0121.86	121.86	21.86	1.86	.86	
1	000000121.8	00000121.8	0000121.8	000121.8	00121.8	0121.8	121.8	21.8	1.8	.8
0	0000000121	000000121	00000121	0000121	000121	00121	0121	121	21	1




 Not permitted  
 Permitted but inaccurate  
 Recommended

Figure 9-17. Result Field Contents Based on Various Field Lengths and Decimal Positions

**COLUMN 53 (HALF ADJUST)**

- Blank      Do not half adjust
- H          Half adjust
- Other      Assume H

The half adjust entry is allowed with all arithmetic operations except MVR. Also, if half adjust is specified for a DIV operation, an MVR operation should not follow it.

Column 53 can also be used to continue message text for an IMSG or MSG operation or to continue a table for a COMP operation. To allow continuation, you must code any nonblank character in this column.

This entry indicates whether or not the contents of the result field are half adjusted (rounded). Half adjusting adds 5 (-5 if the result is negative) to the number at the right of the last decimal position specified for the field. All decimal positions to the right of the position specified for that field drop (Figure 9-18).

**WSU C Specifications**

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Sequence Number	Form Type 7 ES, EW, EJ, SR, AN, OR	Indicators		Factor 1	Operation	Table of Message Text		Blank Continuation	Resulting Indicators	Comments
		And	And			Factor 2	Literal			
		Not	Not				Result Field			
		Not	Not			Name	Length			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
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68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										
79										
80										

This calculation line shows a result field half adjusted to two decimal positions (2 in column 52 and H in column 53).

2nd Decimal Position

↓  
35.7968

Result of an add operation.

5

Add 5 to the number at the right of the last decimal position specified.

35.80xx

Drop all decimal positions to the right of the position specified.

35.80

Result field half-adjusted.

**Figure 9-18. Half Adjust Operations**

## SPECIAL USES OF COLUMNS 33-53

### RANGE Operation

For a RANGE operation, you can code a field name, a numeric literal (up to 10 digits), or an alphameric literal (up to 8 characters) in columns 43-52. The literal must be left adjusted. Factor 2 in columns 33-42 can be a field name, an alphameric literal, or a numeric literal. The descriptions of columns 18-27 and columns 33-42 in this chapter list coding rules for literals.

For further information, refer to the explanation of the RANGE operation in *Columns 28-32 (Operation)* in this chapter.

### MSG and IMSG Operations

For a MSG or an IMSG operation, you can code message text enclosed by apostrophes in columns 33-52. Message text can be as many as 64 characters. Messages longer than 19 characters require a second C specification line. To continue message text, code a nonblank character in column 53 of the line you want to continue and then code the remainder of the text (left adjusted) in columns 7-52 of the next line.

For further information, refer to the explanations of the MSG and IMSG operations in *Columns 28-32 (Operation)* in this chapter.

### COMP Operation

For a COMP operation, you can code a table of values in columns 33-52. Table entries must be either field names or literals; and cannot be a combination of the two. Table entries must be either all alphameric or all numeric. Separate table elements with a semicolon.

Continue a table to columns 7-52 of a second specification line by coding any nonblank character in column 53 of the first specification line. The first line of the table must end with a semicolon so that the second line of the table begins with a left-adjusted table entry.

A table of values cannot be continued to a third line. Do not begin the second line of the table with an asterisk in column 7 because WSU treats such lines as comments.

For further information, refer to the explanation of the COMP operation in *Columns 28-32 (Operation)* in this chapter.

## COLUMNS 54-59 (RESULTING INDICATORS)

Use columns 54-55, 56-57, and 58-59 to indicate the results of operations. You can code these columns only on C specification lines that specify operation codes.

Before an operation is done, all its resulting indicators should be set off. After the operation is done, WSU checks the result and sets on the appropriate indicators.

Figure 9-19 shows resulting indicators that can be used with each operation. (Refer to Chapter 11 for descriptions of the indicators.)

### Columns 54-55 (Plus or High)

An indicator in these columns turns on if:

- The result of an arithmetic operation is positive.
- Factor 1 is greater than factor 2 in a COMP operation.
- A get operation is not successful.
- Factor 1 is greater than the higher field in a RANGE operation.

### Columns 56-57 (Minus or Low)

An indicator in these columns turns on if:

- The result of an arithmetic operation is negative.
- Factor 1 is less than factor 2 in a COMP operation.
- Factor 1 is not equal to any entry in a table in a COMP operation.
- Factor 1 is less than the lower field in a RANGE operation.

### Columns 58-59 (Zero or Equal)

An indicator in these columns turns on if:

- The result of an arithmetic operation is zero.
- Factor 1 equals at least one entry in a table in a COMP operation.
- Factor 1 equals factor 2 in a COMP operation.
- Factor 1 is equal to one value or between the two values in a RANGE operation.

Operation	Resulting Indicators																	
	AE	CG	DL	EJ	ES	EW	IJ	IN	IW	JA- JN JP- JY	KG- KL KQ- KY	RC	RP	RS	RV	SA- SN SP- SY	U1- U8	01- 89
ADD	x			x	x	x				x	x					x	x	x
COMP	x			x	x	x				x	x					x	x	x
DIV	x			x	x	x				x	x					x	x	x
GET																		x
GETNH																		x
GETNR																		x
GETPH																		x
GETPR																		x
IMSG	x			x	x	x				x	x					x	x	x
MSG	x			x	x	x				x	x					x	x	x
MULT	x			x	x	x				x	x					x	x	x
MVR	x			x	x	x				x	x					x	x	x
PUT																		x
PUTN																		x
RANGE	x			x	x	x				x	x					x	x	x
SETOF	x			x	x	x				x	x	x	x			x	x	x
SETON	x			x	x	x				x	x					x	x	x
SUB	x			x	x	x				x	x					x	x	x
Z-ADD	x			x	x	x				x	x					x	x	x
Z-SUB	x			x	x	x				x	x					x	x	x

*Notes:*

1. An x in the above figure specifies a resulting indicator that can be used by the operation.
2. BEGSR, DEBUG, ENDSR, EXSR, GOTO, MOVE, MOVEL, PRTY, PUTS, TAG, and TIME do not allow resulting indicators.

**Figure 9-19. Using Resulting Indicators**

**Additional Use of Columns 54-59**

You can specify indicators in columns 54-59 for the MSG, IMMSG, SETON, and SETOF, operations. For MSG, IMMSG, and SETON, the specified indicators turn on when the operation executes. For SETOF, the specified indicators turn off when this operation executes.

You can specify one indicator in columns 54-55 for a PUT operation. The indicator specifies (in enter mode) the type of record to write to the transaction file. You can specify one indicator in columns 54-55 for a PUTN operation. The indicator specifies the type of record to write to a master file.

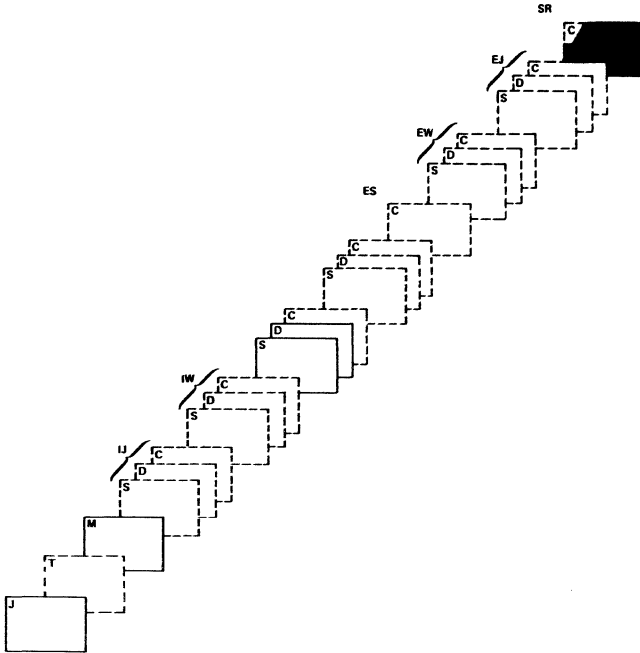
Refer to the explanations of each of these operations in this chapter for further information on how to specify indicators in columns 54-59.

**COLUMNS 60-80 (COMMENTS)**

Comments help document the WSU program. They do not affect WSU operation.



## Chapter 10. Subroutines



A subroutine consists of one or more operations that you code at the end of your program and reference each time the operations should execute. Subroutines consist of C specifications only; they do not have associated displays. You can code multiple subroutines at the end of your program.

In the following description of subroutines, letters **A** through **E** reference items in Figure 10-1.

Begin a subroutine by coding its name in factor 1 followed by the BEGSR operation code **B**. A subroutine name can be one to six characters long, and must begin in column 18 with an alphabetic character. Remaining characters must be alphameric with no imbedded blanks. Each subroutine in your program must have a name. A subroutine cannot have the same name as: another subroutine, a label for a TAG or ENDSR operation, or a field defined in the program.

If a subroutine requires priority, code the PRTY operation after the BEGSR operation. Refer to Chapter 9, *C Specification* for an explanation of the PRTY operation. Refer to *Assigning Priority to Display Screen Formats and Subroutines* in Chapter 13 for further information about assigning priority.

An entry of SR in columns 7-8 is optional on each subroutine C specification **D**. Indicate the last line of a subroutine with the ENDSR operation **C**. You must code ENDSR before you can code another subroutine.

Factor 1 of the ENDSR operation can contain a name **E**. This name indicates a line to which a GOTO within the subroutine can branch.

The GOTO operation can branch only to another line in the same subroutine. You can condition operations within a subroutine by indicators in columns 9-17. Also, fields used by the subroutine can be defined within or outside of the subroutine.

If the MSG operation is used in a subroutine, the current display is shown and processing returns to the first C specification for the display.

You can code multiple subroutines in your program in any order, however you cannot code a subroutine within a subroutine. You can code all operations except EXSR in a subroutine. This means that a subroutine cannot call another subroutine or itself.

Subroutines, even though you code them at the end of your program, execute whenever an EXSR operation calls the subroutine **A**. EXSR causes a branch to the subroutine named in factor 2. When the subroutine ends, the operation following the EXSR operation receives control. You can use indicators in columns 7-17 to condition when the EXSR operation should execute.







## Chapter 11. Indicators

An indicator is an internal switch designated by two characters or digits. Indicators can be used to control whether certain operations are performed. WSU provides the following indicators:

AE	(accept sequence error) allows operators to bypass required displays via the Accept Sequence Error command key.	KG-KL, KQ-KY	(command key) indicate which command key an operator presses.
CG	(current group) indicates that the transaction file record selected by the operator for review is either the most recently entered header record or a data record that follows the most recently entered header record.	RC	(recovery of work session) indicates when an operator resumes a work session either that has ended abnormally or that may have unchained records. The WSU program must have a transaction file in order for this indicator to be used.
DL	(delete record) indicates that the transaction file record selected by the operator for review is a record that is to be logically deleted when the processing cycle ends.	RP	(repeated display) indicates that a display has reappeared because of an MSG operation.
EJ	(end-of-job processing level) indicates the end of a WSU program.	RS	(resume work session) indicates when an operator resumes a work session that ended normally. The WSU program must have a transaction file in order for this indicator to be used.
ES	(end-of-sequence-set processing level) indicates the end of the primary display sequence.	RV	(review mode) indicates the review operating mode. This indicator is also on during insert mode.
EW	(end-of-work-session processing level) indicates the end of a work session.	SA-SN, SP-SY	(session level) provide mode-to-mode retention of indicator settings.
IJ	(job-initiation processing level) indicates the initiation of a WSU program.	U1-U8	(external) provide a way of passing indicator settings to a session from the OCL that initiates the WSU program.
IN	(insert mode) indicates the insert operating mode.	01-89	provide general indicator use in a program; for example, indicating when operations should occur, indicating results of operations, and specifying field attributes for a display. Indicators 90-99 are reserved for WSU and cannot be used in your WSU programs.
IW	(work-session-initiation processing level) indicates the start of a work session.		
JA-JN, JP-JY	(job) provide session-to-session communication of indicator settings.		

WSU automatically turns some of the indicators on and off to indicate the following conditions:

- The current or a pending processing level
  - IJ: Job initiation
  - IW: Work session initiation
  - ES: End of sequence set
  - EW: End of work session
  - EJ: End of job
- The operating mode
  - RV: Review mode
  - IN: Insert mode
  - DL: Delete mode
- The command key an operator pressed

KG		
KH		
KI		
KJ		
KK		
KL		
KQ		and
KR		and
KS		and
KT		and
KU		and
KV		and
KW		and
KX		and
KY		and

- A display repeated by a MSG operation (RP)
- A reviewed record from the same order set as the record being entered (CG)
- A session restarted after abnormal termination (RC) or a record was logically deleted from the session chain being restarted (the transaction file might contain an unchained record for the session)
- A session resumed after normal termination (RS)

You can turn some of the WSU indicators on and off in your WSU program. These indicators are:

- AE (accept-sequence-error). You can set this indicator on to allow operators to use the Accept Sequence Error command key to bypass required displays.
- EJ (end of job processing level).
- ES (end of sequence set processing level).
- EW (end of work session processing level).
- JA-JN, JP-JY (job).
- KG-KL, KQ-KY (command key).
- RC (recovery of work session). You can only set this indicator off.
- RS (resume work session). You can only set this indicator off.
- SA-SN, SP-SY (session level).
- U1-U8 (external). The operator can set these indicators on or off via the SWITCH OCL statement when the program is run or WSU sets them on or off when they are used as resulting indicators.
- 01-89 (display station).

Notice that the EJ, ES, EW, KG-KL, KQ-KY, RC, and RS indicators are in both categories; both WSU controlled and programmer controlled.

## JOB, SESSION, AND MODE INDICATORS

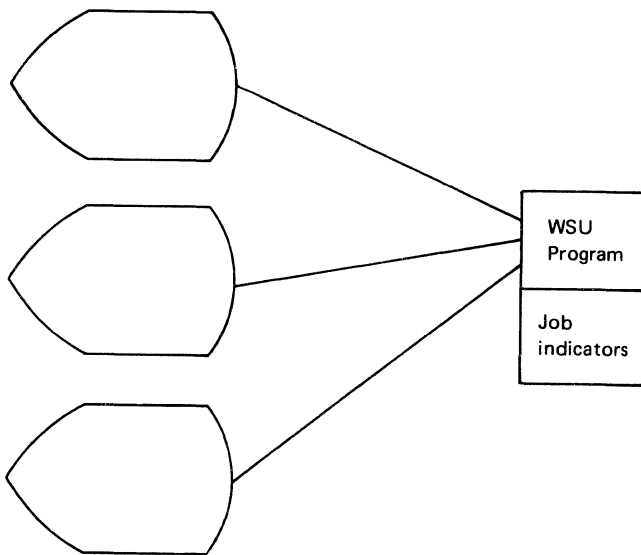
WSU maintains indicators for the job, for a session, and for an operating mode.

### Job Indicators

The job indicators are:

- EJ
- IJ
- JA-JN, JP-JY

As the following shows, WSU maintains one copy of these indicators for all display stations using the same program.



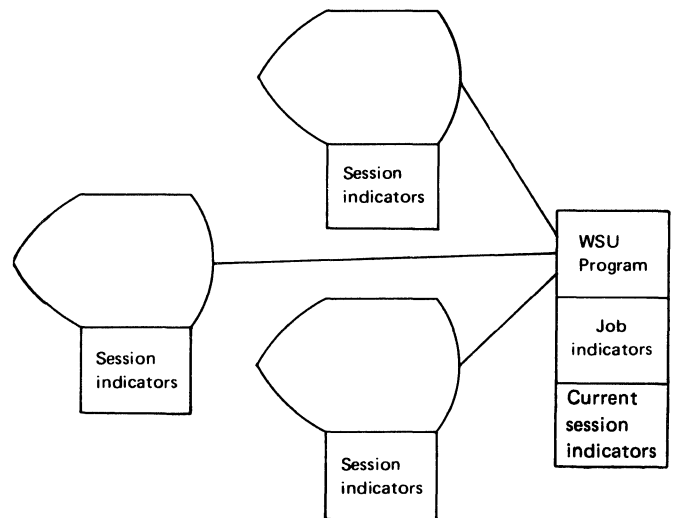
For example, if indicator JA is set on by a display station, that indicator is on for all other display stations that use the program.

### Session Indicators

The session indicators are:

- AE
- ES
- EW
- IW
- RC
- RS
- SA-SN, SP-SY
- U1-U8

As the following shows, WSU maintains a separate copy of these indicators for each display station using the same program. These indicators retain their settings when a display station changes from one operating mode to another.



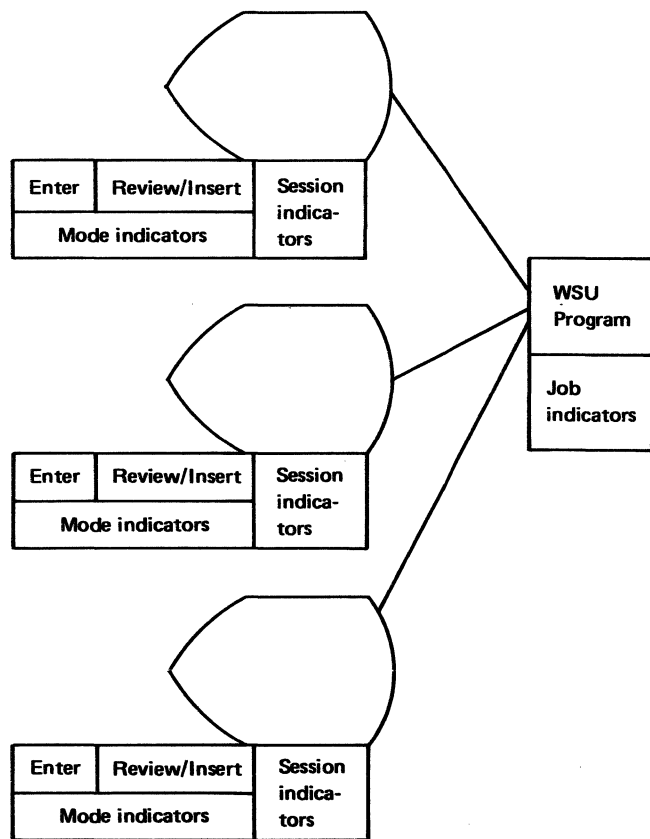
For example, if indicator SA is set on by a display station, the indicator is on only for that display station. Other display stations that use the program might have indicator SA set off or set on.

## Mode Indicators

The mode indicators are:

- CG
- DL
- IN
- KG-KL, KQ-KY
- RP
- RV
- 01-89

As the following shows, WSU maintains a separate copy of these indicators for enter mode and review/insert mode.



For example, if indicator 10 is set on by a display station in enter mode, that indicator is on only for that mode. When the operating mode changes the indicator settings for enter mode are saved and the mode indicators are cleared and adjusted for review mode.

The indicators for enter mode are restored when enter mode resumes. The mode indicators are cleared and adjusted whenever review mode is reset (for example, repeated use of the Roll Up and Roll Down keys causes review mode to be reset for each press of a key).

## INITIAL SETTINGS OF INDICATORS

For the first operator that calls a WSU generated procedure, all indicators are off except IJ, IW, any external indicators (U1-U8) that have been set on, and RS and/or RC if operators had previously run the program and used the transaction file.

For subsequent operators that call this procedure, all indicators are off except for the IW indicator, any external indicators that have been set on, any job indicators that have been set on by other display stations that have called the procedure, and the RS and/or RC indicators.

Figure 11-1 summarizes the use of indicators, Figure 11-2 summarizes where you can use indicators in WSU programs, and the following explains each of these indicators.

	WSU Controlled	Programmer Controlled
Job	EJ IJ	EJ JA-JN, JP-JY
Session	ES EW IW RC RS	AE ES EW RC (SETOF only) RS (SETOF only) SA-SN, SP-SY U1-U8
Mode	CG (off during enter mode) DL (off during enter mode) IN (off during enter mode) KG-KL, KQ-KY RP RV (off during enter mode)	KG-KL, KQ-KY 01-89

Figure 11-1. Indicator Summary

### **AE (Accept Sequence Error) Indicator**

*Set on by:*

- The SETON, MSG, or IMSG operation.
- Results of an arithmetic or compare operation.

*Set off by:*

- The SETOF operation.
- Results of an arithmetic or compare operation.

When on, this indicator allows operators to bypass sequence errors via the Accept Sequence Error command key. (A sequence error occurs when an operator tries to bypass a required display or ES processing.) When off, this indicator causes an error message when operators try to bypass a required display or ES processing.

*Where coded:* Columns 9-17 and columns 54-59 on C specifications.

### **CG (Current Group) Indicator**

*Set on by:* WSU, when a transaction file record that has been selected by an operator for review is either the most recently entered header record or a data record that follows the most recently entered header record.

*Set off by:*

- WSU, when a transaction file record that has been selected by an operator for review is from a different group than the most recently entered record.
- WSU, when an operator switches from review mode to enter mode.

*Where coded:* Columns 9-17 on C specifications.

### **DL (Delete Mode) Indicator**

*Set on by:* WSU (along with the RV indicator), when an operator selects delete mode. Refer to *How Operators Use Review Mode* in Chapter 12 for an explanation of how an operator can select delete mode.

*Set off by:* WSU, when an operator returns to enter mode (via the Resume Entry command key), when enter mode resumes as a result of ES, EJ, or EW being set on, or when an operator selects a record to review.

*Where coded:* Columns 9-17 on C specifications.

### **EJ (End of Job Processing Level) Indicator**

*Set on by:*

- WSU, when both of the following conditions exist:
  - EW processing is completed when only one operator is using the program and that operator has specified end-of-work-session on the WSU menu.
  - The program is a never-ending program (NEP) and the operator has not specified restart on the WSU menu.
- WSU, when any condition occurs that requires termination.
- A SETON, MSG, or IMSG operation.
- Results of an arithmetic or compare operation.

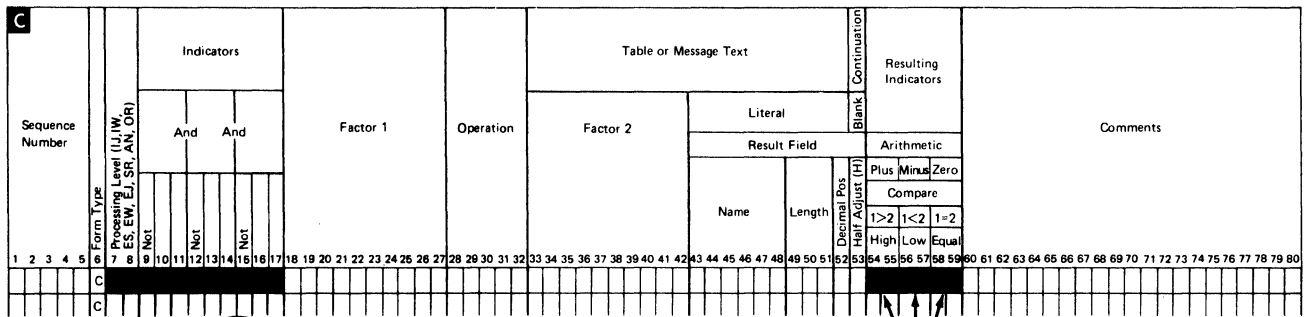
*Set off by:*

- WSU, when all operations conditioned by the EJ indicators complete.
- Results of an arithmetic or compare operation.
- A SETOF operation.

*Where coded:*

- Columns 15-16 on an S specification.
- Columns 7-8, 9-17, and 54-59 on C specifications.





EJ  
ES  
EW  
IJ  
IW

(see note 9)

AE  
CG  
DL  
EJ  
ES  
EW  
IJ  
IN  
IW  
JA-JN, JP-JY  
KG-KL, KQ-KY  
RC  
RP  
RS  
RV  
SA-SN, SP-SY  
U1-U8  
01-89

(see note 10)

AE  
EJ  
ES  
EW  
JA-JN, JP-JY  
KG-KL, KQ-KY  
RC  
RS  
SA-SN, SP-SY  
U1-U8  
01-89

(see note 11)

**Notes:**

1. WSU turns this indicator off when a read is attempted from the file. WSU turns this indicator on when the record type is read from the file.
2. WSU turns the indicator on when a record cannot be read or a record has been read but not identified.
3. The indicator must identify a record type in the transaction file. This indicator allows operators to page from header record to header record when reviewing records.
4. This indicator turns off each time a get operation is done for the file, and turns on if an error occurs in trying to read from the file, or if a record-not-found condition occurs and a not-found indicator has been omitted from the T specification or M specification, and from the C specification.
5. These indicators cause displays to automatically appear for a processing level. One display is allowed per processing level.
6. These indicators control display attributes.
7. These indicators allow control of how operators use review and insert modes and must match record identifying indicators in the transaction file.
8. These indicators control attributes of data on the display.
9. These indicators cause operations to occur for certain processing levels.
10. These indicators condition operations.
11. Figure 9-18 in Chapter 9 shows how these indicators can be used with WSU operation codes.

**Figure 11-2 (Part 2 of 2). Where to Code Indicators**



## ES (End of Sequence Set Processing Level) Indicator

The ES indicator can be used to cause operations to be performed at the end of a sequence of displays. Typically, these operations might be used to perform cleanup functions needed before subsequent operations or to inform the operator (via the IMSG operation) that the display sequence has been completed and the next display will be the first of the sequence set.

### Set on by:

- WSU, each time except the first when the first display in the primary sequence is next to appear. ES does not turn on for secondary display sequences.
- WSU, when the EW or EJ indicator turns on (except during ES processing).
- A SETON, MSG, or IMSG operation.
- Results of an arithmetic or compare operation.

### Set off by:

- WSU, when all operations conditioned by the ES indicator complete and neither the EW indicator nor the EJ indicator is on.
- Results of an arithmetic or compare operation.
- A SETOF operation.

*Where coded:* Columns 7-8, 9-17, and 54-59 on C specifications.

Setting the ES indicator on when ES processing is not in a WSU program causes WSU to select the first display in the primary sequence. If present in the program, ES processing is performed even if the primary sequence is not started before the session ends.

## EW (End of Work Session Processing Level) Indicator

### Set on by:

- WSU, when an operator specifies EW on the WSU menu or selects a session.
- WSU, when the EJ indicator turns on.
- A SETON, MSG, or IMSG operation.
- Results of an arithmetic or compare operation.

### Set off by:

- Results of an arithmetic or compare operation.
- A SETOF operation.

*Note:* The SETOF operation cannot be used to cancel a previous end session or end job request.

### Where coded:

- Columns 15-16 on an S specification.
- Columns 7-8, 9-17, and 54-59 on C specifications.

*Note:* If the EW indicator is used to force an end of session for an operator at a display station with an ID that does not match the work session ID, that operator is allowed to restart by selecting a different session.

### **IJ (Job Initiation Processing Level) Indicator**

*Set on by:* WSU, when the first operator initiates the WSU program.

*Set off by:*

- WSU, when all operations conditioned by the IJ indicator are complete.
- WSU, when the next screen in a different processing level is displayed (normally, this is the IW display).

*Where coded:*

- Columns 15-16 on an S specification.
- Columns 7-8 on C specifications.
- Columns 9-17 on C specifications.

### **IN (Insert Mode) Indicator**

*Set on by:* WSU, when an operator selects insert mode via the Insert Record command key.

*Set off by:* WSU, when the mode switches to enter or review.

*Where coded:* Columns 9-17 on C specifications.

### **IW (Work Session Initiation Processing Level) Indicator**

*Set on by:*

- WSU, after all operations conditioned by the IJ indicator complete (for only the first operator that initiates the WSU program).
- WSU, when any operator after the first operator initiates the WSU program.

*Set off by:*

- WSU, when all operations conditioned by the IW indicator complete.
- WSU, when the next screen in a different processing level is displayed (normally, this is the first screen in the primary sequence).

*Where coded:*

- Columns 15-16 on an S specification.
- Columns 7-8 on C specifications.
- Columns 9-17 on C specifications.

### **JA-JN, JP-JY (Job) Indicators**

*Set on by:*

- A SETON, MSG, or IMSG operation.
- Results of an arithmetic or compare operation.

*Set off by:*

- Results of an arithmetic or compare operation.
- A SETOF operation.

*Where coded:* Columns 9-17 and 54-59 on C specifications.

## KG-KL, KQ-KY (Command Key) Indicators

Set on by:

- A SETON, MSG, or IMSG operation.
- Results of an arithmetic or compare operation.
- WSU, when an operator presses the corresponding command key. WSU turns all other command key indicators off. The command keys and indicators are:

KG		
KH		
KI		
KJ		
KK		
KL		
KQ		and
KR		and
KS		and
KT		and
KU		and
KV		and
KW		and
KX		and
KY		and

Set off by:

- WSU, when a display is shown that has Reset Keyboard specified. (Also, WSU sets all command key indicators off when a display is shown via the IMSG or MSG operation.)
- Results of an arithmetic or compare operation.
- A SETOF operation.

Where coded: Columns 9-17 and 54-59 on C specifications.

## RC (Recovery of Work Session) Indicator

Set on by:

- WSU, when an operator resumes a work session that had been abnormally terminated.
- WSU, when the transaction file might contain unchained records for the session.

Set off by: A SETOF operation.

Where coded: Columns 9-17 and 54-59 on C specifications. In order to use this indicator, a WSU program must have a transaction file.

Note: Once on, this indicator is always on for the session unless a SETOF operation turns the indicator off. The indicator turns on each time the session is restarted until the WSU Recover procedure or the WSU Extract procedure is used to produce a transaction file that has no unchained records for the work session.

## RP (Repeated Display) Indicator

Set on by: WSU, when a MSG operation causes a display to reappear.

Set off by: WSU, when a new display is selected in one of the following ways:

- WSU selects an appropriate display because:
  - Display processing ends normally
  - You bypass a display using command key 2
  - You select an alternative function (RV, DL, or IN)
- You select a non-help display from the WSU menu. (When the RV indicator is on you can reselect the current display.)
- A PUTS operation:
  - Selects a different keyboard—resetting display. (A help display resets the keyboard.)
  - Reselects a display without preprocessing.

Where coded: Columns 9-17 on C specifications.

Notes:

1. The RP indicator setting is not changed when processing for a current display resumes at the C specification that follows a pre-processing PUTS operation.
2. Because RP is a mode level indicator, the enter mode setting is restored when enter mode is resumed.

### **RS (Resume Work Session) Indicator**

*Set on by:* WSU, when an operator resumes a work session.

*Set off by:* A SETOF operation.

*Where coded:* Columns 9-17 and 54-59 on C specifications. In order to use this indicator, a WSU program must have a transaction file.

*Note:* Once on, this indicator is always on for a session until a SETOF operation turns the indicator off.

### **RV (Review Mode) Indicator**

*Set on by:* WSU, when an operator selects review or delete mode. Refer to *How Operators Use Review Mode* in Chapter 12 for an explanation of how an operator can select review mode. The RV indicator remains on during insert mode.

*Set off by:* WSU, when an operator returns to enter mode (via the Resume Entry command key) or enter mode resumes as a result of ES, EJ, or EW being set on.

*Where coded:* Columns 9-17 on C specifications.

### **SA-SN, SP-SY (Session Level) Indicators**

*Set on by:*

- A SETON, MSG, or IMMSG operation.
- Results of an operation.

*Set off by:*

- A SETOF operation.
- Results of an operation.

*Where coded:* Columns 9-17 and 54-59 on C specifications.

### **U1-U8 (External) Indicators**

U1-U8 are indicators accessed by each requesting display station at the beginning of a work session and saved by WSU at the normal end of a work session. Because the indicators are saved, they can be used to pass information from session to session. These indicators are not saved if the work session ends abnormally.

*Set on by:*

- A SWITCH OCL statement entered by an operator or executed from a non-MRT procedure. (See note)
- A SETON, MSG, or IMMSG operation.
- Results of an arithmetic or compare operation.

*Set off by:*

- A SWITCH OCL statement entered by an operator or executed from a non-MRT procedure. (See note)
- Results of an arithmetic or compare operation.
- A SETOF operation.
- The EXTRACT, REBLD, WSU Extract, WSU Create, or WSU Recover procedure when one begins executing.

*Where coded:* Columns 9-17 and 54-59 on C specifications.

*Note:* The procedure that WSU generates to call a WSU program is an MRT procedure. When an MRT procedure is first requested, the SSP copies that requestor's external switches into an area associated with the MRT procedure. OCL statements within the MRT procedure access this copy. A SWITCH OCL statement within the WSU generated procedure does not change the external switch setting associated with the first requestor, but instead changes the copy of those switches.

Changes made to the external switches from within the program affect the requesting display station's external switches rather than the copy of the switches.

## **01-89 Indicators**

### **Set on by:**

- WSU, when the indicator is used to identify a record type and when that type of record is read from the file.
- WSU, when the indicator has been coded in columns 49-50 (Not Found Indicator) of the T specification or an M specification, and when a record to read cannot be found in the file.
- WSU, when an error occurs for a GETNR, GETNH, GETPR, GETPH, GET, PUT, or PUTN operation and the indicator has been coded in columns 61-62 (Error Indicator) of the T specification or M specification.
- A SETON, MSG, or IMSG operation.
- Results of an arithmetic or compare operation.

### **Set off by:**

- WSU, when the indicator is used to identify a record type and when a different type of record is read from the same file.
- Results of an arithmetic or compare operation.
- A SETOF operation.
- WSU, each time a record is selected for review.

### **Where coded:**

- Columns 19-20 on I specifications.
- Columns 49-50, 55-56, and 61-62 on the T specification.
- Columns 49-50 and 61-62 on M specifications.
- Columns 15-16, 25-26, 27-28, 29-30, 48-53, and 54-59 on S specifications.
- Columns 23-24, 32-33, 37-38, 39-40, 41-42, 43-44, 45-46, and 47-48 on D specifications.
- Columns 9-17 and 54-59 on C specifications.

## Chapter 12. Review, Insert, and Delete Modes

This chapter describes the function and use of review mode, insert mode, and delete mode.

### REVIEW MODE

Review mode is an operating mode in which records in the transaction file can be viewed and updated. Operators can review and update only those transaction file records that are in the chain for the current session.

Review mode becomes active when the operator enters a review request or a delete record request during enter mode. WSU then does the following:

- Causes a message to be issued to the operator on the next display to inform the operator that review mode is active.
- Saves all mode-level fields and then sets them to blanks or zeros. Job and session-level fields retain their values when the review request is made. Refer to *Field Area* in Chapter 1 for a description of mode-level fields, session-level fields, and job-level fields.
- Saves all mode-level indicators and then sets them off. Job and session-level indicators retain their settings when the review request is made. Refer to Chapter 11, *Indicators* for a description of mode-level, session-level, and job indicators.
- Sets on the RV indicator.

For each review function requested during review mode, WSU does the following:

- Retrieves the appropriate record and shows the operator a review-capable display for that record. The operator will see blanks in all fields except those fields read from the reviewed record and those fields set by any preprocessing for the display. The record being reviewed is the current record and is used as a reference point in the program for the first paging request or the first operation performed that depends on the session chain information in the record trailers (such as a GETNR operation).
- Issues a message if there was no review-capable display, if the record could not be identified, or if the end of the chain of records was passed. Also, a message is issued if review by relative record number is attempted from the WSU menu and the requested record is not in the chain of records for the current work session.

A review request is invalid when a WSU processing level is active.

Columns 48-53 of the S specification are used to designate review-capable displays. Refer to the explanation of these columns in Chapter 7, *S Specification*, for a description of how to specify review-capable displays.

In review mode, WSU does not follow an automatic display sequence as it does in enter mode. Instead, the operator or program controls display selection. Also, displays that were required or repeated in enter mode are not required or repeated in review mode. The Bypass Display command key selects the next review-capable display for a record. The search starts from the current display. When processing for a display completes, a message appears and the operator must select another record or display for review, resume enter mode, begin insert mode, select a new session, or end the work session.

During review mode, WSU can show a nonreview display (one that is not review-capable for the current record type) via a PUTS operation for that display. When the processing for this display ends, a message appears on the display that indicates the review is complete. If the operator presses the Bypass Display command key (command key 2) during a nonreview-capable display, WSU searches the S specifications for the next one that has the indicator of the displayed record's type in columns 48-53. The search starts at the current S specification and wraps around to the first review-capable S specification for the record type. WSU selects this display for processing the record.

If indicator ES, EW, or EJ is set on or if EW or a session selection is specified on the WSU menu during review mode, the session automatically returns to enter mode and starts the appropriate processing level when processing for the current request ends.

Review mode applies only to records in the transaction file. If the WSU program does not specify a transaction file, review mode cannot be used.

When review mode begins, a special indicator (RV) turns on. This indicator remains on while the operator reviews records. You can use the RV indicator on C specifications to condition operations that should or should not occur in review mode. Enter mode is resumed (at the point entry was interrupted) via one of the following:

- The operator presses the Resume Entry command key (command key 3).
- WSU returns to enter mode automatically.

Indicator RV turns off when the work session returns to enter mode.

Master file records can be read and written while the program is in review mode. However, no PUTS, MSG, or IMSG operations and no GET operation for a different file can occur between the time a master file record is read and subsequently written. Also, a master file record must be read and written in the same mode without an intervening mode change or an intervening review, delete, or insert request. For example, a program cannot read a master file record in enter mode and write that record in review mode.

## How Operators Use Review Mode

In the following description of review mode, *previous record* and *next record* refer to the record ahead of or after the record that was selected. This description also assumes that the displays used for review do not have preprocessing and that the PUTS operation is not used to produce a different display.

Operators request a review function by pressing:

- The *Page Backward Record* key (Roll↓ with Shift). WSU reads the previous record in the chain, determines the record's type, and then searches the S specifications (from first to last) for the first one that contains the indicator of the record's type in columns 48-53. WSU uses this display to show the record. When an operator enters this display, all input fields transmit to the program and processing for the display begins.

When the Page Backward Record key would cause WSU to try to read ahead of the first record in the chain, an error is issued. If Error Reset is pressed and then the Page Backward Record key is pressed, WSU reads the *last* record in the chain.

- The *Page Backward Group* command key (command key 5). WSU reads the previous header record in the chain and then searches the S specifications (from first to last) for the first one that contains the indicator of the header record's type in columns 48-53. WSU uses this display to show the record. When an operator enters this display, all input fields transmit to the program and processing for the display begins.

When the Page Backward Group command key would cause WSU to read ahead of the first record in the chain, an error is issued. If Error Reset is pressed and then the Page Backward Group command key is pressed, WSU reads the *last* header record in the chain.

**Note:** If columns 55-56 (Header Record Identifying Indicator) of the T specification are blank, the Page Backward Group command key cannot be used.

- The *Page Forward Record* key (Roll↑ with Shift), which causes an end-of-chain message to appear. When Error Reset is pressed, the message is cleared. Pressing the Page Forward Record key again causes WSU to read the *first* record in the transaction file and then search the S specifications (from first to last) for the first one that has the indicator of the record's type in columns 48-53. WSU uses this display to show the record. When an operator enters this display, all input fields transmit to the program and processing for the display begins.

A message appears if the type of the record cannot be identified.

- The *Page Forward Group* command key (command key 6), which causes an end-of-chain message to appear. When Error Reset is pressed, the message is cleared. Pressing the Page Forward Group command key again causes WSU to read the *first* header record in the transaction file and then search the S specifications (from first to last) for the first one that contains the indicator of the header record's type in columns 48-53. WSU uses this display to show the record. When an operator enters this display, all input fields transmit to the program and processing for the display begins.

This key cannot be used if columns 55-56 (Header Record Identifying Indicator) of the T specification are blank.

- The *Delete* command key (command key 14), which allows the operator to see the most recently reviewed record (identified by the relative record number in \*RLRR) and to schedule the record to be logically deleted. When a record is logically deleted, it is removed from the work session's chain of records. The record cannot be accessed again. If the operator presses command key 13 or requests a different function, the logical deletion is canceled.

Any record in the work session's chain of records can be logically deleted. If a header record is deleted, all the data records associated with it are also deleted.

The Delete command key is valid only if the program uses a transaction file and supports review mode. The key can be used while the WSU menu is displayed or from any other display, as enabled by the program. The record is displayed using the first display in the program that supports review of the record type. The Delete command key can be used in any mode.



- The *Resume Review* command key (command key 15), which allows the operator to review the most recently reviewed record (identified by the record number in \*RLRR). This key is valid only if the program uses a transaction file and supports review mode. The key can be used while the WSU menu is displayed or from any other display, as enabled by the program. The display used for reviewing the record is the first display in the program that supports review of the record type. The Resume Review command key can be used in any mode.

The *WSU Menu* command key (command key 1) to display the WSU menu, and then specifying the relative record number of the record to be reviewed. The specified number becomes the contents of \*RLRN.

```

X1          ***** WORK STATION UTILITY MENU DISPLAY *****
ENTER DISPLAY SELECTION IDENTIFIER -----
ENTER EW TO END WORK SESSION -----
ENTER SESSION SELECTION IDENTIFIER FOR RESTART -----
ENTER REVIEW RECORD NUMBER ----- 000000
OR USE COMMAND KEY 1 TO RESUME...
IM X1 IM 000004 --

```

When the WSU menu appears, the relative record number shown is zero or the last value entered in the field.

If an operator tries to review a record that is not in his chain of records, WSU displays an error message. The record-not-found indicator does not turn on. If the WSU menu is used after this error and the record causing the error is in a different session chain, the session identifier for the chain is displayed as the default menu selection request. The operator can change sessions if an authorized work station is being used (UNIV-ALL or UNIV-id is specified in the procedure).

**Note:** Retrieving records by relative record number in review mode is intended for those who wish to batch edit the transaction file after its original data entry and then use the WSU data entry program to make any needed corrections.

\*RLRN is initially zero. The batch edit program can supply the value of the relative record number to be entered by the operator to initialize \*RLRN and then this value will be shown automatically when the operator selects the WSU menu. The operator can change the value if necessary. The value of \*RLRN when the operator presses the Enter/Rec Adv key is the value used to retrieve the transaction file record. During the review, the relative record number is contained in \*RLRR. The number will appear on the WSU menu status line if the operator presses command key 1 from the review display.

By using the GETPR, GETPH, GETNR, or GETNH operation, the batch edit program supplies the relative record number that appears at the top of the WSU menu. This number can also be copied from \*RLRU to \*RLRN after a GET operation.

Refer to Chapter 14, *WSU Command Keys, Function Keys, and Menu* for an explanation of the function keys and command keys that operators can use in review mode.

### How to Return to Enter Mode

The operator can return to enter mode at the point entry was interrupted by pressing the Resume Entry command key (command key 3).

### Review Mode Example

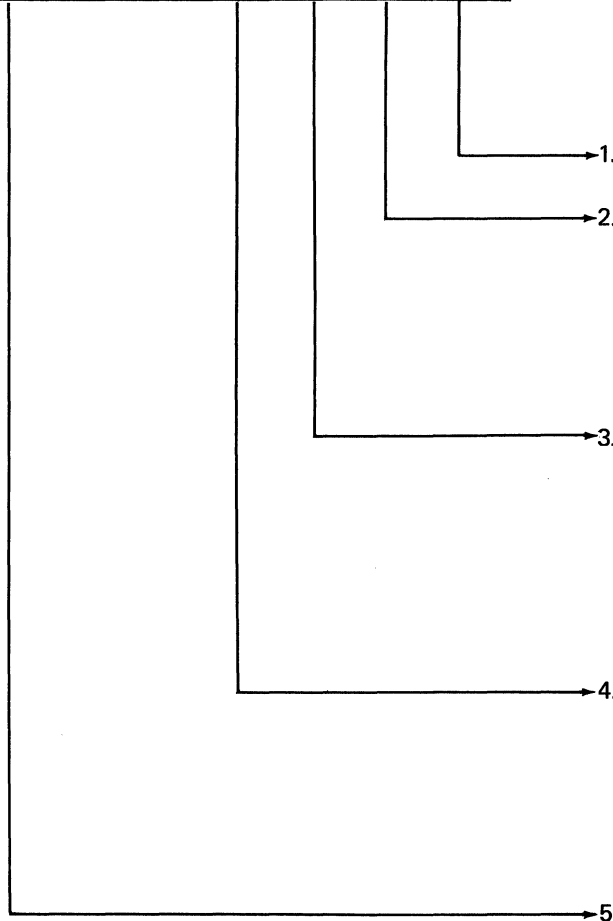
Suppose the transaction file has three record types (header records are type 01, and detail records are types 02 and 03). Operators use DSPLYA to enter header records and DSPLYB and DSPLYC to enter detail records. To allow operators to review header records, columns 48-49 of the S specification for DSPLYA contain 01. To allow operators to review type 02 detail records, columns 48-49 of the S specification for DSPLYB contain 02. Type 03 detail records in this example cannot be reviewed by an operator. Therefore, columns 48-53 of the S specification for DSPLYC are blank.

Following are the sample S specifications for DSPLYA, DSPLYB, and DSPLYC and an example of how those S specifications effect the operator's review of records in the transaction file.



Transaction File Records

01	02	02	02	03	03	03	...
----	----	----	----	----	----	----	-----



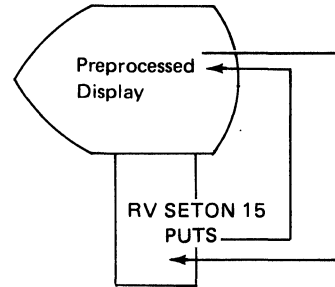
- 1. Current record being entered.
- 2. Operator presses the Roll↓ (Roll Down) Key with shift. WSU reads this record, determines its type (03), and searches the S specifications (starting with the first one) for a display that allows review of this record type. Because 03 is not in columns 48-53, WSU displays a message that the record type is not reviewable.
- 3. Operator presses the Error Reset key and the Roll↓ (Roll Down) key with shift again. WSU reads this record, determines its type (03), and searches the S specifications (starting with the first one) for a display that allows review of this record type. Because 03 is not in columns 48-53, WSU displays a message that the record type is not reviewable.
- 4. Operator presses the Error Reset key and the Roll↓ (Roll Down) key with shift. WSU reads this record, determines its type (02) and searches the S specifications (starting with the first one), for a display that allows review of this record type, and presents DSPLYB.
- 5. If an operator presses command key 5 (Page Backward By Group), WSU reads the previous header record, determines its type, searches the S specifications for the first specification with this type in columns 48-53, and presents that display (DSPLYA).

## Types of Review Mode

Two types of review mode can be coded:

- Review with no update allowed
- Review with update allowed

Chapter 15, *WSU Sample Programs* contains a program for which review mode has been coded.

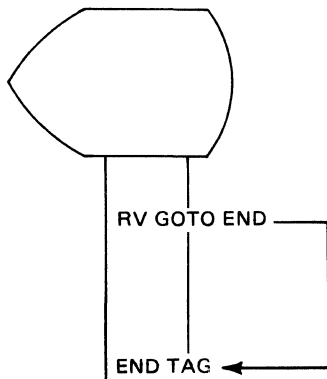


After the SETON operation, code a PUTS operation that presents the review display. When the operator enters the review display, processing resumes with the operation following the PUTS operation. When processing ends for this display, WSU shows an end-of-review message, and the operator can select another record to review.

### Review Mode with No Update Allowed

Review with no update allows operators to review records that they previously entered in the transaction file, but does not allow them to update the reviewed records. To ensure that operators make no changes to the records, you can use one of the following coding methods:

- In the processing for review-capable displays, condition a GOTO operation that branches to the end of the processing with the RV indicator.



- In the processing for review-capable displays, condition PUT operations with NRV in columns 9-17.
- Define a preprocessed display. In the preprocessing, use the RV indicator to condition a SETON operation that turns on an indicator used to protect all input fields.

All fields will be displayed; however, operators cannot change any data that is on the display. The RV indicator cannot be used to protect input fields. Only indicators 01-89 are valid in columns 37-38 (Protect Field) on the D specifications.

### Review Mode With Update Allowed

Review with update allows operators to review and update records that were previously entered in the transaction file. This section explains two types of review with update:

- Simple review with update
- Review with master file update

For a simple review with update, use the RV indicator to condition the C specifications that should or should not execute during review.

For a review that allows master file update, the review display should be a preprocessed display. In the preprocessing, certain operations can be done to the master file record before the reviewed transaction file record is displayed and operators have a chance to change the data.

An operator is not required to enter a reviewed record, which means that the preprocessing would occur and the processing would not occur. Therefore, information from the transaction file record should be saved in the preprocessing and changed in the processing.

Once the transaction file record data is read and saved, a PUTS operation should occur to display the reviewed record. When operators update the data and enter the display, processing resumes with the operation that follows the PUTS operation. Operations should be conditioned by the RV indicator to read the proper master file record and use the saved reviewed transaction file record data to restore the master file fields to their status before the update. (This restoring is done by reversing the updates; subtracting data that was added for example.) The processing that follows the master file update should do the same processing that was done for the initial entry of the record.

### Separate Review Mode Displays

WSU does not automatically generate separate displays for review mode from the enter mode displays. Review mode coding may be simplified by coding separate displays that are used only in review mode. These displays should not be a part of enter mode sequences. The processing for a review display occurs only after operators select this display and then enter it.

### Combined Enter Mode/Review Mode Displays

If you allow a display to be used for both data entry and review, WSU puts 99 (one of the reserved indicators) in columns 23-24 (Output Data) of the D specification for each input field that does not have an entry in columns 23-24. This indicator turns on automatically when an operator selects review mode.

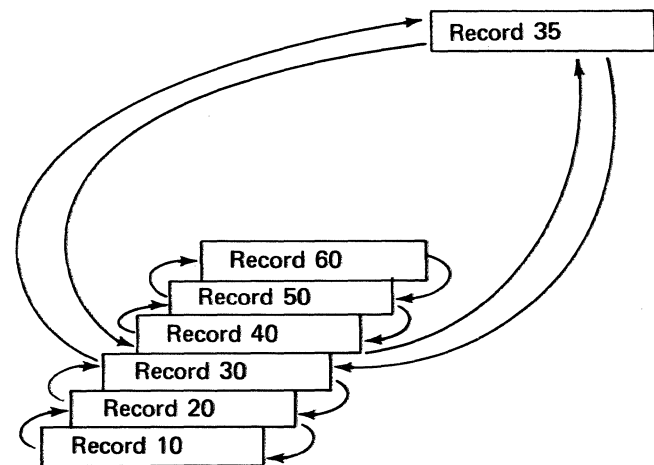
If columns 23-24 contain an indicator, WSU cannot use its own indicator. You must set on the indicator you've coded in these columns before the display appears for review if you want the field to be an output field in review mode.

### INSERT MODE

Insert mode is an operating mode that allows operators to logically insert records in the transaction file. Except for header records, all types of transaction file records can be inserted.

When an attempt is made to insert a header record, one of the following occurs:

- If an error indicator has been coded in columns 61-62 of the T specification, that indicator turns on.
- If an error indicator has not been coded in columns 61-62 of the T specification, WSU abnormally ends the work session.



When an operator inserts a record between existing records, WSU places the record at the end of the file and updates the trailers for the records that logically precede and follow the inserted record. The trailers are updated *after* insert mode ends.

To insert a record, an operator must first select review mode and display the record that is to precede the inserted record (refer to *Review Mode* in this chapter for an explanation of how to do this).

In insert mode, WSU does not follow an automatic display sequence like the enter mode sequence. Instead, the operator or program controls display selection. Displays that were required or repeated during enter mode are not required or repeated during insert mode.

When insert mode begins, a special indicator (IN) turns on. This indicator (and the RV indicator) remain on while the operator inserts records. Indicator 99 remains on so that input fields become output fields also. You can use the IN indicator on C specifications to condition operations that should or should not occur in insert mode. The operator returns to enter mode (at the point entry was interrupted) via the Resume Entry command key (command key 3) or returns to review mode via the Page Backward Group command key (command key 5), the Page Backward Record key (Roll↓ with Shift), the Page Forward Group command key (command key 6), the Page Forward Record key (Roll↑ with Shift), or the relative record number on the WSU menu. Indicator IN turns off.

Insert mode applies only to records in the transaction file. If the WSU program does not specify a transaction file, insert mode cannot be used.

Master file records can be read and written while the program is in insert mode. A master file record must, however, be read and written in the same mode.

Columns 54-59 of the S specification are used to designate insert mode displays. Refer to the explanation of these columns in Chapter 7, *S Specification* for a description of how to specify displays for insert mode. Chapter 15, *Sample WSU Programs* contains a program for which insert mode is allowed.

### How Operators Select Insert Mode

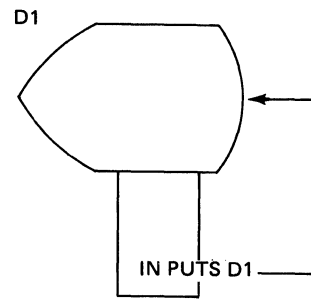
To select insert mode, an operator selects review mode and displays the record that will precede the inserted record. The operator presses the Insert Mode command key (command key 4). WSU selects the display that appears by searching the S specifications from first to last for the first one that contains the indicator of the displayed record's type in columns 54-59. WSU shows this display to allow an operator to insert a record. When the operator enters the display, all input fields transmit to the program and processing for the display begins. Mode level fields and indicators, except for the IN indicator and \*RLNO, remain as they were in review mode.

Refer to Chapter 14 for an explanation of the function keys and command keys that operators can use in insert mode.

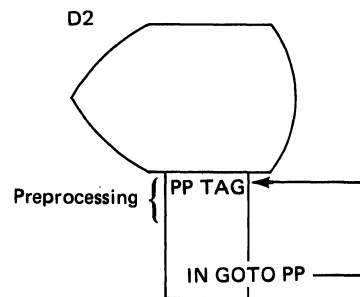
### How to Insert a Group of Records

To allow a group of records to be inserted, either the processing for an insert display can be coded to handle multiple inserts or the operator can switch back and forth from review mode to insert mode for each record that is inserted.

The last operation in the processing for an insert display could be a PUTS operation for the same display. This operation should be conditioned by the IN indicator. When processing for the display completes, the PUTS operation reshows the display and allows another record to be inserted. The operator can insert as many records as he wants. This method works only if the display is not preprocessed.



If preprocessing is specified for an insert display, the last operation should be a GOTO to the first operation in the preprocessing. The GOTO operation should be conditioned by the IN indicator.



If the processing is not coded to handle multiple inserts, an operator can repeat the following steps to insert a group of records.

1. Insert a Record.
2. Press the Page Forward Record key (Roll↑ with Shift) to display the inserted record.
3. Press the Insert Mode command key (Command key 4).



*Transaction File Records*

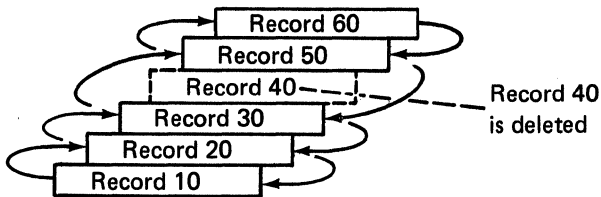
01	02	02	02	02	02	01	02
----	----	----	----	----	----	----	----

- 
1. Suppose that an operator wants to insert a detail record here (right after the header record).
  2. The operator presses the Page Backward Group command key (command key 5) to begin review mode and select this header record. He may have to press this key a number of times to get this record, depending on where he was in the transaction file.
  3. The operator presses the Insert Mode command key (command key 4). WSU searches columns 54-59 of the S specifications for the first one with 01 in these columns and then shows that display (DSPLY2).



## DELETE MODE

Delete mode is an operating mode that allows operators to logically delete records from the transaction file. All types of transaction file records can be deleted. If a header record is deleted, all the records associated with the header record remain chained together, but the entire group is removed from the chain.



When an operator deletes a record, WSU updates the trailers for the records that logically precede and follow the deleted record or group of records. The trailers are updated after the operator has reviewed the record and allowed the delete function to complete.

Delete mode begins when the operator requests the delete record function. At this time a special indicator (DL) turns on. This indicator and the RV indicator remain on while the operator reviews the record. You can use the DL indicator on C specifications to control which operations should or should not occur in delete mode. The operator returns to enter mode at the point entry was interrupted via the Resume Entry command key (command key 3), or returns to review mode via the Page Backward Group command key (command key 5), the Page Backward Record key (Roll↓ with Shift), the Page Forward Group key (command key 6), the Page Forward Record key (Roll↑ with Shift), or the relative record number on the WSU menu. Indicator DL turns off.

Delete mode applies only to records in the transaction file. If the WSU program does not specify a transaction file, delete mode cannot be used.

## How Operators Select Delete Mode

Before the operator requests the delete function, the relative record number of the record to be deleted must be in \*RLRR. To delete the record, the operator presses the Delete command key (command key 14). If delete mode is activated from enter mode, mode-level fields and indicators, except for the DL indicator, are initialized as they would be for a normal review request, and a message is displayed to inform the operator that delete mode is active. When the function is completed, another message is displayed.

Refer to Chapter 14 for an explanation of the function keys and command keys that operators can use in delete mode.

## How to Return to Enter Mode

The operator can return to enter mode at the point entry was interrupted by pressing the Resume Entry command key (command key 3).

## Chapter 13. Additional Topics and Programming Considerations

This chapter provides additional information about:

- Preprocessing
- Assigning priority to display screen processing and subroutines
- Modifying a WSU generated procedure, for example:
  - Changing the maximum number of concurrent operators
  - Changing the disposition of a file
  - Authorizing session selection from the WSU menu
- Determining the optimum region size
- Reserving space for the master track index
- Using reserved fields
- Saving total fields
- Using self check fields
- Interactive communication feature
- Delete-capable file considerations
- Logical delete considerations
- User-defined help screens

### PREPROCESSING

Preprocessing allows you additional control of display screen formats.

You can use preprocessing to:

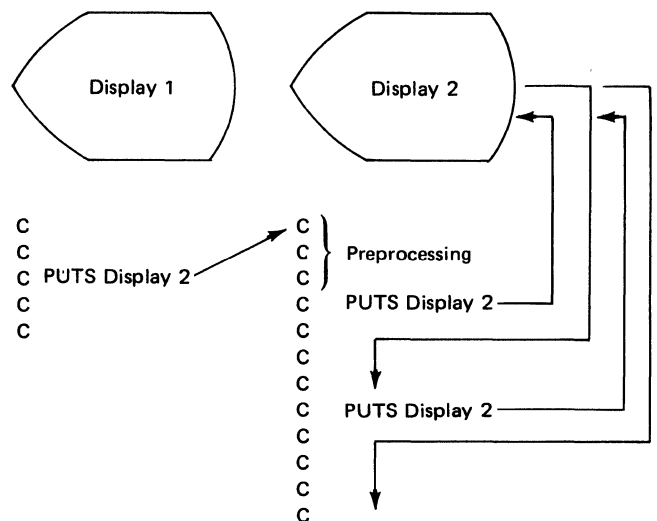
- Initialize values of output fields or output/input fields.
- Determine whether or not to display a format.
- Back out totals during review mode.
- Provide a common end-of-processing routine for several formats.

WSU does not automatically display a format that has Y coded in column 47 (Preprocess) of its S specification. Instead, WSU first executes the C specifications for the display. Then to display the format, a PUTS operation for the format may execute during the preprocessing for the display. If a PUTS causes the display to appear, operators can respond to the display. When an operator enters the display, processing resumes with the operation following the PUTS operation.

You can code any number of PUTS operations to the preprocessed display.

When a PUTS occurs for a preprocessed display from another display (Display 1 uses a PUTS to show Display 2 in the following example), processing starts at the first C specification and the display is not shown.

A display can issue a PUTS operation for itself. After the display is shown, processing resumes at the operation that follows the PUTS.



You must code C specifications for displays that WSU preprocesses. Because a display that does not allow operator input cannot have associated processing, do not specify N for Reset Keyboard (column 23 of an S specification) and preprocessing for the same display.

## ASSIGNING PRIORITY TO DISPLAY SCREEN PROCESSING AND SUBROUTINES

When a WSU program executes, the entire program may not fit in the assigned main storage. WSU uses a technique of dynamically overlaying various segments of an execution program upon one another. Generally, better program performance occurs if segments of C specifications that are required least often are overlaid most frequently.

When the C specifications for a display screen format or subroutine execute, WSU determines whether or not the processing segment for that format is in main storage. If the segment is not in main storage, WSU reads the segment from disk. To make room in main storage, WSU overlays one or more program segments. Segments with the least probability for use in subsequent processing are the best segments to overlay.

The priority of a display screen format or subroutine allows you to control which processing segments are overlaid. Assign a high priority to a display screen format or subroutine that is used frequently, which makes the associated segment less likely to be overlaid. The processing segment remains in main storage for more time. Assign a low priority to display screen formats or subroutines that appear infrequently, which makes the associated processing segments more likely to give up their main storage to more frequently used segments.

Assign display screen format priorities in column 46 of an S specification. An entry of 3 represents the highest priority. Other priority entries, from high to low, are 2, 1, and 0 or blank.

Assign subroutine priorities by coding a PRTY operation immediately following the BEGSR operation.

Note: IJ, IW, ES, EW, and EJ processing segments are automatically assigned priority zero.

## Example of Assigning Priorities

A sample application has nine display screen formats, F1 through F9. The predicted relative frequencies for these displays are:

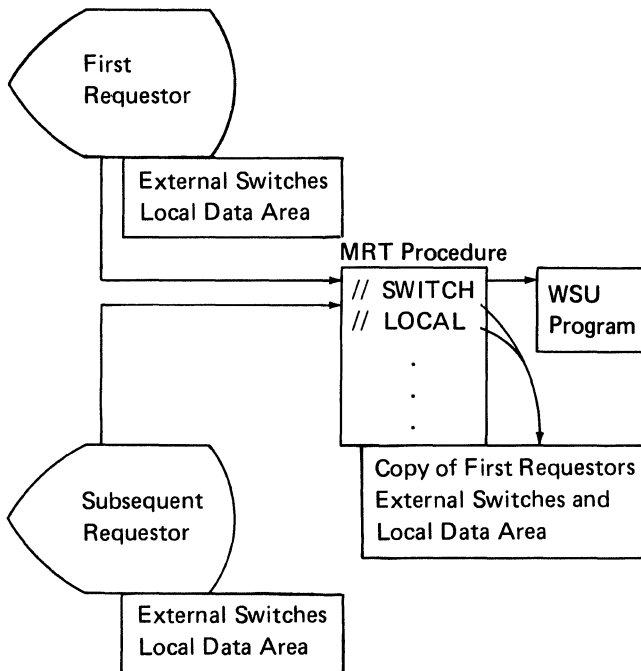
Display	Relative Frequency
F1	6%
F2	6%
F3	67%
F4	10%
F5	2%
F6	2%
F7	3%
F8	3%
F9	1%

Based on these predictions, the assigned priorities are:

Display	Priority
F3	3
F1, F2, F4	2
F5, F6, F7, F8	1
F9	0 or blank

## MODIFYING A WSU GENERATED PROCEDURE

The procedure that WSU generates to call a WSU program is an MRT procedure. When an MRT procedure is first requested, the SSP copies that requestor's external switches and local data area into an area associated with the MRT procedure. OCL statements within the WSU generated procedure access the copy of the first requestor's external switches and local data area.



For example, the SWITCH and LOCAL OCL statements in the WSU generated procedure do not change the external switch settings and local data area associated with the first requestor, but instead change the copy of the first requestor's external switches and local data area.

The WSU program accesses external indicators and the local data area associated with each requesting display station rather than accessing the copy of the first requestor's external switches and local data area.

Figure 1-9 in Chapter 1, *Introduction* shows the contents of the WSU procedure created during program generation. Either you or operators can modify this procedure via SEU. Some possible modifications are:

- Change the REGION SIZE parameter. (Refer to *Determining the Optimum Region Size* in this chapter).
- Change the maximum number of operators who can concurrently use the program without modifying the source program. Change the MRTMAX parameter value in the ATTR statement to the new number of operators.

The MRTMAX value determines the amount of main storage WSU allocates for the display stations. The amount of storage varies from application to application; however, WSU allocates from 25 bytes to 620 bytes of storage per display station.

Changing the MRTMAX value reduces or increases the required region size, which could determine whether or not a program runs in a region. For example, if MRTMAX is 8 but only one display station operates, you can save 155 to 4340 bytes of main storage by reducing MRTMAX to 1. Also, the size of the WSU work file increases as MRTMAX increases.

- Change the WSU generated procedure so that all statements are not logged to the history file. This change should reduce WSU start-up time.
- Change any file's disposition from OLD to SHR. When a master file is shared and updated; PUTS, MSG, MSG, GET, and PUT operations should not occur between the GET operation and the file update. Sharing the transaction file with an update program is not recommended.

- Specify NEP-YES on the ATTR statement. This change, which keeps the program active in storage even when no operators are using it, is best for WSU programs that are used most frequently. To end this program you must set the EJ indicator on in the program or have the system operator stop the program.

For this type of program, IJ processing is done the first time the program is initiated. After all sessions end, any new session will not cause IJ processing to occur. Also, when all active sessions end, EJ processing occurs only if the EJ indicator is on or the system operator stops the program.

- Change DEBUG-YES to DEBUG-NO to turn off the debugging function.
- Specify UNIV-id or UNIV-ALL on the WSX statement. This change allows the work station to be used to access records in a chain of records for a session selected from the WSU menu.

## DETERMINING THE OPTIMUM REGION SIZE

WSU uses the larger of the region size that you code in columns 41-42 of the J specification or the minimum region size as the value for the REGION statement in the WSU generated procedure. (Figure 1-9 in Chapter 1 shows the WSU generated procedure.)

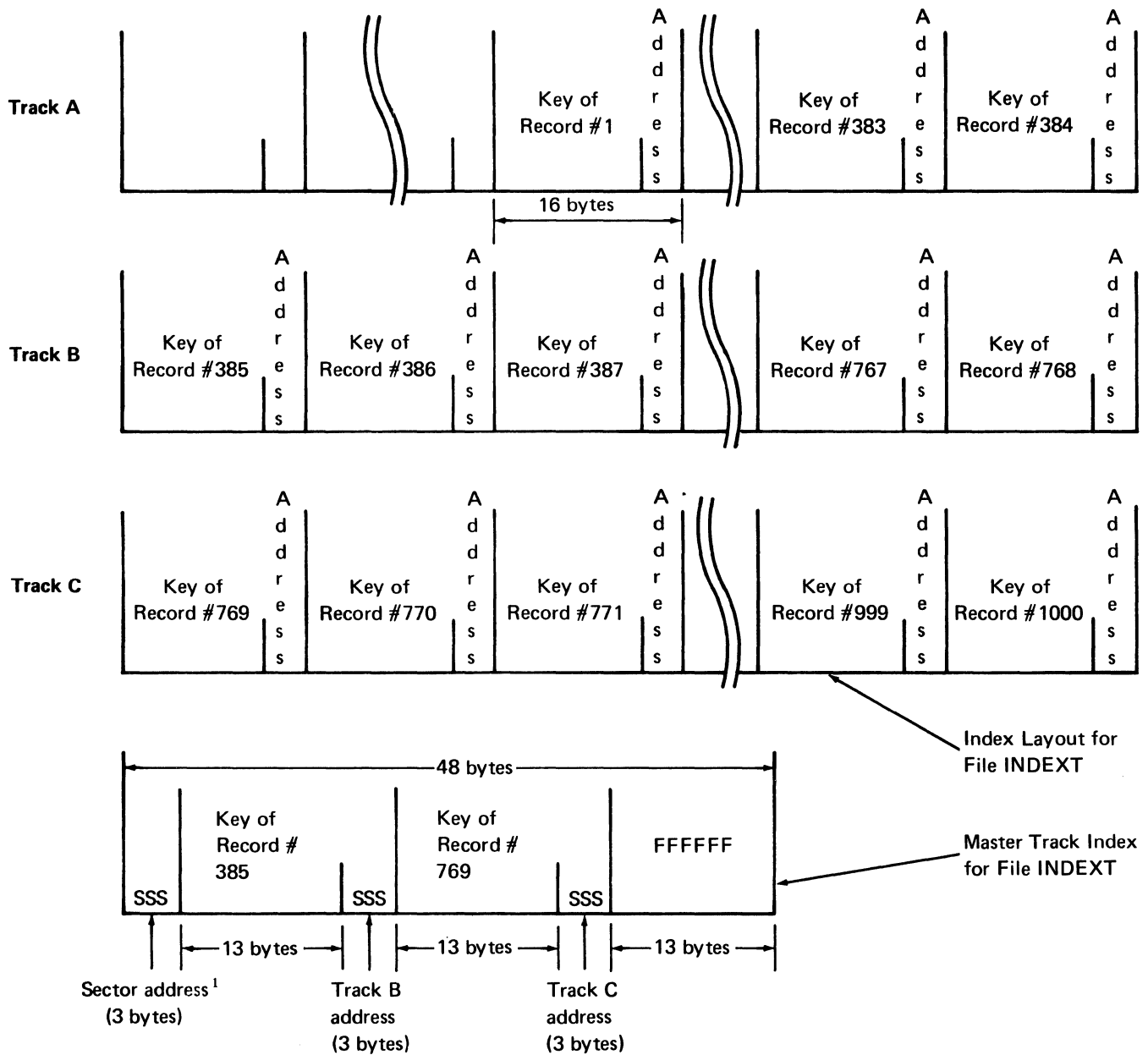
Factors that affect optimum region size include:

- Required/accepted program performance
- Region size limitations (maximum and minimum)
- Relative importance of the performance of the generated WSU program compared to other programs that run with the WSU program

WSU prints the minimum region size and maximum region size that you can code for the generated program. WSU also prints the amount of storage required for each work session, which is useful information when MRTMAX is changed. You can vary the REGION SIZE parameter (via the source entry utility program) from one run to another to experiment with the effect the region size has on WSU performance. WSU adjusts to the region you specify, either taking advantage of additional space, or executing in less space (down to the minimum space specified on the output printed during generation).

## RESERVING SPACE FOR THE MASTER TRACK INDEX

The master track index is a table containing entries for tracks in the index portion of a file. Each entry contains a sector address and the lowest key field from the next track in the file index. The index portion of a file contains the position of the records in the file. Each index entry consists of a key and a 3-byte disk address for each record in the file. The last entry of the file index contains all hexadecimal FFs to indicate the end of the index. Figure 13-1 shows the layout of the index for the indexed file, INDEXT, and the most efficient master track index for the file. Notice that the master track index contains one entry for each track in the file index if enough space is reserved.



<sup>1</sup> If the index begins on a track boundary, this address will also be a track address.

Figure 13-1. Example of Master Track Index

Use of the master track index significantly reduces the amount of time needed to process an indexed file. It enables the system to go more directly to the specific record you want by searching only a small portion of the file index. Without the master track index, all file index entries that precede the record you want must be searched. When the master track index is used, as shown in Figure 13-1, the record 767 can be found in the following manner:

1. Search the master track index until the first key field higher than key 767 is located. In this instance the key is 769 on track C; therefore, key 767 must reside on track B.
2. Search track B in the file index until key 767 is located.
3. Chain directly to the associated data record.

In columns 51-54 of the M specification, specify the number of storage positions (bytes) you want reserved for the master track index. Using the amount of main storage you specify, the system builds the most efficient master track index it can. The master track index is built immediately before your WSU program executes.

For efficient processing, the master track index you specify should be large enough to contain one entry for each track in the file index. The minimum number of bytes required for a master track index entry for one track equals: (the key length + 3) multiplied by 2. For example, if file INDEXT has one track that contains index entries and a key length of 4, the most efficient master track index is 14 bytes, that is, (4 + 3) times 2. If the file index occupies more than one track, the number of bytes required for the master track index equals: (the key length + 3) multiplied by the number of tracks containing index entries plus 1. (If a file has less than 3 index tracks, use of a master track index will probably not increase processing efficiency.) For example, if the key length equals 4 and the number of tracks containing index entries equals 5, the number of bytes required for the master track index is 42; that is, (4 + 3) multiplied by 6 (5 + 1) equals 42.

To determine the number of tracks that contain index entries:

1. Use the CATALOG procedure to find the number of records in the file.
2. Multiply the number of records times (the key length + 3) to find the number of bytes in the index.
3. Divide the number of index bytes by 256 and round the result up to find the number of sectors in the index.
4. Determine the number of tracks in the index by dividing the number of sectors in the index by either:

60, if your disk has 27.1 megabytes or less  
64, if your disk has 63.9 megabytes or more

If the quotient is not a whole number, round it up to the next whole number.

You can use the STATUS SESSION command to determine the number of megabytes on disk; the AVAILABLE DISK SIZE on the third display of work station status gives the number of megabytes (see the *Operator's Guide* for further information on the STATUS SESSION command).

If the storage space specified in columns 51-54 of the M specification is not large enough to contain an entry for every track of file index, the given area is divided into as many entries as there are room for, with each entry pointing to a larger area of the file index. As the number of entries in the master track index decreases, the amount of processing time increases.

## USING RESERVED FIELDS

The reserved fields provided by WSU are:

UPDATE	}	Date fields
UDAY		
UMONTH		
UYEAR		
*RLNO	}	Special WSU fields
*SLNO		
*ERROR		
*RLRU		
*RLRN		
*RLRR		
*USID		
*WSID		
*BLANK		

UPDATE, UDAY, UMONTH, and UYEAR are job-level fields; \*RLNO, \*SLNO, \*ERROR, and \*RLRU are mode-level fields; \*RLRN, \*RLRR, \*USID, and \*WSID are session-level fields; and \*BLANK is a special field that is used only with the MOVE operation.

Do not begin \*RLRN, \*RLNO, \*RLRU, \*RLRR, \*SLNO, \*BLANK, \*ERROR, \*USID, or \*WSID in column 7 of a continued line in a table of values. An asterisk (\*) in column 7 indicates a comment line.

### Date Fields

When the WSU program is initialized, WSU records the following information in the date fields:

UDAY:	day
UMONTH:	month
UYEAR:	year
UPDATE:	program date if a program date has been specified; system date if a program date has not been specified

You can use date fields as output fields on displays, in factor 1 or factor 2 for operations that allow numeric fields for these entries, in a table of values for a COMP operation, or as chain fields on an M specification.

## \*RLNO

\*RLNO is a six-byte field that contains a relative record number. At job initiation, \*RLNO is set to contain the largest reserved relative record number in the transaction file. Also, at work session initiation or whenever a record is added to the transaction file, \*RLNO is set to contain the relative record number of the next record to be added to the transaction file for the corresponding display station. This value will be different for a given display station, depending on whether the display station is in enter mode or insert mode. If there is no transaction file, \*RLNO contains zero during the program's execution. In review mode, \*RLNO is set to zero.

At job initiation prior to any transaction file add operation, \*RLNO may be used to calculate the number of records that can be added to the file. After job initiation or after the first add operation during job initiation, \*RLNO may be used to record the relative record number of the next record to be added to the transaction file for each work session.

\*RLNO is a display station field. The value of \*RLNO remains zero for a WSU program that does not specify a transaction file.

### How to Code

You can code \*RLNO in factor 1 or factor 2 of operations that allow numeric fields for these entries. \*RLNO can also be in a table of values for a COMP operation or a chain field on an M specification. \*RLNO cannot be an input field on a D specification, or a result field.



## **\*SLNO**

\*SLNO is the reserved field that contains the variable starting line number of a display. The S specifications for such displays have a V entered for the start line number.

\*SLNO is a two-byte numeric field with no decimal positions and is a display station field. This field has an initial value of 1 and assumes other values only as direct results of C-specification processing. The contents of \*SLNO are restored to their enter-mode value when the mode changes from review to enter. Other than this restoring, WSU does not change the contents of \*SLNO.

During WSU execution, the work session ends abnormally if the sum of \*SLNO and the maximum line number for the display is greater than 24 for a 1920-character display or is greater than 12 for a 960-character display. The maximum line number is the larger of the number of lines to clear and the largest line number on the D specification.

### *How to Code*

\*SLNO may be coded wherever a field name is valid, except on I specifications and D specifications. Also, \*SLNO may be used during any processing level.

## **\*ERROR**

\*ERROR is the reserved field that contains a 4-digit indication of errors that occur for transaction file operations (GETNR, GETNH, GETPR, GETPH, and PUT) and master file operations (GET, PUT, and PUTN).

\*ERROR is set to zero when a file operation occurs. If an error indicator has been coded in columns 61-62 of the T specification or M specification and an error occurs that causes this indicator to turn on, WSU places one of the following error codes in \*ERROR:

<b>Code</b>	<b>Meaning</b>
0004	An I/O error occurred for a get operation.
0005	A record-not-found error occurred and a not-found indicator was not coded.
0006	The record key contains hexadecimal 'FFs' for a GET operation.
0007	An I/O error occurred on a get operation before a put operation.
0008	A put operation for a file update occurred, but a successful get operation did not precede it.
0009	An I/O error occurred on a PUT operation.
0012	An attempt was made to insert a transaction file header record with a put operation.
0029	The transaction file was full for a data record get operation that occurred before a put operation.
0030	The transaction file record number exceeds 65 535.
0033	The key of the record being updated via a put operation differs from the key of the record read via the previous get operation.
0041	The end of file has been reached on a PUTN operation.

<b>Code</b>	<b>Meaning</b>
0042	The key of the record to be added via a PUTN operation is a duplicate of an existing record key.
0043	The record key contains hexadecimal FFs for a PUTN operation.
0044	An I/O error occurred for a PUTN operation.

*How to Code*

You can code \*ERROR in factor 1 or factor 2 of operations that allow numeric fields for these entries. \*ERROR can also be in a table of field names for a COMP operation.

**\*RLRN**

\*RLRN is a six-byte field that contains the relative record number that an operator specified on the WSU menu or the most recent value that the program placed in it.

The contents of \*RLRN are not set to zero when review mode begins. Also, the contents of \*RLRN are not changed as records are reviewed via the Page Backward Group (5) or Page Forward Group (6) command key, or Page Backward Record (Roll↑ with Shift) or Page Forward Record (Roll↓ with Shift) function key. The contents of \*RLRN are not destroyed at the end of a work session; they are passed to the next work session.

*How to Code*

You can code \*RLRN in factor 1, factor 2, or a result field of operations that allow numeric fields for these entries. You can also code it as a chain field on an M specification.

**\*RLRR**

\*RLRR is a six-byte numeric field that contains the relative record number for the most recent successful input operation performed on the transaction file, when a review function is requested by the operator. The initial value of the field is zero.

*How to Code*

You can code \*RLRR in factor 1 or factor 2 of operations that allow numeric fields for these entries, or as a chain field on the M specification.

**\*RLRU**

\*RLRU is a six-byte numeric field that contains the relative record number for the most recent successful input operation performed on the transaction file for a C specification operation (GETNR, GETNH, GETPR, GETPH). The initial value of the field is zero.

*How to Code*

You can code \*RLRU in factor 1 or factor 2 of operations that allow numeric fields for these entries, or as a chain field on the M specification.

## \*USID

\*USID is a two-byte alphanumeric field that contains:

- Blanks for a new requestor
- The session ID entered by the operator on the WSU menu
- The session ID from the trailer of a WSU file data record or header record (after an I/O operation has been performed on the transaction file for a review request)

The contents of \*USID are not destroyed at the end of a work session; they are passed to the next work session.

### *How to Code*

You can code \*USID in factor 1, factor 2, or a result field of operations that allow alphanumeric fields for these entries.

## \*WSID

\*WSID is the reserved field that contains the symbolic display station identifier.

\*WSID is a two-character alphanumeric field that is set to the symbolic display station ID when the display station first signs on.

### *How to Code*

You can code \*WSID as factor 1 or factor 2 of a C specification. \*WSID cannot be used on D specifications or I specifications.

## \*BLANK

\*BLANK can be used in factor 2 of the MOVE operation to set an alphanumeric result field to blanks.

## SAVING TOTAL FIELDS

When operators resume or recover a WSU program that has a transaction file, internal totals accumulated during previous use of the program are not available. In order to make them available, you should periodically save them by writing them to a master file.

To use a master file to keep the totals, create this file with only one record. The fields in the record should be the totals that are to be saved. When it is time to save the totals, issue a PUT operation to the master file.

To restore the totals when operators resume or recover, issue a GET operation conditioned by the RC indicator or RS indicator for the master file during IJ processing.

## USING SELF-CHECK FIELDS

A practice that provides some protection against clerical and keying errors is that of using self-check fields. WSU provides a method of verifying a self-check field at the same time it is entered.

Numeric self-check fields cannot be longer than 15 digits.

A self-check field is composed of two parts: the base number (for example, your control or account number) and one check digit. The check digit is the rightmost digit in the field. The following is an example of an 8-digit self-check field:

6 3 7 1 2 5 7 1  
└──────────┘ └┬┘  
Base Number Check Digit

When you establish your control or account numbers (the fields you want verified) you must calculate the check digit for each field and include it as the last digit of the number.

The check digit is calculated by your use of a formula (a fixed sequence of operations on the base number). When the field is entered, WSU uses the same formula that you used to calculate the check digit. If the check digit produced does not match the check digit you supplied, an error message is displayed and the field can be reentered.

There are two formulas for obtaining the self-check digit, called modulus 10 and modulus 11. Modulus 10 is used to detect either incorrect entry of a single digit or a single transposition. Modulus 11 is used to detect incorrect entry of a single digit, single transpositions, and double transpositions.

To compute the modulus 10 self-check digit, do the following:

1. Multiply the units position and every alternate position of the base number by 2.
2. Add the digits in the products to the digits in the base number that were not multiplied.
3. Subtract the sum from the next higher number ending in zero.

The difference is the self-check digit.

For example:

Base number	6 1 2 4 8
Units position and every alternate position	6 2 8
Multiply by 2	12 4 16
Digits not multiplied	1 4
Add	1 + 2 + 1 + 4 + 4 + 1 + 6 = 19
Next higher number ending in 0	20
Subtract	-19
Self-check digit	1

**Note:** Only the four low-order bits of each character are used for the check digit.

The number to use in calculating the check digit for nonnumeric characters is determined by the EBCDIC representation for the character.

- A is equal to C1; the number to use is 1.
- R is equal to D9; the number to use is 9.
- % is equal to 6C; the number to use is 0. The number to use is 0 when the four low-order bits are either hex A, B, C, D, E, or F.

To compute the modulus 11 self-check digit, do the following:

1. Assign a weighting factor to each digit position of the base number. These factors are: 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7, 2, 3, ...starting with the units position of the number and progressing toward the high-order digit. For example, the base number 991246351 would be assigned the weighting factors as follows:

base number	9 9 1 2 4 6 3 5 1
weighting factor	4 3 2 7 6 5 4 3 2
	< - - - - -

2. Multiply each digit by its weighting factor.
3. Add the products.
4. Divide this sum by 11.
5. Subtract the remainder from 11.

The difference is the self-check digit.

For example:

Base number	1 3 7 3 9
Weighting factors	6 5 4 3 2
Multiply	6 15 28 9 18
Add	6 +15 +28 +9 +18=76
Divide	76/11 = 6 plus a remainder of 10
Subtract	11 - 10 = 1
Self-check digit	1

**Note:** If the remainder from step 4 is 0, the self-check digit is 0. If the remainder is 1, the base number has no self-check digit; you must ensure that base numbers with remainders of 1 in step 4 are not used in the fields you define as self-check fields.

You specify the self-check feature and the formula that WSU should use via column 30 (self-check) on the D specification.

## INTERACTIVE COMMUNICATIONS FEATURE

If an interactive communications feature session attempts to initiate a WSU program or attach to a WSU program, abnormal program termination occurs. A WSU work session is not initiated for that interactive communications feature session.

## DELETE-CAPABLE FILE CONSIDERATIONS

WSU does not allow records to be physically deleted. (An operator can use the Delete command key to logically delete a record; see *Logical Delete Considerations* for more information.) Therefore, a WSU program ends abnormally if it tries to use a delete-capable transaction file.

A WSU program can, however, use a delete-capable master file. When the program gets a deleted record, a not-found indication occurs. These deleted records cannot be updated.

Also, when a WSU program writes a record that has hexadecimal FF in its first position to a delete-capable master file, the session ends abnormally.

*Note:* A delete-capable file is a file that can contain logically deleted records. The file is not physically compressed for record deletions. In order to support delete-capable files, a System/34 must have extended data management, an optional SSP feature that is specified during system configuration. The *IBM System/34 Installation and Modification Reference Manual*, SC21-7689, describes how the feature is specified. Parameters on OCL statements and commands allow creation and use of delete-capable files. The *IBM System/34 SSP Reference Manual* describes these parameters.

## EXTEND FILE CONSIDERATIONS

WSU can only extend an old file (one specified with DISP-OLD on the FILE statement). If you use the extend function, the file must already exist before the WSU program is executed.

## LOGICAL DELETE CONSIDERATIONS

During review mode, an operator can logically delete transaction file records that were entered for the work session. Logically deleted records are removed from the work session's chain of records.

You can prevent the operator from deleting records by:

- Disabling the Delete command key on the appropriate S specification.
- Using the MSG or IMSG operation to display a message to the operator if he uses the Delete command key (DL indicator is on). This message should instruct the operator to request some other function. This message does not prevent the record from being deleted (it does not set the DL indicator to off) but it can prevent the function from ending.

If records have been logically deleted from a transaction file, the records are unchained and should be removed from the file before the file is used by a non-WSU program. The logically deleted records can be removed by using the WSU Recover procedure. If you want to maintain a record of the logically deleted records, you can move a code into the record when it is deleted, then use the WSU Extract procedure to remove the deleted records from the transaction file. The extracted records can be:

- Printed
- Displayed
- Put in a disk file
- Put in a new diskette file
- Added to an existing diskette file

Chapter 17 contains more information on using the WSU Recover and WSU Extract procedures.

The WSU Recover procedure or the WSU Extract procedure can be used to remove the unchained records. The existence of unchained records in a transaction file affects the performance of relative record operations requested from the WSU menu or during the operation of SUBR22.

## USER-DEFINED HELP SCREENS

You can define special help screens for the operator to use during a work session. A help screen is an informative display that the operator can request from the WSU menu in enter mode, review mode, delete mode, or insert mode. You can use help screens to provide additional information about such program-specific things as:

- User-defined command key usage
- Selectable display IDs
- Program operations and functions

Help screens are defined on the S specifications as nonsequenced displays and must follow these rules:

- A format ID (columns 15-16) must be specified. The format ID must be unique and cannot be IJ, IW, EW, EJ, or ES.
- Return input fields (Y in column 22) must not be specified.
- Screen sequence (Y in columns 41 and 42) must not be specified.
- Review mode record identifying indicators (columns 48-53) must not be specified.
- Insert mode record identifying indicators (columns 54-59) must not be specified.
- Calculations must not be specified (C specifications).

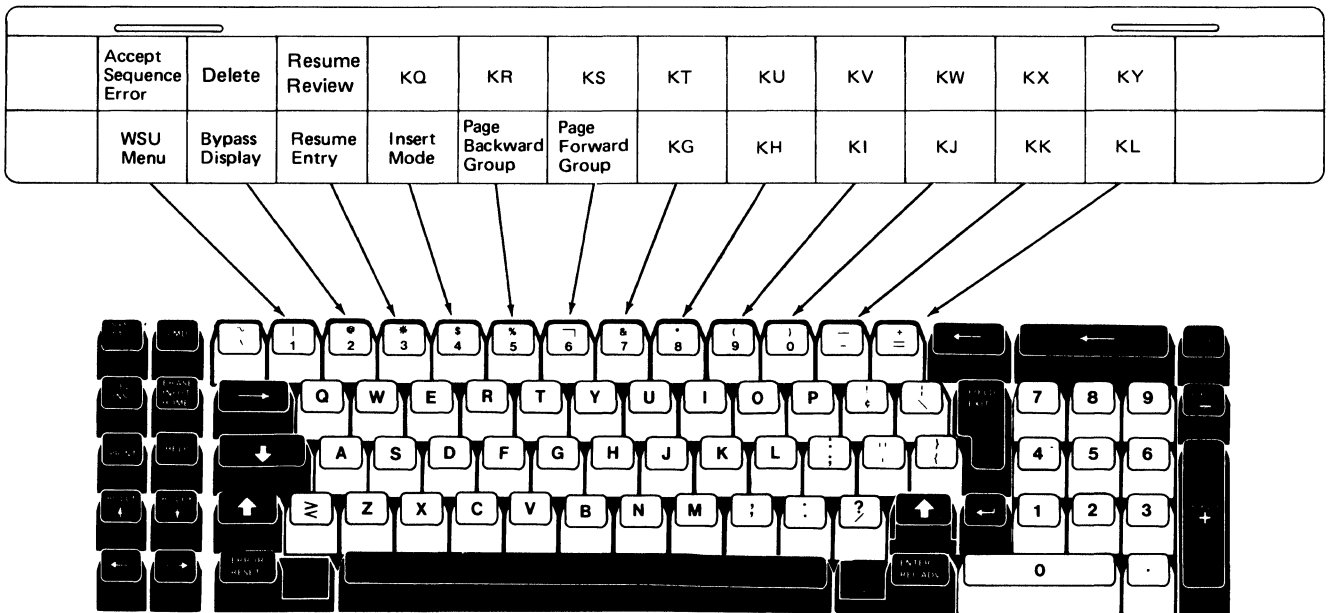
The operator can respond to the help screen by pressing the Enter/Rec Adv key, command key 1, or any other command or function key that is enabled for the help screen. If the operator presses the Enter/Rec Adv key, the user display that was being processed before the help screen was displayed is resumed. If the operator presses command key 1, the WSU menu is displayed. If the operator presses a command key enabled for the help screen, any processing associated with that command key is performed. User-defined command keys cannot be used to respond to a help screen.



## Chapter 14. WSU Command Keys, Function Keys, and Menu

### WSU COMMAND KEYS AND TEMPLATE

A keyboard template is supplied to identify the name and position of each WSU command key.



#### Lowercase

- 1 WSU Menu
- 2 Bypass Display
- 3 Resume Entry
- 4 Insert Mode
- 5 Page Backward Group
- 6 Page Forward Group
- 7 User Command Key for indicator KG
- 8 User Command Key for indicator KH
- 9 User Command Key for indicator KI
- 0 User Command Key for indicator KJ
- User Command Key for indicator KK
- = User Command Key for indicator KL

#### Uppercase

- | Accept Sequence Error
- @ Delete
- # Resume Review
- \$ User Command Key for indicator KQ
- % User Command Key for indicator KR
- ⌵ User Command Key for indicator KS
- & User Command Key for indicator KT
- \* User Command Key for indicator KU
- ( User Command Key for indicator KV
- ) User Command Key for indicator KW
- User Command Key for indicator KX
- + User Command Key for indicator KY

Note: A user command key sets its corresponding indicator on and all other indicators from KA through KY off.



Figure 14-1 describes the lowercase command keys; Figure 14-2 describes the uppercase command keys. Any of these command keys may be disallowed for a display via the Enable Command Keys and Key Mask entries on the S specification. Refer to *Column 28 (Enable Command Keys)* and *Columns 64-79 (Key Mask)* in Chapter 7 for explanations of these entries.

In the explanations of the command keys, the phrase *selects the display* is used to mean one of two actions:

- If the display does not have preprocessing, WSU shows the display, accepts input, and does any processing when the display is entered.
- If the display has preprocessing, WSU first does the preprocessing and shows the display only if PUTS or MSG operation occurs for it.

Lowercase Command Key	Enter Mode	Review Mode	Delete Mode	Insert Mode
1 WSU Menu	Causes the WSU menu to appear. Refer to <i>WSU Menu</i> in this chapter for a description of the menu. If the WSU menu is the current display, the originally interrupted display is shown.			
2 Bypass Display (Note 1)	Causes the next display in the primary sequence or secondary sequence to be selected. For a non-sequenced display, this command key selects the most recently selected sequenced display. Operators can use this command key to advance from a repeated display, but they cannot use this key to bypass a required display. When a processing level display is shown or when a processing level indicator is on, this command key causes the next processing level display to be shown.	Causes WSU to search the S specifications for the next one that has the indicator of the displayed record's type in columns 48-53 (Note 2).	Causes WSU to search the S specifications for the next one that has the indicator of the display record's type in columns 54-59 (Note 2).	
3 Resume Entry (Note 3)	Not allowed	Switches the operating mode to enter mode. WSU redisplay the enter mode user display interrupted when review mode was begun and restores all work station level fields and indicators. Indicators DL, RV, and IN are set to off.		
4 Insert Mode (Note 3)	Not allowed	Switches the operating mode to insert mode and searches the S specifications for the first one that has the indicator of the displayed record's type in columns 54-59. Indicator IN is set on.	Not allowed	

Figure 14-1 (Part 1 of 2). Lowercase Command Keys

Lowercase Command Key	Enter Mode	Review Mode	Delete Mode	Insert Mode
5 Page Backward Group (Note 3)	Switches the operating mode to review mode. Causes WSU to read the previous header record in the transaction file and then search the S specifications for the appropriate display (Note 4).			
6 Page Forward Group (Note 3)	Switches the operating mode to review mode. Causes an end-of-chain message to appear.	Switches the operating mode to review mode. Causes WSU to read the next header record in the transaction file and then search the S specifications for the appropriate display (Note 4).		
7 User Command Key (KG)	Enters the display, sets indicator KG on, and sets all other indicators from KA through KY off.			
8 User Command Key (KH)	Enters the display, sets indicator KH on, and sets all other indicators from KA through KY off.			
9 User Command Key (KI)	Enters the display, sets indicator KI on, and sets all other indicators from KA through KY off.			
0 User Command Key (KJ)	Enters the display, sets indicator KJ on, and sets all other indicators from KA through KY off.			
- User Command Key (KK)	Enters the display, sets indicator KK on, and sets all other indicators from KA through KY off.			
= User Command Key (KL)	Enters the display, sets indicator KL on, and sets all other indicators from KA through KY off.			
<p><i>Notes:</i></p> <ol style="list-style-type: none"> <li>1. This key cannot be used to respond to a WSU display or a user-defined help display.</li> <li>2. The search starts at the current S specification and wraps around to the first mode-capable S specification for the record type. WSU selects this display for processing the record.</li> <li>3. This key cannot be used if the WSU program does not have a transaction file or if the WSU program does not support record review.</li> <li>4. <ul style="list-style-type: none"> <li>• This key cannot be used if columns 55-56 (Header Record Identifying Indicator) of the T specifications are blank.</li> <li>• If this key is pressed after a not-in-chain message is cleared, WSU reads the last (Page Backward Group) or first (Page Forward Group) header record in the transaction file.</li> <li>• The S specifications are searched (from first to last) for the first one that contains the record's type in columns 48-53. WSU selects this display for reviewing the record.</li> <li>• A message is displayed if the type of the record cannot be identified, if there is no review-capable display, or if the end of the chain is reached.</li> <li>• Indicator RV is set on if the key is pressed during enter mode. Indicator IN or DL is set off if the key is pressed during insert or delete mode.</li> </ul> </li> </ol>				

Figure 14-1 (Part 2 of 2). Lowercase Command Keys

Uppercase Command Key	Enter Mode	Review Mode	Delete Mode	Insert Mode
Accept Sequence Error	Allows an operator to bypass a required display if the AE indicator is on.	Causes the WSU aid format to be displayed and permanently stops any current processing.		
@ Delete (Note 1)	Switches the operating mode to delete mode. Requests review and subsequent deletion of the record identified by *RLRR. Indicator DL is set on (Note 2).			
# Resume Review (Note 1)	Switches the operating mode to review mode. Requests review of the record identified by *RLRR. Indicator RV is set on (Note 2).			
\$ User Command Key (KQ)	Enters the display, sets indicator KQ on, and sets all other indicators from KA through KY off.			
% User Command Key (KR)	Enters the display, sets indicator KR on, and sets all other indicators from KA through KY off.			
^ User Command Key (KS)	Enters the display, sets indicator KS on, and sets all other indicators from KA through KY off.			
& User Command Key (KT)	Enters the display, sets indicator KT on, and sets all other indicators from KA through KY off.			
* User Command Key (KU)	Enters the display, sets indicator KU on, and sets all other indicators from KA through KY off.			
( User Command Key (KV)	Enters the display, sets indicator KV on, and sets all other indicators from KA through KY off.			
) User Command Key (KW)	Enters the display, sets indicator KW on, and sets all other indicators from KA through KY off.			
- User Command Key (KX)	Enters the display, sets indicator KX on, and sets all other indicators from KA through KX off.			
+ User Command Key (KY)	Enters the display, sets indicator KY on, and sets all other indicators from KA through KX off.			
<p><i>Notes:</i></p> <ol style="list-style-type: none"> <li>This key cannot be used if the WSU program does not have a transaction file or if the WSU program does not support record review.</li> <li> <ul style="list-style-type: none"> <li>The S specifications are searched (from first to last) for the first one that contains the record's type in columns 48-53. WSU selects this display for reviewing the record.</li> <li>A message is displayed if the type of the record cannot be identified, if there is no review-capable display, or if the end of the chain is reached.</li> <li>A not-in-chain message is issued if *RLRR does not contain the relative record number of a record in the chain for the current session.</li> </ul> </li> </ol>				

**Figure 14-2. Uppercase Command Keys**

## FUNCTION KEYS

Figure 14-3 shows and explains the function keys that can be used to view records in the transaction file.

Function Key	Enter Mode	Review Mode	Delete Mode	Insert Mode
Roll ↓ Page With Backward Shift Record (Note 1)	The operating mode is switched to review mode if review mode is not already active. Causes WSU to read the previous record in the transaction file and then search the S specifications for the appropriate display (Note 2).			
Roll ↑ Page With Forward Shift Record (Note 1)	The operating mode is switched to review mode if review mode is not already active. Causes an end-of-chain message to appear.	The operating mode is switched to review mode if review mode is not already active. Causes WSU to read the next record in the transaction file and then search the S specifications for the appropriate display (Note 2).		
<p><i>Notes:</i></p> <ol style="list-style-type: none"> <li>This key cannot be used if the WSU program does not have a transaction file or if the WSU program does not support record review.</li> <li> <ul style="list-style-type: none"> <li>If this key is pressed after a not-in-chain message is cleared, WSU reads the last (Roll ↓ key) or first (Roll ↑ key) header record in the transaction file.</li> <li>The S specifications are searched (from first to last) for the first one that contains the record's type in columns 48-53. WSU selects this display for reviewing the record.</li> <li>A message is displayed if the type of the record cannot be identified, if there is no review-capable display, or if the end of the chain is reached.</li> <li>Indicator RV is set on if the key is pressed during enter mode. Indicator IN or DL is set off if the key is pressed during insert or delete mode.</li> </ul> </li> </ol>				

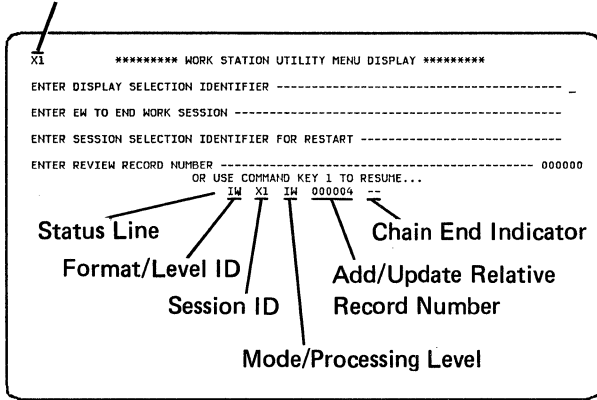
**Figure 14-3. Function Keys**

## WSU MENU

The WSU menu appears when an operator presses the WSU Menu command key (command key 1). This menu can be selected any time a display is waiting for input from the operator and the WSU Menu command key has not been disabled.

The menu allows an operator to select a display via ID, end his work session, select a new work session, or review a record via relative record number. The current display station ID is shown in the upper-left corner of the display. Status information is shown at the bottom of the display. The following shows and explains the WSU menu.

### Display Station ID



### Enter Display Selection Identifier

In enter mode, operators can select a display by entering its two-character ID that has been coded in columns 15-16 of the S specification. A processing level ID (IJ, IW, EW, and EJ) cannot be selected.

In enter mode, the ID of the current display cannot be selected. If input for the current display is required or the display selection causes a sequence error (by bypassing a required display or ES processing) the selection will not occur unless the operator responds to the sequence error message with the Accept Sequence Error command key (command key 13) and the AE indicator is on.

Also, display selection (other than help screens) via the WSU menu is not allowed when a WSU processing level is active.

In review or delete mode, the display is selected only if it is review-capable for the current review record and there is a current review record.

In insert mode, the display is selected only if it is allowed for inserting a record after the current record type.

In enter mode, when WSU finishes processing the selected display:

- WSU stays in the primary sequence if the display is in the primary sequence.
- WSU stays in that secondary sequence if the display is in a secondary sequence.
- WSU reselects the display in the primary or secondary sequence from which the nonsequenced display was selected, if the display is nonsequenced.
- WSU returns to the interrupted processing if the display is a user-defined help display.

### Enter EW to End Work Session

An operator ends his work session by entering EW on the WSU menu and pressing the Enter/Rec Adv key. If the operating mode was review or insert, enter mode automatically resumes. The ES and EW processing levels occur for that display station.

If no other session is active, the program ends and the EJ processing level occurs after the EW processing level for that display station.

The operator can enter a session selection authorization ID on this line of the WSU menu to allow him to select a work session ID that differs from the display station ID shown at the top left corner of the WSU menu. This two-character alphabetic ID must have been specified for the program in the UNIV procedure statement. (See *Output from WSU Program Generation* in Chapter 1.)

### Enter Session Selection Identifier for Restart

An operator can restart his work session or start a different work session by entering the appropriate work session ID on the WSU menu. One of the following can be entered:

- The work session ID of the work session the operator has just completed. This restarts the work session.
- The work session ID of an inactive work session that the display station or operator is authorized to start. This starts the specified work session.

When the operator enters a work session ID, any inserts from the current session are completed, enter mode is resumed, end sequence processing is performed, and end session processing is performed. However, the display station is not released. Instead, the screen is cleared and the WSU menu is displayed again with a message informing the operator that the session is being restarted. The operator responds to the menu by making any necessary changes to the default selections on the menu, then pressing the Enter/Rec Adv key. Session selection authorization is required whenever the selected session ID is different from the display station ID, even when the session ID is entered after the restart message.

### Enter Review Record Number

Operators can review a specific record in the transaction file by entering the record's relative record number. When the WSU menu appears, the relative record number shown is the current contents of the reserved field \*RLRN. If one of the following conditions exists an error message appears:

- The requested record is not in the chain of records for the current session.
- The type of the requested record cannot be identified.
- There is no review-capable display for the requested record.
- The WSU program does not have a transaction file.

An error message appears if the record that was requested was not in the display station's chain of records or if the WSU program does not have a transaction file.

### Status Line

The status line is displayed on the WSU menu directly above the WSU message line. The status line contains the following five fields:

- 1 *Format/level ID* contains:
  - \*\*, if there is no current processing (because a review, insert, or delete request has ended or could not be processed)
  - --, if current processing has been terminated by the operator before it completed
  - The format ID from the S specification of the current display
  - The WSU processing level code (IJ, IW, EW, or EJ) from the S specification
- 2 *Session ID* contains the session ID of the active session.
- 3 *Mode/processing level* contains a code identifying the current WSU mode or processing level:
  - RV, review mode
  - IN, insert mode
  - DL, delete mode
  - IJ, initiate job time
  - IW, initiate work session time
  - ES, end sequence time
  - EW, end work session time
  - EJ, end job time
  - Blank, normal enter mode
- 4 *Add/Update Relative Record Number* identifies the current record number for add or update operations. During review mode, if there is no current review record, the field contains \*\*\*\*\*. If there is no transaction file, the field contains zeros.
- 5 *Chain End Indicator* identifies whether the operator's reference point in the chain is at the end of the chain. The possible contents of this field are:
  - \*\*, if the reference point is at the chain end. A page forward request at this time retrieves the first record of the chain, a page backward retrieves the last record in the chain.
  - --, if the review mode is not supported by the program.
  - blank, if review mode is supported but the operator's reference point is not at the end of the chain or if review mode is not active.

## Returning from the WSU Menu

An operator who displays the WSU menu from enter mode or during a record review, delete, or insert can return to the display from which he selected the WSU menu by pressing the Enter/Rec Adv key or by using command key 1. If the Enter/Rec Adv key is pressed, the Enter-Display-Selection-Identifier entry must be blank, the Enter-EW-to-End-Work-Session entry must be blank, and the Enter-Review-Record-Number entry must be 000000 in order to return. If command key 1 is pressed, any entries on the menu are ignored. Processing returns to the most recent user display (excluding any user-defined help display).

If an operator selects the WSU menu after reviewing, deleting, or inserting a record, he can resume operation by:

- Pressing a command key or a function key that was allowed when he selected the WSU menu. For example, he might press the Page Forward Group command key to resume review mode. Pressing the Enter/Rec Adv key or command key 1 as previously described is not allowed because there is no interrupted processing to resume.
- Keying EW or a session ID on the WSU menu and pressing the Enter/Rec Adv key to end his work session.
- Keying a valid review record number on the WSU menu and pressing the Enter/Rec Adv key.

## WSU AID DISPLAY

WSU provides a display that assists the operator in requesting functions during review, insert, or delete mode. During one of these modes, this display can be requested as follows:

- Pressing command key 13 while a WSU or user-defined display is displayed.
- Pressing Enter/Rec Adv or a user-defined command key when there is no current processing.
- Pressing command key 1 when the WSU menu is displayed when there is no current processing.

The following display is shown:

```
***** WORK STATION UTILITY AID DISPLAY *****
DISPLAY WSU MENU ..... CMD1
SELECT PROGRAM DISPLAY
END OR RESTART SESSION
SELECT RECORD TO REVIEW
RESUME ENTER MODE PROCESSING ..... CMD3
REVIEW TRANSACTION FILE RECORD
PREVIOUS/NEXT DATA RECORD ..... ROLL DOWN/ROLL UP
PREVIOUS/NEXT HEADER RECORD ..... CMD5/CMD6
DELETE MOST RECENT REVIEW RECORD OR GROUP OF RECORDS ..... CMD14
DELETE MOST RECENT REVIEW RECORD ..... CMD15
```

If there was no previous processing to be interrupted, the WSU message that was displayed at the completion of the previous processing is displayed again. If processing was interrupted, no message is displayed.

Once the WSU aid display is requested, the operator cannot return to any interrupted processing. All pending responses are canceled, and subsequent processing depends on the operator's response to the display.

The operator must enter a valid response to continue. The message from the completion of previous processing is displayed to help the operator determine which responses are valid.

**Note:** If the aid display is requested during insert mode, the insert operation is completed and all inserted records are added to the transaction file. Any editing performed on the interrupted display is lost. If the display is requested during delete mode before the delete operation is completed, the record is not deleted.

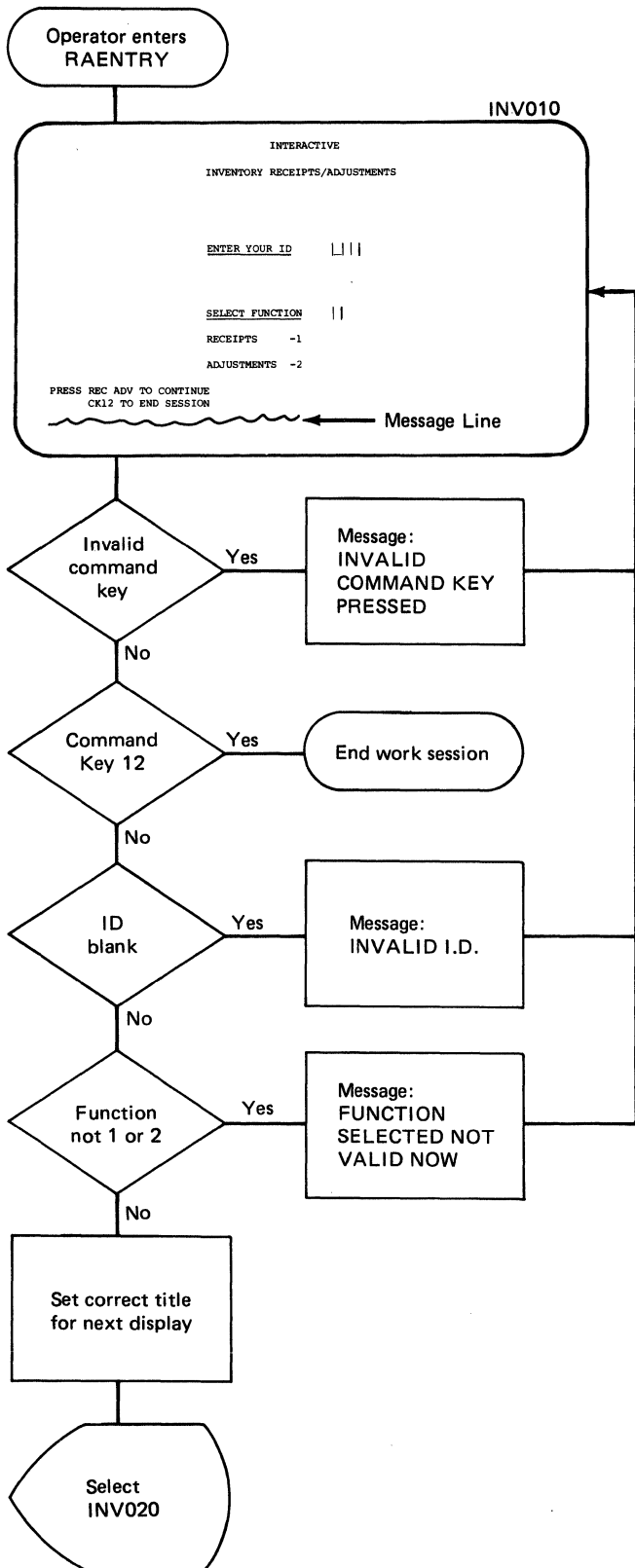
## Chapter 15. Sample WSU Programs

### **SAMPLE PROGRAM 1: INVENTORY RECEIPTS/ ADJUSTMENTS**

This program, named RAENTRY, allows a maximum of four operators to concurrently enter receipts and adjustments to an inventory master file (ITEMMST). Input from operators consists of an item number, a transaction quantity, and a purchase order/memo reference. Output consists of a transaction file that contains all operator receipts/adjustments (INVADJ) and an updated inventory master file (ITEMMST).

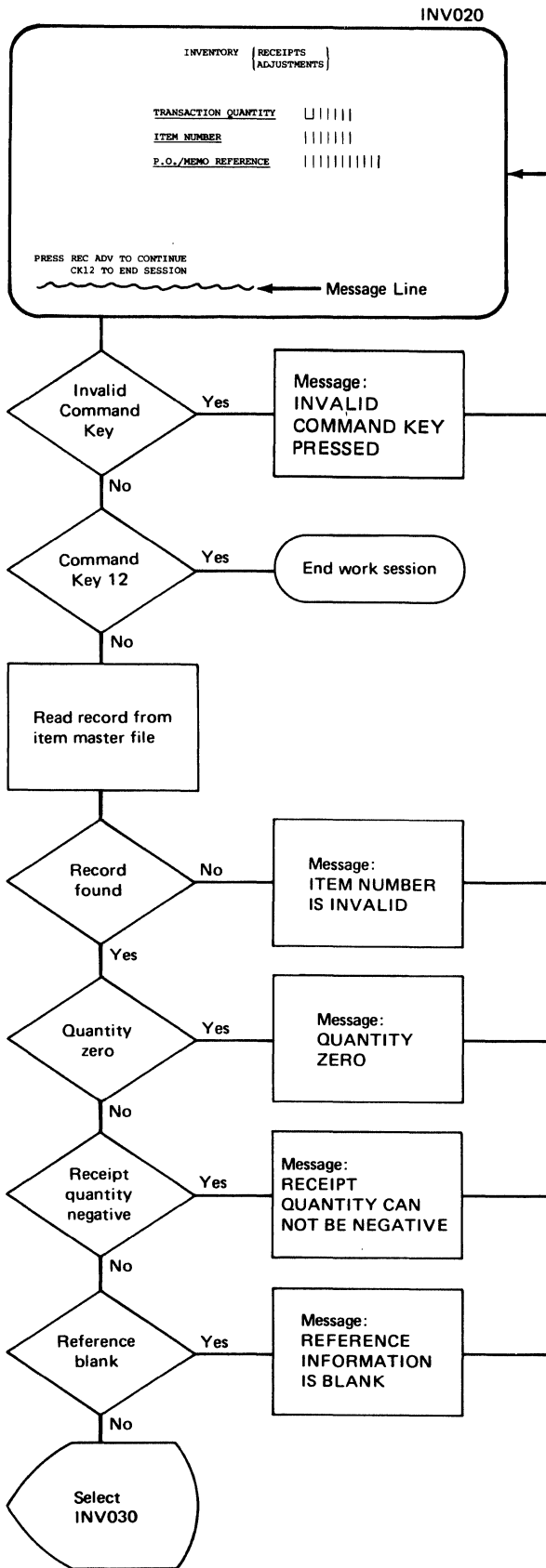
Figure 15-1 shows the logic of the sample program 1.





This display occurs when an operator initiates the WSU program RAENTRY. An operator enters his ID and the function and then presses Enter/Rec Adv to begin the processing for the display or command key 12 to end his session.

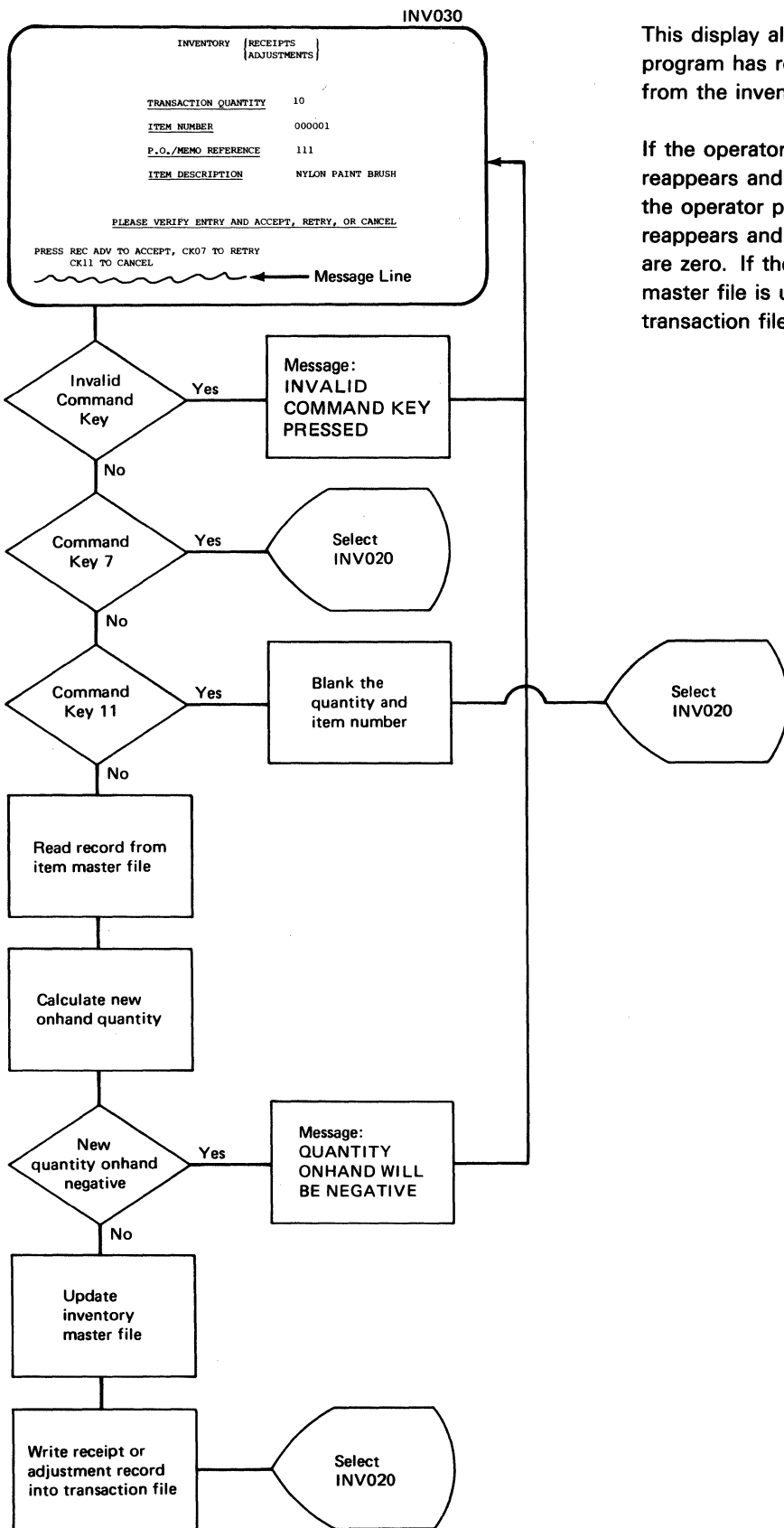
Figure 15-1 (Part 1 of 3). Logic of Sample Program 1



If an operator specified function 1 (receipts) on the previous display, the title of this display is INVENTORY RECEIPTS. If an operator specified function 2 (adjustments) on the previous display, the title of this display is INVENTORY ADJUSTMENTS.

This display has three input fields; transaction quantity, item number, and P.O./memo reference. An operator enters these fields and presses Enter/Rec Adv to cause the processing for the display to begin. An operator presses command key 12 to end his session.

Figure 15-1 (Part 2 of 3). Logic of Sample Program 1



This display allows an operator to verify his entries. The program has read and displayed the item description from the inventory master file.

If the operator presses command key 7, INVO20 reappears and the operator can change his entries. If the operator presses command key 11, INVO20 reappears and the transaction quantity and item number are zero. If the operator presses Enter/Rec Adv, the master file is updated and the record is written to the transaction file.

Figure 15-1 (Part 3 of 3). Logic of Sample Program 1

# DATA DICTIONARY FOR SAMPLE PROGRAM 1

In this example, the data dictionary is in two source members: one source member, INVADJ, contains the F specification and I specifications for the transaction file, INVADJ; the other source member, ITEM, contains the F specification and I specifications for the inventory master file, ITEMST. Figure 15-2 shows these specifications.

## RPG CONTROL AND FILE DESCRIPTION SPECIFICATIONS

GX21-9092-4 UM/050\*  
Printed in U.S.A.

IBM International Business Machine Corporation

Program	Punching Instruction	Graphic	Card Electro Number
Programmer	Date	Punch	

Page	1	2	of	Program Identifica...	75	76	77	78	79	80
------	---	---	----	-----------------------	----	----	----	----	----	----

### Control Specifications

Line	Form Type	Size to Compile	Object Output Listing Options	Size to Execute	Debug	MFCM Stacking Sequence	Date Format	Date Edit	Inverted Print	360/70 2501 Buffer	Number of Print Positions	Alternate Collating Sequence	Address to Start	Work Tapes	Overlay Open	Overlay Printer	Binary Search	Tape Error	2152 Checking	Inquiry	Read/Write/Compute	Keyboard Output	Sign Handling	IP Forms Position	Indicator Setting	File Translation	Punch WPCU Zero	Nonprint Characters	Table Load Halt	Shared I/O	Field Print	Formatted Dump	RPG to RPG II Conversion	
0 1	H																																	Refer to the specific System Reference Library manual for actual entries.

### File Description Specifications

Line	Form Type	Filename	File Type			Mode of Processing						Device	Symbolic Device	Labels S/W/E/M	Name of Label Exit	Extent Exit for DAM		File Addition/Unordered																	
			File Designation	End of File	Sequence	Length of Key Field or of Record Address Field	Record Address Type	Type of File Organization or Additional Area	Overflow Indicator	Key Field Starting Location	Extension Code E/L					Storage Index	Number of Tracks for Cylinder Overflow	Number of Extents	Tape Rewind	File Condition U1-U8															
0 2	F	INVADJ	UC	F	48	48	R																												
0 3	F																																		

Figure 15-2 (Part 1 of 5). Data Dictionary for Sample Program 1



RPG INPUT SPECIFICATIONS

Program, Programmer, Date, Keying Instruction, Graphic, Card Electro Number, Page 1 of 2, Program Identification

Main data dictionary table with columns: Line, Form Type, Filename or Record Name, Sequence, Record Identifying Indicator, External Field Name (Record Identification Codes 1-3), Field Location (From, To), Field Name, Field Indicators, etc.

\*Number of sheets per pad may vary slightly.

Figure 15-2 (Part 4 of 5). Data Dictionary for Sample Program 1



**WSU SPECIFICATIONS FOR SAMPLE PROGRAM 1**

The source program is in a source member named SAMPLE1. Figure 15-3 shows the WSU specifications. The procedure command that begins WSU generation is: WSU SAMPLE1.

IBM		WSU J, T, and M Specifications																				GX21-9252 U/M/050* Printed in U.S.A.						
Sequence Number	Form Type	Execution Program Name	Format Member Name	Message Member Name	Library Name	Maximum Number of Work Stations	Region Size	Date/Edit	Idiographic Mode	Reserved																		
1	J	RAENTRY	RAENTRI		SC2117663	04																						
Sequence Number	Form Type	File Name	Library Name	Member Name	Name 1	Name 2	Name 3	Not Found Indicator	Master Track Index	Header Record Identifying Indicator	Number of Records	Error Indicator	Type	Level	Reserved													
1	T	INVADJ	SC2117663	INVADJ																								
2	M	ITEMMST	SC2117663	ITEM	ITNBR			06																				

Figure 15-3 (Part 1 of 8). WSU Specifications for Sample Program 1

IBM		System/34 Display Screen Format Specifications																				GX21-9253 U/M 050* Printed in U.S.A.	
Second Edition		Use this coding sheet only to define display screen formats for WSU and \$\$\$FGR. This coding sheet could contain typographical errors.																		*No. of sheets per pad may vary slightly.			
Sequence Number	Form Type	Format Name	Format ID (WSU Only)	Start Line Number	Number of Lines to Clear	Lowercase	Return Input	Repeat Keyboard (WSU Only)	Sound Alarm	Enable Function Keys	Enable Command Keys	Blink Cursor	Erase Input Fields	Override Fields	Suppress Input	Reserved	Enter Mode Sequence	Review Mode Record Identifying Indicators	Insert Mode Record Identifying Indicators	Reserved	Key Mask		
1	S	IWV010	IW																				
2	D			0236													Y	Y			P'INTERACTIVE'		
3	D			0426													Y	Y			P'INVENTORY RECEIPTS/ADJX		
4	D																				P'ENTER YOUR ID'		
5	D			1026																	P'SELECT FUNCTION'		
6	D			1046	Y	Y	Y	01									Y	Y			P'RECEIPTS -1'		
7	D			1526																	P'ADJUSTMENTS -2'		
8	D			1546	Y	YN		Z04									Y				P'PRESS REC ADY TO CONTIX		
9	D			1726																	P'CK12 TO END SESSION'		
10	D			1926																			
11	D			2206																			
12	D																						
13	D																						
14	D																						
15	D																						
16	D																						
17	D																						
18	D																						
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79	D																						
80	D																						

Figure 15-3 (Part 2 of 8). WSU Specifications for Sample Program 1













**Listing Printed for Sample Program 1**

Figure 15-4 shows the listing printed after program generation.

IBM SYSTEM/34 WSU RELEASE 06

DATE 04/18/80 TIME 13.46

SC217663 RAENTRY PAGE 0001

```

0001 0001 JRAENTRY RAENTRI          SC2176630434

0002 0002 TINVADJ  SC217663INVADJ
          FINVADJ UC F 48 48R          DISK
0003          IINVADJ NS 11 1 C1
0004          I          OR 17 1 C2
0005          I
0006          I          1 1 RCDT
0007          I          2 70DATE
0008          I          8 150ITNBRB
0009          I          P 19 210TRAMT
0010          I          23 25 OFID
          I          26 35 REFER

0011 0003 MITEMMST SC217663IITEM  ITNBRB          06
          0001 FITEMMST UC F          249R BAI 4 DISK
          0002 IITEMMST NS 10 1 CM 2 CB
0012          0003 I          1 2 RCD
0013          0004 I          3 3 ACREC
0014          0005 I          4 5 VNDNR
0015          0006 I          6 110ITNBR
0016          0007 I          21 240RDATE
0017          0008 I          P 25 270ITCLC
0018          0009 I          32 58 ITDSC
0019          0010 I          64 67 UNMSR
0020          0011 I          69 73 WHSLC
0021          0012 I          74 74 ACTIV
0022          0013 I          P 77 802LSTPC
0023          0014 I          P 81 833CL1PP
0024          0015 I          P 84 863CL2PP
0025          0016 I          P 87 893CL3PP
0026          0017 I          99 99 TAXC1
0027          0018 I          100 100 TAXC2
0028          0019 I          101 101 TAXC3
0029          0020 I          P 102 1053CSTPC
0030          0021 I          P 106 1080MAXBAL
0031          0022 I          P 109 1110QTYOH
0032          0023 I          P 112 1130QTYRES
0033          0024 I          P 114 1160QTY00
0034          0025 I          P 117 1190QTYB0
0035          0026 I          120 1250DTREC
0036          0027 I          P 135 1372USEM0
0037          0028 I          P 138 1402USEYR
0038          0029 I          P 146 1480RECM0
0039          0030 I          P 149 1510RECYR
0040          0031 I          P 152 1552SAQMO
0041          0032 I          P 156 1592SAQYR
0042          0033 I          P 163 1650ADJMO
0043

```

Figure 15-4 (Part 1 of 8). Listing Printed by Sample Program 1

```

0044      0034 I      P 166 1680ADJYR
0045      0035 I      P 169 1722SALMD
0046      0036 I      P 173 1762SALYR
0047      0037 I      P 177 1802SACMO
0048      0038 I      P 181 1842SACYR
0049      0039 I      P 189 1922UPRYD
0050      0040 I      P 193 1940UPFYD
0051      0041 I      P 195 1960NDSTK
0052      0042 I      P 201 2040TMEBL
0053      0043 I      P 205 2083CSTAM
0054      0044 I      P 209 2110EDQ
0055      0045 I      P 212 2140ORDPT

```

```
0056 0004 SINVO10 IW
```

```

0057 0005 D      0236      Y      Y      P'INTERACTIVE'
0058 0006 D      0426      Y      Y      P'INVENTORY RECEIPTS7ADJX
0059 0008 D      1026      Y      Y      P'ENTER YOUR ID'
0060 0009 DOPID  1046Y Y Y 01      Y      Y      P'SELECT FUNCTION'
0061 0010 D      1526      Y      Y      P'SELECT FUNCTION'
0062 0011 DRCDT  1546Y YN Z04      Y      Y      P'RECEIPTS -1'
0063 0012 D      1726      P'ADJUSTMENTS -2'
0064 0013 D      1926      P'PRESS REC ADV TO CONTIX
0065 0014 D      2206      P'PRESS REC ADV TO CONTIX
0066 0016 D      2312      P'CK12 TO END SESSION'

0067 0017 CIW      EXSR CMDCHK
0068 0018 CIW 20    MSG 'INVALID COMMAND KEYX
0069 0019 C PRESSED'
0069 0020 CIW KL    SETON      EW      END-OF-SESSION
0070 0021 CIW KL    GOTO ENDIW
0071 0022 CIW      OPID      COMP ' '      01
0072 0023 CIW 01    MSG 'INVALID I.D.'
0073 0024 CIW      RCDT      COMP '1'      040403 RECEIPTS 03
0074 0025 CIWNO3   RCDT      COMP '2'      040402 ADJUSTMENTS 02
0075 0026 CIW 04    MSG 'FUNCTION SELECTED NX
0076 0027 CDT VALID NOW'
0076 0028 CIW 02    MOVE 'ADJUSTME'FUNCTI 11
0077 0029 CIW 02    MOVE 'NTS'      FUNCTI
0078 0030 CIW 03    MOVE 'RECEIPTS'FUNCTI
0079 0031 CIW      MOVE UDATE      DATE
0080 0032 CIW      ENDIW     TAG

```

Figure 15-4 (Part 2 of 8). Listing Printed by Sample Program 1

```

0081 0033 SINVO20                                Y

0082 0034 D                0231                Y                P'INVENTORY'
0083 0035 DFUNCTI          0241Y                Y
0084 0036 D                0726                Y                P'TRANSACTION QUANTITY'
0085 0037 DTRAMT           0750Y YS Z05        Y                Y                P'ITEM NUMBER'
0086 0038 D                0926                Y                P'P.O./MEMO REFERENCE'
0087 0039 DITNBR           0950Y YN Z06        Y                Y                P'P.O./MEMO REFERENCE'
0088 0040 D                1126                Y                P'P.O./MEMO REFERENCE'
0089 0041 DREFER           1150Y Y 07         Y                Y                P'PRESS REC ADV TO CONTIX
0090 0042 D                2206                P'PRESS REC ADV TO CONTIX
0091 0044 D                2312                P'CK12 TO END SESSION'

0092 0045 C                SETOF                    05
0093 0046 C                EXSR CMDCHK
0094 0047 C 20              MSG 'INVALID COMMAND KEYX
0095 0049 C KL              SETON                    EW    END-OF-SESSION
0096 0050 C KL              GOTO END01                EXIT
0097 0051 C                MOVE ITNBR          ITNBRB 80
0098 0052 C                GET ITEMST                06
0099 0053 C 06              MSG 'ITEM NUMBER IS INVAX
0099 0054 C CLID'
0100 0055 C                TRAMT          COMP 0                1415
0101 0056 C 15              MSG 'QUANTITY ZERO'          05
0102 0057 C 03 14          MSG 'RECEIPT QUANTITY CAX05
0103 0059 C                0058 CANNOT BE NEGATIVE'
0104 0060 C 07              REFER          COMP ' '                07
0104 0061 C 07              REFER          MSG 'REFERENCE INFORMATIX
0105 0062 C                0061 CON IS BLANK'
0105 0062 C                END01          TAG

```

```

0106 0063 SINVO30                                Y

0107 0064 D                0231                Y                P'INVENTORY'
0108 0065 DFUNCTI          0241Y                Y                P'INVENTORY'
0109 0066 D                0726                Y                P'TRANSACTION QUANTITY'
0110 0067 DTRAMT           0750Y J            Y                P'ITEM NUMBER'
0111 0068 D                0926                Y                P'ITEM NUMBER'
0112 0069 DITNBR           0950Y                Y                P'P.O./MEMO REFERENCE'
0113 0070 D                1126

```

Figure 15-4 (Part 3 of 8). Listing Printed by Sample Program 1



```

0114 0071 DREFER      1150Y
0115 0072 D          1426
0116 0073 DITDSC     1450Y
0117 0074 D          1715
0118 0075 DD ACCEPT, RETRY, OR CANCEL'
0118 0076 D          2206
0119 0077 DT, CK07 TO RETRY'
0119 0078 D          2312

0120 0079 C          EXSR CMDCHK
0121 0080 C    20 KK
0122 0081 C    20 KG
0123 0082 C    KL
0124 0083 C    20
0124 0084 C    084 C PRESSED'
0125 0085 C          PROCES
0126 0086 C    KG
0127 0087 C    KK
0128 0088 C
0129 0089 C          TRAMT
0130 0090 C    08
0131 0091 C    091 CL BE NEGATIVE'
0132 0092 C
0132 0093 C
0133 0094 C    02
0134 0095 C    03
0135 0096 C          END03
0136 0097 C
0137 0098 C
0138 0099 CSR          CMDCHK
0139 0100 CSR
0140 0101 CSR KG
0141 0102 CSR KH
0142 0103 CSR KI
0143 0104 CSR KJ
0144 0105 CSR KK
0145 0106 CSR KQ
0146 0107 CSR KR
0147 0108 CSR KS
0148 0109 CSR KT
0149 0110 CSR KU
0150 0111 CSR KV
0151 0112 CSR KW
0152 0113 CSR KX
0153 0114 CSR KY
0154 0115 CSR          SETON
                                ENDSR

```

Figure 15-4 (Part 4 of 8). Listing Printed by Sample Program 1

## INDICATORS USED

IW EW KG KH KI KJ KK KL KM KN KS KT KU KV KW KX KY 01 02 03 04 05 06 07 08 11 14 15 17 20

## WSU-0320 UNREFERENCED INDICATORS

10

## MODE LEVEL DATA FIELD NAMES USED

NAME	STMT#	LNG	DEC	DISP	LCL	F/ICNT	SCR	CHN
*RLNO	RSVD	006	0	005F		000		
*SLNO	RSVD	002	0	0065		000		
RCDT	0005	001	A	0008		001	D	
DATE	0006	006	0	0009		001		
ITNBRB	0007	008	0	000F		001		M
TRAMT	0008	005*	0	0017		001	D	
OPID	0009	003	A	001C		001	D	
REFER	0010	010	A	001F		001	D	
ITNBR	0016	006	0	0029		001	D	
ITDSC	0019	027	A	002F		001	D	
QTYOH	0032	005*	0	004A		001		
FUNCTI	0076	011	A	004F		000	D	
NEWOH	0129	005	0	005A		000		

## SESSION LEVEL DATA FIELD NAMES

NAME	STMT#	LNG	DEC	DISP	LCL	F/ICNT	SCR	CHN
*RLRN	RSVD	006	0	0000		000		
*WSID	RSVD	002	A	0006		000		

## JOB LEVEL DATA FIELD NAMES USED

NAME	STMT#	LNG	DEC	DISP	LCL	F/ICNT	SCR	CHN
UDAY	RSVD	002	0	006B		000		
UMONTH	RSVD	002	0	006A		000		
UYEAR	RSVD	002	0	006C		000		
UDATE	RSVD	006	0	006E		000		
*ERROR	RSVD	004	0	0074		000		

## PROGRAM LABEL NAMES USED

NAME	STMT#	TYPE
CMDCHK	0138	BEGSR
ENDIW	0080	TAG
END01	0105	TAG
PROCES	0125	TAG
END03	0135	TAG

## WSU-0325 UNREFERENCED FIELD NAMES

NAME	STMT#
RCD	0013
ACREC	0014
VNDNR	0015
RDATE	0017
ITCLC	0018
UNMSR	0020
WHS LC	0021
ACTIV	0022

Figure 15-4 (Part 5 of 8). Listing Printed by Sample Program 1

## WSU-0325 UNREFERENCED FIELD NAMES

```

NAME      STMT#
LSTPC     0023
CL1PP     0024
CL2PP     0025
CL3PP     0026
TAXC1     0027
TAXC2     0028
TAXC3     0029
CSTPC     0030
MAXBAL    0031
QTYRES    0033
QTY00     0034
QTYB0     0035
DTREC     0036
USEMO     0037
USEYR     0038
RECMO     0039
RECYR     0040
SAQMO     0041
SAQYR     0042
ADJMO     0043
ADJYR     0044
SALMO     0045
SALYR     0046
SACMO     0047
SACYR     0048
UPRYD     0049
UPPYD     0050
NOSTK     0051
TMEBL     0052
CSTAM     0053
EQQ       0054
DRDPT     0055

```

```

MAIN STORAGE REQUIREMENTS FOR WSU PROGRAM EXECUTION
BYTES REQUIRED PER WORK STATION           MINIMUM      MAXIMUM
TIMES MAXIMUM NUMBER OF WORK STATIONS   4             4
PLUS ADDITIONAL STORAGE REQUIRED          9355          30992
YIELDS STORAGE REQUIRED FOR EXECUTION      9511          32012

REGION REQUIRED FOR EXECUTION              10K           32K

DISK STORAGE REQUIREMENTS FOR WSU EXECUTION PROGRAM WORKFILE
SECTORS REQUIRED PER WORK STATION          12
TIMES MAXIMUM NUMBER OF WORK STATIONS   4
PLUS ADDITIONAL DISK SECTORS REQUIRED      18
YIELDS MINIMUM DISK SECTORS REQUIRED       66

EXECUTION WORKFILE SIZE IN BLOCKS        7

```

```

RAENTRY PROCEDURE CREATED FOR EXECUTION
// ATTR NEP-NO,MRTMAX-4
// REGION SIZE-34
// LOAD #WSX11
// FILE NAME-INVADJ,
// IF DATAF1-INVADJ DISP-OLD
// ELSE DISP-NEW,RECORDS-1000
// FILE NAME-ITEMHST,DISP-OLD
// RUN
// WSX OBJLIBR-SC217663,OBJMBR-RAENTRY,FMTLIBR-SC217663,FMTMBR-RAENTRI
// END

```

```

DIAGNOSTIC TEXT
NOTE# SEV MESSAGE TEXT
WSU-0320 W LISTED INDICATORS DEFINED BUT NOT REFERENCED.
WSU-0325 W LISTED FIELD NAME DEFINED BUT NOT REFERENCED.

```

GENERATION SUCCESSFUL--WARNING ERRORS LISTED ABOVE.

Figure 15-4 (Part 6 of 8). Listing Printed by Sample Program 1

SOURCE INPUT SCREEN FORMAT SOURCE SPECIFICATIONS

DATE 04/18/80 TIME 13.48

RAENTRI - SOURCE MEMBER NAME

```

SINV010 01 NY
DS000000100110236Y          Y  Y      CINTERACTIVE
DS000000200300426Y          Y  Y      CINVENTORY RECEIPTS/ADJUX
DSTMENTS
DS000000300131026Y          Y  Y      CENTER YOUR ID
DDPID 00031046Y Y Y 01          Y  Y      CSELECT FUNCTION
DS000000400151526Y          Y  Y      CRECEIPTS -1
DRCDT 00011546Y YN Z04 Y Y      CADJUSTMENTS -2
DS000000500151726Y          Y  Y      CPRESS REC ADV TO CONTINX
DS000000600151926Y          Y  Y
DUE
DS000000800192312Y          Y  Y      CCK12 TO END SESSION
    
```

EXECUTION TIME OUTPUT BUFFER DESCRIPTION

FIELD NAME	LENGTH	START POSITION	END POSITION
OPID	3	1	3
RCDT	1	4	4

INPUT BUFFER DESCRIPTION

FIELD NAME	LENGTH	START POSITION	END POSITION
OPID	3	1	3
RCDT	1	4	4

SOURCE INPUT SCREEN FORMAT SOURCE SPECIFICATIONS

DATE 04/18/80 TIME 13.48

RAENTRI - SOURCE MEMBER NAME

```

SINV020 01 NY
DS000000900090231Y          Y          CINVENTORY
DFUNCTI 00110241Y          Y          CTRANSACTION QUANTITY
DS000001000200726Y          Y  Y      CITEM NUMBER
DTRAMT 00060750Y YS Z05 Y Y      CP.O./MEMD REFERENCE
DS000001100110926Y          Y  Y      CPRESS REC ADV TO CONTINX
DITNBR 00060950Y YN Z06 Y Y      CCK12 TO END SESSION
DS000001200191126Y          Y  Y
DREFER 00101150Y Y 07 Y
DS000001300252206Y          Y  Y
DUE
DS000001400192312Y          Y  Y
    
```

EXECUTION TIME OUTPUT BUFFER DESCRIPTION

FIELD NAME	LENGTH	START POSITION	END POSITION
FUNCTI	11	1	11
TRAMT	5	12	16
ITNBR	6	17	22
REFER	10	23	32

INPUT BUFFER DESCRIPTION

FIELD NAME	LENGTH	START POSITION	END POSITION
TRAMT	5	1	5
ITNBR	6	6	11
REFER	10	12	21

Figure 15-4 (Part 7 of 8). Listing Printed by Sample Program 1

## SOURCE INPUT SCREEN FORMAT SOURCE SPECIFICATIONS

DATE 04/18/80 TIME 13.48

## RAENTRI - SOURCE MEMBER NAME

SINV030	01	NY			
DS000001500090231Y			Y		CINVENTORY
DFUNCTI	00110241Y		Y		
DS000001600200726Y				Y	CTRANSACTION QUANTITY
DTRAMT	00070750Y				
DS000001700110926Y				Y	CITEM NUMBER
DITNBR	00060950Y				
DS000001800191126Y				Y	CP.O./MEMO REFERENCE
DREFER	00101150Y				
DS000001900161426Y				Y	CITEM DESCRIPTION
DITDSC	00271450Y				
DS000002000481715Y				Y	CPLEASE VERIFY ENTRY ANDX
D ACCEPT, RETRY, OR CANCEL					
DS000002100382206Y					CPRESS REC ADV TO ACCEPTX
D, CK07 TO RETRY					
DS000002200142312Y					CCK11 TO CANCEL

## EXECUTION TIME OUTPUT BUFFER DESCRIPTION

FIELD NAME	LENGTH	START POSITION	END POSITION
FUNCTI	11	1	11
TRAMT	7	12	18
ITNBR	6	19	24
REFER	10	25	34
ITDSC	27	35	61

SC217663- INPUT LIBRARY NAME

DATE 04/18/80 TIME 13.48

SC217663- OUTPUT LIBRARY NAME

RAENTRI - FORMAT LOAD MEMBER NAME

FORMAT INV010	REQUIRES	512 BYTES OF STORAGE
FORMAT INV020	REQUIRES	512 BYTES OF STORAGE
FORMAT INV030	REQUIRES	512 BYTES OF STORAGE

Figure 15-4 (Part 8 of 8). Listing Printed by Sample Program 1

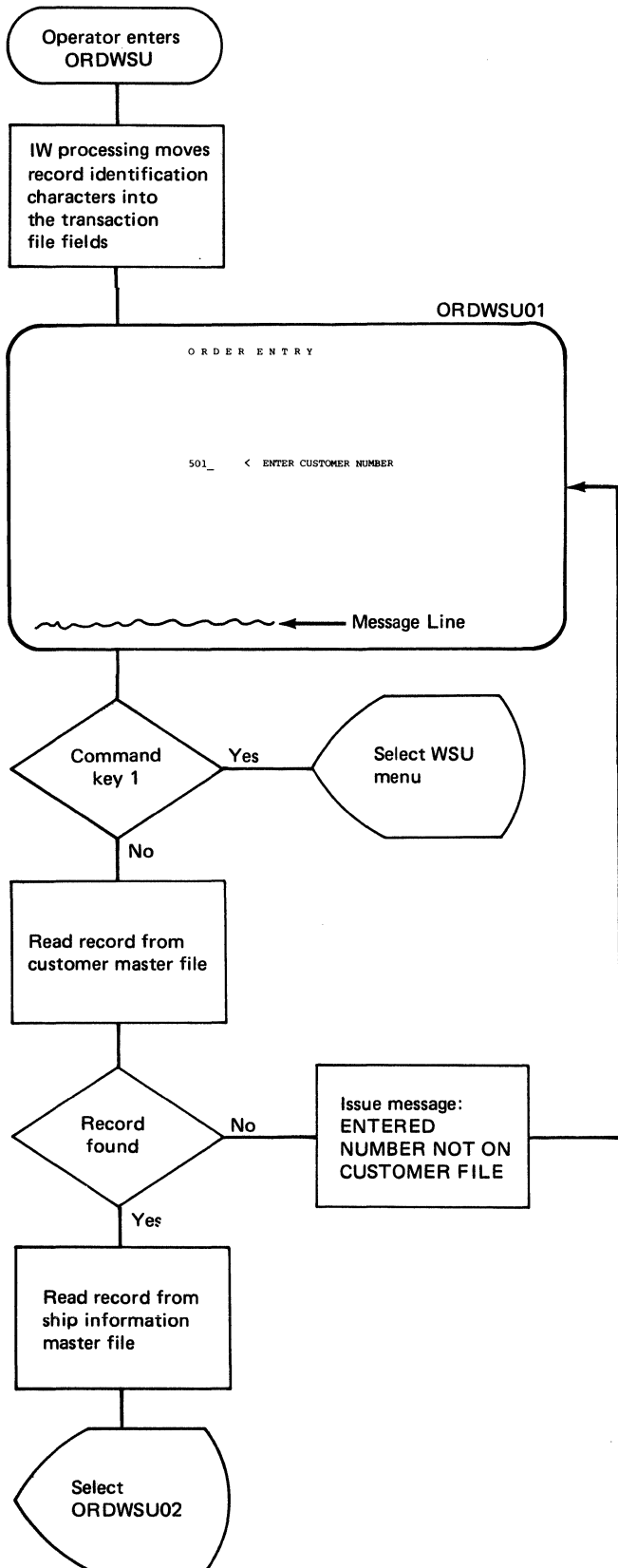
## **SAMPLE PROGRAM 2: ORDER ENTRY**

This program, ORDWSU, allows a maximum of five operators to enter orders concurrently into a transaction file named TRANS. Also, operators can review and insert records in this file. Three master files are used:

- CMAST contains customer name and address information.
- SMAST contains ship-to name and address information.
- IMAST contains inventory information.

CMAST and SMAST are input files; IMAST is an update file (its records can be updated by the program).

Figure 15-5 shows the logic of this program.



This processing occurs when each operator initiates ORDWSU. The ORDWSU01 display appears after the IW processing completes.

An operator enters a customer number and then presses Field Exit, which causes the processing for the display to begin.

The following describes the results of pressing command keys and function keys for this display:

Key	Result
WSU Menu command key (1)	The WSU menu appears.
Bypass Display command key (2)	WSU message 0703 (Input for current display is required) appears.
Resume Entry command key (3)	WSU message 0702 (Function requested is not valid now) appears.
Insert Mode command key (4)	WSU message 0702 (Function requested is not valid now) appears.
Page Backward Group command key (5)	Review mode is selected. ORDWSU05 appears and shows the previous header record. WSU message 0708 (Review mode is active) is on the bottom line of ORDWSU05.
Page Forward Group command key (6)	WSU message 0706 (Review record is not in transaction file chain) appears.
Page Backward Record function key (Roll Down with Shift)	Review mode is selected. ORDWSU07 appears and shows the previous record. WSU message 0708 (Review mode is active) is on the bottom line of ORDWSU07.
Page Forward Record function key (Roll Up with Shift)	WSU message 0706 (Review record is not in transaction file chain) appears.

Figure 15-5 (Part 1 of 7). Logic of Sample Program 2

ORDWSU02

```

ORDER ENTRY
CUSTOMER 000501
SOLD TO: MC CORMICK INC          SHIP TO: W K MITCHELL CO
MILAN INDUSTRIAL PARK          541 SANSOM
426 S GEORGE ST                23120    PHILA., PENN    52972
CUST REF NO                    VIA

```

~~~~~ ← Message Line

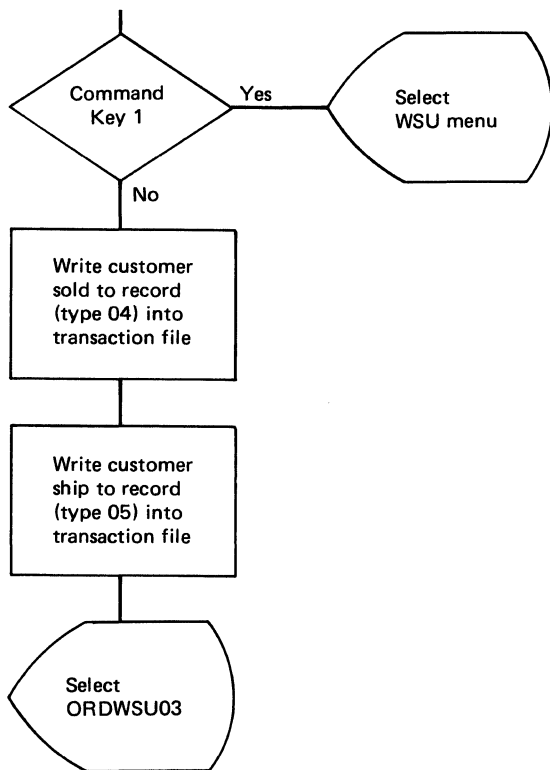


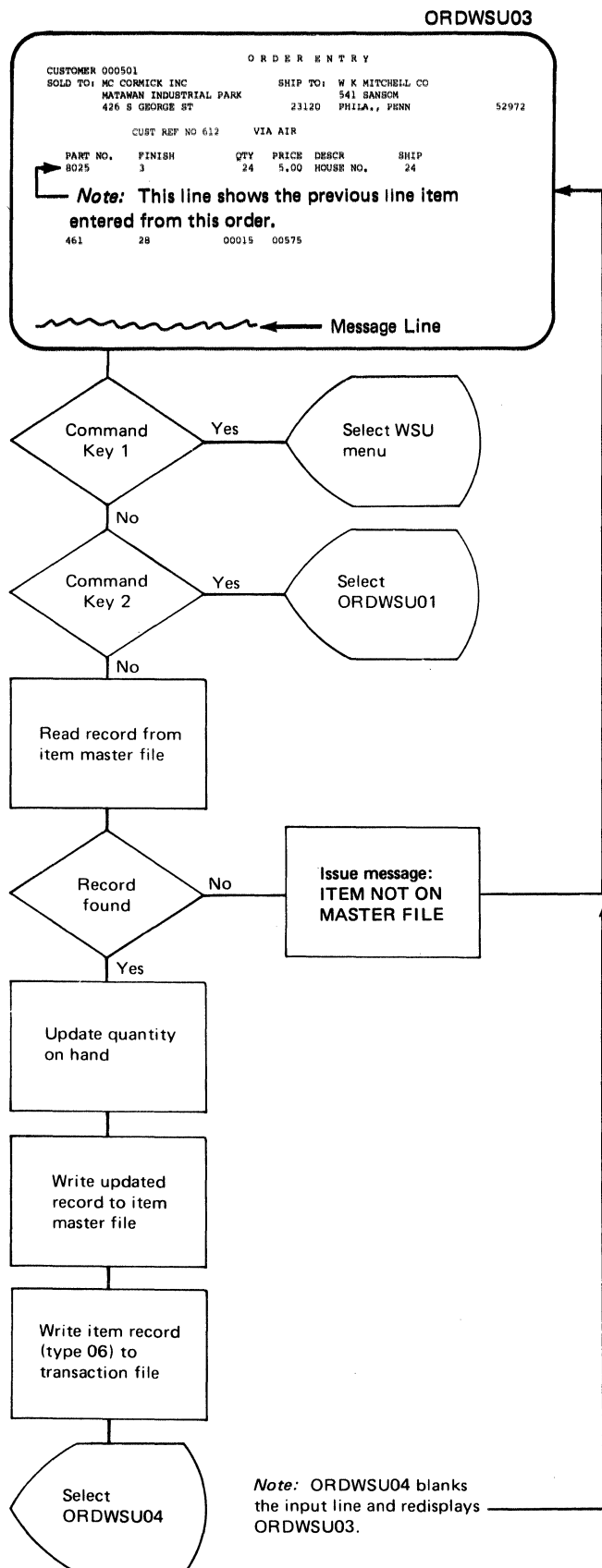
Figure 15-5 (Part 2 of 7). Logic of Sample Program 2

This required display shows the customer name and address information and ship-to information that has been read from the CMAST and SMAST master files. An operator enters the customer reference number and the shipping instructions and can modify the ship-to information. When Enter is pressed, the display's processing begins.

The following describes the results of pressing command keys and function keys for this display:

| Key                                                      | Result                                                                                                                                                      |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WSU Menu command key (1)                                 | The WSU menu appears.                                                                                                                                       |
| Bypass Display command key (2)                           | WSU message 0703 (Input for current display is required) appears.                                                                                           |
| Resume Entry command key (3)                             | WSU message 0702 (Function requested is not valid now) appears.                                                                                             |
| Insert Mode command key (4)                              | WSU message 0702 (Function requested is not valid now) appears.                                                                                             |
| Page Backward Group command key (5)                      | Review mode is selected. ORDWSU05 appears and shows the previous header record. WSU message 0708 (Review mode is active) is on the bottom line of ORDWSU05. |
| Page Forward Group command key (6)                       | WSU message 0706 (Review record is not in transaction file chain) appears.                                                                                  |
| Page Backward Record function key (Roll Down with Shift) | Review mode is selected. ORDWSU05 appears and shows the previous record. WSU message 0708 (Review mode is active) is on the bottom line of ORDWSU05.        |
| Page Forward Record function key (Roll Up with Shift)    | WSU message 0706 (Review record is not in transaction file chain) appears.                                                                                  |





This display begins on line 7, which causes the first six lines of ORDWSU02 to remain on the display. An operator can enter order information (part number, finish, quantity, and price). When Field Exit is pressed, the display's processing begins.

The following describes the results of pressing command keys and function keys for this display:

| Key                                                      | Result                                                                                                                                                              |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WSU Menu command key (1)                                 | The WSU menu appears.                                                                                                                                               |
| Bypass Display command key (2)                           | ORDWSU01 appears.                                                                                                                                                   |
| Resume Entry command key (3)                             | WSU message 0702 (Function requested is not valid now) appears.                                                                                                     |
| Insert Mode command key (4)                              | WSU message 0702 (Function requested is not valid now) appears.                                                                                                     |
| Page Backward Group command key (5)                      | Review mode is selected. ORDWSU05 appears and shows the previous header record. WSU message 0708 (Review mode is active) is on the bottom line of ORDWSU05.         |
| Page Forward Group command key (6)                       | WSU message 0706 (Review record is not in transaction file chain) appears.                                                                                          |
| Page Backward Record function key (Roll Down with Shift) | Review mode is selected. ORDWSU06 or ORDWSU07 appears and shows the previous record. WSU message 0708 (Review mode is active) is on the bottom line of the display. |
| Page Forward Record function key (Roll Up with Shift)    | WSU message 0706 (Review record is not in transaction file chain) appears.                                                                                          |

Figure 15-5 (Part 3 of 7). Logic of Sample Program 2

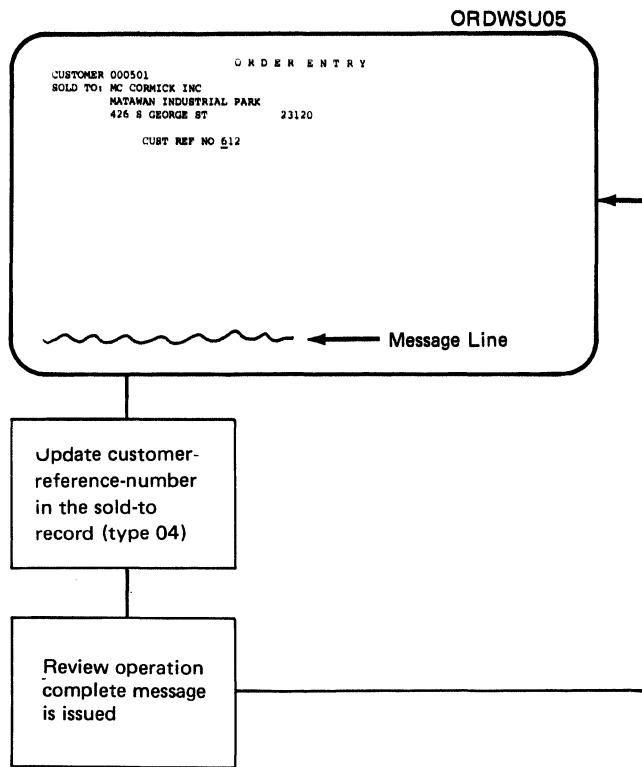


Figure 15-5 (Part 4 of 7). Logic of Sample Program 2

This display is a review mode display that allows an operator to review and update record type 04 (customer name and address information) in the transaction file.

When Enter is pressed, the display's processing begins. If Enter is not pressed, the processing for this display does not occur.

The following describes the results of pressing command keys and function keys for this display:

| Key                                                      | Result                                                                                                                                                                                        |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WSU Menu command key (1)                                 | The WSU menu appears.                                                                                                                                                                         |
| Bypass Display command key (2)                           | This command key has no affect.                                                                                                                                                               |
| Resume Entry command key (3)                             | Enter mode is selected. ORDWSU01, ORDWSU02, or ORDWSU03 is selected to return to the display and record from which review mode was selected. WSU message 0713 (Enter mode is active) appears. |
| Insert Mode command key (4)                              | WSU message 0704 (Insert function is not allowed now) appears.                                                                                                                                |
| Page Backward Group command key (5)                      | The previous header record is shown.                                                                                                                                                          |
| Page Forward Group command key (6)                       | The next header record is shown.                                                                                                                                                              |
| Page Backward Record function key (Roll Down with Shift) | ORDWSU07 is selected and the previous record is shown.                                                                                                                                        |
| Page Forward Record function key (Roll Up with Shift)    | ORDWSU06 is selected and the next record is shown.                                                                                                                                            |

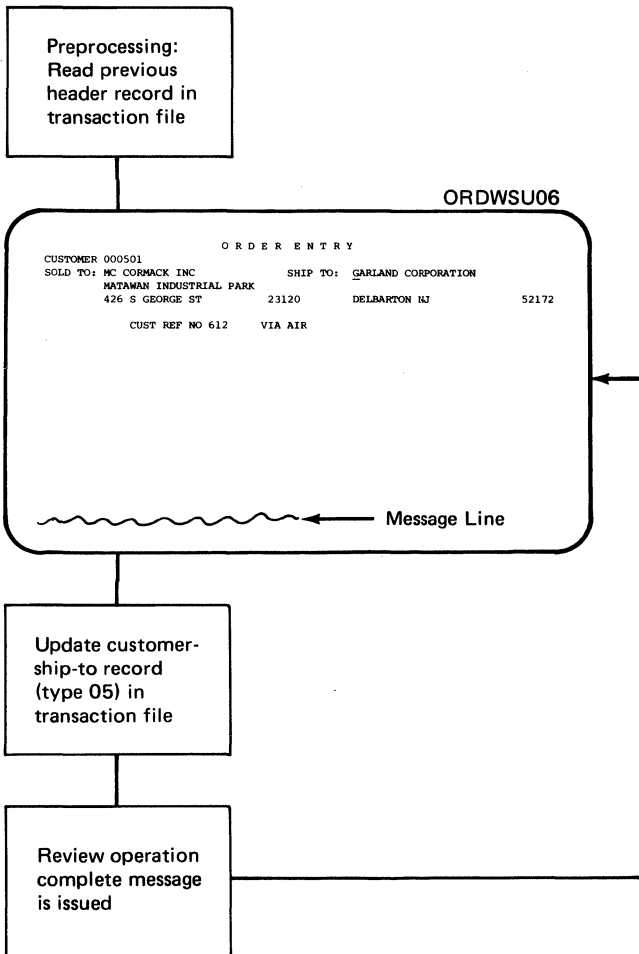


Figure 15-5 (Part 5 of 7). Logic of Sample Program 2

This preprocessing reads the previous header record (type 04) in the transaction file before the display appears. This is done so that customer name and address information can be shown on the review display.

This display is a review mode display that allows an operator to review and update record type 05 (ship-to information) in the transaction file.

When Enter is pressed, the display's processing begins. If Enter is not pressed, the processing for this display does not occur.

The following describes the results of pressing command keys and function keys for this display:

| Key                                                      | Result                                                                                                                                                                                        |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WSU Menu command key (1)                                 | The WSU menu appears.                                                                                                                                                                         |
| Bypass Display command key (2)                           | The previous record is displayed.                                                                                                                                                             |
| Resume Entry command key (3)                             | Enter mode is selected. ORDWSU01, ORDWSU02, or ORDWSU03 is selected to return to the display and record from which review mode was selected. WSU message 0713 (Enter mode is active) appears. |
| Insert Mode command key (4)                              | WSU message 0704 (Insert function is not allowed now) appears.                                                                                                                                |
| Page Backward Group command key (5)                      | ORDWSU05 is selected and the previous header record is shown.                                                                                                                                 |
| Page Forward Group command key (6)                       | ORDWSU05 is selected and the next header record is shown.                                                                                                                                     |
| Page Backward Record function key (Roll Down with Shift) | ORDWSU05 is selected and the previous record is shown.                                                                                                                                        |
| Page Forward Record function key (Roll Up with Shift)    | ORDWSU07 is selected and the next record is shown.                                                                                                                                            |

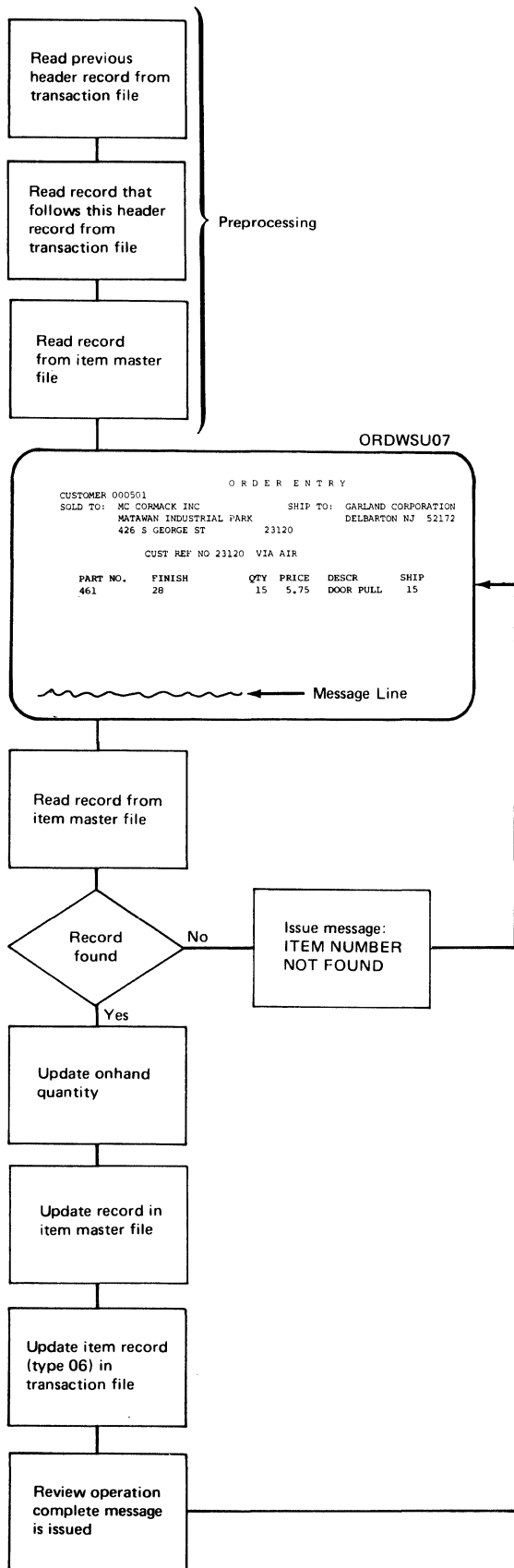


Figure 15-5 (Part 6 of 7). Logic of Sample Program 2

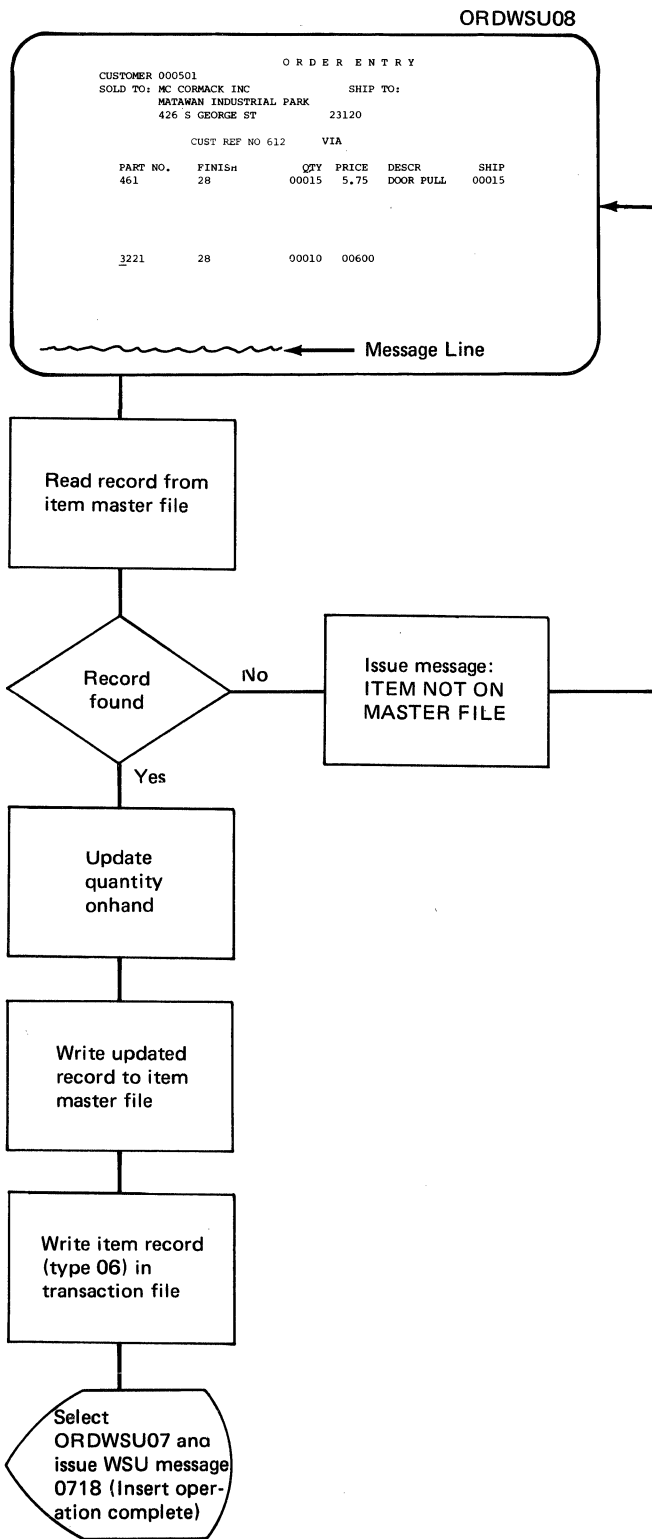
This preprocessing reads the previous header record (type 04) and the record that follows the header record (type 05) in the transaction file. This is done so that customer name and address information as well as ship-to information can be shown on the review display.

This display is a review mode display that allows an operator to review and update record type 06 (order information) in the transaction file.

When Enter is pressed, the display's processing begins. If Enter is not pressed, the processing for this display does not occur.

The following describes the results of pressing command keys and function keys for this display:

| Key                                                      | Result                                                                                                                                                                                 |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WSU Menu command key (1)                                 | The WSU menu appears.                                                                                                                                                                  |
| Bypass Display command key (2)                           | This command key has no affect.                                                                                                                                                        |
| Resume Entry command key (3)                             | Enter mode is selected. ORDWSU01, ORDWSU02, or ORDWSU03 is selected to return to the display and record from which mode was selected. WSU message 0713 (Enter mode is active) appears. |
| Insert Mode command key (4)                              | Insert mode is selected. ORDWSU08 appears and WSU message 0724 (Insert mode is active) is on the bottom line of this display.                                                          |
| Page Backward Group command key (5)                      | ORDWSU05 is selected and the previous header record is shown.                                                                                                                          |
| Page Forward Group command key (6)                       | ORDWSU05 is selected and the next header record is shown.                                                                                                                              |
| Page Backward Record function key (Roll Down with Shift) | ORDWSU06 or ORDWSU07 is selected and the previous record is shown.                                                                                                                     |
| Page Forward Record function key (Roll Up with Shift)    | ORDWSU05 or ORDWSU07 is selected and the next record is shown.                                                                                                                         |



This display is an insert display that allows an operator to insert record type 06 (order information) in the transaction file.

When Enter is pressed, the display's processing begins. This processing is the same as ORDWSU03 processing, which is used to enter a record in the transaction file.

The following describes the results of pressing command keys and function keys for this display:

| Key                                                      | Result                                                                                                                                                                                        |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WSU Menu command key (1)                                 | The WSU menu appears.                                                                                                                                                                         |
| Bypass Display command key (2)                           | This command key has no effect.                                                                                                                                                               |
| Resume Entry command key (3)                             | Enter mode is selected. ORDWSU01, ORDWSU02, or ORDWSU03 is selected to return to the display and record from which review mode was selected. WSU message 0713 (Enter mode is active) appears. |
| Insert Mode command key (4)                              | WSU message 0702 (Function requested is not valid now) appears.                                                                                                                               |
| Page Backward Group command key (5)                      | ORDWSU05 is selected and the previous header record is shown.                                                                                                                                 |
| Page Forward Group command key (6)                       | ORDWSU05 is selected and the next header record is shown.                                                                                                                                     |
| Page Backward Record function key (Roll Down with Shift) | ORDWSU07 is selected and the previous record is shown.                                                                                                                                        |
| Page Forward Record function key (Roll Up with Shift)    | ORDWSU07 is selected and the next record is shown.                                                                                                                                            |

Figure 15-5 (Part 7 of 7). Logic of Sample Program 2

## DATA DICTIONARY FOR SAMPLE PROGRAM 2

The data dictionary for this sample program is in one source member, MSTWSU. This member contains the F and I specifications for the three master files and the transaction file used by the program. Figure 15-6 shows the F and I specifications in the data dictionary.

### RPG CONTROL AND FILE DESCRIPTION SPECIFICATIONS

GX21-9092- UM/050\*  
Printed in U.S.A.

**IBM** International Business Machines Corporation

|            |                      |         |                     |  |  |  |  |  |  |  |  |
|------------|----------------------|---------|---------------------|--|--|--|--|--|--|--|--|
| Program    | Punching Instruction | Graphic | Card Electro Number |  |  |  |  |  |  |  |  |
| Programmer | Date                 | Punch   |                     |  |  |  |  |  |  |  |  |

Page 

|   |   |
|---|---|
| 1 | 2 |
|---|---|

 of 

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 75 | 76 | 77 | 78 | 79 | 80 |
|----|----|----|----|----|----|

  
Program Identification 

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

#### Control Specifications

| Line | Form Type | Size to Compile | Object Output Listing Options | Size to Execute | Debug | MFCM Stacking Sequence | Date Format | Date Edit | Inverted Print | 360/20 2501 Buffer | Number Of Print Positions | Alternate Collating Sequence | Address to Start | Work Tapes | Overlay Open | Overlay Printer | Binary Search | Tape Error | 2152 Checking | Inquiry | Read/Write/Compute | Keyboard Output | Sim Handling | IP Forms Position | Indicator Setting | File Translation | Punch MFCU Zeros | Nonprint Characters | Table Load Halt | Shared I/O | Field Print | Formatted Dump | RPG to RPG II Conversion | Number of Formats |  |  |  |
|------|-----------|-----------------|-------------------------------|-----------------|-------|------------------------|-------------|-----------|----------------|--------------------|---------------------------|------------------------------|------------------|------------|--------------|-----------------|---------------|------------|---------------|---------|--------------------|-----------------|--------------|-------------------|-------------------|------------------|------------------|---------------------|-----------------|------------|-------------|----------------|--------------------------|-------------------|--|--|--|
| 01   | H         |                 |                               |                 |       |                        |             |           |                |                    |                           |                              |                  |            |              |                 |               |            |               |         |                    |                 |              |                   |                   |                  |                  |                     |                 |            |             |                |                          |                   |  |  |  |

Refer to the specific System Reference Library manual for actual entries.

#### File Description Specifications

| Line | Form Type | Filename | File Type | File Designation | End of File | Sequence | File Format | Block Length | Record Length | Mode of Processing | Length of Key Field or of Record Address Field | Record Address Type | Type of File Organization or Additional Area | Overflow Indicator | Key Field Starting Location | Extension Code E/L | Device | Symbolic Device | Labels S/N/E/M | Name of Label Exit | Extent Exit for DAM | Storage Index | Continuation Lines | Option | Entry | File Addition/Unordered | Number of Tracks for Cylinder Overflow | Number of Extents | Tape Rewind | File Condition U1-U8 |  |  |  |  |
|------|-----------|----------|-----------|------------------|-------------|----------|-------------|--------------|---------------|--------------------|------------------------------------------------|---------------------|----------------------------------------------|--------------------|-----------------------------|--------------------|--------|-----------------|----------------|--------------------|---------------------|---------------|--------------------|--------|-------|-------------------------|----------------------------------------|-------------------|-------------|----------------------|--|--|--|--|
| 02   | F         | CMASST   | IC        | F                | 244         | 244R     | 6AI         | 4            | DISK          |                    |                                                |                     |                                              |                    |                             |                    |        |                 |                |                    |                     |               |                    |        |       |                         |                                        |                   |             |                      |  |  |  |  |
| 03   | F         | SMASST   | IC        | F                | 128         | 128R     | 6AI         | 3            | DISK          |                    |                                                |                     |                                              |                    |                             |                    |        |                 |                |                    |                     |               |                    |        |       |                         |                                        |                   |             |                      |  |  |  |  |
| 04   | F         | IMASST   | UC        | F                | 256         | 256R     | 23AI        | 33           | DISK          |                    |                                                |                     |                                              |                    |                             |                    |        |                 |                |                    |                     |               |                    |        |       |                         |                                        |                   |             |                      |  |  |  |  |
| 05   | F         | TRANS    | UC        | F                | 141         | 141R     |             |              | DISK          |                    |                                                |                     |                                              |                    |                             |                    |        |                 |                |                    |                     |               |                    |        |       |                         |                                        |                   |             |                      |  |  |  |  |

Figure 15-6 (Part 1 of 3). Data Dictionary for Sample Program 2





















### System/34 Display Screen Format Specifications

Use this coding sheet only to define display screen formats for WSU and \$SFGR. This coding sheet could contain typographical errors.

Printed in U.S.A.  
\*No. of sheets per pad may vary slightly.

| Sequence Number | Form Type | Format Name | Format ID (WSU Only) | Start Line Number | Number of Lines to Clear | Lowercase | Return Input | Reset Keyboard (WSU Only) | Sound Alarm | Enable Function Keys | Enable Command Keys | Blink Cursor | Erase Input Fields | Override Fields | Suppress Input | Reserved | WSU Only            |                                           |                                           |       |     |                |        |          |          |            | Reserved | Key Mask | Reserved |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----------------|-----------|-------------|----------------------|-------------------|--------------------------|-----------|--------------|---------------------------|-------------|----------------------|---------------------|--------------|--------------------|-----------------|----------------|----------|---------------------|-------------------------------------------|-------------------------------------------|-------|-----|----------------|--------|----------|----------|------------|----------|----------|----------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|                 |           |             |                      |                   |                          |           |              |                           |             |                      |                     |              |                    |                 |                |          | Enter Mode Sequence | Review Mode Record Identifying Indicators | Insert Mode Record Identifying Indicators |       |     |                |        |          |          |            |          |          |          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                 |           |             |                      |                   |                          |           |              |                           |             |                      |                     |              |                    |                 |                |          |                     |                                           |                                           | 1     | 2   | 3              | 1      | 2        | 3        |            |          |          |          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                 |           |             |                      |                   |                          |           |              |                           |             |                      |                     |              |                    |                 |                |          |                     |                                           |                                           | Start | End | Entry Required | Repeat | Reserved | Priority | Preprocess |          |          |          | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 |

| Sequence Number | Form Type | Field Name | Field Length | Starting Location | Line Number | Horizontal Position | Output Data | Edit Code (WSU Only) | Input Allowed | Data Type | Mandatory Fill | Mandatory Entry | Start/Check | Adjust/Full | Position Cursor | Enable Dup | Control Field Exit | Auto Record Advance | Protect Field | High Intensity | Blink Field | Nondisplay | Reverse Image | Underline | Column Separators | Reserved | Constant Type | Constant Data |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | Continuation |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----------------|-----------|------------|--------------|-------------------|-------------|---------------------|-------------|----------------------|---------------|-----------|----------------|-----------------|-------------|-------------|-----------------|------------|--------------------|---------------------|---------------|----------------|-------------|------------|---------------|-----------|-------------------|----------|---------------|---------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|                 |           |            |              |                   |             |                     |             |                      |               |           |                |                 |             |             |                 |            |                    |                     |               |                |             |            |               |           |                   |          |               |               |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                 |           |            |              |                   |             |                     |             |                      |               |           |                |                 |             |             |                 |            |                    |                     |               |                |             |            |               |           |                   |          |               | 1             | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |              | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |

Figure 15-7 (Part 12 of 18). WSU Specifications for Sample Program 2

### WSU C Specifications

| Sequence Number | Form Type | Processing Level (LJ, W, ES, EW, EJ, SR, AN, OR) | Indicators |        |             |                 | Factor 1 | Operation | Factor 2 | Table or Message Text | Blank Continuation | Resulting Indicators | Comments |              |       |            |         |
|-----------------|-----------|--------------------------------------------------|------------|--------|-------------|-----------------|----------|-----------|----------|-----------------------|--------------------|----------------------|----------|--------------|-------|------------|---------|
|                 |           |                                                  | And        | And    | And         | And             |          |           |          |                       |                    |                      |          |              |       |            |         |
|                 |           |                                                  |            |        |             |                 |          |           |          |                       |                    |                      |          | Result Field |       | Arithmetic |         |
|                 |           |                                                  | Name       | Length | Decimal Pos | Half Adjust (H) |          |           |          |                       |                    |                      |          | Plus         | Minus | Zero       | Compare |

Figure 15-7 (Part 13 of 18). WSU Specifications for Sample Program 2











### SAMPLE PROGRAM 3: MASTER FILE INQUIRY

This WSU program is named WSUINQRY and allows a maximum of three operators to inquire into IMAST, the inventory master file used in sample program 2.

An operator requests the WSU program by entering WSUINQRY. The following display appears:

```
INVENTORY ITEM INQUIRY

PART NUMBER: _
FINISH:

PRESS ENTER/REC ADV TO CONTINUED
PRESS CK 1 TO END SESSION FROM WSU MENU
```

The operator enters the part number and finish of an inventory item and presses Enter/Rec Adv. If the item is not in the IMAST master file, the operator receives a message on the bottom line of DSPO1 and can enter another part number and finish his session. If the newly-entered item is found in IMAST, the following display appears:

```
INVENTORY ITEM INQUIRY

PART NUMBER: 8025
FINISH: 3
DESCRIPTION: DOOR PULL
QUANTITY ON HAND: 000015
PRICE: 5.75

PRESS ENTER/REC ADV TO CONTINUED
PRESS CK 1 TO END SESSION FROM WSU MENU
```

DSPO2 provides a description, onhand quantity, and price of the specified item. The operator can press Enter/Rec Adv to return to the initial display or can press command key 1 to display the WSU menu. The operator can end his session from the WSU menu.

### DATA DICTIONARY FOR SAMPLE PROGRAM 3

The data dictionary for sample program 2 is used for sample program 3 also. The data dictionary is in a source member named MSTWSU in a library named MJRLIB. Figure 15-8 shows the F and I specifications in the data dictionary. Only the F and I specifications for the inventory file, IMAST, are needed. The F and I specifications for the other files are ignored.

#### File Description Specifications

| Line | Form Type | Filename | File Type            |             | Mode of Processing                             |                     | Device              | Symbolic Device                              | Name of Label Exit | Extent Exit for DAM         | File Addition/Unordered                |                          |
|------|-----------|----------|----------------------|-------------|------------------------------------------------|---------------------|---------------------|----------------------------------------------|--------------------|-----------------------------|----------------------------------------|--------------------------|
|      |           |          | File Designation     | End of File | Length of Key Field or of Record Address Field | Record Address Type |                     |                                              |                    |                             | Number of Tracks for Cylinder Overflow | Number of Extents        |
|      |           |          | Sequence             | File Format | Block Length                                   | Record Length       | Record Address Type | Type of File Organization or Additional Area | Overflow Indicator | Key Field Starting Location | Continuation Lines                     | Tape Rewind              |
|      |           |          | A/D                  | F/V/S/M/D/E | L/R                                            | L/R                 | A/P/I/K             | I/X/D/T/R or 2                               |                    |                             | K                                      | File Condition U1-U8, UC |
|      |           |          | External Record Name |             |                                                |                     |                     |                                              |                    |                             |                                        |                          |
|      |           |          | Option               |             |                                                |                     |                     |                                              |                    |                             |                                        |                          |
|      |           |          | Entry                |             |                                                |                     |                     |                                              |                    |                             |                                        |                          |
| 02   | F         | CMAST    | IC                   | F           | 244                                            | 244R                | 6AI                 |                                              |                    |                             | 4                                      | DISK                     |
| 03   | F         | SMAST    | IC                   | F           | 128                                            | 128R                | 6AI                 |                                              |                    |                             | 3                                      | DISK                     |
| 04   | F         | IMAST    | UC                   | F           | 256                                            | 256R                | 23AI                |                                              |                    |                             | 33                                     | DISK                     |
| 05   | F         | TRANS    | UC                   | F           | 141                                            | 141R                |                     |                                              |                    |                             |                                        | DISK                     |
| 06   | F         |          |                      |             |                                                |                     |                     |                                              |                    |                             |                                        |                          |
| 07   | F         |          |                      |             |                                                |                     |                     |                                              |                    |                             |                                        |                          |

| IBM International Business Machines Corporation |           | RPG INPUT SPECIFICATIONS |          |                     |                         |                                           |                             |                         |                         |                         |          |                         |                       |                                    |                       |                  | GX21-9094-4 UM/050* |               |        |
|-------------------------------------------------|-----------|--------------------------|----------|---------------------|-------------------------|-------------------------------------------|-----------------------------|-------------------------|-------------------------|-------------------------|----------|-------------------------|-----------------------|------------------------------------|-----------------------|------------------|---------------------|---------------|--------|
| Program                                         |           | Keying Instruction       |          | Graphic             |                         | Card Electro Number                       |                             | Page 1 2 of             |                         | Program Identification  |          | 75 76 77 78 79 80       |                       |                                    |                       |                  |                     |               |        |
| Line                                            | Form Type | Filename or Record Name  | Sequence | External Field Name |                         |                                           | Record Identification Codes |                         |                         | Field Location          |          | RPG Field Name          | Control Level (L1-L9) | Matching Fields or Chaining Fields | Field Record Relation | Field Indicators |                     |               |        |
|                                                 |           |                          |          | Position            | Not (N) C/Z/D Character | Position                                  | Not (N) C/Z/D Character     | Position                | Not (N) C/Z/D Character | From                    | To       |                         |                       |                                    |                       | Plus             | Minus               | Zero or Blank |        |
|                                                 |           | Data Structure Name      | O R      | Number (1-N) L E    | Option (O) U S          | Record Identifying Indicator: . . . or DS | Position                    | Not (N) C/Z/D Character | Position                | Not (N) C/Z/D Character | Position | Not (N) C/Z/D Character | Occurs n Times        | Length                             | Decimal Positions     |                  |                     |               |        |
| 01                                              | I         |                          | SR       | 05                  |                         | 1 CS                                      |                             | 2 CR                    |                         |                         |          |                         |                       |                                    |                       |                  |                     |               |        |
| 02                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 1                       | 2                     |                                    |                       |                  |                     |               | CODESR |
| 03                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 9                       | 33                    |                                    |                       |                  |                     |               | SHPNM  |
| 04                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 34                      | 58                    |                                    |                       |                  |                     |               | SHPAL  |
| 05                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 59                      | 83                    |                                    |                       |                  |                     |               | SHPA2  |
| 06                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 86                      | 123                   |                                    |                       |                  |                     |               | SHINS  |
| 07                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 124                     | 1280                  |                                    |                       |                  |                     |               | ZIPST  |
| 08                                              | I         | IR                       | 06       |                     |                         | 1 CI                                      |                             | 2 CR                    |                         |                         |          |                         |                       |                                    |                       |                  |                     |               |        |
| 09                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 1                       | 2                     |                                    |                       |                  |                     |               | CODEIR |
| 10                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 9                       | 19                    |                                    |                       |                  |                     |               | PARTNO |
| 11                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 20                      | 31                    |                                    |                       |                  |                     |               | FINSH  |
| 12                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 32                      | 360                   |                                    |                       |                  |                     |               | QTY    |
| 13                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 37                      | 412                   |                                    |                       |                  |                     |               | PRICE  |
| 14                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 47                      | 520                   |                                    |                       |                  |                     |               | DATE   |
| 15                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          | 56                      | 590                   |                                    |                       |                  |                     |               | SHIP   |
| 16                                              | I         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          |                         |                       |                                    |                       |                  |                     |               |        |
| 17                                              | T         |                          |          |                     |                         |                                           |                             |                         |                         |                         |          |                         |                       |                                    |                       |                  |                     |               |        |

Figure 15-8 (Part 1 of 2). Data Dictionary for Sample Program 3

**RPG INPUT SPECIFICATIONS**

|            |                    |         |                     |
|------------|--------------------|---------|---------------------|
| Program    | Keying Instruction | Graphic | Card Electro Number |
| Programmer | Date               | Key     |                     |

| Line | Form Type | Filename or Record Name | Sequence | Number (I/N), E<br>Option (O), U, S<br>Record Identifying Indicator,<br>+, or DS | External Field Name         |    |   |          |                               |          |                               |          |                               | Field Location            |                   | RPG<br>Field Name | Control Level (L1-L9) | Matching Fields or<br>Chaining Fields | Field Record Relation | Field Indicators |       |                     |
|------|-----------|-------------------------|----------|----------------------------------------------------------------------------------|-----------------------------|----|---|----------|-------------------------------|----------|-------------------------------|----------|-------------------------------|---------------------------|-------------------|-------------------|-----------------------|---------------------------------------|-----------------------|------------------|-------|---------------------|
|      |           |                         |          |                                                                                  | Record Identification Codes |    |   |          |                               |          |                               |          |                               | From                      | To                |                   |                       |                                       |                       | Plus             | Minus | Zero<br>or<br>Blank |
|      |           |                         |          |                                                                                  | 1                           | 2  | 3 | Position | Not (N)<br>C/Z/D<br>Character | Position | Not (N)<br>C/Z/D<br>Character | Position | Not (N)<br>C/Z/D<br>Character | Stacker Select<br>P/B/L/R | Occurs<br>n Times |                   |                       |                                       |                       |                  |       |                     |
| 01   | I         | CMAST                   | CR       | 01                                                                               | 1                           | CM | 2 | CA       |                               |          |                               | 4        | 90                            | CUSNR                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 02   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 11       | 35                            | CUSNM                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 03   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 36       | 60                            | CUSAL                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 04   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 61       | 85                            | CUSA2                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 05   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 111      | 1150                          | ZIPCD                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 06   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               |          |                               |                           |                   |                   |                       |                                       |                       |                  |       |                     |
| 07   | I         | SMAST                   | SR       | 02                                                                               |                             |    |   |          |                               |          |                               | 3        | 80                            | CUSNR                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 08   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 9        | 33                            | SHPNR                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 09   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 34       | 58                            | SHPAL                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 10   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 59       | 83                            | SHPA2                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 11   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 109      | 1130                          | ZIPST                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 12   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               |          |                               |                           |                   |                   |                       |                                       |                       |                  |       |                     |
| 13   | I         | IMAST                   | IR       | 07                                                                               |                             |    |   |          |                               |          |                               | 33       | 43                            | PARTNO                    |                   |                   |                       |                                       |                       |                  |       |                     |
| 14   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 44       | 55                            | FINSH                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 15   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 56       | 65                            | DESCR                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 16   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 72       | 7700                          | ONHAND                    |                   |                   |                       |                                       |                       |                  |       |                     |
| 17   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 111      | 1152                          | PRICE                     |                   |                   |                       |                                       |                       |                  |       |                     |
| 18   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               |          |                               |                           |                   |                   |                       |                                       |                       |                  |       |                     |
| 19   | I         | TRANS                   | CR       | 04                                                                               | 1                           | CC | 2 | CR       |                               |          |                               | 1        | 2                             | CODECR                    |                   |                   |                       |                                       |                       |                  |       |                     |
| 20   | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 3        | 80                            | ORDNO                     |                   |                   |                       |                                       |                       |                  |       |                     |
|      | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 9        | 140                           | CUSNR                     |                   |                   |                       |                                       |                       |                  |       |                     |
|      | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 15       | 39                            | CUSNM                     |                   |                   |                       |                                       |                       |                  |       |                     |
|      | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 40       | 64                            | CUSAL                     |                   |                   |                       |                                       |                       |                  |       |                     |
|      | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 65       | 89                            | CUSA2                     |                   |                   |                       |                                       |                       |                  |       |                     |
|      | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 90       | 950                           | ALLOC                     |                   |                   |                       |                                       |                       |                  |       |                     |
|      | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 115      | 1190                          | ZIPCD                     |                   |                   |                       |                                       |                       |                  |       |                     |
|      | I         |                         |          |                                                                                  |                             |    |   |          |                               |          |                               | 120      | 125                           | CUREF                     |                   |                   |                       |                                       |                       |                  |       |                     |

\*Number of sheets per pad may vary slightly.

Figure 15-8 (Part 2 of 2). Data Dictionary for Sample Program 3









## Chapter 16. WSU Error Messages

This chapter describes WSU printed messages. (WSU displayed messages are described in the *Displayed Messages Guide*.) WSU prints a message for each error found during program generation. No operator action is required when these errors occur. The messages are for the programmer's information.

Each message in this chapter includes:

- Program identification code (WSU)
- A four-digit message identification code (MIC)
- Message text
- Severity code:
  - W (Warning) Warning that an abnormal condition exists. WSU generation does not stop because of a warning, and generation output is produced if no terminal errors have occurred.
  - T (Terminal) Indication that an error condition exists that requires correction. WSU generation does not stop because of the error, but generation output is not produced. Terminal errors must be corrected and WSU generation must be retried in order to produce the generation output.

An explanation of the message, when included, describes the message in more detail (for example, action taken by the system, suggested ways to correct the error, or where in this manual you can find more information about the error).

### WSU–0000 through WSU–0006

(These messages are WSU displayed messages. Refer to the *Displayed Messages* manual for explanations of them.)

#### WSU–0007 REGION SIZE ENTRY (POSITIONS 41–42) MUST BE AN EVEN NUMBER. ASSUME NEXT HIGHER NUMBER.

*Severity:* Warning

*Specification Type:* J

*Explanation:* Refer to *Columns 41–42 (Region Size)* in Chapter 4, *J Specification*.

#### WSU–0008 MISSING OR OUT OF SEQUENCE J SPECIFICATION.

*Severity:* Terminal

*Specification Type:* J

*Explanation:* Refer to Chapter 4, *J Specification*.

#### WSU–0009 INVALID FORM TYPE ENTRY (POSITION 6) OR SPECIFICATION OUT OF SEQUENCE.

*Severity:* Terminal

*Specification Type:* J, T, M, S, D, or C

*Explanation:* The preceding specification is not in the correct sequence, or the entry in position 6 is incorrect. Entries allowed in position 6 are J, T, M, S, D, and C.

#### WSU–0010 INVALID PROGRAM MEMBER NAME ENTRY (POSITIONS 7–14).

*Severity:* Terminal

*Specification Type:* J

*Explanation:* The program name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

#### WSU–0011 INVALID FORMAT MEMBER NAME ENTRY (POSITIONS 15–22).

*Severity:* Terminal

*Specification Type:* J

*Explanation:* The format member name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

**WSU-0012** INVALID MESSAGE MEMBER  
NAME ENTRY (POSITIONS  
23-30).

Severity: Terminal

Specification Type: J

Explanation: The message member name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

**WSU-0013** INVALID LIBRARY NAME ENTRY  
(POSITIONS 31-38).

Severity: Terminal

Specification Type: J

Explanation: The library name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

**WSU-0014** INVALID MAXIMUM NUMBER OF  
WORK STATIONS ENTRY  
(POSITIONS 39-40). MUST BE  
BLANK OR RIGHT-JUSTIFIED  
NUMBER FROM 1 TO 99.  
ASSUME 1.

Severity: Warning

Specification Type: J

Explanation: Refer to Columns 39-40 (*Maximum Number of Work Stations*) in Chapter 4, *J Specification*.

**WSU-0015** INVALID REGION SIZE ENTRY  
(POSITIONS 41-42). MUST BE  
BLANK OR RIGHT-JUSTIFIED  
NUMBER FROM 8 TO 64.  
ASSUME 14.

Severity: Warning

Specification Type: J

Explanation: Refer to Columns 41-42 (*Region Size*) in Chapter 4, *J Specification*.

**WSU-0016** INVALID DATE/EDIT ENTRY  
(POSITION 43). MUST BE M, D,  
Y, OR BLANK. ASSUME M.

Severity: Warning

Specification Type: J

Explanation: Refer to Column 43 (*Date/Edit*) in Chapter 4, *J Specification*.

**WSU-0017** SPECIFIED LIBRARY NAME  
ENTRY (POSITIONS 31-38) NOT  
FOUND.

Severity: Terminal

Specification Type: J

**WSU-0018** TOO MANY M SPECIFICATIONS.  
MAXIMUM IS 20.

Severity: Terminal

Specification Type: M

Explanation: Refer to Chapter 6, *M Specification*.

**WSU-0019** FILE NAME ENTRY (POSITIONS  
7-14) NOT UNIQUE.

Severity: Terminal

Specification Type: M

Explanation: The file name in positions 7-14 is the same as the file name on the T specification or another M specification in the program.

**WSU-0020** OUT OF SEQUENCE T  
SPECIFICATION.

Severity: Terminal

Specification Type: T

Explanation: A T specification was found after the first M, S, D, or C specification.

**WSU-0021** INVALID FILE NAME ENTRY  
(POSITIONS 7-14).

Severity: Terminal

Specification Type: M

Explanation: The file name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

**WSU-0022** INVALID LIBRARY NAME ENTRY  
(POSITIONS 15-22).

*Severity:* Terminal

*Specification Type:* M

*Explanation:* The library name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

**WSU-0023** INVALID MEMBER NAME ENTRY  
(POSITIONS 23-30).

*Severity:* Terminal

*Specification Type:* M

*Explanation:* The member name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

**WSU-0024** INVALID CHAIN FIELD NAME  
ENTRY (POSITIONS 31-36, 37-42,  
OR 43-48). ASSUME BLANK.

*Severity:* Terminal

*Specification Type:* M

*Explanation:* Each chain field name must be a left-adjusted alphameric field name.

**WSU-0025** INVALID NOT FOUND INDICATOR  
ENTRY (POSITIONS 49-50).  
MUST BE BLANK OR 01 TO 89.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* M

*Explanation:* Refer to *Columns 49-50 (Not-Found Indicator)* in Chapter 6, *M Specification*.

**WSU-0026** INVALID MASTER TRACK INDEX  
ENTRY (POSITIONS 51-54).  
MUST BE BLANK OR  
RIGHT-JUSTIFIED NUMBER.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* M

*Explanation:* Refer to *Columns 51-54 (Master Track Index)* in Chapter 6, *M Specification*.

**WSU-0027** INVALID HEADER RECORD  
IDENTIFYING INDICATOR ENTRY  
(POSITIONS 55-56). MUST BE  
BLANK OR 01-89. ASSUME  
BLANK.

*Severity:* Warning

*Specification Type:* T

*Explanation:* Refer to *Columns 55-56 (Header Record Identifying Indicator)* in Chapter 5, *T Specification*.

**WSU-0028** INVALID NUMBER OF RECORDS  
ENTRY (POSITIONS 57-60).  
MUST BE BLANK OR  
RIGHT-JUSTIFIED NUMBER  
GREATER THAN 0. ASSUME  
1000.

*Severity:* Warning

*Specification Type:* T

*Explanation:* Refer to *Columns 57-60 (Number of Records)* in Chapter 5, *T Specification*.

**WSU-0029** CHAIN FIELDS ENTRY  
(POSITIONS 31-48) MUST NOT  
BE BLANK ON M  
SPECIFICATIONS.

*Severity:* Terminal

*Specification Type:* M

*Explanation:* Refer to *Columns 31-36, 37-42, 43-48 (Chain Field Names)* in Chapter 6, *M Specification*.

**WSU-0030** HEADER RECORD IDENTIFYING  
INDICATOR ENTRY (POSITIONS  
55-56) MUST BE BLANK ON M  
SPECIFICATIONS. ASSUME  
BLANK.

*Severity:* Warning

*Specification Type:* M

**WSU-0031** NUMBER OF RECORDS ENTRY  
(POSITIONS 57-60) MUST BE  
BLANK ON M SPECIFICATIONS.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* M

**WSU-0032** TOO MANY T SPECIFICATIONS.  
MAXIMUM IS 1.

*Severity:* Terminal

*Specification Type:* T

*Explanation:* Refer to Chapter 5, *T Specification*.

**WSU-0033** CHAIN FIELDS ENTRY  
(POSITIONS 31-48) MUST BE  
BLANK ON T SPECIFICATIONS.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* T

**WSU-0034** MASTER TRACK INDEX ENTRY  
(POSITIONS 51-54) MUST BE  
BLANK ON T SPECIFICATIONS.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* T

**WSU-0035** SPECIFIED LIBRARY NAME  
ENTRY (POSITIONS 15-22) NOT  
FOUND.

*Severity:* Terminal

*Specification Type:* T or M

**WSU-0036** SPECIFIED MEMBER NAME  
ENTRY (POSITIONS 23-30) NOT  
FOUND.

*Severity:* Terminal

*Specification Type:* T or M

**WSU-0037** FILE NAME ENTRY (POSITIONS  
7-14) NOT UNIQUE IN DATA  
DICTIONARY.

*Severity:* Warning

*Specification Type:* F

*Explanation:* More than one F specification in the  
data dictionary contains the same file name in  
columns 7-14.

**WSU-0038** MISSING F SPECIFICATION IN  
DATA DICTIONARY FOR  
FILENAME ENTRY (POSITIONS  
7-14).

*Severity:* Terminal

*Specification Type:* F

*Explanation:* An F specification was not found for the  
file name specified in columns 7-14 of the  
preceding T specification or M specification.

**WSU-0039** INVALID FILE TYPE ENTRY  
(POSITION 15). MUST BE I OR U.

*Severity:* Terminal

*Specification Type:* F

*Explanation:* Refer to *Column 15 (File Type)* in  
Chapter 2, *RPG F Specification*.

**WSU-0040** INVALID RECORD LENGTH ENTRY  
(POSITIONS 24-27). MUST BE  
RIGHT-JUSTIFIED NUMBER  
FROM 14 TO 4096 FOR  
TRANSACTION FILES. ASSUME  
256.

*Severity:* Warning

*Specification Type:* F

*Explanation:* Refer to *Columns 24-27 (Record Length)*  
in Chapter 2, *RPG F Specification*.

**WSU-0041** INVALID RECORD ADDRESS TYPE  
ENTRY (POSITION 31). MUST BE  
A, P, OR BLANK. ASSUME  
BLANK.

*Severity:* Warning

*Specification Type:* F

*Explanation:* Refer to *Column 31 (Record Address  
Type)* in Chapter 2, *RPG F Specification*.

**WSU-0042** INVALID TYPE OF FILE  
ORGANIZATION ENTRY  
(POSITION 32). MUST BE I OR  
BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* F

*Explanation:* Refer to *Column 32 (Type of File  
Organization)* in Chapter 2, *RPG F Specification*.

**WSU-0043** INVALID LENGTH OF KEY FIELD ENTRY (POSITIONS 29-30). MUST BE RIGHT-JUSTIFIED NUMBER GREATER THAN 0. ASSUME 3.

Severity: Terminal

Specification Type: F

Explanation: Refer to Columns 29-30 (Length of Key Field) in Chapter 2, RPG F Specification.

**WSU-0044** INVALID KEY FIELD STARTING LOCATION ENTRY (POSITIONS 35-38). MUST BE RIGHT-JUSTIFIED NUMBER FROM 1 TO 4096. ASSUME 1.

Severity: Terminal

Specification Type: F

Explanation: Refer to Columns 35-38 (Key Field Starting Location) in Chapter 2, RPG F Specification.

**WSU-0045** RECORD ADDRESS TYPE ENTRY (POSITION 31) MUST BE BLANK FOR DIRECT FILES. ASSUME BLANK.

Severity: Warning

Specification Type: F

**WSU-0046** KEY FIELD STARTING LOCATION ENTRY (POSITIONS 35-38) MUST BE BLANK FOR DIRECT FILES. ASSUME BLANK.

Severity: Terminal

Specification Type: F

**WSU-0047** LENGTH OF KEY FIELD ENTRY (POSITIONS 29-30) MUST BE BLANK FOR DIRECT FILES. ASSUME BLANK.

Severity: Terminal

Specification Type: F

**WSU-0048** LENGTH OF KEY FIELD ENTRY (POSITIONS 29-30) MUST BE 8 OR LESS FOR FILES WITH PACKED KEYS. ASSUME 3.

Severity: Terminal

Specification Type: F

Explanation: Refer to Columns 29-30 (Length of Key Field) in Chapter 2, RPG F Specification.

**WSU-0049** LENGTH OF KEY FIELD ENTRY (POSITIONS 29-30) MUST BE LESS THAN OR EQUAL TO 29. ASSUME 3.

Severity: Terminal

Specification Type: F

Explanation: Refer to Columns 29-30 (Length of Key Field) in Chapter 2, RPG F Specification.

**WSU-0050** KEY FIELD STARTING LOCATION ENTRY (POSITIONS 35-38) MUST BE LESS THAN OR EQUAL TO RECORD LENGTH. ASSUME 1.

Severity: Terminal

Specification Type: F

Explanation: Refer to Columns 35-38 (Key Field Starting Location) in Chapter 2, RPG F Specification.

**WSU-0051** KEY FIELD STARTING LOCATION ENTRY (POSITIONS 35-38) PLUS LENGTH OF KEY FIELD ENTRY (POSITIONS 29-30) EXCEEDS RECORD LENGTH. ASSUME 1 AND 3.

Severity: Terminal

Specification Type: F

Explanation: The key field starting location is assumed to be 1; the length of the key field is assumed to be 3. Refer to Columns 29-30 (Length of Key Field) and Columns 35-38 (Key Field Starting Location) in Chapter 2, RPG F Specification.

**WSU-0052** DISK I/O ERROR IN DATA  
DICTIONARY MEMBER SPECIFIED  
ON T OR M SPECIFICATION.

*Severity:* Terminal

*Specification Type:* T or M

**WSU-0053** OVERRIDE FIELDS ENTRY  
(POSITIONS 33-34) IS NOT  
BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Blanks are the only acceptable entries in  
positions 33-34.

**WSU-0054** INVALID RECORD LENGTH ENTRY  
(POSITIONS 24-27). MUST BE  
RIGHT-JUSTIFIED NUMBER  
FROM 1 TO 4096 FOR MASTER  
FILES. ASSUME 256.

*Severity:* Warning

*Specification Type:* F

*Explanation:* Refer to Columns 24-27 (Record Length)  
in Chapter 2, *RPG F Specification*.

**WSU-0055** MISSING I SPECIFICATION IN  
DATA DICTIONARY FOR  
FILENAME ENTRY (POSITIONS  
7-14).

*Severity:* Terminal

*Specification Type:* F or I

*Explanation:* An F specification was found with no  
corresponding I specification (one with a matching  
file name in columns 7-14).

**WSU-0056** INVALID COMBINATION OF FIELD  
TYPE ENTRIES (POSITIONS  
43-58) AND RECORD TYPE  
ENTRIES (POSITIONS 7-42).  
ASSUME FIELD TYPE ENTRIES  
BLANK.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* One I specification cannot have entries  
in columns 7-42 and columns 43-58. One group  
of entries must be blank.

**WSU-0057** DATA DICTIONARY I  
SPECIFICATIONS OUT OF  
SEQUENCE.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* A field type I specification (one that uses  
columns 43-58) or an AND/OR I specification was  
found before a record type I specification (one that  
uses columns 7-42).

**WSU-0058** MISSING FIELD TYPE I  
SPECIFICATION.

*Severity:* Warning

*Specification Type:* I

*Explanation:* A record type I specification (one that  
uses columns 7-42) was found but no field type I  
specifications (ones that use columns 43-58)  
followed.

**WSU-0059** MASTER TRACK INDEX ENTRY  
(POSITIONS 51-54) MUST BE  
BLANK FOR DIRECT FILES.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* M and F

*Explanation:* A master track index entry was found on  
the previous M specification, but column 32 (Type  
of File Organization) on the F specification was  
not I.

**WSU-0060** TO FIELD LOCATION ENTRY  
(POSITIONS 48-51) EXCEEDS  
RECORD LENGTH. ASSUME  
RECORD LENGTH.

*Severity:* Terminal

*Specification Type:* I

**WSU-0061** AND LINE FOLLOWS LINE WITH  
NO RECORD IDENTIFICATION  
CODES.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* The preceding I specification contained  
no record identification codes in columns 21-41.

**WSU-0062** TOO MANY RECORD TYPE  
DEFINING I SPECIFICATIONS.  
MAXIMUM IS 255.

Severity: Terminal

Specification Type: I

Explanation: This program uses data dictionaries that  
have too many record type I specifications (entries  
are in columns 7-42).

**WSU-0063** RECORD IDENTIFYING  
INDICATOR ENTRY (POSITIONS  
19-20) BLANK ON RECORD TYPE  
DEFINING I SPECIFICATION.

Severity: Warning

Specification Type: I

Explanation: Refer to Columns 19-20 (Record  
Identifying Indicator) in Chapter 3, RPG I  
Specification.

**WSU-0064** RECORD IDENTIFYING  
INDICATOR ENTRY (POSITIONS  
19-20) MUST BE BLANK ON AND  
CONTINUATION LINE. ASSUME  
BLANK.

Severity: Warning

Specification Type: I

**WSU-0065** INVALID RECORD IDENTIFYING  
INDICATOR ENTRY (POSITIONS  
19-20). MUST BE 01-89.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 19-20 (Record  
Identifying Indicator) in Chapter 3, RPG I  
Specification.

**WSU-0066** RECORD IDENTIFYING  
INDICATOR ENTRY (POSITIONS  
19-20) NOT UNIQUE FOR THIS  
FILE.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 19-20 (Record  
Identifying Indicator) in Chapter 3, RPG I  
Specification.

**WSU-0067** INVALID POSITION ENTRY  
(POSITIONS 21-24, 28-31, OR  
35-38). MUST BE  
RIGHT-JUSTIFIED NUMBER  
FROM 1 TO 4096 FOR MASTER  
FILES AND 1 TO 4083 FOR  
TRANSACTION FILES.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 21-24, 28-31, 35-38  
(Position) in Chapter 3, RPG I Specification.

**WSU-0068** POSITION ENTRY (POSITIONS  
21-24, 28-31, OR 35-38)  
EXCEEDS RECORD LENGTH FOR  
MASTER FILE OR RECORD  
LENGTH MINUS 13 FOR  
TRANSACTION FILE. ASSUME  
MAXIMUM ACCEPTABLE VALUE.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 21-24, 28-31, 35-38  
(Position) in Chapter 3, RPG I Specification.

**WSU-0069** TOO MANY AND/OR LINES FOR  
RECORD TYPE I SPECIFICATIONS.  
MAXIMUM IS 20.

Severity: Terminal

Specification Type: I

Explanation: More than 20 consecutive AND/OR I  
specifications were found.

**WSU-0070** INVALID NOT ENTRY (POSITIONS  
25, 32, OR 39). MUST BE N OR  
BLANK. ASSUME N.

Severity: Warning

Specification Type: I

Explanation: Refer to Columns 25, 32, 39 (Not) in  
Chapter 3, RPG I Specification.



**WSU-0071** INVALID C/Z/D ENTRY  
(POSITION 26, 33, OR 40). MUST  
BE C, Z, OR D. ASSUME C.

Severity: Warning

Specification Type: I

Explanation: Refer to Columns 26, 33, 40 (C/Z/D) in  
Chapter 3, RPG I Specification.

**WSU-0072** INVALID P/B/L/R ENTRY  
(POSITION 43). MUST BE P OR B  
OR BLANK. ASSUME BLANK.

Severity: Terminal

Specification Type: I

Explanation: If column 43 contains P, WSU expects a  
packed decimal numeric field. If column 43  
contains a B, WSU expects a binary field. For a  
blank entry or an entry other than P or B, WSU  
assumes a zoned decimal numeric field or an  
alphameric field.

**WSU-0073** INVALID FIELD LOCATION ENTRY  
(POSITIONS 44-47 OR 48-51).  
ASSUME 1 FOR BOTH.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 44-51 (Field Location)  
in Chapter 3, RPG I Specification.

**WSU-0074** FROM FIELD LOCATION ENTRY  
(POSITIONS 44-47) EXCEEDS TO  
FIELD LOCATION ENTRY  
(POSITIONS 48-51). ASSUME TO  
FIELD LOCATION.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 44-51 (Field Location)  
in Chapter 3, RPG I Specification.

**WSU-0075** INVALID LENGTH OF NUMERIC  
FIELD ENTRY (POSITIONS 44-51).  
MUST BE LESS THAN OR EQUAL  
TO 15. ASSUME 15.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 44-51 (Field Location)  
in Chapter 3, RPG I Specification.

**WSU-0076** INVALID LENGTH OF  
ALPHANUMERIC FIELD ENTRY  
(POSITIONS 44-51). MUST BE  
LESS THAN OR EQUAL TO 256.  
ASSUME 256.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 44-51 (Field Location)  
in Chapter 3, RPG I Specification.

**WSU-0077** INVALID LENGTH OF PACKED  
FIELD ENTRY (POSITIONS 44-51).  
MUST BE LESS THAN OR EQUAL  
TO 8. ASSUME 8.

Severity: Terminal

Specification Type: I

Explanation: Refer to Columns 44-51 (Field Location)  
in Chapter 3, RPG I Specification.

**WSU-0078** INVALID DECIMAL POSITIONS  
ENTRY (POSITION 52). MUST BE  
BLANK OR 0-9. ASSUME 0.

Severity: Warning

Specification Type: I

Explanation: Refer to Column 52 (Decimal Positions)  
in Chapter 3, RPG I Specification.

**WSU-0079** DECIMAL POSITIONS ENTRY  
(POSITION 52) MUST BE LESS  
THAN OR EQUAL TO FIELD  
LENGTH. ASSUME FIELD  
LENGTH.

Severity: Terminal

Specification Type: I

Explanation: Refer to Column 52 (Decimal Positions)  
in Chapter 3, RPG I Specification.

**WSU-0080** DECIMAL POSITIONS ENTRY (POSITION 52) MUST NOT BE BLANK FOR PACKED OR BINARY FIELDS. ASSUME 0.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* Refer to *Column 52 (Decimal Positions)* in Chapter 3, *RPG I Specifications*.

**WSU-0081** FIELD NAME ENTRY (POSITIONS 53-58) MUST NOT BE A RESERVED NAME.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* The field name in positions 53-58 cannot be UDATE, UDAY, UMONTH, or UYEAR.

**WSU-0082** INVALID FIELD NAME ENTRY (POSITIONS 53-58).

*Severity:* Terminal

*Specification Type:* I

*Explanation:* The field name is invalid. A valid field name is from 1 to 6 characters long, is left-adjusted, its first character is alphabetic, and any remaining characters are alphameric. Embedded blanks are not allowed.

**WSU-0083** TO FIELD LOCATION ENTRY (POSITIONS 48-51) EXCEEDS RECORD LENGTH MINUS 13 FOR TRANSACTION FILE. ASSUME NO WSU DEFINITION FOR THIS FIELD.

*Severity:* Warning

*Specification Type:* I

*Explanation:* Fields cannot be defined in the last 13 bytes of transaction file records. These bytes are reserved for WSU trailers.

**WSU-0084** FORMAT AND MESSAGE MEMBER NAME ENTRIES (POSITIONS 15-22 AND 23-30) NOT UNIQUE.

*Severity:* Terminal

*Specification Type:* J

*Explanation:* The same name cannot be used for the format member (columns 15-22) and message member (columns 23-30).

**WSU-0085** INVALID FORMAT NAME ENTRY (POSITIONS 7-14).

*Severity:* Terminal

*Specification Type:* S

*Explanation:* The format name must be left-adjusted and must begin with an alphabetic character, which can be followed by zero to seven alphameric characters.

**WSU-0086** INVALID FORMAT ID ENTRY (POSITIONS 15-16). MUST BE BLANK OR TWO-CHARACTER ALPHANUMERIC OTHER THAN ES.

*Severity:* Terminal

*Specification Type:* S

*Explanation:* Refer to *Columns 15-16 (Format ID)* in Chapter 7, *S Specification*.

**WSU-0087** INVALID ENTER MODE SEQUENCE START ENTRY (POSITION 41). MUST BE Y, N, OR BLANK. ASSUME N.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Column 41 (Start)* in Chapter 7, *S Specification*.

**WSU-0088** INVALID ENTER MODE  
SEQUENCE END ENTRY  
(POSITION 42). MUST BE Y, N,  
OR BLANK. ASSUME N.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 42 (End) in Chapter 7,  
S Specification.

**WSU-0089** INVALID ENTER MODE  
SEQUENCE ENTRY REQUIRED  
ENTRY (POSITION 43). MUST BE  
Y, N, OR BLANK. ASSUME N.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 43 (Entry Required) in  
Chapter 7, S Specification.

**WSU-0090** INVALID ENTER MODE  
SEQUENCE REPEAT ENTRY  
(POSITION 44). MUST BE Y, N,  
OR BLANK. ASSUME N.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 44 (Repeat) in Chapter  
7, S Specification.

**WSU-0091** INVALID INSERT MODE RECORD  
IDENTIFYING INDICATOR ENTRY  
(POSITIONS 54-55, 56-57, OR  
58-59). MUST BE BLANK OR  
01-89. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Refer to Columns 54-55, 56-57, 58-59  
(Insert Mode Record Identifying Indicators) in  
Chapter 7, S Specification.

**WSU-0092** INVALID REVIEW MODE RECORD  
IDENTIFYING INDICATOR ENTRY  
(POSITIONS 48-49, 50-51, OR  
52-53). MUST BE BLANK OR  
01-89. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Refer to Columns 48-49, 50-51, 52-53  
(Review Mode Record Identifying Indicators) in  
Chapter 7, S Specification.

**WSU-0093** SUPPRESS INPUT ENTRY  
(POSITIONS 35-36) IS NOT  
BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Blanks are the only acceptable entries in  
positions 35-36.

**WSU-0094** INVALID PREPROCESS ENTRY  
(POSITION 47). MUST BE Y, N,  
OR BLANK. ASSUME N.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 47 (Preprocess) in  
Chapter 7, S Specification.

**WSU-0095** INVALID PRIORITY ENTRY  
(POSITION 46). MUST BE BLANK  
OR 0-3. ASSUME 0.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 46 (Priority) in Chapter  
7, S Specification.

**WSU-0096** INVALID LOWER CASE ENTRY  
(POSITION 21). MUST BY Y, N,  
OR BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 21 (Lowercase) in  
Chapter 7, S Specification.

**WSU-0097** INVALID ENABLE FUNCTION KEYS ENTRY (POSITION 27) MUST BE Y, N, R, OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Column 27 (Enable Function Keys)* in Chapter 7, *S Specification*.

**WSU-0098** INVALID SOUND ALARM ENTRY (POSITIONS 25-26). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Columns 25-26 (Sound Alarm)* in Chapter 7, *S Specification*.

**WSU-0099** WSU SOURCE INCOMPLETE.

*Severity:* Terminal

*Specification Type:* S

*Explanation:* The last specification in the source program was an S specification.

**WSU-0100** FORMAT ID ENTRY (POSITIONS 15-16) NOT UNIQUE.

*Severity:* Terminal

*Specification Type:* S

*Explanation:* The format ID on this S specification matches the ID of another S specification in the program.

**WSU-0101** PROCESSING LEVEL FORMAT ENTRIES (POSITIONS 41, 42, 44, 46, AND 48-59) MUST BE BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Columns 41 (Start), 42 (End), 44 (Repeat), 46(Priority), 48-53 (Review Mode Record Identifying Indicators), and 54-59 (Insert Mode Record Identifying Indicators) must be blank if IJ, IW, EW, or EJ is coded in columns 15-16.

**WSU-0102** TOO MANY FORMATS USED IN THIS PROGRAM.

*Severity:* Terminal

*Specification Type:* S

*Explanation:* More than 32 S specifications are in the program.

**WSU-0103** MISSING START OF SEQUENCE ENTRY (POSITION 41). ASSUME END SEQUENCE ENTRY (POSITION 42) BLANK.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Using Column 41-42 to Specify a Sequence of Displays* in Chapter 7, *S Specification*.

**WSU-0104** MISSING END OF SEQUENCE ENTRY (POSITION 42). ASSUME START SEQUENCE ENTRY (POSITION 41) BLANK.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Using Columns 41-42 to Specify a Sequence of Displays* in Chapter 7, *S Specification*.

**WSU-0105** FIRST NON-PROCESSING LEVEL FORMAT DOES NOT CONTAIN Y IN START SEQUENCE ENTRY (POSITION 41). ASSUME Y.

*Severity:* Warning

*Specification Type:* S

*Explanation:* The first display that is not a processing level display is not coded as the start of a display sequence.

**WSU-0106** INVALID RESET KEYBOARD ENTRY (POSITIONS 23-24). MUST BE Y, N, OR BLANK. ASSUME Y.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Columns 23-24 (Reset Keyboard)* in Chapter 7, *S Specification*.

**WSU-0107** RESET KEYBOARD ENTRY (POSITIONS 23-24) MUST NOT BE N IF POSITIONS 15-16, 21-22, OR 41-59 ARE NON-BLANK OR THE FORMAT IS A MEMBER OF A SEQUENCE OF FORMATS. ASSUME RESET KEYBOARD IS Y.

Severity: Warning

Specification Type: S

Explanation: Refer to Columns 23-24 (Reset Keyboard) in Chapter 7, S Specification.

**WSU-0108** INVALID START LINE NUMBER ENTRY (POSITIONS 17-18). MUST BE RIGHT-JUSTIFIED NUMBER FROM 1 TO 24 OR V. ASSUME 01.

Severity: Warning

Specification Type: S

Explanation: Refer to Columns 17-18 (Start Line Number) in Chapter 7, S Specification.

**WSU-0109** INVALID NUMBER LINES TO CLEAR ENTRY (POSITIONS 19-20). MUST BE RIGHT-JUSTIFIED NUMBER FROM 0 TO MAXIMUM NUMBER LINES TO CLEAR. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: The number of lines to clear is invalid. Clearing begins with the starting line specified in columns 17-18 of the S specification. The allowed maximum number of lines to clear is 25 minus the starting line number.

**WSU-0110** MISSING S SPECIFICATION.

Severity: Terminal

Specification Type: S

Explanation: D specifications require a leading S specification.

**WSU-0111** INVALID FIELD LENGTH ENTRY (POSITIONS 15-18). MUST BE BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to Columns 15-18 (Field Length) in Chapter 8, D Specification.

**WSU-0112** MISSING D SPECIFICATION(S).

Severity: Terminal

Specification Type: D

Explanation: Two consecutive S specifications or consecutive S and C specifications have been found.

**WSU-0113** INVALID PROCESSING LEVEL SEQUENCE.

Severity: Terminal

Specification Type: S or C

Explanation: The processing levels on S and/or C specifications are out of order. The correct order is: IJ, IW, columns 7-8 blank on C specifications or columns 15-16 not a processing level on S specifications, ES, EW, EJ, and SR.

**WSU-0114** MORE THAN ONE FORMAT FOR SPECIFIED PROCESSING LEVEL ENTRY (POSITIONS 15-16).

Severity: Terminal

Specification Type: S

Explanation: The format ID in positions 15-16 on the S specification contains a processing level (IJ, IW, EW, EJ) that is the same as a processing level specified on a previous S specification or C specification in the program.

**WSU-0115** INVALID RPG II/WSU FIELD NAME ENTRY (POSITIONS 7-12).

Severity: Terminal

Specification Type: D

Explanation: Refer to Columns 7-12 (Field Name) in Chapter 8, D Specification.

**WSU-0116** INVALID LINE NUMBER ENTRY (POSITIONS 19-20). MUST BE RIGHT-JUSTIFIED NUMBER FROM 1 TO MAXIMUM LINE NUMBER.

*Severity:* Terminal

*Specification Type:* D

*Explanation:* Either the line number is not right adjusted or the line number exceeds the maximum number allowed (for a 1920-character display, 25 minus the display's starting line number; for a 960-character display, 13 minus the display's starting line number).

**WSU-0117** INVALID HORIZONTAL POSITION ENTRY (POSITIONS 21-22). MUST BE RIGHT-JUSTIFIED NUMBER FROM 1 TO MAXIMUM NUMBER OF CHARACTERS ON THE LINE.

*Severity:* Terminal

*Specification Type:* D

*Explanation:* Refer to Columns 21-22 (*Horizontal Position*) in Chapter 8, *D Specification*.

**WSU-0118** INVALID AUTO RECORD ADVANCE ENTRY (POSITION 36). MUST BE Y, N, OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Column 36 (*Auto Record Advance*) in Chapter 8, *D Specification*.

**WSU-0119** INVALID CONTROLLED FIELD EXIT ENTRY (POSITION 35). MUST BE Y, N, OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Column 35 (*Controlled Field Exit*) in Chapter 8, *D Specification*.

**WSU-0120** INVALID MANDATORY ENTER ENTRY (POSITION 29). MUST BE Y, N, OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Column 29 (*Mandatory Entry*) in Chapter 8, *D Specification*.

**WSU-0121** INVALID MANDATORY FILL ENTRY (POSITION 28). MUST BE Y, N, OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Column 28 (*Mandatory Fill*) in Chapter 8, *D Specification*.

**WSU-0122** INVALID SELF CHECK ENTRY (POSITION 30). MUST BE T, E, OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Column 30 (*Self Check*) in Chapter 8, *D Specification*.

**WSU-0123** INVALID POSITION CURSOR ENTRY (POSITIONS 32-33). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Columns 32-33 (*Position Cursor*) in Chapter 8, *D Specification*.

**WSU-0124** INVALID HIGH INTENSITY ENTRY (POSITIONS 39-40). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Columns 39-40 (*High Intensity*) in Chapter 8, *D Specification*.

**WSU-0125** INVALID PROTECT FIELD ENTRY (POSITIONS 37-38). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to Columns 37-38 (Protect Field) in Chapter 8, D Specification.

**WSU-0126** INVALID NON-DISPLAY ENTRY (POSITIONS 43-44). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to Columns 43-44 (Nondisplay) in Chapter 8, D Specification.

**WSU-0127** INVALID BLINK FIELD ENTRY (POSITIONS 41-42). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to Columns 41-42 (Blink Field) in Chapter 8, D Specification.

**WSU-0128** INVALID REVERSE IMAGE ENTRY (POSITIONS 45-46). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to Columns 45-46 (Reverse Image) in Chapter 8, D Specification.

**WSU-0129** INVALID OUTPUT DATA ENTRY (POSITIONS 23-24). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to Columns 23-24 (Output Data) in Chapter 8, D Specification.

**WSU-0130** INVALID EDIT CODE ENTRY (POSITION 25). MUST BE J, Y, Z, OR BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to Column 25 (Edit Code) in Chapter 8, D Specification.

**WSU-0131** INVALID DATA TYPE ENTRY (POSITION 27). MUST BE A, B, E, F, K, N, S, X, OR BLANK. ASSUME BLANK.

Severity: Terminal

Specification Type: D

Explanation: Refer to Column 27 (Data Type) in Chapter 8, D Specification.

**WSU-0132** INVALID CONSTANT DATA ENTRY (POSITIONS 57-79).

Severity: Terminal

Specification Type: D

Explanation: Either the data in positions 57-79 does not match the type specified in position 56 or this data is not in the proper format. Possible causes of the error are:

- Position 56 contains an M but positions 57-60 do not contain a 4-digit MIC.
- Position 56 contains an M but positions 61-79 are not blank.
- Position 56 contains a P but:
  - The data in positions 57-79 is not enclosed in apostrophes.
  - The data in positions 57-79 contains a beginning apostrophe and no end apostrophe or vice versa.
  - The closing apostrophe in columns 57-79 is followed by a nonblank character.
  - There is no data between the apostrophes.

**WSU-0133** INVALID CONTINUATION ENTRY.  
MUST BE BLANK FOR A  
COMPLETE SPECIFICATION.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* C or D

*Explanation:* Continuation has been specified for a D specification and one of the following exists:

- A MIC is in positions 57-60.
- A closing apostrophe for a prompt is before position 79.
- The data type in position 56 is F or blank.

Or continuation has been specified for a C specification and one of the following exists:

- For a COMP operation that has a table, the table ends before column 52.
- For a MSG or IMSG operation, the closing apostrophe for the message came before column 52 or a MIC was in columns 33-36.

**WSU-0134** INVALID CONTINUATION ENTRY.  
ONLY ONE CONTINUATION  
RECORD ALLOWED. ASSUME  
BLANK.

*Severity:* Warning

*Specification Type:* C or D

*Explanation:* Consecutive continuation lines have been found.

**WSU-0135** MISSING OR INVALID  
CONTINUATION SPECIFICATION.

*Severity:* Terminal

*Specification Type:* C or D

*Explanation:* Continuation is specified, but the first noncomment specification that follows the continued specification is a different type.

**WSU-0136** INVALID STARTING LOCATION  
ENTRY (POSITIONS 19-22).  
MUST NOT BE 0101.

*Severity:* Terminal

*Specification Type:* D

*Explanation:* Refer to Columns 19-22 (Starting Location) in Chapter 8, D Specification.

**WSU-0137** INVALID INPUT ALLOWED ENTRY  
(POSITION 26). MUST BE Y, N,  
OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Column 26 (Input Allowed) in Chapter 8, D Specification.

**WSU-0138** INVALID ADJUST/FILL ENTRY  
(POSITION 31). MUST BE Z, B,  
OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Column 31 (Adjust/Fill) in Chapter 8, D Specification.

**WSU-0139** MANDATORY FILL ENTRY  
(POSITION 28) IS Y AND  
ADJUST/FILL ENTRY (POSITION  
31) IS Z OR B. ASSUME BLANK  
FOR ADJUST/FILL.

*Severity:* Warning

*Specification Type:* D

**WSU-0140** INVALID ENABLE DUP ENTRY  
(POSITION 34). MUST BE BLANK.  
ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

**WSU-0141** INVALID UNDERLINE ENTRY  
(POSITIONS 47-48). MUST BE Y,  
N, BLANK, OR 01-89. ASSUME  
BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to Columns 47-48 (Underline) in Chapter 8, D Specification.



**WSU-0142** INVALID COLUMN SEPARATORS ENTRY (POSITION 49). MUST BE Y, N, OR BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to *Column 49 (Column Separator)* in Chapter 8, *D Specification*.

**WSU-0143** INVALID CONSTANT TYPE ENTRY (POSITION 56). MUST BE C, M, P, F, D, OR BLANK. ASSUME BLANK.

Severity: Terminal

Specification Type: D

Explanation: Refer to *Column 56 (Constant Type)* in Chapter 8, *D Specification*.

**WSU-0144** ENTRIES IN POSITIONS 27-38 MUST BE BLANK WHEN INPUT ALLOWED ENTRY (POSITION 26) IS NOT Y. ASSUME POSITIONS 27-38 BLANK.

Severity: Warning

Specification Type: D

Explanation: Refer to *Column 26 (Input Allowed)* in Chapter 8, *D Specification*.

**WSU-0145** OPERATION ENTRY (POSITIONS 28-32) IS BLANK BUT FOLLOWING SPECIFICATION DOES NOT CONTAIN AN/OR IN POSITIONS 7-8.

Severity: Terminal

Specification Type: C

Explanation: Either the C specifications are out of order or this C specification is missing the Operation entry.

**WSU-0146** AN/OR LINE OUT OF SEQUENCE. ASSUME PREVIOUS LEVEL.

Severity: Terminal

Specification Type: C

Explanation: A C specification with AN or OR in positions 7-8 has no immediately preceding C specification or follows a C specification that has an operation in positions 28-32. WSU defaults to the last processing level found in positions 7-8 of the C specifications or determined from positions 15-16 of the S specification. If the C specification in error is not preceded by a C specification or an S specification, the processing level is assumed to be IJ.

**WSU-0147** TOO MANY CONSECUTIVE AN/OR LINES. MAXIMUM IS 6.

Severity: Terminal

Specification Type: C

Explanation: More than seven consecutive AN/OR lines have been specified.

**WSU-0148** CONDITIONING INDICATORS ENTRY (POSITIONS 9-17) MUST NOT BE BLANK ON AN/OR LINE.

Severity: Terminal

Specification Type: C

Explanation: A C specification that contains AN or OR in positions 7-8 is blank in positions 9-17.

**WSU-0149** INVALID PROCESSING LEVEL ENTRY (POSITIONS 7-8). ASSUME PREVIOUS LEVEL.

Severity: Terminal

Specification Type: C

Explanation: Positions 7-8 of the C specification do not contain IJ, IW, ES, EW, EJ, AN, OR, SR, or blank.

**WSU-0150** MISSING BEGSR OPERATION.

Severity: Terminal

Specification Type: C

Explanation: A C specification with SR in columns 7-8 is not preceded by a BEGSR operation.

**WSU-0151** MISSING ENDSR OPERATION.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The first C specification in a subroutine must contain a BEGSR operation; the last C specification in a subroutine must contain an ENDSR operation.

**WSU-0152** NOT ENTRY (POSITION 9, 12, OR 15) MUST BE FOLLOWED BY AN INDICATOR. ASSUME NOT ENTRY BLANK.

*Severity:* Warning

*Specification Type:* C

*Explanation:* Position 9, 12, or 15 contains an N and the next two positions are blank.

**WSU-0153** INVALID NOT ENTRY (POSITION 9, 12, OR 15). MUST BE N OR BLANK. ASSUME N.

*Severity:* Warning

*Specification Type:* C

*Explanation:* Position 9, 12, or 15 is neither N nor blank and the following two positions are not blank.

**WSU-0154** INVALID NOT ENTRY (POSITION 9, 12, OR 15). MUST BE N OR BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* C

*Explanation:* Position 9, 12, or 15 is neither N nor blank and the following two positions contain blanks.

**WSU-0155** INVALID CONDITIONING INDICATOR ENTRY (POSITIONS 10-11, 13-14, OR 16-17). ASSUME BLANK.

*Severity:* Warning

*Specification Type:* C

*Explanation:* Positions 10-11, 13-14, or 16-17 contain an invalid indicator. Refer to *Columns 9-17 (Indicators)* in Chapter 9, *C Specification* for a list of valid indicators.

**WSU-0156** INVALID FACTOR 1 ENTRY (POSITIONS 18-27).

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Factor 1 is not a valid name, alphameric literal, or numeric literal. Refer to *Columns 18-27 (Factor 1)* and *Columns 33-42 (Factor 2)* in Chapter 9, *C Specification* for a list of valid factor 1 entries.

**WSU-0157** EMBEDDED BLANK FOUND IN KEY MASK FIELD ENTRY (POSITIONS 64-79). ENTRIES AFTER THE BLANK ARE IGNORED.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Columns 64-79 (Key Mask)* in Chapter 7, *S Specification*.

**WSU-0158** DUPLICATE KEY MASK ENTRY (POSITIONS 64-79). IGNORE THE DUPLICATE ENTRY.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Columns 64-79 (Key Mask)* in Chapter 7, *S Specification*.

**WSU-0159** INVALID KEY MASK ENTRY (POSITIONS 64-79). INVALID ENTRY IS IGNORED.

*Severity:* Warning

*Specification Type:* S

*Explanation:* Refer to *Columns 64-79 (Key Mask)* in Chapter 7, *S Specification* for a description of valid entries for the key mask.

**WSU-0160** INVALID RESULTING INDICATOR ENTRY (POSITIONS 54-55, 56-57, OR 58-59). ASSUME BLANK.

Severity: Terminal

Specification Type: C

Explanation: One of the following has occurred:

- A resulting indicator is blank or invalid. Refer to *Columns 54-59 (Resulting Indicators)* in Chapter 9, *C Specification* for a list of valid indicators.
- The resulting indicator is not 01-89 for a PUT operation.
- The resulting indicator is AE and the operation is neither SETON nor SETOF.
- The resulting indicator is RC or RS and the operation is not SETOF.

**WSU-0161** INVALID FACTOR 2 ENTRY (POSITIONS 33-42).

Severity: Terminal

Specification Type: C

Explanation: Factor 2 is not a valid name, alphameric literal, or numeric literal. Refer to *Columns 18-27 (Factor 1)* and *Columns 33-42 (Factor 2)* in Chapter 9, *C Specification* for a list of valid factor 2 entries.

**WSU-0162** NUMBER OF LINES TO CLEAR ENTRY (POSITIONS 19-20) EXCEEDS MAXIMUM NUMBER OF LINES AVAILABLE.

Severity: Terminal

Specification Type: S

Explanation: Positions 19-20 contain a number that is greater than the maximum number of lines on the display: Refer to *Columns 19-20 (Number of Lines to Clear)* in Chapter 7, *S Specification*.

**WSU-0163** ENABLE FUNCTION KEY ENTRY (POSITION 27) IS BLANK OR R, BUT KEY MASK FIELD ENTRY (POSITIONS 64-79) CONTAINS A FUNCTION KEY MASK. DEFAULT MASKING IS USED.

Severity: Warning

Specification Type: S

Explanation: Positions 64-79 contain a 2 (roll up) or 3 (roll down), but position 27 is not Y, N, or R. Both the roll up and roll down keys are enabled.

**WSU-0164** ENABLE COMMAND KEY ENTRY (POSITION 28) IS BLANK OR R, BUT KEY MASK FIELD (POSITIONS 64-79) CONTAINS A COMMAND KEY MASK. DEFAULT MASKING IS USED.

Severity: Warning

Specification Type: S

Explanation: Positions 64-79 specify A through N or P through Y, but position 28 is not Y, N, or R. All of these command keys are enabled.

**WSU-0165** ERASE INPUT FIELDS ENTRY (POSITIONS 31-32) IS NOT BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Blanks are the only acceptable entries in positions 31-32.

**WSU-0166** IDEOGRAPHIC MODE ENTRY (POSITION 44) MUST BE Y, N, OR BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: J

Explanation: Refer to *Column 44 (Ideographic Mode)* in Chapter 4, *J Specification*.

**WSU-0167** INVALID RESULT FIELD ENTRY  
(POSITIONS 43-52).

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The result field is invalid for one of the following reasons:

- The result field contains a name, and:
  - The name begins with \*, but is not a reserved field name.
  - The name begins with \*, but the reserved field is not valid for the result field.
  - The name does not begin with \*, &, or an alphabetic character.
  - The name contains a nonalphanumeric character.
- The result field contains a literal (The first character of the name is an apostrophe, +, -, decimal point, comma, or digit) and the operation is not RANGE.

**WSU-0168** INVALID RESULT FIELD LENGTH ENTRY (POSITIONS 49-51). MUST BE BLANK OR RIGHT-JUSTIFIED NUMBER FROM 1 TO 256. ASSUME BLANK.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Refer to *Columns 49-51 (Result Field Length)* in Chapter 9, *C Specification*.

**WSU-0169** RESULT FIELD LENGTH ENTRY (POSITIONS 49-51) MUST BE BLANK IF RESULT FIELD NAME ENTRY BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* C

*Explanation:* The result field length is specified, but a result field name is not specified.

**WSU-0170** DECIMAL POSITION. ENTRY (POSITION 52) MUST BE BLANK IF RESULT FIELD LENGTH ENTRY (POSITIONS 49-51) IS BLANK. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* C

**WSU-0171** INVALID DECIMAL POSITION ENTRY (POSITION 52). MUST BE BLANK OR 0-9. ASSUME 0.

*Severity:* Terminal

*Specification Type:* C

**WSU-0172** DECIMAL POSITION ENTRY (POSITION 52) MUST BE LESS THAN OR EQUAL TO RESULT FIELD LENGTH. ASSUME 0.

*Severity:* Terminal

*Specification Type:* C

**WSU-0173** RESULT FIELD LENGTH (POSITIONS 49-51) MUST BE LESS THAN OR EQUAL TO 15 FOR NUMERIC DATA. ASSUME 15.

*Severity:* Terminal

*Specification Type:* C

**WSU-0174** INVALID HALF ADJUST ENTRY (POSITION 53). MUST BE H OR BLANK. ASSUME H.

*Severity:* Warning

*Specification Type:* C

**WSU-0175** INVALID OPERATION ENTRY  
(POSITIONS 28-32) OR INVALID  
OPERATION SEQUENCE.

Severity: Terminal

Specification Type: C

Explanation: One of the following has occurred:

- The operation in positions 28-32 is invalid. Refer to *Columns 28-32 (Operation)* in Chapter 9, *C Specification* for a list of valid operations.
- A PRTY operation is not preceded by a BEGSR operation.

**WSU-0176** CONDITIONING INDICATORS  
ENTRIES (POSITIONS 9-17)  
MUST BE BLANK.

Severity: Terminal

Specification Type: C

Explanation: Conditioning indicators are not allowed for the operation in positions 28-32.

**WSU-0177** MISSING FACTOR 1 ENTRY  
(POSITIONS 18-27).

Severity: Terminal

Specification Type: C

Explanation: Factor 1 is blank, but factor 1 is required for the operation in positions 28-32.

**WSU-0178** FACTOR 1 ENTRY (POSITIONS  
18-27) MUST BE BLANK.

Severity: Terminal

Specification Type: C

Explanation: Refer to *Columns 18-27 (Factor 1)* and *Columns 33-42 (Factor 2)* in Chapter 9, *C Specification*.

**WSU-0179** MISSING FACTOR 2 ENTRY  
(POSITIONS 33-42).

Severity: Terminal

Specification Type: C

Explanation: Refer to *Columns 18-27 (Factor 1)* and *Columns 33-42 (Factor 2)* in Chapter 9, *C Specification*.

**WSU-0180** FACTOR 2 ENTRY (POSITIONS  
33-42) MUST BE BLANK.

Severity: Terminal

Specification Type: C

Explanation: Refer to *Columns 18-27 (Factor 1)* and *Columns 33-42 (Factor 2)* in Chapter 9, *C Specification*.

**WSU-0181** MISSING RESULT FIELD ENTRY  
(POSITIONS 43-48).

Severity: Terminal

Specification Type: C

Explanation: Refer to *Columns 28-32 (Operation)* in Chapter 9, *C Specification* for a list of operations that require result fields.

**WSU-0182** RESULT FIELD ENTRY  
(POSITIONS 43-48) MUST BE  
BLANK.

Severity: Terminal

Specification Type: C

Explanation: Refer to *Columns 28-32 (Operation)* in Chapter 9, *C Specification* for a list of operations that do not allow a result field.

**WSU-0183** FIELD LENGTH AND DECIMAL  
POSITION ENTRIES (POSITIONS  
49-52) MUST BE BLANK.

Severity: Terminal

Specification Type: C

Explanation: Refer to *Columns 28-32 (Operation)* in Chapter 9, *C Specification* for a list of operations and how field length and decimal position entries are used with each operation.

**WSU-0184** FORMAT MEMBER NAME (POSITIONS 15-22) OR PROGRAM LIBRARY MUST BE REDEFINED TO PREVENT WSU SOURCE DELETION.

*Severity:* Terminal

*Specification Type:* J

*Explanation:* The WSU source program name must not be the same as the format member name when the source program and the format member are in the same library.

**WSU-0185** HALF ADJUST ENTRY (POSITION 53) MUST BE BLANK.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The half adjust entry in position 33 must be blank for the operation in positions 28-32.

**WSU-0186** MISSING RESULTING INDICATORS ENTRY (POSITIONS 54-59).

*Severity:* Terminal

*Specification Type:* C

*Explanation:* At least one resulting indicator is required for the operation in positions 28-32.

**WSU-0187** RESULTING INDICATORS ENTRY (POSITIONS 54-59) MUST BE BLANK.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Resulting indicators cannot be used with the operation in positions 28-32.

**WSU-0188** IDEOGRAPHIC DATA OR LITERAL ON D SPECIFICATION OR IDEOGRAPHIC LITERAL ON C SPECIFICATION NOT ALLOWED IN THIS PROGRAM.

*Severity:* Terminal

*Specification Type:* C or D

*Explanation:* The ideographic mode entry in position 44 of the J specification must be Y to allow ideographic data to be specified on C or D specifications.

**WSU-0189** LOW AND EQUAL RESULTING INDICATOR ENTRIES (POSITIONS 56-59) MUST BE BLANK.

*Severity:* Warning

*Specification Type:* C

*Explanation:* Positions 56-59 must be blank for a GET, GETNH, GETNR, GETPH, GETPR, or PUT operation.

**WSU-0190** PROCESSING LEVEL ENTRY (POSITIONS 7-8) MUST NOT BE BLANK. ASSUME PREVIOUS LEVEL.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Positions 7-8 of the previous C specification contain a valid processing level; however, this processing level is blank. WSU assumes that the previous processing level is in positions 7-8.

**WSU-0191** TOO MANY CHARACTERS IN FACTOR 2 ENTRY (POSITIONS 33-42). MAXIMUM IS 8 (FILE/FORMAT NAMES) OR 6 (FIELD/LABEL NAMES).

*Severity:* Terminal

*Specification Type:* C

**WSU-0192** FIELD NAME IN FACTOR 1 ENTRY (POSITIONS 18-27) IS LONGER THAN 6 CHARACTERS.

*Severity:* Terminal

*Specification Type:* C

**WSU-0193** PROCESSING LEVEL ENTRY (POSITIONS 7-8) BLANK BUT SPECIFICATION APPEARS DURING IJ PROCESSING. ASSUME IJ.

*Severity:* Terminal

*Specification Type:* C

**WSU-0194** INVALID PRIORITY IN FACTOR 2 ENTRY (POSITIONS 33-42). MUST BE 0-3 FOLLOWED BY BLANKS. ASSUME 0.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Refer to PRTY (Priority) in Chapter 9, C *Specification.*

**WSU-0195** INVALID CHARACTER IN FACTOR 2 ENTRY (POSITION 33). MUST BE AN APOSTROPHE OR 0-9.

*Severity:* Terminal

*Specification Type:* C

**WSU-0196** INVALID MIC IN MESSAGE TEXT (POSITIONS 33-53). MUST BE FOUR DECIMAL DIGITS FOLLOWED BY BLANKS.

*Severity:* Terminal

*Specification Type:* C

**WSU-0197** SPECIFICATION ENTRY CONTAINING LITERAL OR CONSTANT DATA ENDED IN IDEOGRAPHIC MODE.

*Severity:* Terminal

*Specification Type:* D or C

*Explanation:* A shift-in character is missing at the end of a literal or constant.

**WSU-0198** INVALID LITERAL IN MESSAGE TEXT.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The literal is invalid for one of the following reasons:

- A closing apostrophe is missing.
- A nonblank character follows the closing apostrophe.
- A closing apostrophe is specified, but continuation is indicated in position 53.

**WSU-0199** TOO MANY LITERAL CHARACTERS IN MESSAGE TEXT STARTING IN FACTOR 2 ENTRY (POSITION 33). MAXIMUM IS 64.

*Severity:* Terminal

*Specification Type:* C

**WSU-0200** INVALID FIELD NAME IN TABLE.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* A field name is invalid for one of the following reasons:

- A name begins with \*, but is not a reserved field name.
- A name does not begin with \*, &, or an alphabetic character.
- A name contains a nonalphabetic character.
- A name is longer than six characters.

**WSU-0201** DATA TYPE ENTRY (POSITION 27) MUST NOT BE E, F, OR X IF IDEOGRAPHIC MODE ENTRY (POSITION 44) ON THE J SPECIFICATION IS NOT Y.

*Severity:* Terminal

*Specification Type:* D

*Explanation:* Refer to Column 27 (Data Type) in Chapter 8, D *Specification.*

**WSU-0202** INVALID NUMERIC LITERAL IN TABLE.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The table contains an element that begins with +, -, decimal point, comma, or 0-9, and the element contains a non-numeric digit, a sign after the first position, or a second decimal point.

**WSU-0203** INVALID ALPHAMERIC LITERAL IN TABLE.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The table contains an element that begins with an apostrophe but the closing apostrophe is missing or the closing apostrophe is not followed by a semicolon (;).

**WSU-0204** FIELD NAME IN TABLE LONGER THAN 6 CHARACTERS.

*Severity:* Terminal

*Specification Type:* C

**WSU-0205** LITERAL IN TABLE LONGER THAN 10 CHARACTERS.

*Severity:* Terminal

*Specification Type:* C

**WSU-0206** ALL ELEMENTS OF A TABLE MUST BE THE SAME TYPE.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* All elements in a table used with the COMP operations must be either field names, numeric literals, or alphameric literals.

**WSU-0207** INVALID CHARACTERS AFTER LAST ELEMENT IN TABLE OR CLOSING APOSTROPHE IN MESSAGE TEXT. MUST BE BLANK. ASSUME BLANK.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The error has occurred for one of the following reasons:

- One or more characters appear after the end of a table or message.
- The resulting indicators (positions 54-59) are not blank on a continued line of a table or message.

**WSU-0208** TABLE INCOMPLETE BUT CONTINUATION NOT SPECIFIED.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The last element of the table ended with a semicolon (;), which indicated that more elements should follow: however, continuation was not specified in position 53.

**WSU-0209** INVALID TABLE OF NUMERIC LITERALS. MAXIMUM DIGITS PRECEDING DECIMAL POINT PLUS MAXIMUM DIGITS FOLLOWING DECIMAL POINT MUST BE LESS THAN OR EQUAL TO 15.

*Severity:* Terminal

*Specification Type:* C

**WSU-0210** TABLE DATA EXCEEDS MAXIMUM SIZE.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The number and size of the elements in the table, after WSU has done the necessary padding to make all elements the same length, has caused the table to exceed its allowed size. To avoid this error, try splitting the table and using two COMP operations.



**WSU-0211** NO TABLE ELEMENT PRECEDES DELIMITER.

Severity: Terminal

Specification Type: C

Explanation: Either two semicolons are together or the table begins with a semicolon.

**WSU-0212** HIGH RESULTING INDICATOR ENTRY (POSITIONS 54-55) MUST BE BLANK ON A COMPARE TO A TABLE OPERATION. ASSUME BLANK.

Severity: Warning

Specification Type: C

**WSU-0215** POSITIONS 9-27 AND/OR 43-59 MUST BE BLANK FOR PRTY OPERATIONS. ASSUME BLANK.

Severity: Terminal

Specification Type: C

**WSU-0216** CONDITIONING INDICATOR ENTRY (POSITIONS 9-17) REQUIRED WHEN OPERATION CODE (POSITIONS 28-32) IS BLANK.

Severity: Terminal

Specification Type: C

**WSU-0220** INVALID RETURN INPUT ENTRY (POSITION 22). MUST BE Y, N, OR BLANK. ASSUME N.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 22 (Return Input) in Chapter 7, S Specification.

**WSU-0221** INVALID BLINK CURSOR ENTRY (POSITIONS 29-30). MUST BE Y, N, BLANK, OR 01-89. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Refer to Columns 29-30 (Blink Cursor) in Chapter 7, S Specification.

**WSU-0222** ENABLE COMMAND KEYS ENTRY (POSITION 28) IS NOT Y, N, R, OR BLANK. ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Refer to Column 28 (Enable Command Keys) in Chapter 7, S Specification.

**WSU-0223** WSU FUNCTIONS HAVE BEEN RESTRICTED BY COMMAND/FUNCTION KEY MASK ENTRY (POSITIONS 64-79).

Severity: Warning

Specification Type: S

Explanation: One or more WSU command keys (A-F and M-P) or the roll up or roll down function key (2 or 3) have been disabled. When these keys are disabled, problems may occur during program operation.

**WSU-0225** FIELD NAME ENTRY (POSITIONS 7-14) TOO LONG. POSITIONS 13-14 MUST BE BLANK. ASSUME POSITIONS 13-14 BLANK.

Severity: Warning

Specification Type: D

**WSU-0226** INVALID DATA TYPE ENTRY (POSITION 27). MUST BE A, B, E, F, K, N, S, X, OR BLANK. ASSUME S.

*Severity:* Warning

*Specification Type:* D

*Explanation:* Refer to *Column 27 (Data Type)* in Chapter 8, *D Specification*.

**WSU-0227** CONSTANT DATA ENTRY (POSITIONS 57-79). MUST BE BLANK WHEN CONSTANT TYPE ENTRY (POSITION 56) IS F OR BLANK. ASSUME CONSTANT DATA ENTRY (POSITIONS 57-79) BLANK.

*Severity:* Warning

*Specification Type:* D

**WSU-0228** IDEOGRAPHIC CHARACTER IN CONSTANT OR PROMPT STARTS IN LAST POSITION OF SCREEN LINE.

*Severity:* Terminal

*Specification:* D

*Explanation:* An ideographic character requires two consecutive positions on a display. Both positions must be on the same line. Therefore, an ideographic character cannot be in the last position of a line and the first position of the next lower line.

**WSU-0231** MULTIPLE M SPECIFICATIONS FOR SESSION LEVEL OR LOCAL DATA AREA.

*Severity:* Terminal

*Specification Type:* M

*Explanation:* Two or more M specifications have been coded for a group of session-level fields or a local data area. One group of session-level fields and one local data area can be defined per WSU program.

**WSU-0232** SESSION LEVEL OR LOCAL DATA AREAS HAVE OVERLAPPING FIELDS.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* Field lines for a group of session-level fields or local-data-area fields must be coded in ascending order with no field overlap.

**WSU-0233** INVALID TYPE AND LEVEL ENTRIES ON M SPECIFICATION (POSITIONS 63-64).

*Severity:* Terminal

*Specification Type:* M

*Explanation:* Refer to *Column 63 (Type)* and *Column 64 (Mode)* in Chapter 6, *M Specification*.

**WSU-0234** INVALID ERROR INDICATOR ENTRY (POSITIONS 61-62) ON T OR M SPECIFICATION.

*Severity:* Warning

*Specification Type:* T or M

*Explanation:* Positions 61-62 of the T or M specification must be an indicator from 01-89.

**WSU-0235** LOCAL FIELDS DEFINITION ASSUMES MORE SPACE THAN AVAILABLE IN WORK STATION LOCAL DATA AREA.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* The I specifications in the program's data dictionary specify fields that have a total length greater than 256 bytes.

**WSU-0236** INVALID LENGTH OF BINARY FIELD ENTRY (POSITIONS 44-51). MUST BE 2 OR 4. ASSUME 2.

*Severity:* Terminal

*Specification Type:* I

*Explanation:* Refer to *COLUMNS 44-51 (Field Location)* in Chapter 3, *RPG I Specifications*.

**WSU-0237** TYPE AND LEVEL ENTRIES  
(POSITIONS 63-64) MUST BE  
BLANK ON T SPECIFICATIONS.

Severity: Warning

Specification Type: T

Explanation: Type and level entries must be blank on  
T specifications. Assume blank.

**WSU-0238** PACKED OR BINARY FIELD  
SPECIFIED FOR SESSION OR  
LOCAL DATA AREA.

Severity: Terminal

Specification Type: I

Explanation: P or B is specified in column 43 of an I  
specification that defines a session-level field or a  
field that is part of a local data area. The entry  
must be blank.

**WSU-0253** (This message is a WSU-displayed  
message. Refer to the *Displayed  
Messages* manual for its explanation.)

**WSU-0254** WSU GENERATOR COMPILATION  
ERROR ENCOUNTERED DURING  
INITIAL SYNTAX CHECKS.

Severity: Terminal

**WSU-0255** INVALID HEADER RECORD  
IDENTIFYING INDICATOR ENTRY  
(POSITIONS 55-56). MUST BE A  
TRANSACTION FILE RECORD  
IDENTIFYING INDICATOR.  
ASSUME BLANK.

Severity: Warning

Specification Type: T

**WSU-0256** INVALID INSERT/REVIEW MODE  
RECORD IDENTIFYING  
INDICATOR ENTRY (POSITIONS  
48-59). ASSUME BLANK.

Severity: Warning

Specification Type: S

Explanation: Refer to *Columns 48-49, 50-51, 52-53  
(Review Mode Record Identifying Indicators)* and  
*Columns 54-55, 56-57, 58-59 (Insert Mode  
Record Identifying Indicators)* in Chapter 7, *S  
Specification*.

**WSU-0257** CONSTANT TYPE ENTRY  
(POSITION 56) MUST NOT BE M  
IF FIELD NAME ENTRY  
(POSITIONS 7-12) NOT BLANK.  
ASSUME BLANK.

Severity: Warning

Specification Type: D

**WSU-0258** CONSTANT TYPE ENTRY  
(POSITION 56) MUST NOT BE F,  
D, OR C IF FIELD NAME ENTRY  
BLANK.

Severity: Terminal

Specification Type: D

**WSU-0259** CONSTANT TYPE ENTRY  
(POSITION 56) MUST BE M OR P  
WHEN FIELD NAME ENTRY  
(POSITIONS 7-12) IS BLANK.

Severity: Terminal

Specification Type: D

**WSU-0260** EDIT CODE ENTRY (POSITION 25)  
MUST BE BLANK IF FIELD NAME  
ENTRY (POSITIONS 7-12) IS  
BLANK. ASSUME EDIT CODE  
BLANK.

Severity: Warning

Specification Type: D

**WSU-0261** INPUT ALLOWED ENTRY (POSITION 26) AND OUTPUT DATA ENTRY (POSITIONS 23-24) MUST NOT BOTH BE N OR BLANK IF FIELD NAME ENTRY (POSITIONS 7-12) NOT BLANK. ASSUME INPUT FIELD.

*Severity:* Warning

*Specification Type:* D

**WSU-0262** INPUT ALLOWED ENTRY (POSITION 26) AND OUTPUT DATA ENTRY (POSITIONS 23-24) MUST BOTH BE N OR BLANK IF FIELD NAME ENTRY (POSITIONS 7-12) BLANK. ASSUME POSITIONS 23-24 AND 26 BLANK.

*Severity:* Warning

*Specification Type:* D

**WSU-0263** NON-DISPLAY ENTRY (POSITIONS 43-44) CONFLICTS WITH OTHER FIELD DISPLAY ATTRIBUTES. ASSUME NON-DISPLAY BLANK.

*Severity:* Warning

*Specification Type:* D

*Explanation:* A field cannot be nondisplayed and blinked, intensified, or reversed at the same time.

**WSU-0264** ALL C SPECIFICATIONS ARE IN SUBROUTINES.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The program requires one or more C specifications that are not part of a subroutine. An EXSR operation to execute a subroutine cannot have SR in positions 7-8 and must precede all of the subroutines in the program.

**WSU-0265** MVR MUST FOLLOW DIV WITHOUT HALF ADJUST.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The MVR operation can only follow a DIV operation for which half adjust is not specified.

**WSU-0266** RESULT FIELD ENTRY (POSITIONS 43-52) MUST NOT BE A LITERAL.

*Severity:* Terminal

*Specification Type:* C

**WSU-0267** SAME INDICATOR CODED IN ALL THREE RESULTING INDICATOR POSITIONS.

*Severity:* Warning

*Specification Type:* C

*Explanation:* Since the same indicator is in all three resulting indicator positions, this indicator turns on each time the operation occurs.

**WSU-0268** EXSR OPERATION CANNOT APPEAR IN A SUBROUTINE.

*Severity:* Terminal

*Specification Type:* C

**WSU-0269** NAME IN FACTOR 2 ENTRY (POSITIONS 33-42) MUST BE MASTER OR TRANSACTION FILE NAME.

*Severity:* Terminal

*Specification Type:* C

**WSU-0270** RESET KEYBOARD ENTRY (POSITIONS 23-24) MUST NOT BE N IF FORMAT IS INPUT CAPABLE OR HAS ASSOCIATED PROCESSING. ASSUME KEYBOARD RESET IS Y.

*Severity:* Warning

*Specification Type:* S

**WSU-0271** PREPROCESS ENTRY (POSITION 47) MUST BE N OR BLANK IF FORMAT HAS NO ASSOCIATED PROCESSING. ASSUME N.

*Severity:* Warning

*Specification Type:* S

**WSU-0273** MASTER FILE NAME NOT REFERENCED BY A GET OPERATION.

*Severity:* Warning

*Specification Type:* M and C

*Explanation:* A master file that has been defined for use within the program is not referenced by a GET operation.

**WSU-0274** TRANSACTION FILE NAME NOT REFERENCED BY A PUT OPERATION.

*Severity:* Warning

*Specification Type:* C

*Explanation:* The program contains no PUT operation to the transaction file. If transaction output is desired, a PUT operation to the transaction file must be coded.

**WSU-0275** NO FORMAT NAMES DEFINED.

*Severity:* Terminal

*Specification Type:* S

*Explanation:* A WSU program must define at least one display. Define a display with S and D specifications or S, D, and C specifications.

**WSU-0276** NOT FOUND INDICATOR NOT CODED ON C SPECIFICATION OR ON T OR M SPECIFICATION FOR FILE NAME IN FACTOR 2.

*Severity:* Warning

*Specification Type:* C, T, or M

*Explanation:* A GET operation does not contain a not-found indicator in positions 54-55 of the C specification or in positions 49-50 of the T specification or M specifications for the file named in factor 2. When a record-not-found condition occurs, a message appears at the display station.

**WSU-0277** NOT FOUND INDICATOR CODED ON C SPECIFICATION DOES NOT MATCH THAT ON T OR M SPECIFICATION FOR FILE NAME IN FACTOR 2.

*Severity:* Warning

*Specification Type:* C, T, or M

*Explanation:* The indicator in positions 54-55 for a GET operation does not match the indicator in positions 49-50 of the T specification or M specifications for the file named in factor 2. When a record-not-found condition occurs for this file, the not-found indicator on the C specification turns on.

**WSU-0278** RECORD IDENTIFYING INDICATOR ENTRY (POSITIONS 54-55) MUST BE BLANK FOR PUT OPERATION WITH MASTER FILE NAME IN FACTOR 2. IGNORE INDICATOR.

*Severity:* Warning

*Specification Type:* C

**WSU-0279** INVALID RECORD IDENTIFYING INDICATOR ENTRY (POSITIONS 54-55). MUST BE BLANK OR A TRANSACTION FILE RECORD IDENTIFYING INDICATOR. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* C or I

*Explanation:* A PUT operation with the transaction file name in factor 2 has an indicator specified in positions 54-55, but this indicator is not a record identifying indicator in the transaction file.

**WSU-0280** NAME IN FACTOR 2 ENTRY (POSITIONS 33-42) MUST BE MASTER FILE NAME FOR GET OPERATION.

*Severity:* Terminal

*Specification Type:* C

**WSU-0281** NAME IN FACTOR 2 ENTRY (POSITIONS 33-42) MUST BE FORMAT NAME FOR PUTS OPERATION.

Severity: Terminal

Specification Type: C

Explanation: Factor 2 of the PUTS operation is not defined in positions 7-14 of an S specification.

**WSU-0282** INVALID PUTS OPERATION FOR PROCESSING LEVEL FORMAT.

Severity: Terminal

Specification Type: C

Explanation: A PUTS operation can reference a processing level (IJ, IW, EW, or EJ,) display only if:

- The processing level C specification is the same as the processing level of the display and
- Preprocessing is specified for the display

**WSU-0283** NAME IN FACTOR 2 ENTRY (POSITIONS 33-42) MUST BE TRANSACTION FILE NAME FOR GETNR, GETPR, GETNH, OR GETPH OPERATIONS.

Severity: Terminal

Specification Type: C

**WSU-0284** NO PRIMARY FORMAT SEQUENCE SPECIFIED.

Severity: Terminal

Specification Type: S

Explanation: Refer to *Using Columns 41-42 to Specify a Sequence of Displays* in Chapter 7, S Specification.

**WSU-0285** FORMAT NAME ENTRY (POSITIONS 7-14) NOT UNIQUE.

Severity: Terminal

Specification Type: S

Explanation: Refer to *Format Name* in Chapter 7, S Specification.

**WSU-0286** FORMAT SEQUENCE STARTED BUT NOT ENDED. ASSUME END ENTRY (POSITION 42) IS Y.

Severity: Warning

Specification Type: S

Explanation: An S specification with a Y in position 41 has no corresponding S specification with a Y in position 42. A Y is assumed in position 42 of the S specification that is indicated by the error.

**WSU-0287** TRANSACTION FILE RETRIEVAL INVALID FOR A PROGRAM WITHOUT A TRANSACTION FILE.

Severity: Terminal

Specification Type: None

Explanation: A GETNR, GETPR, GETNH, or GETPH operation has been coded for a program that does not specify a transaction file.

**WSU-0288** FACTOR 1 ENTRY (POSITIONS 18-27) MUST NOT BE A LITERAL.

Severity: Terminal

Specification Type: C

**WSU-0289** FACTOR 2 ENTRY (POSITIONS 33-42) MUST NOT BE A LITERAL.

Severity: Terminal

Specification Type: C

**WSU-0290** RETURN INPUT ENTRY (POSITION 22) MUST BE N IF FORMAT NOT INPUT CAPABLE. ASSUME N.

Severity: Warning

Specification Type: S

**WSU-0291** ENTRY REQUIRED ENTRY (POSITION 43) IS Y BUT FORMAT IS NOT INPUT CAPABLE.

Severity: Warning

Specification Type: S

**WSU-0292** GETPH OR GETNH OPERATION SPECIFIED IN OPERATION ENTRY (POSITIONS 28-33) BUT TRANSACTION FILE DOES NOT HAVE HEADER RECORDS.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* GETPH and/or GETNH operation specified, but the transaction file has no header records (Columns 55-56 of the T specification are blank).

**WSU-0293** HIGH INTENSITY, REVERSE IMAGE, AND UNDERLINE ENTRIES (POSITIONS 39-40, 45-46, AND 47-48) MUST NOT ALL BE Y OR THE SAME INDICATOR.

*Severity:* Terminal

*Specification Type:* D

*Explanation:* Any two of the three attributes may be specified for the same field at the same time.

**WSU-0294** OUTPUT DATA ENTRY (POSITIONS 23-24) MUST BE N OR BLANK WHEN CONSTANT TYPE ENTRY (POSITION 56) IS M, D, OR C. ASSUME OUTPUT DATA BLANK.

*Severity:* Warning

*Specification Type:* D

**WSU-0295** POSITION CURSOR ENTRY (POSITIONS 32-33) MUST NOT BE Y FOR MORE THAN ONE FIELD PER FORMAT.

*Severity:* Terminal

*Specification Type:* D

**WSU-0296** THIS FORMAT SPECIFIES DATA ON A LINE THAT IS NOT CLEARED.

*Severity:* Warning

*Specification Type:* D

*Explanation:* A field has been positioned (via the line number entry on a D specification) on a line that will not be cleared when the display is shown. If the data overlays an attribute byte on the uncleared line, the program ends abnormally.

**WSU-0297** FACTOR 2 ENTRY (POSITIONS 33-42) MUST BE INDEXED MASTER FILE NAME FOR PUTN OPERATIONS.

*Severity:* Terminal

*Specification Type:* C

**WSU-0298** RECORD TYPE SPECIFIED ON A PUTN OPERATION IS NOT DEFINED AS A RECORD TYPE FOR THE FILE.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The indicator coded in positions 54-55 of a PUTN operation is not a valid record type for the file named in factor 2.

**WSU-0320** LISTED INDICATORS DEFINED BUT NOT REFERENCED.

*Severity:* Warning

*Specification Type:* I, T, M, or C

*Explanation:* The indicators listed are neither tested by WSU nor used to condition processing on an S, D, or C specification. In the program, these indicators are associated with a not-found condition, explicitly set on or set off, associated with a record type, or used as resulting indicators.

**WSU-0321** LISTED INDICATORS  
REFERENCED BUT NOT DEFINED.

*Severity:* Warning

*Specification Type:* I, T, M, or C

*Explanation:* The indicators listed are used to condition processing on an S, D, or C specification, however the indicators are not:

- Associated with a not-found condition
- Explicitly set on or set off
- Associated with a record type
- Used as a resulting indicator
- Set by WSU

**WSU-0324** DERIVED LENGTH FOR MIC  
CONSTANT MUST BE GREATER  
THAN OR EQUAL TO 6.  
ASSUME 0.

*Severity:* Terminal

*Specification Type:* D

*Explanation:* The minimum allowed length of a message is 6 characters.

**WSU-0325** LISTED FIELD NAME DEFINED  
BUT NOT REFERENCED.

*Severity:* Warning

*Specification Type:* I, M, D, or C

*Explanation:* The field is defined on an I specification for a master file, but this field is not referenced on an M, D, or C specification.

**WSU-0326** LISTED FIELD NAME DEFINED ON  
MULTIPLE I OR C SPECIFICATION  
WITH CONFLICTING  
CHARACTERISTICS OR FORMAT.  
ASSUME DEFINITION IN NAME  
TABLES.

*Severity:* Warning

*Specification Type:* I or C

**WSU-0327** LISTED FIELD NAME  
REFERENCED BUT NOT DEFINED

*Severity:* Terminal

*Specification Type:* I, M, D, or C

*Explanation:* A field name on an M, D, or C specification was not defined by an I specification or C specification.

**WSU-0328** FACTOR 1 ENTRY (POSITIONS  
18-27) FOR DEBUG OPERATION  
CODE MUST HAVE A FIELD  
LENGTH OF 8 OR FEWER  
POSITIONS.

*Severity:* Terminal

*Specification Type:* C

**WSU-0350** CHAIN FIELD NAME ENTRY  
(POSITIONS 31-36, 37-42, OR  
43-48) MUST NOT BE A  
PROGRAM LABEL NAME.

*Severity:* Terminal

*Specification Type:* M

*Explanation:* A chain field name in positions 31-48 cannot be the same as a label in the program. Program labels are factor 1 of a TAG, BEGSR, OR ENDSR operation and factor 2 of a GOTO or EXSR operation.

**WSU-0351** LENGTH FOR CHAIN FIELD NAME  
ENTRY (POSITIONS 31-48) MUST  
BE LESS THAN OR EQUAL TO 6  
FOR DIRECT FILES.

*Severity:* Terminal

*Specification Type:* M

**WSU-0352** SUM OF LENGTHS FOR CHAIN  
FIELD NAME ENTRIES  
(POSITIONS 31-48) MUST EQUAL  
LENGTH OF KEY FIELD.

*Severity:* Terminal

*Specification Type:* M or F

*Explanation:* The sum of the lengths of chain fields specified on the M specification must equal the length of the key field specified on the F specification.



**WSU-0353** CHAIN FIELD NAME (POSITIONS 31-48) MUST BE NUMERIC FOR DIRECT FILES OR FILES WITH PACKED KEYS.

Severity: Terminal

Specification Type: M

**WSU-0354** TOO MANY CHAIN FIELD NAME (POSITIONS 31-48). MAXIMUM IS 1 FOR DIRECT FILES OR FILES WITH PACKED KEYS.

Severity: Terminal

Specification Type: M

**WSU-0355** FIELD OVERLAPS A FIELD PREVIOUSLY SPECIFIED IN THIS FORMAT.

Severity: Terminal

Specification Type: D

*Explanation:* Refer to *Guidelines for Planning a Display* in Chapter 8, *D Specification*.

**WSU-0356** TOO MANY FIELDS DEFINED FOR A FORMAT. MAXIMUM IS 256.

Severity: Terminal

Specification Type: D

*Explanation:* Refer to *Guidelines for Planning a Display* in Chapter 8, *D Specification*.

**WSU-0357** EDIT CODE ENTRY (POSITION 25) MUST NOT BE Y FOR SPECIFIED FIELD NAME ENTRY (POSITIONS 7-14). ASSUME EDIT CODE ENTRY BLANK.

Severity: Warning

Specification Type: D

*Explanation:* When a Y edit code is used, the field named in positions 7-12 must contain at least three digits and must contain no more than six digits. Also this field cannot have decimal positions.

**WSU-0358** EDIT CODE ENTRY (POSITION 25) MUST BE BLANK FOR ALPHANUMERIC OR INPUT FIELDS. ASSUME BLANK.

Severity: Warning

Specification Type: D

*Explanation:* Edit codes are valid only for numeric output fields.

**WSU-0359** FIELD NAME ENTRY (POSITIONS 7-14) MUST NOT BE PROGRAM LABEL.

Severity: Terminal

Specification Type: D

*Explanation:* The field name in positions 7-14 cannot be the same as a label in the program. Program labels are factor 1 of a TAG, BEGSR, or ENDSR operation and factor 2 of a GOTO or EXSR operation.

**WSU-0360** FIELD IN A TABLE MUST BE ALL NUMERIC OR ALL ALPHANUMERIC.

Severity: Terminal

Specification Type: C

**WSU-0361** FIELDS OF A COMP OR RANGE OPERATION MUST BE ALL NUMERIC OR ALL ALPHANUMERIC.

Severity: Terminal

Specification Type: C

**WSU-0362** DATA TYPE ENTRY (POSITION 27) IS S BUT SPECIFIED FIELD NAME ENTRY (POSITIONS 7-12) IS LONGER THAN 15 CHARACTERS.

Severity: Terminal

Specification Type: D

*Explanation:* Signed-numeric input fields must be 15 digits or less.

**WSU-0363** RESULT FIELD ENTRY  
(POSITIONS 43-48) MUST BE  
ALPHANUMERIC.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* \*BLANK can be used in factor 2 of a  
MOVE operation to set only alphameric result  
fields to blanks.

**WSU-0364** PROGRAM LABEL IN FACTOR 2  
ENTRY (POSITIONS 33-42) MUST  
BE DEFINED IN SAME C  
SPECIFICATION GROUP.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* A GOTO operation references a label on  
a TAG operation that is not in the same set of  
processing.

**WSU-0365** FACTOR 2 ENTRY (POSITIONS  
33-42) MUST BE TAG OR ENDSR  
PROGRAM LABEL FOR GOTO  
OPERATIONS.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Factor 2 of a GOTO operation must be  
factor 1 of a TAG or ENDSR operation within the  
same set of processing.

**WSU-0366** FACTOR 2 ENTRY (POSITIONS  
33-42) MUST BE BEGSR  
PROGRAM LABEL FOR EXSR  
OPERATIONS.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Factor 2 of an EXSR operation must be  
factor 1 of a BEGSR operation.

**WSU-0367** FACTOR 1 ENTRY (POSITIONS  
18-27) MUST BE NUMERIC.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Arithmetic operations require numeric  
fields in factor 1, factor 2, and the result field.  
Factor 1 is not numeric.

**WSU-0368** FACTOR 2 ENTRY (POSITIONS  
33-42) MUST BE NUMERIC.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Arithmetic operations require numeric  
fields in factor 1, factor 2, and the result field.  
Factor 2 is not numeric.

**WSU-0369** RESULT FIELD ENTRY  
(POSITIONS 43-48) MUST BE  
NUMERIC.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Arithmetic operations require numeric  
fields in factor 1, factor 2, and the result field. The  
result field is not numeric.

**WSU-0370** FACTOR 1 ENTRY (POSITIONS  
18-27) MUST NOT BE A  
PROGRAM LABEL.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Factor 1 can be a program label for only  
the TAG, BEGSR, and ENDSR operations.

**WSU-0371** FACTOR 2 ENTRY (POSITIONS  
33-42) MUST NOT BE A  
PROGRAM LABEL.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Factor 2 can be a program label for only  
the GOTO and EXSR operations.

**WSU-0372** RESULT FIELD ENTRY  
(POSITIONS 43-48) MUST NOT  
BE A PROGRAM LABEL.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* The result field cannot be a program  
label. Program labels can only be factor 1 of a  
TAG, BEGSR, or ENDSR operation and factor 2 of  
a GOTO or EXSR operation.

**WSU-0373** FIELD EXTENDS OFF LAST SCREEN LINE.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* A field has overlapped to the bottom line of a display.

**WSU-0374** FIRST FIELD IN A TABLE IS A PROGRAM LABEL. ASSUME NUMERIC FIELDS IN TABLE.

*Severity:* Terminal

*Specification Type:* C

**WSU-0375** SELF-CHECK ENTRY (POSITION 30) MUST BE BLANK FOR ALPHANUMERIC FIELDS. ASSUME BLANK.

*Severity:* Warning

*Specification Type:* D

**WSU-0376** RESULT FIELD ENTRY (POSITIONS 43-51) FOR TIME OPERATION CODE MUST BE EITHER 6 OR 12 CHARACTERS WITH ZERO DECIMAL POSITIONS.

*Severity:* Terminal

*Specification Type:* C

*Explanation:* Refer to the description of the TIME operation code in *Columns 28-32 (Operation)* in Chapter 9, *C Specification*.

**WSU-0377** ODD LENGTH CONFLICTS WITH DATA TYPE F OR X FOR SCREEN FIELD.

*Severity:* Terminal

*Specification Type:* D

*Explanation:* Data type F or X in column 27 of the D specification can be specified only for even-length fields.

**WSU-0395** WORK STATION LOCAL DATA AREA FIELDS MUST BE DEFINED AS ALL MODE LEVEL OR ALL SESSION LEVEL, NOT MIXED.

*Severity:* Terminal

*Specification Type:* M or I

**WSU-0396** TOTAL SIZE OF FIELDS EXCEEDS 64 K.

*Severity:* Terminal

*Explanation:* The total size of all fields referenced in the program exceeds 64 K. These fields are listed under Workstation Level Data Field Names Used in the list printed during program generation. Either reduce the size of fields or reduce the number of fields used in the program.

**WSU-0397** MINIMUM REGION REQUIRED FOR EXECUTION EXCEEDS 64 K.

*Severity:* Terminal

*Explanation:* The minimum region size required for the program exceeds 64 K. Either reduce the size of fields or reduce the number of fields used in the program. These fields are listed under Workstation Level Data Field Names Used in the list printed during program generation.

**WSU-0398** MAXIMUM REGION SIZE CAN NOT EXCEED 64 K DUE TO SYSTEM RESTRICTIONS.

*Severity:* Warning

*Specification Type:* None

*Explanation:* The WSU execution program is capable of occupying a region greater than 64 K, but the largest region available is 64 K.

**WSU-0399** MINIMUM REGION REQUIRED  
FOR EXECUTION EXCEEDS  
REGION SIZE SPECIFIED.  
GENERATED PROCEDURE  
ASSUMES LARGER VALUE.

*Severity:* Warning

*Specification Type:* J

*Explanation:* The minimum region size that has been calculated for execution is greater than the region size specified in positions 41-42 of the J specification (or the default region size if positions 41-42 are blank). WSU places the minimum region size into the generated WSU procedure. You can use the procedure as is or reduce the size of the program so that it fits in this region and regenerate the program.

**WSU-0480** (This message is a WSU displayed message. Refer to the *Displayed Messages* manual for an explanation of it.)

**WSU-0497** UNABLE TO CONTINUE  
EXTENDED DIAGNOSTICS

*Severity:* Terminal

*Explanation:* Extended diagnostics cannot be completed because of terminal errors found in the program. Correct these terminal errors and regenerate the program.

**WSU-0510** WSU COMMON DATA AREA AND  
DYNAMIC TABLES OUT OF  
SYNC.

*Severity:* Terminal

*Explanation:* A system error has occurred. Contact IBM for programming support.

**WSU-0511** WSU COMMON DATA AREA AND  
WORKFILE OUT OF SYNC.

*Severity:* Terminal

*Explanation:* A system error has occurred. Contact IBM for programming support.

**WSU-0600** and higher

(These messages are WSU displayed messages. Refer to the *Displayed Messages* manual for explanations of them.)



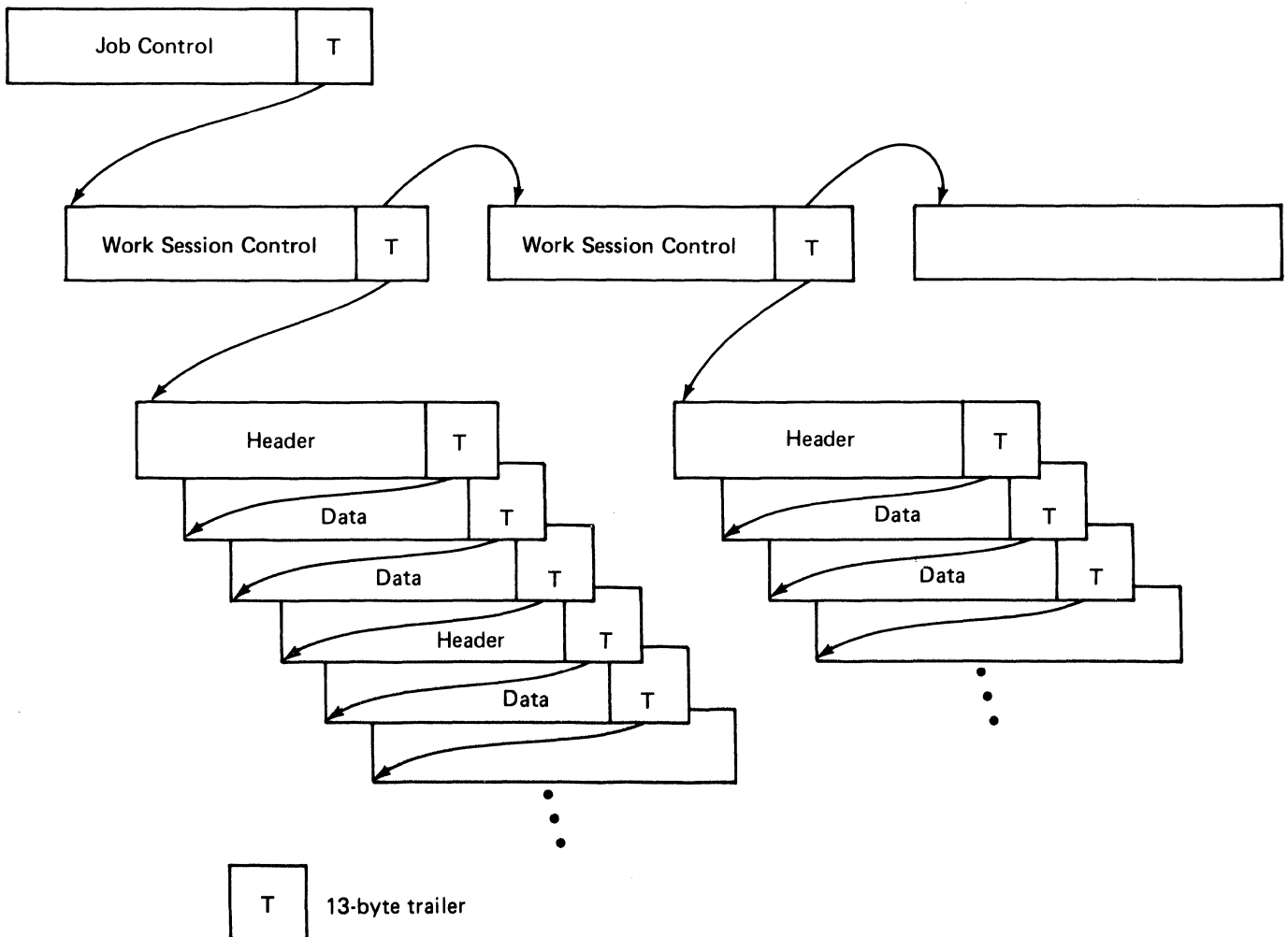
## Chapter 17. Extract/Create Utility and Transaction File Create/Recover Utility

The Extract/Create utility (#TXEX) and the Transaction File Create/Recover utility (#TXCR) are utilities supplied with WSU that offer useful file processing capabilities. The utilities process WSU transaction files and non-WSU files (but not immediate access files). A WSU transaction file is a direct file that differs from a normal file on System/34 in the following ways:

- A WSU transaction file has control records and data records. Control records consist of one job control record, one or more work session control records, and one or more blank chain end records. One work session control record exists for each chain of data records entered from the display station. One blank chain end record is required for each job and work session control record.

- All data records and control records in a WSU file contain 13 bytes of trailer information at the end of the record. See Appendix B for the information contained in the trailers.

Trailers contain information that WSU uses to logically chain records together for each distinct work session. WSU allows logical insertion and deletion of records within each chain and prevents more than one display station at a time from accessing records that are entered for a session.



The following procedures request functions of the Extract/Create utility and Transaction File Create/Recover utility. You can use the indicated procedure command to request that procedure.

| Procedure   | Procedure Command | Utilities Called         |
|-------------|-------------------|--------------------------|
| Rebuild     | REBLD             | #TXEX                    |
| Extract     | EXTRACT           | #TXEX                    |
| WSU Extract | WSUTXEX           | \$COPY and #TXEX         |
| WSU Create  | WSUTXCR           | \$COPY, #TXEX, and #TXCR |
| WSU Recover | WSUTXRV           | #TXCR                    |

Each procedure command has a help display that you can use to help you enter the command parameters.

This chapter describes each procedure, its major functions, command statement format, command parameters, and help display. Examples of using each procedure are also provided.

## TYPICAL USES OF THE WSU PROCEDURES

You can use the Rebuild, Extract, WSU Extract, WSU Create, and WSU Recover procedures to do functions that you did in previous System/34 releases with SSP procedures or with the SUBR22 subroutine in RPG II. The following examples describe some typical uses of these WSU procedures:

### Prepare a WSU Transaction File for use by a Non-WSU Program

You can prepare a WSU transaction file for use by a non-WSU program in any of these ways:

- Use the WSU Extract procedure or RPG subroutine SUBR22 to extract records in logical order from the WSU transaction file.
- Use the Extract or the WSU Extract procedure to extract only data records from the WSU transaction file.
- Use the WSU Extract procedure to copy the WSU transaction file and remove trailers from its records.

### Change File Organization

The Rebuild procedure can copy and change the organization of a file. If the index was put in when the WSU transaction file was built, this allows you to change a file of data records extracted from a WSU transaction file into an indexed or sequential file.

### Remove Blank Records

The Extract procedure or WSU Extract procedure can extract and print nonblank records from a WSU transaction file. Also, the Extract procedure can select and copy a limited number of records from a WSU transaction file. These functions are useful for removing blank records that WSU requires in its transaction files and increasing the number of records in the file that are available.

### **Create One Record Chain from Several Record Chains**

The WSU Extract procedure and the WSU Create procedure can extract one or more record chains, recreate a WSU transaction file from them, and assign the same display station ID to all of the records in the new file. WSU only allows a display station to review records for the session that is currently active for the display station. Therefore, these procedures are useful when you need an efficient way to view multiple chains from one display station.

*Note:* To temporarily change a transaction file to assign the same display station ID to all the records requires that the file provide extra space for a new trailer for the extracted records. The display station ID is assigned in the new trailer. Because of the longer record length, a different WSU program is required to review the records. The extra space can be removed from the records when the changed transaction file is no longer needed, which results in a file that can be processed (or recreated for processing) by the original WSU program.

### **Print Relative Record Numbers**

The WSU Extract procedure can select and print records for a work session in logical order. The relative number of each record is printed. The WSU menu allows an operator to review a record by entering its relative record number. Using the Extract procedure to print a list of relative record numbers can help the operator know what relative numbers to specify on the WSU menu.

### **Create a WSU File from a Non-WSU File**

The WSU Create procedure can create a WSU transaction file from a non-WSU file. This function is useful if initial data entry is done using a non-WSU program and you want to convert the file to a WSU transaction file so that it can be maintained interactively by a WSU program.

### **Reorder or Exclude Record Chains**

The logical order of the session chains in a WSU file is the order in which the work session control records are in the file. The WSU Extract and WSU Create procedures are useful for putting the session chains in another order (for example, by display station ID—W1,W2,...) or for excluding unwanted chains. The WSU Extract procedure can extract session chains in a specified order (collecting the records into a single file) and the WSU Create procedure can recreate a WSU transaction file from them.

### **Concatenate Multiple Transaction Files**

The WSU Extract procedure can collect records from multiple WSU transaction files into a single file and from them the WSU Create procedure can recreate one WSU Transaction file on the disk. A WSU program can create multiple files, for example, if it is run on more than one System/34 or if it is run on different days on the same System/34. The WSU Extract and WSU Create procedures are used to put the data back into one file.

### **Reclaim or Remove Partially Inserted Records**

The WSU Recover procedure can reclaim or remove partially inserted records from a WSU transaction file. Records that were being inserted when the WSU program ended abnormally become partially inserted because the pointers in their trailers are not correct. These records can cause errors when WSU tries to reuse them as blank chain records. The WSU Recover procedure is useful for reclaiming or removing those records before they confuse an operator.

### **Remove Partially Inserted and Logically Deleted Records**

The WSU Recover procedure or the WSU Extract procedure in conjunction with the WSU Create procedure can be used to delete partially inserted and logically deleted (unchained) records from a WSU transaction file. Partially inserted and logically deleted records should be removed from a WSU file to improve program performance. When there are no partially inserted or logically deleted records in a file, WSU can access a record that is requested by the relative record number if the record has the current work session ID in the trailer. Otherwise, WSU must scan the session chain for the selected record to ensure that access can be allowed.



## Recover a WSU Transaction File

The WSU Recover procedure can recover a WSU transaction file. A transaction file in need of recovery can have the following symptoms:

- The WSU program that uses it cannot be initialized.
- A work session cannot be resumed.
- A new work session cannot begin.
- Data records cannot be added from a current work session.
- The job or a session ends abnormally when an unidentified record is encountered.

## REBUILD PROCEDURE (REBLD)

### Major Functions

The Rebuild procedure can be used to rebuild a disk file (but not an immediate access file). Rebuilding is done as records are copied from the input file on disk to an output file on disk. Any of the following types of rebuilding can be requested:

- Create a sequential file from an indexed, sequential, or direct file.
- Create a direct file from an indexed, sequential, or direct file.
- Create an indexed file from an indexed, sequential, or direct file.
- Copy records from an indexed input file in key sequence.
- Copy only those records that contain data from the input file.
- Change the amount of disk space (number of records) that is allocated for the output file.

- Specify a longer record length and extend each record with blanks.
- Specify a shorter record length and truncate each record.

The Rebuild procedure calls the Extract/Rebuild (#TXEX) utility.

### Command Statement Format

REBLD input file label, output file label, [number of records]

[record length] , [ S  
I  
D ] , [key position] , [key length]

[REORG] , [ 'include-not-equal character'  
include-not-equal hexadecimal value ]

## Parameters

*input file label:* Specifies the label of the input file.

*output file label:* Specifies the label of the output file. This file must not be on disk when the REBLD command is entered. The output file is given a temporary retention.

*number of records:* Specifies the number of records that are allocated for the output file. If the number of records is not specified, the default used for this parameter is either the number of records actually used in the input file (if the S/I/D parameter is specified) or the number of blocks or records originally allocated for the input file (if the S/I/D parameter is not specified).

*record length:* Specifies the record length for the output file. If this record length is longer than the records in the input file, records are extended and padded with blanks when they are copied to the output file. If this record length is shorter than the records in the input file, records are truncated to this length when they are copied to the output file.

If the record length is not specified, the default used for this parameter is the record length of the input file.

*S/I/D:* S specifies that a sequential output file will be created from the input file, I specifies that an indexed output file will be created from the input file, and D specifies that a direct output file will be created from the input file.

If this parameter is omitted, the organization of the input file is assumed for the output file.

*key position:* Specifies the position of the leftmost byte of the key field in each record in the output file. Each output record must contain a unique key value at this position. The position must not exceed 999. If a key position is omitted, the key position in the input file is the default value.

*key length:* Specifies the length of the key field in each record of the output file. The length can be from 1 to 29, however the rightmost byte of the key field cannot extend beyond the end of the output record. If a key length is omitted, the length of the key in the input file is the default value.

*Note:* The position and length parameters are ignored under the following conditions:

- The S/I/D parameter is S, D, or blank.
- The position is specified but the length is blank.
- The length is specified but the position is blank.

If I is specified for the S/I/D parameter, if the position and length are blank, and if the input file is indexed, then the key position and key length in the output file are the same as the key position and key length in the input file. If the input file is not an indexed file, or if the rightmost byte of the key field is in the truncated portion of shortened records, an error message is displayed.

*REORG:* Specifies that the input file records are read sequentially by key. This parameter can be used only for an *indexed* input file.

*'include-not-equal character':* Specifies one character enclosed in apostrophes. Input records that contain this character in every position of the record are excluded from the output file.

*include-not-equal hexadecimal value:* Specifies the hexadecimal representation of one character. This value must begin with X and must not be enclosed in apostrophes. Input records that contain this hexadecimal value in every position of the record are excluded from the output file. For example, X40 can be used to exclude blank records from the output file.

*Note:* In a direct file, no records are considered unused. If blank records are to be treated as unused, they must be excluded using X40.

## Help Display

| REBLD PROCEDURE                                            | OPTIONAL-(0) |
|------------------------------------------------------------|--------------|
| Rebuilds an existing disk file.                            |              |
| Label Of The Input File .....                              | -            |
| Label Of The Output File .....                             |              |
| Number Of Records To Allocate (1-8000000) .....            | (0)          |
| Record Length (1-4096) .....                               | (0)          |
| Output File Type (S/I/D) .....                             | (0)          |
| Starting Position Of The Key (1-999) .....                 | (0)          |
| Length Of The Key (1-29) .....                             | (0)          |
| To Copy Records In Key Order, Enter REORG .....            | (0)          |
| Character String For Records To Be Omitted ('C'/Xhh) ..... | (0)          |

## Examples

- Increase the length of records in a direct transaction file name TRAN from 80 positions to 82 positions. Assume that space has been provided in TRAN to allow for the longer record length.

```
REBLD TRAN,TRANX,,82,D
```

- Transfer records from a file named TRAN to a new file named NTRAN and change the file organization from direct to sequential.

```
REBLD TRAN,NTRAN,,,S
```

- Create an indexed file (TRANI1) from the nonblank records in a direct file (TRAND). The key field is a sequence number in positions 73-79 in TRAND. The key field must contain unique values, but the keys do not have to be in ascending sequence. If blank records are copied to an indexed file, duplicate key errors occur.

```
REBLD TRAND,TRANI1,,,I,73,7,,X40
```

- Copy records in key sequence from one indexed file (TRANI1), which has a considerable amount of unused space, to a new indexed file (TRANI2). TRANI2 should be large enough to contain only the actual number of records in TRANI1.

```
REBLD TRANI1,TRANI2,,,I,,,REORG
```

- Create a sequential file (TRANS) from an indexed file (TRANI2). Records are copied in key sequence and the key field at the end of each record (positions 66-71) is dropped when the record is copied.

```
REBLD TRANI2,TRANS,,65,S,,,REORG
```

## EXTRACT PROCEDURE (EXTRACT)

### Major Function

The Extract procedure can be used to extract records from a disk file (but not an immediate access file) according to user-specified selection criteria. Records can be printed, displayed, or placed in a disk file. The output file is a sequential file.

The Extract procedure calls the #TXEX utility.

### Command Statement Format

EXTRACT input file label,  $\left[ \begin{array}{l} \text{OUTPTX} \\ \text{output file label} \\ \text{IGC} \end{array} \right]$ ,  $\left[ \begin{array}{l} \text{T} \\ \text{P} \\ \text{J} \\ \text{S} \end{array} \right]$ ,  $\left[ \begin{array}{l} \text{INCLUDE} \\ \text{OMIT} \end{array} \right]$ ,  $\left[ \begin{array}{l} \text{EQ} \\ \text{NE} \\ \text{LT} \\ \text{GE} \\ \text{GT} \\ \text{LE} \end{array} \right]$ , [search position],  
 $\left[ \begin{array}{l} \text{'character string'} \\ \text{hexadecimal value} \end{array} \right]$ , [maximum number of records]

### Parameters

*input file label:* The label of the disk input file from which records are extracted. Records are processed in physical order.

*OUTPTX:* Extracted records are printed or displayed on the system list device. For a direct file or sequential file, each extracted record is preceded by the relative record number it has in the input file. For an indexed file, each extracted record is preceded by the key it has in the input file.

The hexadecimal representation of the characters in the records is shown as follows:

|   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | 2 | 3 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | E | F | F |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 6 | 2 | 3 |

The hexadecimal representation of character W is E6, for example.

These hexadecimal values do not have printable characters.

If a display station is the system list device, the records are displayed one at a time. The operator can use command key 2 to page backward through the set of extractable records. The extract operation is not terminated when all the records have been displayed; display of the current extractable record is repeated when the operator requests backward or forward paging and there is no previous or next extractable record. If the input file is shared with a program that is adding or updating records, the operator using the Extract procedure can monitor changes that are made in the set of extractable records.

*IGC*: Extracted records contain ideographic characters that are to be printed or displayed on the current syslist device. If your System/34 does not have ideographic support, IGC is ignored and OUTPTX is assumed. If the current syslist device does not support ideographic characters, a message is displayed and you can select option 0 to continue processing as though OUTPTX had been specified for this parameter.

*Note*: If the OUTPTX/output-file-label/IGC parameter is blank, extracted records are treated as if OUTPTX had been specified. If a printer is the system list device, the hexadecimal representation is shown only for unprintable characters. The previous example would be printed as follows:

```
                W 2 3
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 4
```

*output file label*: The label of the disk output file that contains the extracted records. This file must not exist when the command is entered.

*T/P/J/S*: T specifies temporary retention of the output file, P specifies permanent retention of the output file, J specifies retention of the output file for the duration of the job, and S specifies retention of the file for the duration of the job step. An entry of S means that subsequent job steps will not be able to use the file.

| *Note*: If a retention is specified and the output file label is omitted, the retention is used to allocate the input file, which allows a temporary input file to be displayed and then scratched.

*INCLUDE*: Specifies that those records that meet the selection criteria are extracted from the file.

*OMIT*: Specifies that those records that meet the selection criteria are not extracted from the file.

*EQ, NE, LT, GE, GT, LE*: Specifies the type of comparison for the selection criteria:

- EQ The character string or hexadecimal value in the record equals the specified character string or hexadecimal value.
- NE The character string or hexadecimal value in the record does not equal the specified character string or hexadecimal value.
- LT The character string or hexadecimal value in the record is less than the specified character string or hexadecimal value.
- GE The character string or hexadecimal value in the record is greater than or equal to the specified character string or hexadecimal value.
- GT The character string or hexadecimal value in the record is greater than the specified character string or hexadecimal value.
- LE The character string or hexadecimal value in the record is less than or equal to the specified character string or hexadecimal value.

*search position*: Specifies the leftmost record position, to be compared with either the leftmost character in the character string or the leftmost hexadecimal character in the hexadecimal value. The maximum position is 4096; however, it must not exceed the record length.

If the search position value is zero or blank, it indicates a floating search position. The first comparison is made at record position one, the next comparison is made at record position two, and so on until the search condition is satisfied or until there are no more input record positions to test.

If you specify *INCLUDE, NE, O, X40*, all records that do not contain all blanks are extracted from the record set. Records that contain all blanks are not extracted from the file.

If you specify *OMIT, EQ, O, X40*, any records that contain blank characters are not extracted from the file.

*'character string'*: The character string parameter consists of one to six characters that are enclosed in apostrophes. It is compared with the contents of each record at a specified or floating search position. The character string cannot have embedded blanks, commas, hyphens (-), or single apostrophes.

*hexadecimal value*: The hexadecimal value parameter consists of the hexadecimal representation of one to three characters. It is compared with the contents of each record at a specified or floating search position in each record, if the search position parameter is zero or blank. The hexadecimal value must begin with X and must not be enclosed in apostrophes. For example, X40, is a valid hexadecimal value.

*Note*: If the character string/hexadecimal value parameter is omitted and a search position is specified, the default used for each record is the contents in the search position. The search position is the first and only position searched in each record.

If the character string/hexadecimal value parameter is omitted and the search position is zero or blank, a floating search is done. The default used for each record is the contents of the first record position.

*maximum number of records*: Specifies the maximum number of records that can be extracted. If this parameter is omitted, the number of records used in the input file is the maximum number of records. This parameter is ignored if the extracted records are displayed.

This parameter must be specified if the retention of the input file is specified as S or J. Otherwise, the system issues error message SYS-4120.

## Help Display

| EXTRACT PROCEDURE                                                      | OPTIONAL-(0) |
|------------------------------------------------------------------------|--------------|
| Selectively extracts records from a disk file on the basis of content. |              |
| Input File Label .....                                                 | -            |
| Output File Label, OUTPTX, IGC, or blank .....                         | (0)          |
| Retention Type (P/T/J/S) .....                                         | (0)          |
| Record Extraction Mode (INCLUDE/OMIT) .....                            | (0)          |
| Comparison Type (EQ/NE/LT/GE/GT/LE) .....                              | (0)          |
| Starting Position Of Character String (0, 1-4096) .....                | (0)          |
| Character String ('cccccc'/Xhhhhhh) .....                              | (0)          |
| Maximum Number Of Records (1-8000000) .....                            | (0)          |

## Examples

- From a file named TRAN, extract and print those records that reference an item named SOAP. The records are printed in physical, sequential order.

```
EXTRACT TRAN,,,,,'SOAP'
```

- From a transaction file named TRAN, print or display the hexadecimal representation of records that have a W3 display station identifier in positions 69-70.

```
EXTRACT TRAN,OUTPTX,,,EQ,69,'W3'
```

- Select as many as 25 records from a disk file named TRAN and place them in a new disk file named NTRAN. The selection criteria is that the quantity in positions two through four must be greater than 500.

```
EXTRACT  
TRAN,NTRAN,T,INCLUDE,GT,2,'500',25
```

- Display all records in a file named TRAN that have not been logically deleted. A user program has placed the character D in the first position of a record to denote logical deletion.

```
EXTRACT TRAN,,,OMIT,EQ,1,'D'
```

- Print all data records in a direct file named DFILE. Records that have not been updated since the file was allocated are blank and should be excluded.

```
EXTRACT DFILE,,,INCLUDE,NE,,X40
```

- Display all detail records in a WSU transaction file named DFILE. Detail records are indicated by the hexadecimal value F6 in the last position, position 71, of the trailer.

```
EXTRACT DFILE,,,OMIT,NE,71,XF6
```

## WSU EXTRACT PROCEDURE (WSUTXEX)

### Major Functions

The WSU Extract procedure can be used to extract records from a WSU transaction file or a non-WSU file (but not an immediate access file). The difference between these two types of files is that the WSU file has control records, data records, and 13-bytes of trailer information in each record. The non-WSU file may or may not have control records and trailers, but the file is not usable by a WSU program.

The WSU Extract procedure can specify that one or all work session chains are extracted from a WSU file in logical order, that one or all work session chains are extracted from a WSU file in physical order, or that all data-containing records are extracted.

Extracted records can be printed, displayed, put in a disk file, put in a new diskette file, or added to an existing diskette file.

If extracted records are put in a disk or diskette file, the output record length can be shortened to exclude trailer information. Also, the number of records allocated for the output file can be reduced to allow for exclusion of control records.

The WSU Extract procedure calls the Disk Copy/Display Utility (\$COPY) and the Extract/Rebuild Utility (#TXEX).

### Notes:

- The WSU Extract procedure can be used to do the functions provided by SUBR22, a subroutine of RPG.
- If logically deleted (unchained) records exist in the file, the chain should be extracted in logical order because unchained records cannot be identified and cannot otherwise be excluded.
- The transaction file is created as a direct file; after a copy it becomes a sequential file.

## Command Statement Format

- For extracting records from a WSU transaction file or a non-WSU file and copying them to a new disk file, displaying them, or printing them:

WSUTXEX input file label,  $\left[ \frac{F1}{I1} \right]$ ,  $\left[ \frac{RS}{RC} \right]$ ,  $\left[ \frac{ALL}{id} \right]$ ,

$\left[ \begin{array}{l} \text{output file label, [number of records], [record length]} \\ \text{OUTPTX} \\ \text{IGC} \end{array} \right]$

- For extracting records from a WSU transaction file or a non-WSU file and copying them to a new diskette file:

WSUTXEX input file label, [F1],  $\left[ \frac{RS}{RC} \right]$ ,  $\left[ \frac{ALL}{id} \right]$ ,

output file label, [number of records], [record length],

vol-id,  $\left[ \frac{1}{\text{retention days}} \right]$ ,  $\left[ \begin{array}{l} S1 \\ S2 \\ S3 \\ M1.nn \\ M2.nn \end{array} \right]$

- For extracting records from a WSU transaction file or a non-WSU file and adding them to an existing diskette file:

WSUTXEX input file label, [F1],  $\left[ \frac{RS}{RC} \right]$ ,  $\left[ \frac{ALL}{id} \right]$ ,

output file label, [number of records], [record length],

vol-id, ADD,  $\left[ \begin{array}{l} S1 \\ S2 \\ S3 \\ M1.nn \\ M2.nn \end{array} \right]$



**Parameters**

*input file label*: Specifies the label of the input file.

*F1*: Specifies that the input file is a disk file.

*I1*: Specifies that the input file is a diskette file. This file must not be on disk when the WSUTXEX command is entered.

*RS*: Specifies that header and detail records are copied in logical order from a WSU transaction file. Unchained records are not copied.

*RC*: Specifies that header and detail records are copied in physical order from a WSU transaction file or a non-WSU file.

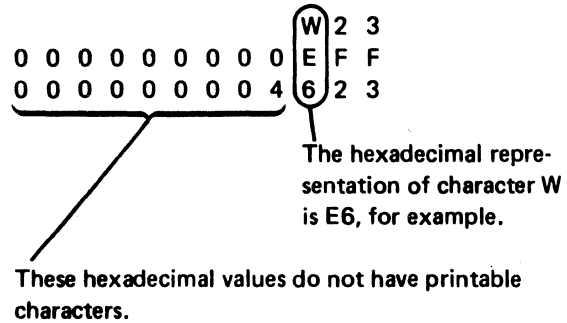
*CR*: Specifies that all records that contain at least one non-blank position are copied in physical order from a non-WSU file.

*ALL*: Specifies that all header and detail records are copied.

*id*: Specifies that only those header and detail records identified with this session chain identifier are copied.

*output file label*: Specifies the label of the disk output file that contains the extracted records. This file must not exist when the WSUTXEX command is entered. The output file is allocated as a sequential file with a temporary retention.

*OUTPTX*: Specifies that extracted records are printed or displayed on the system list device. Each extracted record is preceded by the relative record number it has in the input file. The hexadecimal representation of the characters in the records is shown as follows:



If a display station is the system list device, the records are displayed one at a time.

The number of extracted records is shown at the end of the listing or the display.

Note: If the *OUTPTX/output-file-label IGC* parameter is blank, extracted records are treated as if *OUTPTX* has been specified. If a printer is the system list device, the hexadecimal representation is shown only for unprintable characters. The previous example would be printed as follows:

```

                                W 2 3
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 4
    
```

*IGC*: Extracted records contain ideographic characters that are to be printed or displayed on the current system list device. If your System/34 does not have ideographic support, *IGC* is ignored and *OUTPTX* is assumed. If the current system list device does not support ideographic characters, a message is displayed and you can select option 0 to continue processing as though *OUTPTX* had been specified for this parameter.

*number of records*: Specifies the number of records that are allocated on disk for the output file. If a number of records is not specified, the default used for this parameter is the number of records actually used in the input file.

The number of records must be specified when extracting records from a file whose retention is S or J.

*record length*: Specifies the record length for the output file. If this length is longer than the records in the input file, records are extended and padded with blanks when they are copied to the output file. If this length is shorter than the records in the input file, records are truncated to this length when they are copied to the output file.

If a record length is not specified, the default used for this parameter is the record length of the input file.

For example, to remove trailers from a WSU transaction file, the record length specified for the output file should be 13 positions shorter than the input file record length.

*vol-id*: Specifies the volume ID of the diskette on which the output file is copied. If a vol-id is specified, the output-file-label parameter is the name of a new or existing diskette file to which records are copied from an intermediate disk output file.

*retention days*: Specifies the length of the retention period (0 to 999 days) for the diskette file. If this parameter is omitted, the default value is 1 day. The record length and type of organization of the intermediate output file on disk (sequential) are used for the new diskette output file.

*ADD*: Specifies that the output-file-label parameter names an existing diskette file to which records are added. The record length of the diskette file must match the record length of the intermediate disk output file.

*S1, S2, or S3*: Identifies the diskette slot that contains the first diskette to be used for output. If a parameter is not specified, S1 is assumed.

*M1.nn or M2.nn*: Identifies the magazine location that contains the first diskette to be used for output. M1 indicates the first magazine, and M2 indicates the second magazine. nn is a decimal value from 01 through 10 that identifies the location of the diskette in the magazine.

## Help Display

```

                                WSUTXEX PROCEDURE                                OPTIONAL-(0)
                                Extracts a logical WSU view of records in a file.
Input File Label ..... (0)
Input File Unit (F1/I1) ..... (0)
Option (RS/RC/CR) ..... (0)
Session Identifier (ALL/workstation-id) ..... (0)
Output File Label, OUTPTX, IGC, or blank ..... (0)
Number Of Records To Allocate (1-8000000) ..... (0)
Record Length (1-4096) ..... (0)
If Extracting Records To Diskette, Enter Volume ID ..... (0)
New File Retention Days Or ADD ..... (0)
Diskette File Location (S1/S2/S3/M1.nn/M2.nn) ..... (0)

```

## Examples

- Print all data records in the WSU transaction file TRANF00 for session W0, including those records that the operator cannot review in the W0 chain of records. Print records in physical order and show the hexadecimal representation of only unprintable characters.

WSUTXEX TRANF00,F1,RC,W0

- Print the chain of data records in WSU transaction file TRANF01 for session W1. Print records in logical order and precede each record with the relative record number it has in the input file. Show the hexadecimal representation of each character whether it is printable or not printable.

WSUTXEX TRANF01,F1,RS,W1,OUTPTX

- Extract all data records in the WSU transaction file TRANF02 for session W2 and copy them to a new diskette file, TRANFD2. The volume ID of the diskette is PRIV97. No more than 30 records are extracted.

WSUTXEX TRANF02,F1,RS,W2,TRANFD2,  
30,,PRIV97

*Note*: Control records are not copied to the diskette file, however the trailer remains in each data record.

- Extract as many as 30 data records in the WSU transaction file TRANF02 for session W3, and copy them to an old diskette file, TRANFD2. The diskette volume ID is PRIV97.

```
WSUTXEX TRANF02,F1,RS,W3,TRANFD2,
30,,PRIV97,ADD
```

This example and the previous example show how you can collect work session chains in any order on a diskette. Any chains can be excluded from the diskette. These examples could also be modified to collect work session chains from two or more WSU transaction files or to concatenate a work session chain that is in two or more WSU transaction files.

- Add all nonblank records from a non-WSU direct file, STDDIRC, to an old diskette file, TRANFD2. The diskette volume ID is PRIV97.

```
WSUTXEX STDDIRC,,CR,,TRANFD2,,,PRIV97,ADD
```

- Copy records from a WSU transaction file, TRANF018, to a new diskette file, TRANFI18. The diskette is in slot S2 and its volume ID is PRIV97. The file is retained for 7 days. Records are copied in logical order, control records are removed, and trailers (in positions 59-71) are removed from the data records.

```
WSUTXEX TRANF018,,RS,ALL,
TRANFI18,,58,PRIV97,7,S2
```

## WSU CREATE PROCEDURE (WSUTXCR)

### Major Functions

The WSU Create procedure can be used to create a WSU transaction file from a non-WSU file (but not from an immediate access file). An output record length that allows for the addition of a trailer to each record can be specified. A number of records that allows for the addition of control records to the output file can be specified. A display station ID can be assigned to all of the output records. Also, a WSU program that processes the newly created file can be specified.

The WSU Create procedure can be used to recreate a WSU transaction file from an existing WSU transaction file. This recreation can be done:

- To remove unrecognized records or to allow another WSU program to use a subset of the file.
- To allow a specified display station to access all the chains as a single chain.
- To allocate additional or fewer records for the file.
- To recover inserted records that were lost when the WSU program ended abnormally. These records can be recovered, but they will not be in the originally intended chain positions. If the session chain has changed since the records were lost, these records might not be recoverable.

For either creating or recreating a WSU transaction file, the input file can be on disk or diskette and the output file is always a direct, disk file.

The WSU Create procedure calls the Disk Copy/Display Utility (\$COPY), the Extract/Rebuild Utility (#TXEX), and the Transaction File Create/Recover Utility (#TXCR).

You can use the WSUTXRV procedure to recover or remove any records that are logically deleted or partially inserted into a file.

## Command Statement Format

WSUTXCR input file label,  $\left[ \begin{array}{c} F1 \\ I1 \end{array} \right]$ ,  $\left[ \begin{array}{c} CR \\ RC \\ RS \end{array} \right]$ ,  $\left[ \begin{array}{c} ALL \\ id \end{array} \right]$ ,  
output file label, [number of records], [record length],  
[program name],  $\left[ \begin{array}{c} \text{library name} \\ \#LIBRARY \end{array} \right]$ ,  $\left[ \begin{array}{c} S1 \\ S2 \\ S3 \\ M1.nn \\ M2.nn \end{array} \right]$

## Parameters

*input file label*: Specifies the label of the input file.

*F1*: Specifies that the input file is on disk.

*I1*: Specifies that the input file is on diskette. The input file must not exist on disk when the WSUTXCR command is entered.

*CR*: Specifies that a WSU transaction file is to be *created* from records extracted from a non-WSU file. All the records that contain at least one non-blank position are copied in physical order from the input file to the output file. Blank records are added to the file in the relative record positions the control records will occupy later.

*RC*: Specifies that a WSU transaction file is *recreated* from WSU transaction file or a non-WSU file. All control, header, and detail records are copied in physical order from the input file to the output file.

*RS*: Specifies that a WSU transaction file is recreated from a WSU transaction file. All header and detail records are copied in logical order from the input file to the output file.

*ALL*: Indicates that the session ID in each input record is copied unchanged to the output record. The ID is assumed to be in the next-to-last 2 bytes in the input record.

*id*: Indicates the session ID that is placed in the trailer of each output record.

*output file label*: Specifies the label of the disk output file. This file must not exist when the WSUTXCR command is entered.

*number of records*: Specifies the number of records that are allocated for the output file. If the number of records is not specified, the default used for this parameter is the number of records actually used in the input file. When a WSU transaction file is created from a non-WSU file, the output file requires more records than the input file to allow storage for a job control record, a work session control record for each record chain, and a blank record at the logical end of each record chain.

*record length*: Specifies the record length for the output file. If CR (create WSU transaction file) is specified, the record length parameter should allow for the 13 byte trailer at the end of each record in the output file. If the record length parameter is omitted, the default length used is the input record length.

*program name*: Specifies the name of a generated WSU program that processes the newly created or recreated WSU transaction file. Information in this WSU program is used to identify header records and detail data records in the file and logically chain them together. The named WSU program should not contain any set of tests for identifying a record type in which the tests could be satisfied by a record containing blanks in the user data portion of the record.

WSU can be specified as the program name. This would be done if the WSU program for which the transaction file is being created is not available (for example, it has not yet been compiled) or if blank records in the file would be erroneously identified as data records for a defined record type. If WSU is specified as the program name, all non-blank detail records in the output file are identified as detail data records.

If the program name is omitted, a trailer must be present in each input record because the last byte of the trailer is used to identify header records and detail records. A header record contains hexadecimal F7 in the last byte of its trailer. A detail record contains hexadecimal F6 in the last byte of its trailer.

*library name*: Specifies the name of the library that contains the generated WSU program. The library name parameter can be specified only if the program name is specified. If a library name is omitted when a program name is specified, the default library is #LIBRARY. The library name is ignored if WSU is specified as the program name.

#LIBRARY: The generated WSU program is in the system library, #LIBRARY.

S1, S2, or S3: Identifies the diskette slot that contains the first diskette to be used for input. If a parameter is not specified, S1 is assumed.

M1.nn or M2.nn: Identifies the magazine location that contains the first diskette to be used for input. M1 indicates the first magazine and M2 indicates the second magazine. nn is a decimal value from 01 through 10 that identifies the location of the diskette in the magazine.

## Help Display

| WSUTXCR PROCEDURE                                       | OPTIONAL-(0) |
|---------------------------------------------------------|--------------|
| Creates/recreates a transaction file for a WSU program. |              |
| Input File Label .....                                  |              |
| Input File Unit (F1/I1) .....                           | (0)          |
| Option (CR/RC) .....                                    | (0)          |
| Session Identifier (ALL/workstation-id) .....           | (0)          |
| Output File Label .....                                 | (0)          |
| Number Of Records To Allocate (1-8000000) .....         | (0)          |
| Record Length (1-4096) .....                            | (0)          |
| Name Of Generated WSU Program .....                     | (0)          |
| Program Library .....                                   | (0)          |
| Diskette File Location (S1/S2/S3/M1.nn/M2.nn) .....     | (0)          |

## Examples

- Create a WSU transaction file, TRANF02, from a non-WSU diskette file, TRANFD2. Extend the output record length to allow room for trailers in positions 59-71. Increase the number of records to 5000 when the output file is created. A WSU program named WSUFT02 processes the output file.

```
WSUTXCR TRANFD2,I1,CR,ALL,TRANF02,
5000,71,WSUFT02
```

Because ALL is specified, each input file record is assumed to have a session ID in the next-to-last two bytes in each record. This ID is preserved when records are copied.

- Create a WSU transaction file, TRANF018, from a non-WSU diskette file, TRANFI18. Extend the output record length to allow room for trailers in positions 59-71. Assign all records to session W0, allocate 1000 records for the output file, and allow WSU program WSUFT018 to process the file.

```
WSUTXCR TRANFI18,I1,CR,W0,TRANF018,
1000,71,WSUFT018
```

- Recreate a WSU transaction file so that another WSU program and a specified display station can use it. The WSU file to be recreated is TRANF01. This file was previously extracted using the WSUTXEX procedure to make the physical and logical order of the records in the file the same. The new file name is TRANF018, and display station W1 and WSU program WSUFT018 in library WSUTEST are able to use it.

```
WSUTXCR TRANF01,,RC,W1,TRANF018,,
WSUFT018,WSUTEST
```

If this example were modified to use a second set of appended trailers, a new TRANF01 file could be recreated for the original sessions from any updated TRANF018 records.

- Recreate a WSU transaction file in order to recover inserted records that cannot be reclaimed because the session was used after the WSU program ended abnormally. The file to be recreated is TRANF018 and the new WSU file is TRANFR18.

```
WSUTXCR TRANF018,,RC,ALL,TRANFR18
```

## WSU RECOVER PROCEDURE (WSUTXRV)

### Major Function

The WSU Recover procedure can be used to recover a transaction file that is causing program execution problems. Unidentified records are removed from the file and blanks are placed in the locations that they occupied. (Unidentified records are those records that do not match any of the record types that the WSU program recognizes.)

In addition to recovering a file, the WSU Recover procedure can be used to reclaim or remove partially inserted or logically deleted records. These records can be in the file after the WSU program or a WSU session ends abnormally during insert mode.

The WSU Recover procedure calls the Transaction File Create/Recover (#TXCR) utility.

### Programming Notes

The following symptoms can indicate a transaction file in need of recovery:

- The WSU program ends abnormally during its initiation.
- The WSU program ends abnormally when a new session begins.
- A WSU session ends abnormally during its initiation.
- A WSU session ends abnormally when the WSU program tries to add a record to the transaction file.
- A WSU session ends abnormally when the WSU program reads an unidentified record.
- An operator can review an inserted record from the WSU menu but he cannot page to the record.
- While reviewing his chain of records, an operator encounters a record that WSU cannot display.

## Command Statement Format

WSUTXRV file label, RECLAIM  
REMOVE  
RECOVER , [ program name, library name  
#LIBRARY ]

### Parameters

*file label*: The label of the WSU transaction file that will be recovered.

**RECLAIM**: Reclaim partially inserted records. Operators are able to page to records after the records have been reclaimed.

**REMOVE**: Remove partially inserted and logically deleted records from the transaction file.

**Note**: If neither RECLAIM nor REMOVE is specified, any partially inserted or logically deleted records remain partially inserted or logically deleted in the transaction file.

**RECOVER**: Restore the control records so no flag indicates records have been deleted. (No change is made to the data records.)

*program name*: The name of a generated WSU program. This program is used to determine the record types that are valid in the transaction file and to determine which record type is the header record type. Records that do not match a valid record type are removed from the transaction file. If the program name is omitted but the library name parameter is specified, the program name is prompted for by the system.

*library name*: The name of the library that contains the generated WSU program. If the library name is omitted when the program name is specified, #LIBRARY is the default library.

**#LIBRARY**: The generated WSU program is in the system library, #LIBRARY.

### Help Display

| WSUTXRV PROCEDURE                                                       | OPTIONAL-(0) |
|-------------------------------------------------------------------------|--------------|
| Recovers a transaction file that is causing program execution problems. |              |
| Label Of The Transaction File .....                                     |              |
| To Process Partially Inserted Records,<br>Enter RECLAIM Or REMOVE ..... | (0)          |
| Name Of The Generated Program .....                                     | (0)          |
| Program Library Name .....                                              | (0)          |

### Examples

- Reclaim all partially inserted records in a transaction file named TRANF02.

WSUTXRV TRANF02,RECLAIM

- Delete records from a transaction file named TRANF03 that do not match the record types described in a WSU program named PGM03. The WSU program is in a user library named LIB03.

WSUTXRV TRANF03,,PGM03,LIB03

- Recover a transaction file named TRANF04 and remove partially inserted and logically deleted records from it.

WSUTXRV TRANF04,REMOVE

## Appendix A. Summary of Specification Entries

### File Description Specification

| Columns | Name                      | Entry       | Explanation                                                                                                                                                                                                                                 |
|---------|---------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-2     | Page                      | Page number | Numbers each coding form.                                                                                                                                                                                                                   |
| 3-5     | Line                      | Line number | Numbers a specification line.                                                                                                                                                                                                               |
| 6       | Form type                 | F           | Identifies this as a file description specification.                                                                                                                                                                                        |
| 7       |                           | *           | Identifies this line as a comment line.                                                                                                                                                                                                     |
| 7-14    | File name                 | File name   | Required entry that names a transaction file or master file.                                                                                                                                                                                |
| 15      | File type                 | I           | Input file.                                                                                                                                                                                                                                 |
|         |                           | U           | Update file.                                                                                                                                                                                                                                |
|         |                           | Other       | WSU ignores these entries, issues a terminal error message, and does not produce an execution program.                                                                                                                                      |
| 16-23   |                           |             | WSU ignores these columns.                                                                                                                                                                                                                  |
| 24-27   | Record length             | 1 to n      | Length (in bytes) of records in the file. For a transaction file, this entry includes 13 bytes for the trailer. This entry can be from 1 to 4096 bytes long for a master file and can be from 14 to 4096 bytes long for a transaction file. |
|         |                           | Blank       | WSU assumes 256.                                                                                                                                                                                                                            |
| 28      |                           |             | WSU ignores this column.                                                                                                                                                                                                                    |
| 29-30   | Length of key field       | 1 to n      | Length (in bytes) of record keys. The maximum length, n, is 8 for packed keys and 29 for all other keys.                                                                                                                                    |
|         |                           | Blank       | Columns 29-30 must be blank for a direct file.                                                                                                                                                                                              |
|         |                           | Other       | WSU assumes 3, issues a terminal error message, and does not generate a program.                                                                                                                                                            |
| 31      | Record address type       | P           | Indexed file with packed decimal keys.                                                                                                                                                                                                      |
|         |                           | A           | Indexed file with alphameric record keys.                                                                                                                                                                                                   |
|         |                           | Other       | WSU assumes A.                                                                                                                                                                                                                              |
| 32      | Type of file organization | I           | Indexed file organization.                                                                                                                                                                                                                  |
|         |                           | Other       | Assume a direct file organization.                                                                                                                                                                                                          |
| 33-34   |                           |             | WSU ignores these columns.                                                                                                                                                                                                                  |



**File Description Specification (continued)**

| <b>Columns</b> | <b>Name</b>                 | <b>Entry</b> | <b>Explanation</b>                                                                                                                                                                                                                                     |
|----------------|-----------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 35-38          | Key field starting location | 1 to n       | Starting position of the key in each record of an indexed master file. This entry must be right-adjusted and must be less than or equal to record length. The key's starting location plus the key's length minus one cannot exceed the record length. |
|                |                             | Other        | WSU assumes 1, issues a terminal error, and does not generate a program.<br><i>Note:</i> This entry must be blank for a direct file.                                                                                                                   |
| 39-80          |                             |              | WSU ignores entries in these columns.                                                                                                                                                                                                                  |

## Input Specification

| Columns                | Name                         | Entry       | Explanation                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-2                    | Page                         | Page number | Numbers each coding form.                                                                                                                                                                                                                                                                                                                                          |
| 3-5                    | Line                         | Line number | Numbers a specification line.                                                                                                                                                                                                                                                                                                                                      |
| 6                      | Form type                    | I           | Identifies this as an input specification.                                                                                                                                                                                                                                                                                                                         |
| 7                      |                              | *           | Identifies this line as a comment line.                                                                                                                                                                                                                                                                                                                            |
| 7-14                   | File name                    | File name   | Specifies a name for a transaction file, master file, group of session-level fields, or local data area. The file name can be from one to eight characters long, must be left-adjusted, and must begin with an alphabetic character.                                                                                                                               |
| 14-16                  | OR/AND                       | AND or OR   | Enter AND in columns 14-16 on the next line of the input specifications sheet if you need more than three record identification codes to identify the record. Enter OR in columns 14-15 if either one of the codes can be present to identify the record. You can code a maximum of 20 AND or OR lines in any combination to describe the record identifying code. |
|                        |                              | Other       | WSU ignores entries other than AND or OR.                                                                                                                                                                                                                                                                                                                          |
| 17-18                  |                              |             | WSU ignores these columns.                                                                                                                                                                                                                                                                                                                                         |
| 19-20                  | Record identifying indicator | 01-89       | Assigns an indicator to a record type.                                                                                                                                                                                                                                                                                                                             |
| 21-41                  | Record identification codes  |             | <i>Note:</i> Columns 21-41 are divided into three fields that are described separately: (1) columns 21-27, (2) columns 28-34, and (3) columns 35-41. An AND relationship exists between these three fields. Each of these fields has four subentries: Position, Not, C/Z/D, and Character.                                                                         |
| 21-24, 28-31, or 35-39 | Position                     | 1 to n      | Location in the record of the record identification character. The maximum enterable position, n, is the length of the records for a master file and the length of the records minus 13 for a transaction file.                                                                                                                                                    |
|                        |                              | Blank       | Record identification code not specified.                                                                                                                                                                                                                                                                                                                          |
| 25, 32, or 39          | Not (N)                      | N           | The specified position in the record does not contain the character in column 27, 34, or 41.                                                                                                                                                                                                                                                                       |
|                        |                              | Blank       | The specified position in the record does contain the character in column 27, 34, or 41.                                                                                                                                                                                                                                                                           |
|                        |                              | Other       | Assume N.                                                                                                                                                                                                                                                                                                                                                          |

**Input Specification (continued)**

| <b>Columns</b>        | <b>Name</b>                                      | <b>Entry</b> | <b>Explanation</b>                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|--------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26, 33,<br>or 40      | C/Z/D                                            | C            | Entire character in column 27, 34, or 41 is the record identification character.                                                                                                                                                                                                                                                                                  |
|                       |                                                  | Z            | Zone portion of character in column 27, 34, or 41 is the record identification character.                                                                                                                                                                                                                                                                         |
|                       |                                                  | D            | Digit portion of character in column 27, 34, or 41 is the record identification character.                                                                                                                                                                                                                                                                        |
|                       |                                                  | Other        | Assume C.                                                                                                                                                                                                                                                                                                                                                         |
| 27, 34,<br>or 41      | Character                                        |              | Any alphabetic character, special character, or digit used as the record identification character.                                                                                                                                                                                                                                                                |
| 42                    |                                                  |              | WSU ignores this column.                                                                                                                                                                                                                                                                                                                                          |
| 43                    | P/B/L/R                                          | P            | Packed decimal numeric field.                                                                                                                                                                                                                                                                                                                                     |
|                       |                                                  | B            | Binary field.                                                                                                                                                                                                                                                                                                                                                     |
|                       |                                                  | L/R          | Issue a warning message and do no further checking of the specification entries.                                                                                                                                                                                                                                                                                  |
|                       |                                                  | Blank        | Zoned decimal numeric field, or alphameric field.                                                                                                                                                                                                                                                                                                                 |
| Other                 | Issue a terminal error message and assume blank. |              |                                                                                                                                                                                                                                                                                                                                                                   |
| 44-47<br>and<br>48-51 | Field location                                   | 1 to n       | Two right-adjusted numbers that identify the beginning of a field (From in columns 44-47) and the end of a field (To in columns 48-51) in the input record. These entries are identical for a 1-position field. The maximum entry, n, is the length of the record. For the transaction file, fields can neither begin nor end in the last 13 bytes of the record. |
| 52                    | Decimal positions                                | 0-9          | Number of decimal positions to the right of the decimal point in the numeric field named in columns 53-58. This column must contain an entry for numeric fields.                                                                                                                                                                                                  |
|                       |                                                  | Blank        | Field named in columns 53-58 is an alphameric field.                                                                                                                                                                                                                                                                                                              |
|                       |                                                  | Other        | Assume 0.                                                                                                                                                                                                                                                                                                                                                         |
| 53-58                 | Field name                                       | Field name   | Field name for each field defined in columns 44-52. Field names must be 1 to 6 characters long and must be left adjusted.                                                                                                                                                                                                                                         |
| 59-80                 |                                                  |              | WSU ignores these columns.                                                                                                                                                                                                                                                                                                                                        |

## J Specification

| Columns | Name                            | Entry                           | Explanation                                                                                                                                                                                                                                                                                                                           |
|---------|---------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-5     | Sequence number                 | Line number                     | Numbers a specification line.                                                                                                                                                                                                                                                                                                         |
| 6       | Form type                       | J                               | Identifies this as a J specification.                                                                                                                                                                                                                                                                                                 |
| 7       |                                 | *                               | Identifies this line as a comment line.                                                                                                                                                                                                                                                                                               |
| 7-14    | Execution program name          | Program name and procedure name | This required entry specifies the name of the execution program and WSU generated procedure.                                                                                                                                                                                                                                          |
| 15-22   | Format member name              | Format member name              | This required entry specifies the name of the load member in which display screen formats are stored. The format member name must not be the same as the message member name. Also, the format member name must not be the same as the WSU source program name when the format member and the source program are in the same library. |
| 23-30   | Message member name             | Message member name             | Name of your message member (if any) used by your program. The message member name must not be the same as the format member name.                                                                                                                                                                                                    |
| 31-38   | Library name                    | Library name                    | Name of the library that will contain output from WSU program generation. If you specify your own message member, it must be in this library.                                                                                                                                                                                         |
| 39-40   | Maximum number of work stations | 1 to n<br>Other                 | Maximum number of work stations that can concurrently use the WSU program.<br>Assume 01.                                                                                                                                                                                                                                              |
| 41-42   | Region size                     | 8 to 32<br>Other                | Amount of main storage (in 2 K-byte increments) in which the WSU program runs. The region size should be an even number (right-adjusted) from 8 to 32.<br>Assume the minimum region size in which the program can execute.                                                                                                            |
| 43      | Date/Edit                       | M or blank<br>D<br>Y            | Format of edited program date is month/day/year.<br>Format of edited program date is day/month/year.<br>Format of edited program date is year/month/day.<br>This entry also affects how WSU edits a numeric output field when a J edit code is in column 25 of the D specification.                                                   |
| 44      | Ideographic mode                | Y<br>N<br>Other                 | This WSU program can be run only from a display station that is in ideographic mode.<br>This WSU program cannot be run from a display station that is in ideographic mode.<br>Assume N.                                                                                                                                               |
| 45-80   |                                 | Blank                           | These columns are reserved. WSU ignores entries in them.                                                                                                                                                                                                                                                                              |

## T Specification

| Columns | Name                                | Entry        | Explanation                                                                                                                                                                                                                                                                                             |
|---------|-------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-5     | Sequence number                     | Line number  | Numbers a specification line.                                                                                                                                                                                                                                                                           |
| 6       | Form type                           | T            | Identifies this as a T specification.                                                                                                                                                                                                                                                                   |
| 7       |                                     | *            | Identifies this as a comment line.                                                                                                                                                                                                                                                                      |
| 7-14    | File name                           | File name    | This entry is required and specifies the name of the transaction file. This name matches the name in columns 7-14 of the F and I specifications for the transaction file. The transaction file name cannot match a master file name in this program.                                                    |
| 15-22   | Library name                        | Library name | Name of the library that contains the F and I specifications for the transaction file.                                                                                                                                                                                                                  |
| 23-30   | Member name                         | Member name  | Name of the source member that contains the F and I specifications for the transaction file.                                                                                                                                                                                                            |
| 31-48   |                                     |              | Not allowed on a T specification.                                                                                                                                                                                                                                                                       |
| 49-50   | Not-found indicator                 | 01-89        | Indicator that turns on when WSU cannot determine the record type of the record read from the transaction file or when WSU tries to read beyond the logical end of a chain of records in the transaction file.                                                                                          |
| 51-54   |                                     |              | Not allowed on a T specification.                                                                                                                                                                                                                                                                       |
| 55-56   | Header record identifying indicator | 01-89        | Record identifying indicator coded on the I specification for the header record in the transaction file.                                                                                                                                                                                                |
|         |                                     | Blank        | Assume no grouping by header record and detail records.                                                                                                                                                                                                                                                 |
| 57-60   | Number of records                   | 1-9999       | Number of records that operators can enter in the transaction file.                                                                                                                                                                                                                                     |
|         |                                     | Blank        | Allocate storage for 1000 records for the transaction file.                                                                                                                                                                                                                                             |
| 61-62   | Error indicator                     | 01-89        | Indicator that turns on when an input/output error occurs for a transaction file operation (GETNH, GETNR, GETPH, GETPR, or PUT) or when a record-not-found condition occurs for the transaction file and an indicator has not been coded in columns 49-50 (not-found indicator) of the T specification. |
|         |                                     | Blank        | No error indicator is specified for the transaction file.                                                                                                                                                                                                                                               |
|         |                                     | Other        | WSU issues a warning message during program generation and assumes blank.                                                                                                                                                                                                                               |
| 63      |                                     |              | Not allowed on a T specification.                                                                                                                                                                                                                                                                       |
| 64      |                                     |              | Not allowed on a T specification.                                                                                                                                                                                                                                                                       |
| 65-80   |                                     |              | These columns are reserved.                                                                                                                                                                                                                                                                             |

## M Specification

| Columns                   | Name                | Entry                          | Explanation                                                                                                                                                                                                                                                          |
|---------------------------|---------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-5                       | Sequence number     | Line number                    | Numbers specifications lines.                                                                                                                                                                                                                                        |
| 6                         | Form type           | M                              | Identifies this as an M specification.                                                                                                                                                                                                                               |
| 7                         |                     | *                              | Identifies this as a comment line.                                                                                                                                                                                                                                   |
| 7-14                      | File name           | File name                      | Name of a master file, group of session-level fields, or local data area.                                                                                                                                                                                            |
| 15-22                     | Library name        | Library name                   | Name of the library that contains the source member named in columns 23-30.                                                                                                                                                                                          |
| 23-30                     | Member name         | Member name                    | Name of the source member that contains the F and I specifications for the master file, the I specifications for the group of session-level fields, or the I specifications for the local data area.                                                                 |
| 31-36,<br>37-42,<br>43-48 | Chain field names   | One, two, or three field names | Fields that WSU combines (in the order you code them) to form the key field in the master file. This field is used to access records (via GET and PUT operations) in a master file.                                                                                  |
| 49-50                     | Not-found indicator | 01-89                          | Indicator that turns on when WSU cannot determine the type of the record read from the master file or when there is no record that has the specified key.                                                                                                            |
| 51-54                     | Master track index  | Number of bytes                | Main storage used to maintain a master track index in main storage. This entry is valid only for an indexed file.                                                                                                                                                    |
| 55-60                     |                     |                                | Not allowed on M specifications.                                                                                                                                                                                                                                     |
| 61-62                     | Error indicator     | 01-89                          | Indicator that turns on when an input/output error occurs during a file operation (GET, PUT, or PUTN) for a master file or when a record-not-found condition occurs for the master file and an indicator has not been coded in columns 49-50 of the M specification. |
|                           |                     | Blank                          | No error indicator is specified for the master file.                                                                                                                                                                                                                 |
|                           |                     | Other                          | WSU issues a warning message during program generation and assumes blank.                                                                                                                                                                                            |
| 63                        | Type                | U                              | Indicates use of the local data area.                                                                                                                                                                                                                                |
|                           |                     | F                              | Indicates use of a group of fields.                                                                                                                                                                                                                                  |
|                           |                     | Blank                          | Indicates use of a master file.                                                                                                                                                                                                                                      |
|                           |                     | Other                          | WSU issues a terminal-error message and does not generate a program because of the error.                                                                                                                                                                            |

## M Specification (continued)

| Columns | Name  | Entry | Explanation                                                                                                                                                                                                                                                     |
|---------|-------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 64      | Level | S     | If column 63 is U, indicates session-level local-data-area fields.<br>If column 63 is F, indicates a group of session-level fields.<br>If column 63 is blank, WSU issues a terminal-error message and does not generate a program because of the error.         |
|         |       | Blank | If column 63 is U, indicates mode-level local-data-area fields.<br>If column 63 is F, WSU issues a terminal-error message and does not generate a program because of the error.<br>If column 63 is blank, indicates that the master file fields are mode level. |
|         |       | Other | WSU issues a terminal-error message and does not generate a program because of the error.                                                                                                                                                                       |
| 65-80   |       |       | Not allowed on M specification.                                                                                                                                                                                                                                 |

## S Specification

| Columns | Name                     | Entry                      | Explanation                                                                                                                                                        |
|---------|--------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-5     | Sequence number          | Line number                | Numbers a specification line.                                                                                                                                      |
| 6       | Form type                | S                          | Identifies this as an S specification.                                                                                                                             |
| 7       |                          | *                          | Identifies this line as a comment line.                                                                                                                            |
| 7-14    | Format name              | Display screen format name | This entry is required and specifies the name of the display screen format that WSU creates from these S and D specifications.                                     |
| 15-16   | Format ID                | IJ, IW, EW, EJ             | Indicates the processing level for which the display automatically appears.                                                                                        |
|         |                          | Format ID                  | Two alphameric characters (other than IJ, IW, EW, ES or EJ) that operators can enter to select this display from the WSU menu.                                     |
|         |                          | Blank                      | Operators cannot select this display by entering a format ID on the WSU menu.                                                                                      |
| 17-18   | Start line number        | 1 to n                     | Number of the line at which the display begins.                                                                                                                    |
|         |                          | V                          | Variable starting line number.                                                                                                                                     |
|         |                          | Other                      | Assume 1.                                                                                                                                                          |
| 19-20   | Number of lines to clear | 0 to n                     | Number of lines to clear, including and following the starting line.                                                                                               |
| 21      | Lowercase                | Y                          | While operators press Shift, all alphabetic characters are entered in uppercase. Without Shift, all alphabetic characters are entered in lowercase.                |
|         |                          | N                          | All alphabetic characters are entered in uppercase.                                                                                                                |
|         |                          | Other                      | Assume N.                                                                                                                                                          |
| 22      | Return input             | Y                          | Input fields on this display transmit to the execution program, even if the operator enters no data.                                                               |
|         |                          | N                          | Input fields do not transmit to the execution program unless the operator enters data in one or more of the fields. Then all input fields transmit to the program. |
|         |                          | Other                      | Assume N.                                                                                                                                                          |
| 23-24   | Reset keyboard           | Y                          | Allow processing for this display.                                                                                                                                 |
|         |                          | N                          | Do not allow processing for this display.                                                                                                                          |
|         |                          | Other                      | Assume Y.                                                                                                                                                          |
| 25-26   | Sound alarm              | Y                          | The alarm sounds when this display appears.                                                                                                                        |
|         |                          | N                          | The alarm does not sound when this display appears.                                                                                                                |
|         |                          | 01-89                      | The alarm sounds when this display appears only if the specified indicator is on.                                                                                  |
|         |                          | Other                      | Assume N.                                                                                                                                                          |



## S Specification (continued)

| Columns | Name                 | Entry | Explanation                                                                                                                             |
|---------|----------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 27      | Enable function keys | Y     | Enable the function keys specified in columns 64-79                                                                                     |
|         |                      | N     | Disable the function keys specified in columns 64-79.                                                                                   |
|         |                      | R     | Use the function key mask that the previous display used.                                                                               |
|         |                      | Blank | Enable the Roll Up and Roll Down keys.                                                                                                  |
|         |                      | Other | Issue a warning message and assume blank.                                                                                               |
| 28      | Enable command keys  | Y     | Enable the command keys specified in columns 64-79.                                                                                     |
|         |                      | N     | Disable the command keys specified in columns 64-79.                                                                                    |
|         |                      | R     | Use the command key mask that the previous display used.                                                                                |
|         |                      | Blank | Enable all command keys.                                                                                                                |
|         |                      | Other | Issue a warning message and assume blank.                                                                                               |
| 29-30   | Blink cursor         | Y     | The cursor blinks when this display appears.                                                                                            |
|         |                      | N     | The cursor does not blink.                                                                                                              |
|         |                      | 01-89 | The cursor blinks only if the specified indicator is on.                                                                                |
|         |                      | Other | Assume N.                                                                                                                               |
| 31-32   | Erase input fields   | Blank | Columns 31-32 should be blank. WSU ignores these columns.                                                                               |
| 33-34   | Override fields      | Blank | Columns 33-34 should be blank. WSU ignores these columns.                                                                               |
| 35-36   | Suppress input       | Blank | Columns 35-36 should be blank. WSU ignores these columns.                                                                               |
| 37-40   | Reserved             | Blank | Columns 37-40 should be blank. WSU ignores these columns.                                                                               |
| 41*     | Start                | Y     | This display is the first in a primary sequence or secondary sequence of displays.                                                      |
|         |                      | N     | This display is not the first in a primary sequence or secondary sequence of displays.                                                  |
|         |                      | Other | Assume Y if this display is the first display (other than IJ or IW). Assume N if this display is not the first display (other than IW). |
| 42*     | End                  | Y     | This display is the last in a primary sequence or secondary sequence of displays.                                                       |
|         |                      | N     | This display is not the last in a primary sequence of secondary sequence of displays.                                                   |
|         |                      | Other | Assume N.                                                                                                                               |
| 43*     | Entry required       | Y     | This display has at least one input field. The operators cannot bypass this display.                                                    |
|         |                      | N     | Operators can bypass this display.                                                                                                      |
|         |                      | Other | Assume N.                                                                                                                               |
| 44*     | Repeat               | Y     | Repeat this display.                                                                                                                    |
|         |                      | N     | Do not repeat this display.                                                                                                             |
|         |                      | Other | Assume N.                                                                                                                               |

\*Applies to enter mode sequence only.

**S Specification (continued)**

| <b>Columns</b> | <b>Name</b>                               | <b>Entry</b>                                   | <b>Explanation</b>                                                                                                                                               |
|----------------|-------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 45             | Reserved                                  | Blank                                          | Column 45 should be blank. WSU ignores this column.                                                                                                              |
| 46             | Priority                                  | 0, 1, 2, or 3<br>Other                         | Relative expected frequency of this display, where 3 indicates most frequently used and 0 indicates least frequently used.<br>Assume 0.                          |
| 47             | Preprocess                                | Y<br>N<br>Other                                | Begin by executing the C specifications for this display rather than showing the display.<br>Do not preprocess this display.<br>Assume N.                        |
| 48-53          | Review mode record identifying indicators | One, two, or three indicators (01-89)<br>Blank | Type of transaction file records that the operators can review with this display.<br>This display cannot be selected by operators to review records.             |
| 54-59          | Insert mode record identifying indicators | One, two, or three indicators (01-89)<br>Blank | Types of transaction file records after which operators can insert records with this display.<br>This display cannot be selected by operators to insert records. |
| 60-63          | Reserved                                  | Blank                                          | Columns 60-63 should be blank. WSU ignores these columns.                                                                                                        |
| 64-79          | Key mask                                  | Mask                                           | Identifies the command keys and function keys that are enabled or disabled when this display appears.                                                            |
| 80             | Reserved                                  | Blank                                          | Column 80 should be blank. WSU ignores this column.                                                                                                              |

## D Specification

| Columns | Name                | Entry                    | Explanation                                                                                                                                                                                                                                                                    |
|---------|---------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-5     | Sequence number     | Line number              | Numbers a specification line.                                                                                                                                                                                                                                                  |
| 6       | Form type           | D                        | Identifies this as a D specification.                                                                                                                                                                                                                                          |
| 7       |                     | *                        | Identifies this line as a comment line.                                                                                                                                                                                                                                        |
| 7-12    | Field name          | Field name<br>Blank      | Name of an input field, output field, or output/input field. _<br>This D specification line defines only constant data.                                                                                                                                                        |
| 13-14   | Reserved            | Blank                    | Columns 13 and 14 must be blank.                                                                                                                                                                                                                                               |
| 15-18   | Field length        | Blank                    | Columns 15-18 must be blank.                                                                                                                                                                                                                                                   |
| 19-20   | Line number         | 1 to n                   | Relative line number on which data appears. The actual line number is Start Line Number (columns 17-18 on the S specification) plus this line number, minus one.                                                                                                               |
| 21-22   | Horizontal position | 1-80                     | Position of the data within a line. Columns 19-22 cannot be 0101. If this D specification line names a field and a prompt, this entry specifies the beginning position of the prompt.                                                                                          |
| 23-24   | Output data         | Y<br>N<br>01-89<br>Other | Display data from field named in columns 7-12.<br>Do not display data from the field named in columns 7-12.<br>Display data from the field named in columns 7-12 only if the specified indicator is on.<br>Assume N.                                                           |
| 25      | Edit code           | J<br>Y<br>Z<br>Other     | Insert commas, decimal points, and a minus sign (for a negative field) in the numeric output field.<br>Omit leading zeros and insert slashes (/) for each pair of digits in the numeric output field.<br>Suppress leading zeros from the numeric output field.<br>Do not edit. |
| 26      | Input allowed       | Y<br>N<br>Other          | The field named in columns 7-12 is an input field.<br>This D specification lines does not describe an input field.<br>Columns 27-38 must be blank.<br>Assume N.                                                                                                                |

## D Specification (continued)

| Columns | Name            | Entry | Explanation                                                                                                                                                                                                        |
|---------|-----------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 27      | Data type       | A     | Operators can enter only alphabetic data in the input field.                                                                                                                                                       |
|         |                 | B     | Operators can enter only alphameric data in the input field.                                                                                                                                                       |
|         |                 | E     | Operators can enter alphanumeric (A/N) and Katakana characters or ideographic characters, but not both. The field is initially filled with zeros.                                                                  |
|         |                 | F     | Operators can enter alphanumeric (A/N) and Katakana characters or ideographic characters, but not both. The field is initially filled with ideographic nulls (shift out, followed by zeros, followed by shift in). |
|         |                 | K     | Operators can enter Katakana characters in the input field.                                                                                                                                                        |
|         |                 | N     | Operators can enter only numeric data, commas, a period, a plus sign, and a minus sign in the input field.                                                                                                         |
|         |                 | S     | Operators can enter positive or negative decimal numbers in the input field. WSU places the sign in the zone portion of the last position in the field.                                                            |
|         |                 | X     | Operators can enter only ideographic data in the field.                                                                                                                                                            |
|         |                 | Other | Assume B for an alphameric field; assume S for a numeric field.                                                                                                                                                    |
| 28      | Mandatory fill  | Y     | Operators must key all or key none of the input field.                                                                                                                                                             |
|         |                 | N     | Operators can key all, none, or part of the input field.                                                                                                                                                           |
|         |                 | Other | Assume N.                                                                                                                                                                                                          |
| 29      | Mandatory entry | Y     | Operators must enter at least one character or blank in the input field.                                                                                                                                           |
|         |                 | N     | Operators can bypass the input field.                                                                                                                                                                              |
|         |                 | Other | Assume N.                                                                                                                                                                                                          |
| 30      | Self check      | T     | The input field is a modulus 10 self-check field.                                                                                                                                                                  |
|         |                 | E     | The input field is a modulus 11 self-check field.                                                                                                                                                                  |
|         |                 | Other | The input field is not a self-check field.                                                                                                                                                                         |
| 31      | Adjust/fill     | Z     | Right adjust and zero fill.                                                                                                                                                                                        |
|         |                 | B     | Right adjust and blank fill.                                                                                                                                                                                       |
|         |                 | Other | Adjust/fill is not done for the field.                                                                                                                                                                             |
| 32-33   | Position cursor | Y     | Cursor is at the beginning of the input field when this display appears.                                                                                                                                           |
|         |                 | N     | Cursor is not at the beginning of the input field.                                                                                                                                                                 |
|         |                 | 01-89 | Cursor is at the beginning of the input field only if the specified indicator is on.                                                                                                                               |
|         |                 | Other | Assume N.                                                                                                                                                                                                          |
| 34      | Reserved        | Blank | Column 34 should be blank. WSU ignores any entry in this column.                                                                                                                                                   |

## D Specification (continued)

| Columns | Name                  | Entry | Explanation                                                                                                                                                                                                                                                          |
|---------|-----------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 35      | Controlled field exit | Y     | Operators must advance the cursor to the next field with a field exit key (Enter, Field Adv, Field Exit, Field+, Field-, Field Backspace, Home, or Erase Input).                                                                                                     |
|         |                       | N     | Cursor automatically skips to the next unprotected field when operators fill the last position of the field, unless adjust/fill is specified for the field.                                                                                                          |
|         |                       | Other | Assume Y if adjust/fill is specified for the field. Assume N if adjust/fill is not specified for the field.                                                                                                                                                          |
| 36      | Auto record advance   | Y     | All input fields on this display automatically enter when: <ul style="list-style-type: none"><li>• Operators enter the last character of the input field, or</li><li>• The cursor is in the input field and operators press Field Exit, Field+, or Field-.</li></ul> |
|         |                       | N     | Automatic record advance does not occur for this field.                                                                                                                                                                                                              |
|         |                       | Other | Assume N.                                                                                                                                                                                                                                                            |
| 37-38   | Protect field         | Y     | The cursor skips the field. Operators cannot enter data in a protected field.                                                                                                                                                                                        |
|         |                       | N     | The cursor does not skip the field. This field allows operator input.                                                                                                                                                                                                |
|         |                       | 01-89 | The cursor skips the field only if the specified indicator is on.                                                                                                                                                                                                    |
|         |                       | Other | Assume N for an input field; assume Y for an output-only field.                                                                                                                                                                                                      |
| 39-40   | High intensity        | Y     | Intensify the data.                                                                                                                                                                                                                                                  |
|         |                       | N     | Do not intensify the data.                                                                                                                                                                                                                                           |
|         |                       | 01-89 | Intensify the data only if the specified indicator is on.                                                                                                                                                                                                            |
|         |                       | Other | Assume N.                                                                                                                                                                                                                                                            |
| 41-42   | Blink field           | Y     | Blink the field.                                                                                                                                                                                                                                                     |
|         |                       | N     | Do not blink the field.                                                                                                                                                                                                                                              |
|         |                       | 01-89 | Blink the field only if the specified indicator is on.                                                                                                                                                                                                               |
|         |                       | Other | Assume N.                                                                                                                                                                                                                                                            |
| 43-44   | Nondisplay            | Y     | Do not display the data.                                                                                                                                                                                                                                             |
|         |                       | N     | Display the data.                                                                                                                                                                                                                                                    |
|         |                       | 01-89 | If the specified indicator is on, do not display the data.                                                                                                                                                                                                           |
|         |                       | Other | Assume N.                                                                                                                                                                                                                                                            |
| 45-46   | Reverse image         | Y     | Reverse the data image (dark characters on a light green background).                                                                                                                                                                                                |
|         |                       | N     | Do not reverse the data image (characters are light green on a dark background).                                                                                                                                                                                     |
|         |                       | 01-89 | Reverse the data image only if the specified indicator is on.                                                                                                                                                                                                        |
|         |                       | Other | Assume N.                                                                                                                                                                                                                                                            |
| 47-48   | Underline             | Y     | Underline the data.                                                                                                                                                                                                                                                  |
|         |                       | N     | Do not underline the data.                                                                                                                                                                                                                                           |
|         |                       | 01-89 | Underline the data only if the specified indicator is on.                                                                                                                                                                                                            |
|         |                       | Other | Assume N.                                                                                                                                                                                                                                                            |

**D Specification (continued)**

| <b>Columns</b>  | <b>Name</b>                     | <b>Entry</b>                   | <b>Explanation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|---------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 49              | Column separator                | Y<br>N<br>Other                | Separate (precede) each position of the data with a vertical line ( ).<br>Do not use column separators.<br>Assume N.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 50-55           | Reserved                        | Blank                          | Columns 50-55 should be blank.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 56 and<br>57-79 | Constant type (in<br>column 56) | C<br>D<br>P<br>F<br>M<br>Blank | Columns 57-79 specify a constant initial value for the input field named in columns 7-12.<br>Columns 57-79 specify a constant initial value for the input field named in columns 7-12, and the field's name is used as the prompt for the field.<br>Columns 57-79 specify a prompt that appears in the position specified in columns 19-22.<br>The field name in columns 7-12 becomes the prompt for the field.<br>Columns 57-60 specify a four-digit MIC that references a prompt in your message member.<br>Assume no constant data. |
| 80              | Continuation                    | Non-blank<br>character         | Allows continuation of constant data to columns 7-79 of the following line. Column 56 must contain C, P, or D.                                                                                                                                                                                                                                                                                                                                                                                                                         |

## C Specification

| Columns | Name             | Entry                                                                                                                                                           | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-5     | Sequence number  | Line number                                                                                                                                                     | Numbers a specification line.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 6       | Form type        | C                                                                                                                                                               | Identifies this as a C specification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 7       |                  | *                                                                                                                                                               | Identifies this line as a comment line.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 7-8     | Processing level | IJ<br>IW<br>ES<br>EW<br>EJ<br>Blank<br>SR<br>AN, OR                                                                                                             | <p>Operation occurs only during job-initiation processing level.</p> <p>Operation occurs only during work-session-initiation processing level.</p> <p>Operation occurs only during end-of-sequence-set processing level.</p> <p>Operation occurs only during end-of-work-session processing level.</p> <p>Operation occurs only during end-of-job-session processing level.</p> <p>Operation for the display defined by the S and D specifications that precede these C specifications, or operation in a subroutine.</p> <p>Operation is in a subroutine.</p> <p>Indicators specified on this line are in either an AND relationship or in an OR relationship with indicators on the preceding line. A maximum of seven AN, OR, or mixed AN or OR lines are allowed to condition an operation.</p> |
| 9-17    | Indicators       | Indicators<br>(blank, AE,<br>CG, DL, EJ,<br>ES, EW, IJ, IN,<br>IW, JA-JN,<br>JP-JY,<br>KG-KL,<br>KQ-KY, RC,<br>RP, RS, RV,<br>SA-SN,<br>SP-SY,<br>U1-U8, 01-89) | <p>Columns 9-17 are used to assign indicators that specify conditions for doing an operation. From one to three indicators can be coded on one line in columns 10-11, 13-14, and 16-17. If an indicator must be off before the operation is done, code an N before the indicator in column 9, 12, or 15. By coding an AN or OR entry in columns 7-8, more than three indicators can be used to condition a single operation. Refer to Chapter 11, <i>Indicators</i> for an explanation of the indicators.</p>                                                                                                                                                                                                                                                                                       |
| 18-27   | Factor 1         |                                                                                                                                                                 | Figure 9-3 in Chapter 9 summarizes the entries that are allowed in factor 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 28-32   | Operation        | Operation code                                                                                                                                                  | Figure 9-5 in Chapter 9 summarizes the operation codes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 33-42   | Factor 2         |                                                                                                                                                                 | Figure 9-3 in Chapter 9 summarizes the entries that are allowed in factor 2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**C Specification (continued)**

| <b>Columns</b> | <b>Name</b>         | <b>Entry</b>    | <b>Explanation</b>                                                                                                                                                                                                                                                                                                           |
|----------------|---------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 33-53          |                     | Message text    | For a MSG or IMSG operation, you can code message text enclosed in apostrophes. You can continue message text to columns 7-52 of the next line if you code a nonblank character in column 53.                                                                                                                                |
|                |                     | Table of values | For a COMP operation, you can code a table of values (field names or literals). Separate table elements with a semicolon.<br><i>Note:</i> You can continue a table to columns 7-52 of the next line if you code a nonblank character in column 53.                                                                           |
| 43-48          | Result field        | Field name      | Name of the field that will contain the results of the operation coded in columns 28-32.                                                                                                                                                                                                                                     |
| 43-52          |                     | Literal         | For a RANGE operation, numeric literal (up to 10 digits), an alphameric literal (up to eight characters), or the name of a field upon which the operation is done.                                                                                                                                                           |
| 49-51          | Result field length | 1 to n          | Result field length. Maximum length of a numeric result field is 15 digits; maximum length of an alphameric result field is 256 characters. The entry must be right adjusted.                                                                                                                                                |
|                |                     | Blank           | Field is defined elsewhere in this program or on the I specifications in this program's data dictionary.                                                                                                                                                                                                                     |
|                |                     | Other           | Assume blank.                                                                                                                                                                                                                                                                                                                |
| 52             | Decimal Positions   | 0-9             | Number of positions to the right of the decimal in a numeric result field.                                                                                                                                                                                                                                                   |
|                |                     | Blank           | Alphameric result field or numeric result field defined by an I specification or C specification elsewhere in the program.                                                                                                                                                                                                   |
|                |                     | Other           | Assume zero if the field length in columns 49-51 is not blank; assume blank if the field length is blank.                                                                                                                                                                                                                    |
| 53             | Half adjust         | Blank           | Do not half adjust (round) the contents of the result field.                                                                                                                                                                                                                                                                 |
|                |                     | H               | Half adjust (round) the contents of the result field. Half adjust is allowed with all arithmetic operations except MVR.<br><i>Note:</i> You can code a nonblank character in column 53 to continue message text of an MSG or IMSG operation or a table of a COMP operation to columns 7-52 of the following C specification. |
|                |                     | Other           | Assume H.                                                                                                                                                                                                                                                                                                                    |



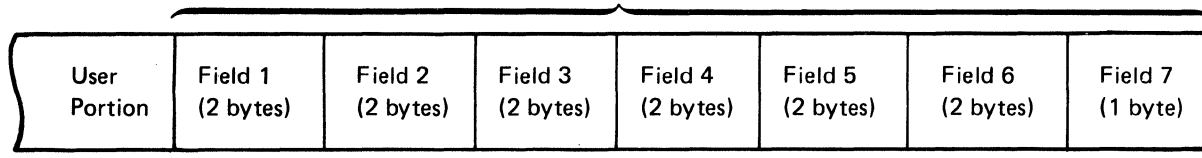
### C Specification (continued)

| <b>Columns</b> | <b>Name</b>         | <b>Entry</b>                                                                                               | <b>Explanation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------|---------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 54-59          | Resulting indicator | AE, EJ,<br>ES, EW,<br>JA-JN,<br>JP-JY,<br>KG-KL,<br>KQ-KY<br>RC, RS,<br>SA-SN<br>SP-SY,<br>U1-U8,<br>O1-89 | Columns 54-59 are used: <ul style="list-style-type: none"><li>• To indicate the results of an arithmetic operation or the results of a GET, COMP or RANGE operation.</li><li>• To specify which indicator to set on or to set off for MSG, IMMSG, SETON, or SETOF.</li><li>• To indicate the results of an arithmetic operation or the results of a GET, COMP, or RANGE operation.</li><li>• To specify which indicators to set on or set off for MSG, IMMSG, SETON, or SETOF.</li><li>• To specify a record identifying indicator for a PUT operation.</li></ul> Refer to Figure 9-18 in Chapter 9 for further information. |
| 60-80          | Comments            |                                                                                                            | Information that helps document the WSU program.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## Appendix B. Contents of Trailers

Figure B-1 shows the contents of the 13-byte trailers in the transaction file's job control, work session control, and data records. All pointers in the transaction file are 2-byte, binary relative record numbers (relative to zero). If the transaction file is read in an RPG II program without using the RPG II subroutine, SUBR22, add one to each pointer to obtain an actual relative record number.

13-Byte Trailer



Job Control Record

User Portion: Not used (X'40's)

- Field 1: Largest relative record number allocated in the file
- Field 2: Point (relative record number) to the first work session control record (X'0001')
- Field 3: Not used (X'0000')
- Field 4: Not used (X'0000')
- Field 5: Not used (X'0000')
- Field 6: Not used (X'0000')
- Field 7: X'F1' – Previous execution of this job ended normally  
X'F2' – Previous execution of this job ended abnormally or the job is running  
X'40' – No job control record present. This file is a new file.

Work Session Control Record

User Portion: Not used (X'40's)

- Field 1: Largest relative record number allocated in this work session chain
- Field 2: Pointer to the next work session control record
- Field 3: Pointer to the last logical header record in this chain
- Field 4: Pointer to the last logical record in this chain
- Field 5: Pointer to the first logical data record in the work session chain
- Field 6: Identifier for this work session
- Field 7: X'F3' – Work session ended normally  
X'F4' – Work session ended abnormally or work session is running  
X'F5' – Work session was restarted after ending abnormally. The file might contain unchained records entered for the session. Deleting a record changes it to F3.  
X'40' – End of work session control record chain

Data Record

User Portion: User data

- Field 1: X'0000' Record can be reclaimed if it is not chained to the previous record but it can be validly chained to the previous record  
X'FF00' Record cannot be reclaimed
- Field 2: Not used (X'0000')
- Field 3: Pointer to the previous header record. Field 3 is X'0000' for the first record in the file or for files that have no header records
- Field 4: Pointer to the previous record in the work session chain. Field 4 is X'0000' for the first data record in a chain
- Field 5: Pointer to the next record in a work session chain. For the last record, field 5 points to a blank record
- Field 6: Display station identifier for this work session
- Field 7: X'F6' – This record is a detail data record  
X'F7' – This record is a header data record  
X'40' – This is the last data record in the chain of data records.

Figure B-1. Trailer Contents

**\*BLANK:** A reserved field that can be used with the MOVE operation to set a result field to blanks.

**\*ERROR:** A reserved field that contains a 4-digit indication of errors that occur for transaction file operations and master file operations.

**\*RLNO:** A reserved field that is initialized to the largest reserved relative record number in the transaction file. When a record is added to the transaction file, \*RLNO contains the relative record number of the next record to be added to the file.

**\*RLRN:** A reserved field that contains either the relative record number that an operator specified on the WSU menu or the most recent value that the program placed in this field.

**\*RLRR:** A reserved field that contains the relative record number for the most recent successful operator review GET performed on the transaction file.

**\*RLRU:** A reserved field that contains the relative record number for the most recent successful C specification GET operation performed on the transaction file.

**\*SLNO:** A reserved field that contains the variable starting line number for a display.

**\*USID:** A reserved field that contains either the session ID entered by the operator on the WSU menu or the session ID from the trailer of either a WSU file data record or a WSU file header record after an I/O operation for a review request has been performed on the transaction file.

**\*WSID:** A reserved field that contains the symbolic display station identifier.

**abnormal termination:** The termination of a WSU program's execution without ES, EW, or EJ processing.

**accept-sequence-error indicator (AE):** An indicator that allows operators to bypass required displays.

**active work session:** A work session for which operators are running programs.

**AE:** Accept-sequence-error indicator.

**alphabetic character:** Any one of the letters A through Z, or one of the special characters #, \$, and @.

**alphabetic field:** One or more alphabetic characters of related information in a record.

**alphameric character:** An alphabetic character, or one of the digits 0 through 9.

**alphameric field:** One or more alphameric characters of related information in a record. Any character that can be entered from the keyboard is valid in an alphameric field.

**alphanumeric (A/N):** Consisting of both letters and numbers and often other symbols (such as punctuation marks and mathematic symbols). Contrast with ideographic.

**alphanumeric character:** A character that requires 1 byte of storage. Contrast with ideographic character.

**AN line:** A means of coding more than three conditioning indicators for an operation on the C specification.

**AND line:** A means of coding more than three record identification codes for a record type on the I specification.

**audible alarm:** A buzzing signal at the display station that is intended to direct the operator's attention to the display.

**A/N:** Alphanumeric.

**base number:** The part of a self-check field from which WSU calculates a self-check digit.

**blank:** (1) The storage equivalent of hexadecimal 40. (2) The space on a document caused by the absence of a printed or written character.

**C (calculation) specification:** A means of specifying processing for a display, processing level, or subroutine.

**CG:** Current group indicator.

**chain fields:** Fields that form a single field that WSU uses (as the record key) to access records in a master file.

**column separator:** Vertical line that precedes a position of a field on a display. This line does not occupy a position on the display. An example of a field with column separators is: |A|B|C.

**command key indicator (KG-KL, KQ-KY):** An indicator that is set on when an operator presses the corresponding command key.

**command keys:** The keys on the top row of the display station keyboard that are used with the Cmd function key to request functions.

**conditioning indicator:** An indicator used to control when calculations are done or which attributes apply to a format or format field.

**constant:** A data item that does not change during the execution of a program. This item represents itself and is actually used in processing rather than being a field name representing the data. Constants can be coded on D and C specifications.

**continuation line:** The second line that completes a D or C specification line.

**current-group-indicator (CG):** An indicator that signals whether the displayed record is from the same order set as the previously entered record.

**D (display data) specification:** The means of coding fields, prompts, constants and messages to appear on a display. Also, the means of specifying attributes of display data (for example, blinking data or underlined data).

**data dictionary:** RPG II file description and input specifications that describe the records and fields in the transaction file and any master files.

**default prompt:** A field name from a D specification used to prompt for the field's contents.

**delete mode indicator:** An indicator that signals that the transaction file record selected by the operator for review is to be logically deleted when the processing cycle ends.

**detail record:** A record that contains the daily activities or transactions of a business. For example, the items on a customer order are typically stored in detail records. Contrast with header record.

**direct file:** A disk file in which records are assigned specific record positions. Regardless of the order in which records are put in a direct file, they always occupy the assigned position in the file.

**display:** (Noun) A visual presentation of data. Appears when a display screen format executes. (Verb) To present an image on the display screen.

**display layout sheet:** A preprinted form used to illustrate which fields appear on a display and where those fields appear. Also, a form on which to list valid command keys for the display.

**display name (also format name or display screen format name):** The name of the display screen format generated by WSU from a set of S and D specifications. Code the display name in columns 7-14 of the S specification.

**display station field:** Field for which WSU maintains one copy for each display station attached to the program. You define these fields on I specifications or in result fields on C specifications.

**display station field name:** A name that begins with an alphabetic character, and contains zero to seven additional alphanumeric characters.

**display station indicators:** Indicators for which WSU maintains a separate copy for each display station that uses a program.

**DL indicator:** Delete mode indicator.

**edit code:** A character indicating that editing (for example, zero suppression and decimal point insertion) should be done according to a predefined pattern.

**EJ indicator:** End-of-job indicator.

**end-of-job indicator (EJ):** Indicator that signals when the last operator specifies end-of-work-session on the WSU menu.

**end-of-job processing level:** Processing level that occurs once per job after EW processing completes for the last display station or when the program sets the EJ indicator on.

**end-of-sequence-set indicator (ES):** Indicator that signals each time (except the first) when the first display in the primary sequence set is next to appear.

**end-of-sequence-set processing level:** Processing level that occurs after the processing of the last display in the primary sequence ends.

**end-of-work-session indicator (EW):** The indicator that signals when an operator specifies end-of-work-session on the WSU menu.

**end-of-work-session processing level:** The processing level that occurs each time a work station operator specifies end-of-work-session on the WSU menu or when the program sets the EW or EJ indicator on.

**enter mode:** The operating status of WSU during which operators can add records to their chain of records in the transaction file.

**ES indicator:** End-of-sequence-set indicator.

**EW indicator:** End-of-work-session indicator.

**external indicators (U1-U8):** Eight indicators that are normally set by the SWITCH statement before job execution. These indicators can be tested and changed during execution.

**F (file description) specification:** The RPG II specification that describes the physical characteristics (for example, record length) of a file.

**factor:** A field name, constant, literal, subroutine name, label, display name, or file name used in an operation on a C specification.

**field area:** An area in main storage that contains all of the fields defined in a WSU program.

**first level message number:** A message member in which each record contains up to 75 bytes of text.

**format ID:** Two alphanumeric characters other than IJ, IW, EW, EJ, or ES that can be coded in columns 15-16 of an S specification. Operators can key this ID on the WSU menu to select the display.

**format member:** A load member that contains as many as 32 display screen formats generated from S and D specifications in your program.

**function keys:** Special keys on the keyboard used to request specific system functions.

**half adjust:** The process of adding 5 (-5 for a negative field) to the number at the right of the last decimal position specified for the field.

**header record:** A record that contains relatively permanent information. For example, customer name and customer address are fields typically found in a header record. Contrast with detail record.

**I (input specification):** The RPG II specification that specifies the record type(s) in a file and the field names and field attributes (length, field location, and decimal positions).

**ideographic:** Consisting of both pictograms and graphics and often other types of symbols.

**ideographic character (IGC):** A pictogram or graphic that requires 2 bytes of storage. Contrast alphanumeric character. See also IGC.

**ideographic mode:** A display station operating mode that an operator requests by specifying Y for the IGC prompt on the sign on display.

**IGC:** See *ideographic character*.

**indicator:** (1) A 2-digit or 2-character entry on the specification forms used to tell when certain operations are to be performed. (2) An internal switch used by the program to remember when a certain event occurs.

**IJ indicator:** Job-initiation indicator.

**IN indicator:** Insert-mode indicator.

**indexed file:** A file in which the position of each record is recorded in a separate portion of the file called an index. The index contains an index key and disk address for each record in the file.

**input field:** A field (area on the display) in which operators key data. Input fields are blank on the display, and can be preceded by a prompt.

**insert mode:** The operating status of WSU during which operators can logically insert records in the transaction file.

**insert-mode indicator (IN):** The indicator that signals that the operator is running WSU in insert mode.

**IW indicator:** Work-session-initiation indicator.

**J (job) specification:** The first specification in a WSU source program. The J specification provides job information that WSU uses to generate a procedure.

**JA-JN and JP-JY indicators:** Job indicators.

**job:** Execution of a single copy of a WSU execution program. Jobs can have multiple operators entering data at the same time.

**job control record:** The first record in the transaction file. The trailer in this record points to the first work station control record and the logical end of the file. Also, the trailer indicates if the previous job execution ended normally.

**job field name:** A name that begins with & followed by an alphabetic character and zero to four additional alphanumeric characters. Embedded blanks are not allowed.

**job indicators:** Indicators for which WSU maintains one copy for all display stations running a job. The job indicators are EJ, IJ, JA-JN, and JP-JY.

**job-initiation indicator (IJ):** The indicator that signals when the first operator signs on.

**job initiation processing level:** The processing level that occurs only once per job when the first operator signs on.

**job level field:** A field in a WSU program that remains in the field area in main storage. This field is available to any active display station that is using the WSU program. Contrast with session level and mode level fields.

**K bytes:** 1024 bytes.

**Katakana:** A native Japanese character set that is used to represent the different Japanese sounds.

**KG-KL and KQ-KY indicators:** Command key indicators.

**label (also program label):** The name used in factor 1 of a TAG or ENDSR operation.

**left-adjust:** To move the contents of a field or entry on a specification to the leftmost end.

**line number:** The entry on RPG II F specifications and I specifications used to number specification lines. WSU prints but ignores line numbers.

**literal:** A symbol or quantity in a source program that is data itself, rather than a reference to data. You can code literals on D specifications and C specifications.

**local data area:** A 256-byte area on disk that can be used to pass information to a WSU program. A separate local data area exists for each display station that uses a WSU program.

**M (master file) specification:** The means of coding information about each master file required in the WSU program.

**mandatory entry:** A field attribute on the D specification that indicates an operator must key at least one character into the field.

**mandatory fill:** A field attribute on the D specification that indicates an operator must key all or none of the field.

**master file:** A collection of permanent information; for example, a customer address file. Master files are often processed along with a transaction file by a WSU program.

**master track index:** The table containing entries for tracks in the index portion of a file. Each entry contains a track address of the lowest key field from the next track in the file index.

**message text:** A series of words or symbols stored in a message member and referenced by a MIC that is intended to convey information. For example, PRESS ENTER TO CONTINUE.

**MIC (message identification code):** A four-digit number that identifies a record in a message member.

**mode indicator:** An indicator that is set off when the operating mode changes. Contrast with session indicator and job indicator.

**mode level field:** A field in a WSU program that has its value saved and is then cleared when the operating mode changes. Contrast with session level and job level fields.

**nonsequenced display:** A display that is not in a sequence. Columns 41-42 of its S specification are blank.

**not-found indicator:** Indicator that is set on when the type of a record cannot be determined, when an attempt has been made to read beyond the end of a chain of records, or when the record with the specified key cannot be found.

**operation code:** A word or abbreviation specified on a C specification to identify an operation, such as SUB for subtraction or ADD for addition.

**OR line:** (1) A means of coding more than three record identification codes for a record type on the I specification. (2) A means of coding more than three conditioning indicators for an operation on the C specification.

**order set:** A group of records consisting of one header record followed by one or more detail records.

**output field:** A field on a display that operators see but cannot modify. Output fields can have a constant value or the value of the contents of the field.

**output/input field:** A field on a display whose contents operators initially see (initial contents can be a constant or the current value of the field) and that the operators can update. The contents of an output/input field transmit to a program as input when operators enter the display.

**packed decimal format:** Each byte within a field represents two numeric digits except the rightmost byte, which contains one digit in bits 0 through 3 and the sign in bits 4 through 7. For all other bytes, bits 0 through 3 represent one digit; bits 4 through 7 represent one digit. For example, the decimal value +123 is 0001 0010 0011 1111. Contrast with zoned decimal format.

**packed key:** An index key in packed decimal format.

**page number:** An entry on RPG II F specifications and I specifications used to number the pages. WSU prints but ignores page numbers.

**preprocessing:** Processing for a display that occurs when the display is selected before the display is shown. A PUTS from within the preprocessing is required if the display is to appear.

**primary display sequence:** The first set of displays coded in a source program. The first display in the primary sequence appears immediately after IW processing. The primary display sequence repeats indefinitely until operators specify a display outside of the sequence or until a PUTS operation shows a display outside of the primary sequence. ES processing occurs after the last display in the primary sequence completes.

**priority:** Expected frequency of use. Assign priority to a display screen(s) and subroutines to attain better WSU performance. High priority displays/subroutines are expected to be used most frequently. Low priority displays/subroutines are expected to be used infrequently.

**processing level:** The consecutive steps or stages that occur in the WSU program cycle. The processing levels are: job initiation, work session initiation, end of sequence set, end of work session, and end of job.

**processing level display:** A display that appears when the associated processing level occurs. You can specify one processing level display for each of the following processing levels: job initiation, work session initiation, end of work session, and end of job.

**processing level indicator:** The indicator (IJ, IW, ES, EW, or EJ) that WSU turns on automatically when the processing level begins, or that you can set on to cause any processing for that level to occur (ES, EW, EJ only).

**program date:** The date associated with a program. The program data is specified by a DATE OCL statement or the DATE procedure used between the LOAD and RUN OCL statements for the program. If a program date is not specified, the program date is the same as the session date.

**protected field:** A field on a display in which operators cannot key data.

**RC indicator:** Recovery-of-work-session indicator.

**record identification code:** Character placed (or not placed) in a record which can be combined with other record identification codes to identify a record type.

**record identifying indicator:** An indicator that identifies the type of record being processed.



**record type** The classification of records in a file. Records are classified according to a specific field or fields within each record. Records of the same type have the same fields in the same order and identical record identification codes.

**recovery-of-work-session indicator (RC):** The indicator that signals when an operator restarts a work session after abnormal termination.

**relative record number:** A number that specifies the location of a record in relation to the beginning of a chain of records.

**repeated-display indicator (RP):** The indicator that signals when a display reappears due to an MSG operation.

**reserved fields:** Special fields provided by WSU. These fields are UDATE, UDAY, UMONTH, UYEAR, \*BLANK, \*ERROR, \*RLRN, \*RLRU, \*RLRR, \*RLNO, \*SLNO, \*USID, and \*WSID.

**resulting indicator:** An indicator that signifies whether the result of a calculation is plus, minus, or zero; whether a field is greater than, less than, or equal to another field; whether an element of a table was found; or whether a field is within a range of values.

**resume-work-session indicator (RS):** The indicator that signals when an operator resumes operating WSU after all operators successfully ended their work sessions.

**review mode:** The operating status of WSU during which operators can selectively display transaction file records or can page from one transaction file record to another.

**review mode indicator (RV):** The indicator that signals that the operator is running WSU in review mode. This indicator is also on in insert mode.

**right-adjust:** To move the contents of a field or entry on a specification to the rightmost end.

**RP indicator:** Repeated-display indicator.

**RS indicator:** Resume-work-session indicator.

**RV indicator:** Review-mode indicator.

**S (display screen) specification:** The means of defining and describing attributes for a display.

**SA-SN and SP-SY:** Session indicators.

**secondary display sequence:** A display sequence that physically follows the primary display sequence in a WSU source program. Either the operator or program must select this sequence; WSU does not automatically select it.

**sequence checking:** Checking done by WSU in enter mode only to ensure that operators use displays in the order you intended (coded) them to be used. For example, WSU checks that operators do not bypass required displays.

**sequence errors:** Errors caused by operators trying to bypass required displays or ES processing.

**sequence number:** A five-digit entry on WSU specifications that allows you to number the specifications. WSU prints but ignores sequence numbers.

**sequence set:** One or more displays that appear in the order that you code S and D specifications. You indicate the first and last display on the S specifications. You can code one or more sequence sets. The first set is called the primary sequence.

**sequenced display:** A display within a sequence.

**session date:** The date associated with a session. The session data is specified by a DATE OCL statement or DATE procedure used before the first program is run from the display station, or by the SET procedure or the \$SETCF utility program. If the session data is not specified, the session date is the same as the system date.

**session indicator:** An indicator that retains its setting when the operating mode changes. Contrast with mode indicator and job indicator.

**session level field:** A field in a WSU program that retains its value when the operating mode changes. Contrast with mode level field and job level field.

**shift-in (S/I) control character:** A character that indicates the end of a string of ideographic characters. The shift-in control character is represented by hex 0F. Contrast with shift-out (S/O) control character.

**shift-out (S/O) control character:** A character that indicates the start of a string of ideographic characters. The shift-out control character is represented by hex 0E. Contrast with shift-in (S/I) control character.

**special characters:** A character other than a digit, a letter, or #, \$, and @. For example, \*, +, and % are special characters.

**statement number:** The number that WSU assigns to each specification. Comments, continued lines, F specifications, and unrecognized or out-of-sequence specifications are not assigned statement numbers.

**system date:** The date assigned by the system operator during the initial program load.

**T (transaction file) specification:** The means of coding information about the transaction file used in the WSU program.

**trailer:** Thirteen bytes of control information that WSU adds to the end of each record in the transaction file.

**transaction:** An item of business. Customer orders and customer invoices are examples of transactions.

**UDATE:** A reserved field that contains the program date.

**UDAY:** A reserved field that contains the program date's day.

**UMONTH:** A reserved field that contains the program date's month.

**unprotected field:** A field on a display in which operators can key data.

**UYEAR:** A reserved field that contains the program date's year.

**U1-U8 indicators:** External indicators.

**work file:** An area on disk that is reserved for temporary storage of data being processed.

**work session:** Time during which an operator is using a WSU program. A work session begins when the operator initiates the procedure generated for the program. The work session ends normally when the operator specifies EW on the WSU menu or when the program sets the EW or EJ indicator on.

**work session control record:** The first record in each work station's chain of records in the transaction file. The trailer in this record points to the next work session control record, the first data record in the chain, and the last data record added to the chain.

**work-session-initiation indicator (IW):** The indicator that signals when an operator initiates a WSU program.

**work-session-initiation processing level:** The processing level that occurs once when each operator initiates a WSU program. For the first work station operator, work station initiation begins when job initiation ends.

**WSU command statement:** A command statement that begins the WSU generation to produce a WSU program, a procedure to call the program, display screen formats, and a listing of source statements and diagnostic data.

**WSU menu:** A display selected via the WSU Menu command key that allows operators to select a display by entering a format ID, review a record by entering a relative record number, or end a work session by entering EW.

**WSU generated procedure:** OCL that is generated from J specification entries. This procedure loads and runs a WSU program for the first operator that calls the procedure. Subsequent operators *attach to* the same copy of the program.

**WSU program:** The MRT program produced by WSU generation. Operators initiate this program via the procedure generated from J specification entries. One WSU program can be used by multiple operators concurrently, and different WSU programs can be used by multiple operators concurrently. **zero suppress:** The elimination of preceding zeros in a number. For example, 00057 becomes 57 when zeros are suppressed.

**zoned decimal format:** Representation of a decimal value by 1 byte per digit. Bits 0-3 of the rightmost byte represent the sign; bits 0-3 of all other bytes represent the zone portion; bits 4-7 of all bytes represent the numeric portion. For example, the decimal value +123 is represented as 1111 0001 1111 0010 1111 0011. Contrast with packed decimal format.



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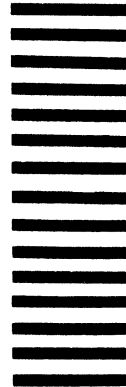


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