

T H E L A N / R O V E R (tm)

T E C H N I C A L G U I D E

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THIS DOCUMENT is to be used in conjunction with MODEL 110 of The ADEVCO LAN/Rover(tm) Local Area Network System, and is subject to change without notice.

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T A B L E O F C O N T E N T S

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TECHNICAL SECTION C

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CIRCUIT BOARD INSTALLATION INSTRUCTIONS.....C.1

NETWORK WIRING.....C.2

SOFTWARE CONFIGURATIONC.3

NETWORK APPLICATIONS.....C.4

DIAGNOSIS.....C.5

- PN 385 -

**THE ADEVCO LAN/Rover Model 110
Local Area Network System**

PREFACE

WELCOME

We hope that you find the ADEVCO LAN/Rover(tm)* will meet your office needs. We have made every effort to develop an integrated networking system that will operate efficiently under demanding conditions. It has been designed to provide the management benefits of an automated office for a reasonable price.

The LAN/Rover system is made up of these parts:

- LAN/Rover network interface circuit board.
- LAN/Rover connecting cables and hardware.
- LAN/Rover User Manual, Warranty & Sales Agreement.
- LAN/Scape operating system software.
- LAN/Rover network support software.

The hardware included in the LAN/Rover is manufactured and tested to exacting standards by ADEVCO, Inc. It has just been developed to be the simplest, least cost and highest performance local area network system now available.

Prior to shipping, each interface circuit board is subjected to a 72 hour burn-in, and then is dynamically tested for send and receive performance on a network system with a cable length of over 4,000 feet.

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THE LAN/ROVER GUIDES
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The ADEVCO LAN/Rover Manuals are made up of:

USER GUIDE, MANUAL "A" - Contains all the most frequently used functions of The LAN/Rover network. It is recommended that each user have a copy of this section.

MANAGEMENT GUIDE, MANUAL "B" - Details the planning, set-up, testing, software configuration and management of the network. This section should only be made available to those responsible for network management.

TECHNICAL GUIDE, MANUAL "C" - Contains step by step instructions for installing and wiring the ADEVCO network interface circuit board into a computer, instructions to wire an office for the LAN/Rover and a problem solving section.

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TECHNICAL SPECIFICATIONS

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Computer Models: Select CP/M MODELS OF KAYPRO, MORROW & XEROX microcomputers.

Software required: CP/M 2.2 & LAN/Scape 1.1 software.

Compatibility: Supports most CP/M 1.4 and 2.2 programs.

Memory available: The LAN/Rover takes about 7k. of TPA leaving over 48k in most cases. (1k less available when using remote printing.) Most popular programs run without difficulty.

Hardware needed: ADEVCO network interface board mounted inside each KAYPRO workstation.

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PERFORMANCE

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Net type Baseband, CSMA/CD
Topology Bus

Speed 500 k baud.
Protocol Bisynchronous

Medium 4 conductor twisted-pair wire.

Maximum length of the network. Up to 3000 feet without optional repeaters.

Number of Users Addressable, 255. Estimated electrical limit, 64 users. Suggested limit for a "normal" office environment, 20.

Number of disk drives and storage available per user at one time. 16 drives, A: to P: (Users may allow their local files to be accessed by other remote users) for a maximum of 128 megabytes.

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SECURITY

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Passwords Up to 15 characters. Any printable character may be used.

User Areas 15 standard CP/M user areas available.

Privilege 17 privilege levels implemented.

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SPECIAL ATTRIBUTES

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Mail Saves messages to a private mailbox for each user, AND serves optionally as a network bulletin board.

Flash Displays messages directly to other user screens, as desired.

Map Displays or reallocates disk drive access.

Dir Displays directory AND network status.

File attributes: Local/Remote
 Exclusive/Global
 Lockable/Open

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CP/M is a registered trademark of Digital Research, Inc.
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 KAYPRO is a trademark of the KAYPRO Corporation.
 MORROW is a trademark of the MORROW Corporation.
 PerfectCalc & Perfect Writer are trademarks of Perfect Software, Inc.
 WordStar is a registered trademark of Micropro, Inc.

FCC NOTICE

This equipment generates and uses radio frequency energy and if not installed and used properly may cause harmful interference to radio and television reception. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications of Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a commercial installation. However, there is no guarantee that interference will not occur in any particular installation. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference. If this equipment does cause interference, the user is encouraged to try to correct the interference by one or more of the following measures: a) Reorient the receiving antenna. b) Relocate the equipment with respect to the receiver. c) Move the equipment away from the receiver. d) Plug the equipment into a different outlet so that it and the receiver are on different branch circuits. e) Use shielded and grounded I/O cables.

If necessary the user should consult the dealer or an experienced radio/television technician for additional suggestions. In addition, an FCC booklet, "How to Identify and Resolve Radio-TV Interference Problems" Stock # 004-000-00345-4 is available from the U.S. Government Printing Office, Washington, D.C., 20402.

P R E L I M I N A R Y
INTERFACE INSTALLATION INSTRUCTIONS
for MORROW MD-3 & MD-5 Series Computers.
 (REV 2.0 only)

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OVERVIEW:
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The LAN/Rover hardware provides MORROW MD-3 and MD-5 computers with a high-speed network communications port.

The LAN/Rover utilizes an Ethernet-type network environment, with packet switching, carrier sensing, collision detection and avoidance. The data-link layer which integrates each computers operating system into the network is designed to operate at 500 k baud. This permits the use of inexpensive cabling options, reduces potential transmission difficulties and simplifies installation & maintenance.

The MD-5 family of computers can support high speed serial communications, and the LAN/Rover board is installed with a cable which plugs into the Z80 SIO socket. While the network is in use, no other use of this serial data output is possible.

The MD-3 does not have the same high-speed serial communications capabilities as the MD-5, so this is provided by the LAN/Rover network interface PC board.

Before installing the LAN/Rover in any computer you must know exactly which computer PC board you have. In describing PC boards, think of standing at the front looking down into the computer. The power cord is at the upper right, the floppy disk doors at the lower left.

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MORROW MD-3 HARDWARE DIFFERENCES:
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If you are planning to use the LAN/Rover in an MD-3, identify the computer PC board and follow the instructions for that board.

The MORROW MD-3 Rev 2.0 PC motherboard is produced in two different versions; one made in Korea and the other made in Japan by Kohjinsha. The Korean board uses some IC sockets and has the MORROW bus interface at the upper right, near the power supply. the Japanese PC board has few if any sockets and has the MORROW bus interface in the lower left.

While the ADEVCO LAN/Rover uses the MORROW MD-3 bus interface, a few additional signals must be provided to the network PC board by a wiring harness which plugs into the LAN/Rover PC board. These signals are taken from from 2 locations. One circuit trace must be cut in the operation.

From the foregoing it is clear that knowledge of electronics and the MORROW circuit board are required for this installation.

NOTE: The LAN/Rover brings much of the power of a multi-user system to the MORROW. A new ROM and BIOS must be installed in the MD-3 to do so. Old systems disks will run with the new ROM installed, but not allow network operation. NEW systems disks which allow network operation will NOT run with the old ROM installed.

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MORROW MD-5:
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The MD-5 family of hard-disk computers all should use the same PC board, with sockets for major ICs. The current LAN/Rover board for the MD-5 required one wire connection to the MD-5 circuit board to provide a timing signal. No ROM changes are requires though a new BIOS is required. The LAN/Rover is designed to be used only with the Rev 2.0 MORROW PC boards.

The following instructions, apply to all current MORROW MD-3 models using CP/M 2.2, and the MD-5, 11 and related models using CP/M 3.0, and the respective Rev 2.0 PC boards..

While every effort has been made to provide accurate instructions, the installer may encounter differences from one computer to another due to manufacturer's changes. Slightly different techniques may be required in some cases. Please notify ADEVCO, Inc. if the instructions do not match your units. Proceed with CARE.

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GETTING STARTED:
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The ADEVCO network interface circuit board comes ready to install. One hardware unit must be installed in each computer to be used on the network. The complete hardware components for this task consist of:

- (1) ADEVCO Network Interface Circuit Board with ribbon interface cable and network I/O cable attached.

- (1) Board Installation Kit which consists of:
- (2) Connector cables & wires as follows:
 - (1) 6-pin plug (blue dot coded) connected to:
 - (1) Black/White wire pair.
 - (1) Grey/Violet wire pair.
 - (2) Mounting screws, nuts and angle brackets.
 - (2) Stand-off clips, self-adhesive.

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**TOOLS NEEDED TO INSTALL THE INTERFACE BOARD
IN MORROW COMPUTERS:**

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Phillips head screw driver (medium).
Soldering pencil (max. 30 watts).
Fine rosin core solder.

and the following tools, are recommended.

40 pin DIP extraction tool (MD-5 only).
40 pin DIP insertion tool (MD-5 only).
Wire stripping tool.

Network cable will be needed to test and install network systems in an office.

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CIRCUIT BOARD INSTALLATIONS INSTRUCTIONS:

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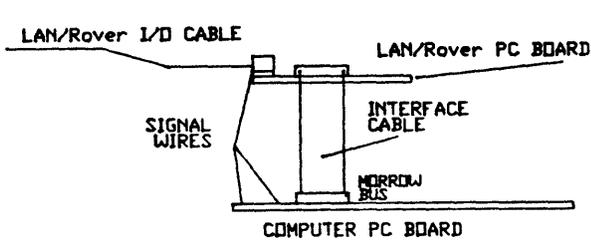
CAUTION: THIS UNIT IS INSTALLED INSIDE THE MORROW COMPUTER, WHICH REQUIRES SOME TECHNICAL FAMILIARITY. INSTALLATION MAY INVALIDATE THE MORROW WARRANTY. EACH MORROW COMPUTER SHOULD BE USED PRIOR TO NETWORK INSTALLATION TO ASSURE RELIABLE OPERATION AND USER FAMILIARITY.

While the ADEVCO staff have experienced no damage to MORROW computers through errors in the attempted installation, the disassembly and assembly of electronic equipment must be undertaken with great care. Also take precautions to prevent IC damage due to static electricity.

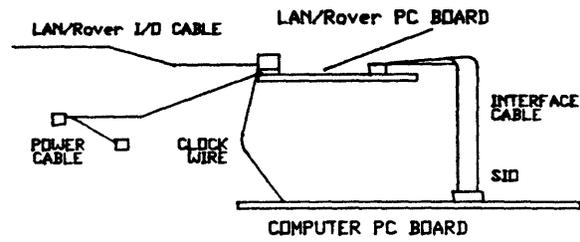
ADEVCO, Inc. assumes no responsibility for any direct, indirect or consequential damages which may result from the installation of this system. Please refer to warranty.

All references to PC boards will be made as if viewed from the front of a MORROW, looking down.

INTERFACE DIAGRAMS:



MORROW MD-3

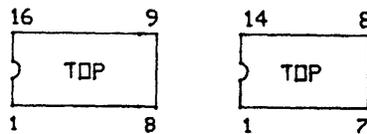


MORROW MD-5

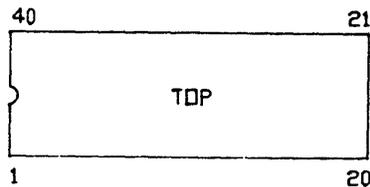
TERMS:

- o COMPUTER PC BOARD - MORROW Printed circuit board.
- o LAN/Rover PC BOARD - ADEVCO Printed circuit board.
- o INTERFACE CABLE - Connects LAN/Rover PC board to computer.
- o POWERCABLE - Cable to provide power and a clock signal to LAN/Rover PC Board. (MD-5)
- o SIGNAL WIRES - Wires providing computer signals to LAN/Rover PC board (MD-3).
- o LAN I/O CABLE - Communications cable connecting computer to network.

The following diagram illustrates IC pin numbering:



16 & 14 pin IC numbering



40 pin IC numbering

NOTE: BE CAREFUL. When soldering to ICs and circuit traces DO NOT apply excessive heat! Only apply enough heat to solder the wire directly to the IC lead.

Before attempting to install the ADEVCO network board, make sure the computer's power is turned off. It is a good practice to remove the power cord from its socket on the back panel before starting a procedure like this.

* * * * * FOR ALL MORROWS * * * * *

REMOVING THE COVER

1. The MORROW cover is attached to the case with four screws. These screws are inserted from the bottom, go through the cover and attach to the computer's case under the lip on either side. There is one near the front and one near the back on each side. Remove these screws and slide the cover forward and off of the computer.

2. If you look at the computer from the front, you will see the floppy disk drive on the left, the power supply on the right and on the MD-5 the hard disk drive to the right of the floppy drives.

If you look behind the drives at the bottom of the computer you will be able to see the green MORROW main computer printed circuit board.

The MD-3 installation requires that the MORROW PC board be removed completely to assure proper installation. For the MD-5, this circuit board must be loosened and partly slid out the back of the case to install the network cables.

REMOVING THE CIRCUIT BOARD SCREWS

3. The circuit board is attached with four screws in the bottom of the case approximately at the corners of the board. The only other screws in the bottom of the case are four smaller screws that attach the power supply. They are directly under the power supply. Don't loosen these screws. Only remove the four screws securing the circuit board.

4. The circuit board is also held in place by the rear connector mounting plate. Looking at the back of the computer this is the piece of metal that all the connectors (Terminal, printer, etc.) are attached to. It is fastened to the case with two screws near the right and left edge. Remove these screws.

SLIDING THE CIRCUIT BOARD OUT

5. With these screws removed, the circuit board can be slid out the opening in the rear of the case. Be careful of the cables going from the circuit board to the disk drives and the power cable coming from the power supply. The disk cables go very close to and can catch on the support bracket holding the disk drives in the case.

Reach under the floppy drive and gently push these cables down as you pull the connector mounting plate (and the circuit board with it) out the back.

After it goes out an inch or two the power cable may catch on this same bracket, but on the side of the board under the hard disk (MD-5). CAREFULLY applying a slight pressure on the

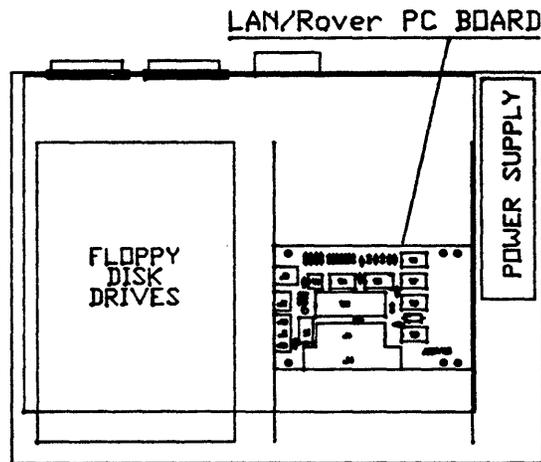
circuit board itself is usually enough to release it and allow the board to slide out another couple of inches. Three or four inches is needed to install the network in the MD-5.

NOTE: The MD-3 installation requires the the MORROW motherboard be completely removed from the case. As you remove this PC board, be careful to note & then disconnect the cables from the power supply, floppy disk drives, etc. Be SURE you know where to reconnect these cables!

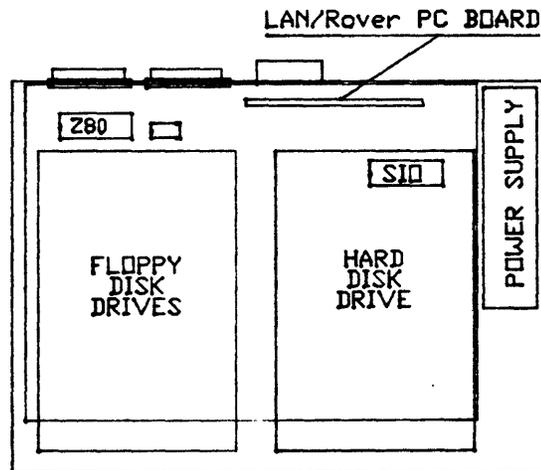
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INSTALLATION ORIENTATION DIAGRAMS:

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MD-3 CASE LAYOUT



MD-5 CASE LAYOUT

*** THE FOLLOWING STEPS ARE FOR MODELS MD-3 ONLY. ***
 JAPANESE BOARD, KOHJINSHA (WITHOUT SOCKETS.)

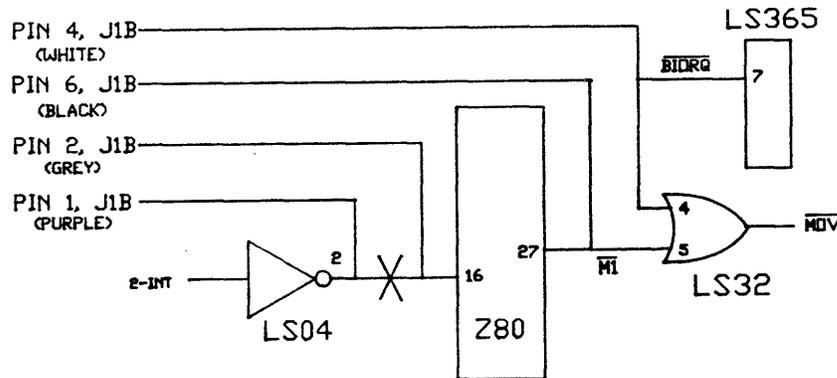
IC NUMBERING SCHEME:

		COLUMN			
		1	2	3	4
ROW	A				
	B				
	C				
	D				

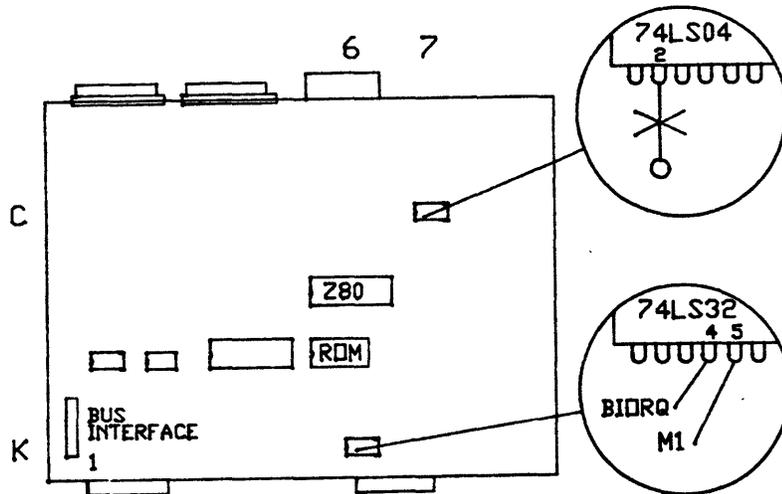
ICs are numbered by COLUMN & ROW, as in 2J or 4K.

The LAN/Rover wiring harness which plugs into J1B (the 6 bottom pins of J1,) has 4 wires which must be connected to the MORROW circuit board.

LAN/Rover SIGNAL WIRE SCHEMATICS:



MD-3 (JAPAN) PC BOARD INSTALLATION:



MD-3 MOTHERBOARD - JAPAN

INTERRUPT LINE

The PURPLE & GREY wires attached to pins 1 & 2 of J1B connect the LAN/Rover into the MORROW interrupt line. To install these wires a single trace must be cut on the component side of the MORROW board.

The interrupt line runs from pin 2 of a 74LS04 (7C) to pin 16 of the Z80 CPU (7-8K).

Locate the 74LS04 (7C). A short trace (c. 5/8") runs from pin 2 to a plate-through hole on the component side of the board. Cut this trace and solder the PURPLE wire from pin 1 of connector J1B to pin 2 of the LS04. Now solder the GREY wire from pin 2 of connector J1B to the plate-through hole on the other side of the trace cut.

SIGNAL LINES

The WHITE & BLACK wires attached to pins 4 & 6 of the ADEVCO plug J1B are to provide two additional signals required for network operation. Try to find a plate-through hole nearest to the IC pin number when soldering these wires to the MORROW PC board,

BIORQ:

Locate the 74LS32 (6K) and solder the WHITE wire from pin 4 of connector J1B to the most convenient plate-through hole leading to the 74LS32 (6K) pin 4.

M1:

The M1 signal is available on the trace running from pin 5 of the 74LS32 (6K) to the Z80 CPU (5-6E) pin 27. Locate a convenient plate-through hole on the trace close to pin 5 of the 74LS32 (6K) on the component side of the MORROW board & solder the BLACK wire to that plate-through hole.

ROM CHANGE

Now remove the ROM (a 2732 near location H6) from the MORROW board and replace with the LAN/Rover ROM provided by ADEVCO.

*** THE FOLLOWING STEPS ARE FOR MODELS MD-3 ONLY ***
 KOREAN BOARD (WITH SOCKETS.)

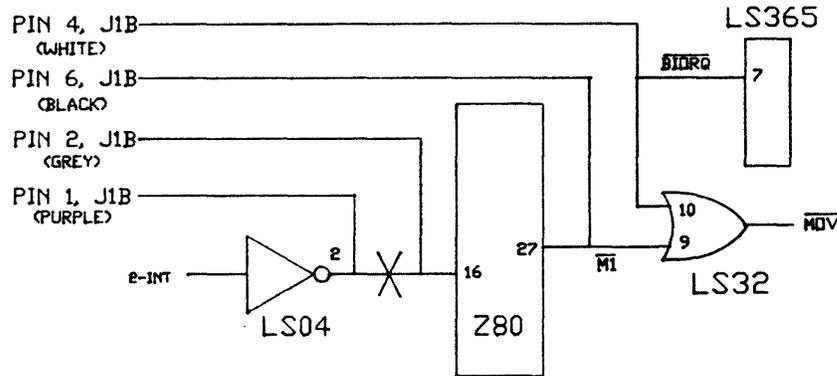
MORROW NUMBERING SCHEME:

		COLUMN			
		1	2	3	4
ROW	A				
	B				
	C				
	D				

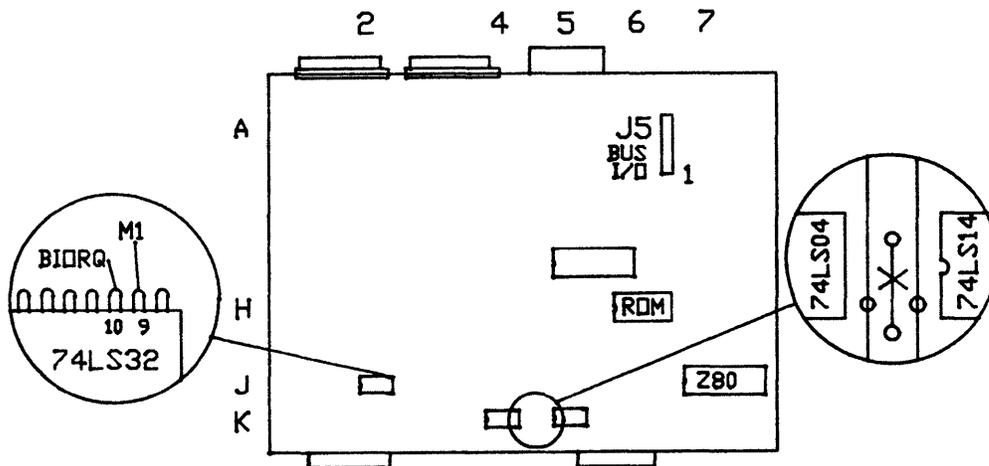
ICs on this board are named by COLUMN & ROW, as in 2J or 4K.

The LAN/Rover wiring harness which plugs into J1B (the 6 bottom pins of J1,) has 4 wires which must be connected to the MORROW circuit board.

LAN/Rover SIGNAL WIRE SCHEMATICS



MD-3 PC BOARD (KOREA) INSTALLATION:



MD-3 REV 2.0 MOTHERBOARD - KOREAN

INTERRUPT LINE

The PURPLE & GREY wires attached to pins 1 & 2 of connector J1B connect the LAN/Rover to the MORROW interrupt line. To install these wires a single trace must be cut on the component side of the MORROW board.

The MORROW interrupt line runs from pin 2 of a 74LS04 (4K) to pin 16 of the Z80 CPU (7J).

Locate the 74LS04 (4K). Between 4K & 5K there are three vertical traces. The middle trace is a short (c. 5/8") run on the component side of the board with plate-through holes at either end.

Cut this trace between the two plate-through holes.

Solder the PURPLE wire from pin 1 of connector J1B to the plate-through hole which leads to pin 2 of the 74LS04. Solder the GREY wire from pin 2 of connector J1B to the plate-through hole on the other side of the trace which leads to the Z80 (7J).

SIGNAL LINES

The WHITE & BLACK ADEVCO wires from pins 4 & 6 of connector J1B provide two additional signals required for network operation.

BIORQ LINE:

Locate a 74LS32 (2J) and solder the WHITE wire from pin 4 of connector J1B to the most convenient plate-through hole leading to pin 10 of the 74LS32 (2J).

M1:

Locate a convenient plate-through hole on the trace coming from pin 9 of the 74LS32 (2J) to the MORROW Z80 CPU (7J) and solder the BLACK wire from pin 6 of connector J1B to this hole.

MORROW INTERFACE HEADER

The Korean MD-3 Rev 2.0 board should come with the 40 pin header installed in the MORROW interface bus labeled J5 in position A6.

ROM CHANGE

Now remove the ROM (5-6H) from the MORROW circuit board & replace with the ADEVCO LAN/Rover ROM.

*** THE FOLLOWING STEPS ARE FOR ALL MODEL MD-3 MORROWS ***

Plug the LAN/Rover ribbon cable into the MORROW bus interface with the red stripe towards pin 1 on the connector. Fold this cable to the right, flat over the top of the PC board.

RE-ASSEMBLY

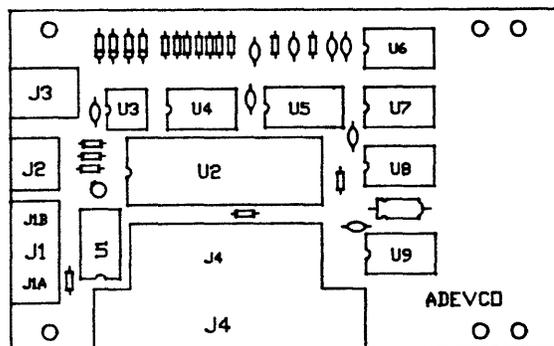
Carefully push the computer circuit board back into the case. Pay close attention to all cables when sliding the PC board back in. Align the attachment standoffs with the holes in the bottom of the case and attach the circuit board using the screws that you originally took out of the holes. Then screw in the screws that hold the connector panel to the rear of the case.

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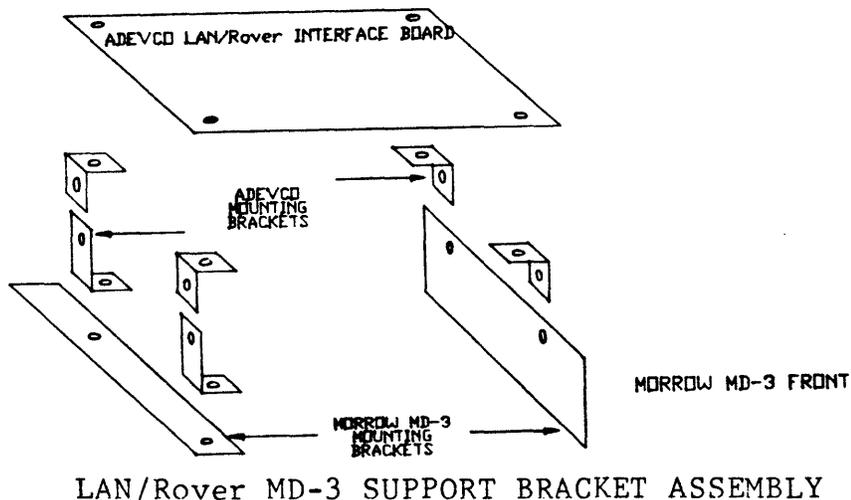
LAN/Rover PC BOARD INSTALLATION:

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The LAN/Rover PC board for the MD-3 looks like this:



Now that the MORROW PC board is back in place, install the LAN/Rover circuit board into the MORROW using the brackets, bolts and nuts provided, following diagram:



Locate the two ADEVCO long right-angle mounting brackets. Using the self-tapping screw provided, screw one bracket into the empty hole just to the right of the floppy disk drives.

Unscrew the screw holding the MORROW bracket and use this to screw the other long ADEVCO bracket in place.

Locate the four short ADEVCO mounting brackets and following the bracket assembly diagram, use the short bolts with nuts to fasten the two left ones to the long mounting brackets, and the remaining two to the upright metal bracket on the right of your MORROW.

Now using the remaining 4 bolts & nuts, fasten the LAN/Rover circuit board onto the top of the mounting brackets with the plugs to the left and the ribbon cable to the front.

Now plug the signal cable into the LAN/Rover PC board at J1B with the BLUE dot up and the PURPLE wire, pin 1 closest to the edge of the board.

Do NOT replace the MORROW cover until you have tested the installation and verified operation.

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DROP CABLE :
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First install a strain relief. Take the black plastic clip supplied and remove the protection from the self-adhesive foot. On the inside left rear of the MORROW case, find a convenient location and press the clip firmly in place.

The network drop cable should be connected into the RJ-11 jack on the LAN/Rover board, looped through the plastic strain-relief, and through the opening in the left rear of the case. This drop line will plug directly into the prepared junction boxes (see WIRING, C.2) or be used with a coupler with a LDC cable.

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NETWORK TRAFFIC INDICATOR:
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Note that the LAN/Rover PC board has an LED mounted just above the connector location J1B. This is a network traffic indicator and lights when the network is active. It is used primarily as a diagnostic aid and to verify performance.

Congratulations! You have now completed installation of the LAN/Rover PC board and are ready for testing. Skip to TESTING just after the next section.

***** THE FOLLOWING STEPS ARE FOR THE MD-5 and up ONLY. *****

Now that the MORROW motherboard is partially removed from the case, the next steps are to install the interface cable into the SIO socket, solder on the clock signal wire and attach the LAN/Rover power cable. Then after mounting the LAN/Rover PC board, the MD-5 can be re-assembled and tested.

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INSTALLING THE SIO CABLE:

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Refer to the pictorial representation of the MORROW MD-5 PC board below. If you look at the upper right of the board, you will see two 40 pin ICs next to each other. The rightmost of these two (directly behind the AUX connector), is the Z80 SIO which must be removed to install the network.

Using the IC puller, remove this integrated circuit. Put this IC aside for use later.

Insert the end of the ribbon cable marked SIO into this socket, facing toward the rear. The red strip of the cable should be on the notch side of the socket.

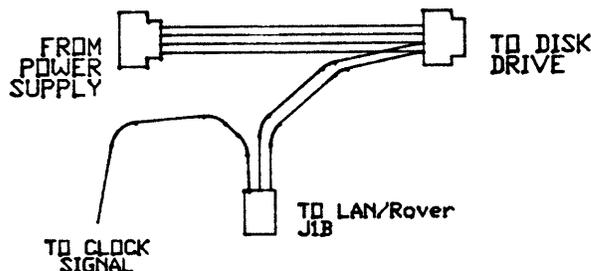
It is awkward to get your hand in this limited space. It is important that none of the pins get bent and that all of the pins go into the socket. You can see the alignment of the pins on one side of the socket through the opening in the rear of the case. This is the most difficult and critical part of the installation. Be careful & patient.

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INSTALLING THE NETWORK POWER CABLE:

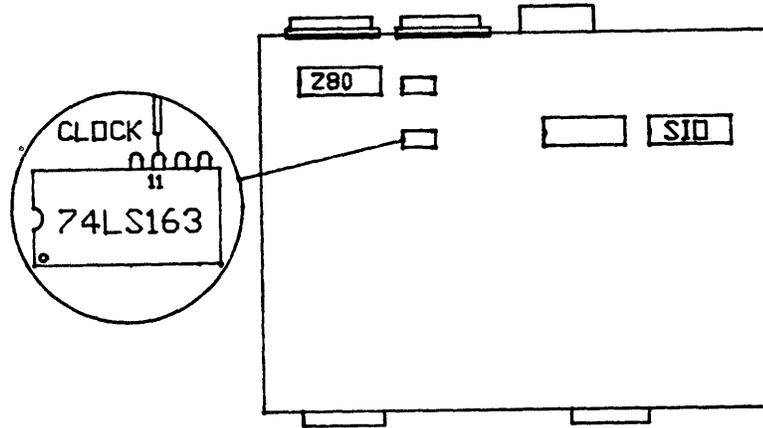
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POWER CABLE DIAGRAM:



The power cable has two floppy drive power connectors and a brown CLOCK wire that is tinned on the end but otherwise unconnected. This brown wire must be soldered to a pin on an integrated circuit on the circuit board.

MD-5 PC BOARD DIAGRAM:



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CLOCK SIGNAL:
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Locate the Z80 at the left rear of the circuit board. (just behind the terminal connector.) Next to the Z80 is a 14-pin IC labeled 7404. (It could have other letters also such as DM7404, SN7404JN, etc. There may be another string of numbers on it such as the manufacturer's date code.)

Just in front of the 7404 is another 16-pin IC labeled 74LS163. The brown wire must be soldered to pin 11 on this integrated circuit, the third pin in from the upper right. When you solder the brown wire to this pin, make sure to use MINIMUM heat and be sure that it does not touch either of the two adjacent pins.

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CONNECTING TO THE FLOPPY POWER CABLE:
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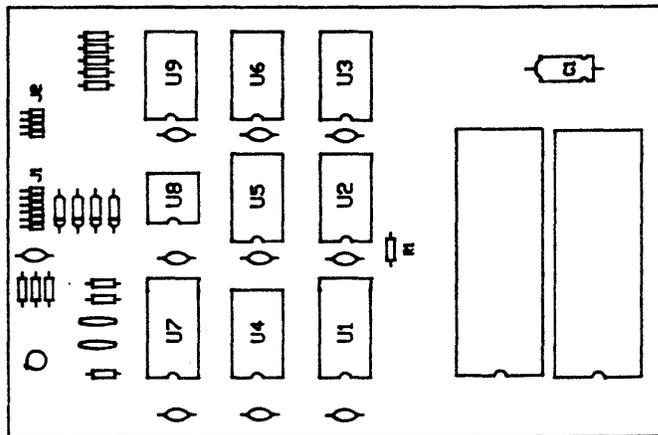
The remaining wires on this connector are connected to power plugs that will mate with the floppy disk drive power connector.

Disconnect the power connector from the floppy drive. (Large four pin nylon connector going into the back of the drive.) One end of this cable will mate directly into one connector on the network power cable. Push it in so it mates securely. The last end of the network power cable will fit in the now empty power socket of the floppy drive where you removed the power cable. Push it in so it is also secure.

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INSTALL SIO IC:
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Take the SIO IC which was removed from the MORROW motherboard earlier and CAREFULLY insert it into the empty socket on the LAN/Rover PC board. Note proper orientation. Be very careful that the pins all enter the socket.

LAN/Rover CIRCUIT BOARD for MD-5 FAMILY



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INSTALLING THE NETWORK BOARD:
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The ADEVCO LAN/Rover PC board is installed in the MD-5 case as shown on page 6. The board is mounted on the inside of the MD-5 back panel on stand-offs with screws through the vent holes. The board should be mounted component side visible and with the 40 pin sockets to the right as shown above. The ribbon cable will be connected from the right with the power and LAN I/O cables going to the left.

Position the ribbon cable from the SIO socket so it folds under the hard disk drive with the other end near the empty 40 pin socket on the network board. It will be plugged into this socket after the MORROW circuit board is slid back in place.

CASE RE-ASSEMBLY

Carefully push the computer circuit board back into the case. Again you will have to handle the cables to get it to go back in.

Align the attachment standoffs with the holes in the bottom of the case and attach the circuit board using the screws that you originally took out of the holes.

Now attach the screws that hold the connector panel to the rear of the case.

CABLE INSPECTION

Check the ribbon cable that comes from the SIO socket. It should not be touching any of the other cables, especially the cables that come from the back of the disk drives, or any metal object. If the disk drive cables are in the way, they can be moved under the drives themselves and away from the SIO cable.

After the ribbon cable is in position plug the loose end into the empty socket on the network board. Again the red stripe should be aligned on the side of the socket with the notch. Make sure that the cable is folded between the disk drives so that it won't be touching the cover when it is put back on.

Now plug the power cable plug into position J1 of the LAN/Rover board with the BLUE dot facing up.

=====
DROP CABLE:
 =====

First install a strain relief. Take the black plastic clip and remove the protection from the self-adhesive foot. On the inside left rear of the MORROW case, find a convenient location and press the clip firmly in place.

The network drop cable has a black AMP connector on one end with a RED dot. This plugs directly into the LAN/Rover board at J2. This cable should be looped through the plastic strain-relief, and out through the opening in the left rear of the MORROW case. This drop line will plug directly into the prepared junction boxes (see WIRING, C.2) or be used with a coupler with a LDC cable.

=====
NETWORK TRAFFIC INDICATOR:
 =====

Note that the LAN/Rover PC board has an LED mounted just above the connector location J1B. This is a network traffic indicator and lights when the network is active. It is used primarily as a diagnostic aid and to verify performance.

NOTE: Do NOT replace the MORROW cover until you have tested the installation and verified operation.

Congratulations! Advance to TESTING; the next section.

 IF YOU HAVE ANY DOUBTS, GO NO FURTHER !

* * * * * FOR ALL MORROW LAN/Rover INSTALLATIONS * * * * *

=====

PRELIMINARY BOARD TESTING:

=====

The following is a basic test to check that the LAN/Rover interface PC board is properly installed, and able to send and receive data. This is NOT a complete test, but will help verify installation and identify fundamental problems.

1. After inspecting your installation for accuracy, turn on the power to the MORROW. The screen should light up normally, the computer should "boot" normally and the keyboard should work. If the computer is NOT operating normally, refer to section C.5, Problem Solving.

2. Ask for a directory then try to run a simple program or utility that you would normally use.

3. If everything appears normal, use a working diskette you have prepared using the SOFTWARE CONFIGURATION section, C.3. It should have the following programs:

LANM5.COM (MD-5)
 or LANM3.COM (MD-3)
 LANCCPR.OVL
 SIGN.COM
 FLASH.COM

4. Log into the network by running the appropriate LAN/Rover program: LANM5.COM (MD-5) or LANM3.COM (MD-3).

5. Answer the prompt USER NUMBER: with 0.

6. Answer the prompt PASSWORD: with TEST (note all capital letters.)

7. From the A0> prompt type:
 FLASH AL HELLO THERE!

8. If the computer responds with a quick warm boot, and the network traffic LED indicator (on the LAN/Rover PC board) blinks, the installation is ready for full testing.

4. This completes the basic test of the MORROW and the network interface board. If you have problems at this point refer to section C.5 in the rear of this technical guide.

Proceed to an actual test of the network by wiring a short test network as per the instructions in the following section, C.2, and software configuration, Section C.3.

CONGRATULATIONS...At this stage your LAN/Rover is installed and ready to be operational.

NETWORK WIRING

Once the ADEVCO network interface hardware has been installed in your microcomputers, they are LAN/Rover workstations and ready for use. You need only hook up cables across which they can communicate. This section of the Technical Guide "C" explains your cabling options and their use.

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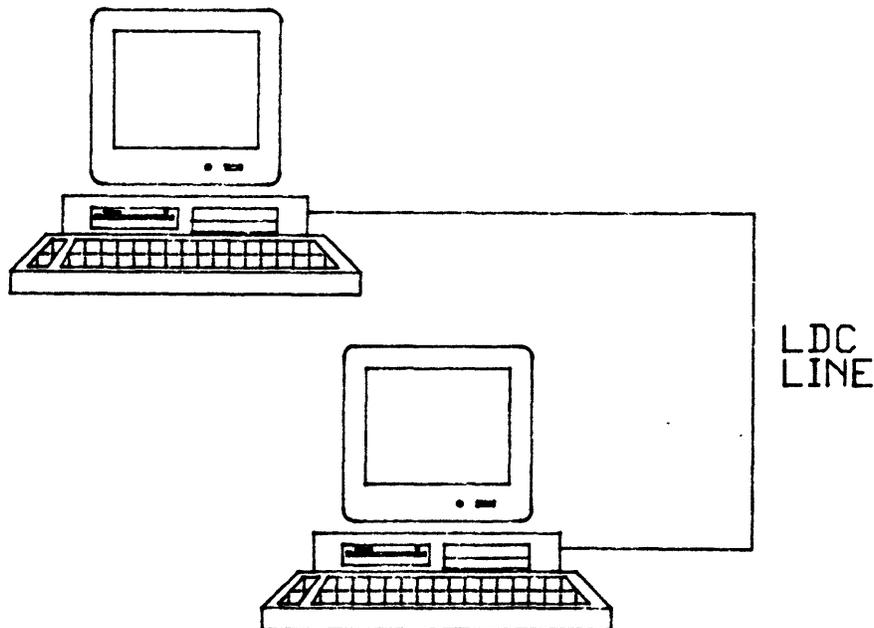
CABLING OPTIONS

=====

The LAN/Rover system cabling falls into two basic categories:

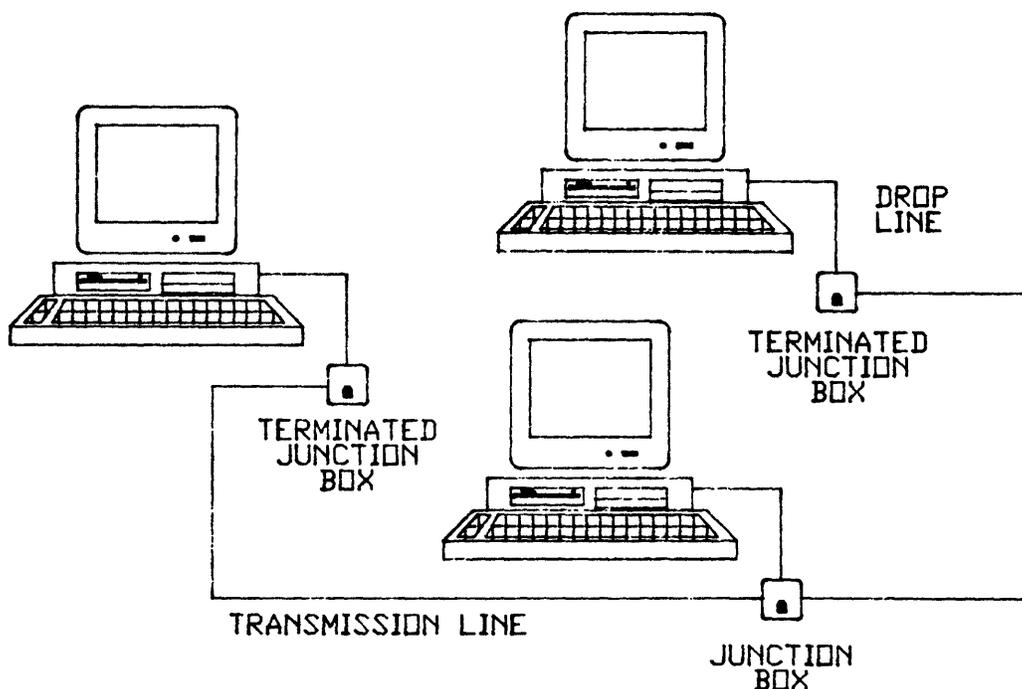
1. Three workstations or less at no more than 100 feet from each other, as in the "LAN for Two" system;
2. More than three workstations, or greater than 200 feet total range, as in the LAN/Pack systems.

Two or three workstations no farther than 100' from each other can be connected directly to each other by LAN/Rover Direct-Connect (LDC) cables. The six-foot LDC cable you used to connect workstations for the test in the last phase of the installation was an example of this kind of cable--though they can be up to 100' long. These LDC cables are shipped with the "LAN for 2" system, and their installation is documented only in that package. The diagram below illustrates the simplicity of the LDC connection:



Networks of more than 3 workstations or greater than 200 feet require a more sophisticated network cable, or transmission line. This Network Wiring section details the planning and installation of this transmission line.

The LAN/Rover transmission line is a continuous length (up to 3000 feet in length) of three-wire cable, with two ends and periodically spliced with junction boxes into which the individual workstations are connected. The line is terminated--at each end a special junction box with two extra resistors installed is connected to the line. These boxes, called terminators, catch signals as they reach the end of the transmission line and prevent them from being reflected back along the cable. These terminators also act as junction boxes--"jacks" by which the workstations can be connected to the network transmission line. A drop line, a six-foot long flat cable with clear modular connectors on each end, connects each workstation to its junction box. The diagram below shows these components in a typical three-station LAN/Rover network:



LAN/Pack system terms:

- TRANSMISSION LINE - Data cable running through the networked office, to which workstations are connected. Also referred to as the Network Cable.
- WORKSTATION - Any computer with LAN/Rover hardware installed.
- DROP LINE - Short cable from workstation to junction box.
- JUNCTION BOX - Box connecting workstations to network cable.
- TERMINATOR - Junction box with terminating resistors installed. Required at both ends of the transmission line.

=====

NETWORK LIMITS

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The distance between the first and last computers on the network should not exceed 3000 feet. Generally the greater the number of stations placed on the network, the less distance the line can run. Large networks (over 10 workstations) may be limited to less than 1500 feet.

The electrical limitation of the network is approximately 64 stations. However, the maximum practical number will be determined by the type of work to be done over the network. In a typical office environment about 20 computers can be linked together and still maintain satisfactory network performance.

If there is intense computer use in your office (for example: you are running a large, complex accounting system over the net with multiple entry stations), the system could be limited to less than five users.

If there is very little network activity and the network is used mainly for sending "flash" messages, or sending mail or files to other stations, a maximum number of stations can be used.

The effect of network overuse will be sluggish response to network commands. Optimum performance may be achieved by skilled management of the network resources.

=====

THE NETWORK LAYOUT

=====

For the sake of efficiency and flexibility, you should plan the layout of your network before beginning to install the transmission line. Knowing the number of workstations to be connected, and having decided on their locations, mark the sites at which the junction boxes will be attached to the wall. The junction boxes must be within six feet (the length of the drop line) of the workstations that will connect to them.

You'll also want to mark any probable sites for future or extra workstations, so that the transmission line can be routed past them. It's alright to have unoccupied junction boxes on the network--i.e., more junction boxes than workstations--so you might want to order extras from ADEVCO and install them now.

Once you know where the junction boxes will be located you're ready to route the network between them, ideally in the most efficient way possible.

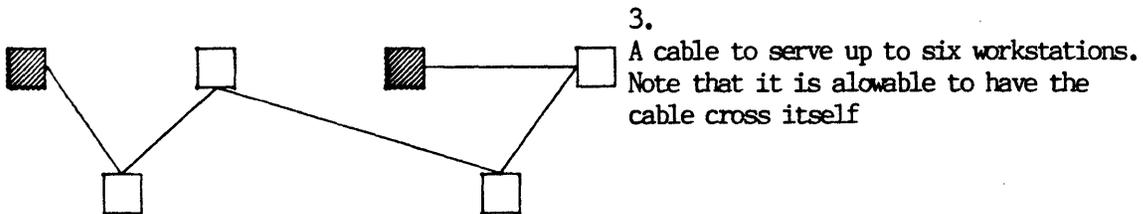
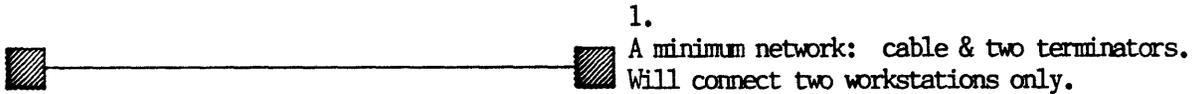
Decide which junction boxes will be ends of the transmission line. The cable that carries the network signals should span the shortest possible distance between the first and last computer on the net. Occasionally you may have to double the cable back on itself to reach a computer--at the end of a hall or when dropping the cable down from a suspended ceiling to connect to a single junction box, and then running it immediately back up.

The cable should not be run out to different workstations in branches or configured in a "T". It must be a single strand from beginning to end with only the drop cables connecting the workstations to the network cable. If you were to detach the cable from the workstations and stretch it out, it would form a straight line.

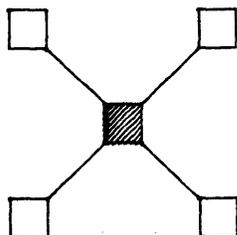
The diagram below shows some acceptable and unacceptable transmission line layouts.

 junction box

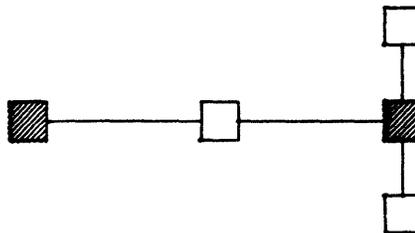
 terminator



1. No "star" configurations.



2. No "tees" or branches.



=====

CABLE COMPONENTS

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The long LAN/Rover transmission line can be assembled from either of two types of cable hardware. The standard transmission line components shipped with the LAN/Pack systems are phone-modular junction boxes, three-wire, 22-gauge station cable, and phone-modular drop lines. Installation of these components involves cutting, trimming and soldering wire, with some degree of care, and the use of diagnostic skills. In return, it provides a high degree of both economy and flexibility.

In addition, ADEVCO manufactures an alternative set of transmission line components called LAN/Lines which provide a trouble-free, "snap-together" network cable installation.

LAN/Lines are shielded, fixed-length data cables with DIN plug connectors preinstalled on each end; they connect to special LAN/Line junction boxes or--with a Splicer--to each other. The LAN/Line junction boxes accept the same standard Drop Lines as the phone-modular junction boxes, and are terminated with an add-on, plug-in terminator rather than by the internal installation of extra resistors.

LAN/Lines are available direct from ADEVCO; more details about ordering them are found in the ADEVCO product catalog, or by phoning ADEVCO. Their installation, once the network layout is planned as per above, is very simple and is documented in a separate set of instructions supplied with them.

The rest of this Network Wiring section details the installation of the three-wire cable and phone-modular junction boxes provided with the standard LAN/Packs.

=====

CABLING PROCEDURE

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The three-wire cable included in each LAN/Pack comes from ADEVCO as one continuous length, with terminators pre-installed and tested. Extra junction boxes and lengths of cable will be spliced in during the installation.

The installation should begin at one end of the net, with a terminated junction box. You will then move from one station on the net to the next until you re-install the second terminating box at the far end of the network, as described below.

If possible, have two LAN/Rover-equipped workstations in the office during network cable installation. As you complete the installation of each junction box, test the network with at least two workstations on the transmission line; one at the terminated end, and one at the last junction box installed. This way you will be able to find any wiring problems as they occur, and save a great deal of the time which would be necessary to find a "bug" in the cabling of a large multi-station network.

The LAN/Pack shipment contains a special "mobile" terminator which will be used to test the dataline as each new junction box is installed. Rather than terminate each new junction box for testing, you'll plug this mobile terminator into the new junction box plug the drop line of the test station into the terminator, and test.

We recommend that you not splice the network cable -- except, of course, with junction boxes. The workstations have to transmit data across the transmission line at about 500,000 bits per second and even careful splices will adversely effect the electrical characteristics of the cable.

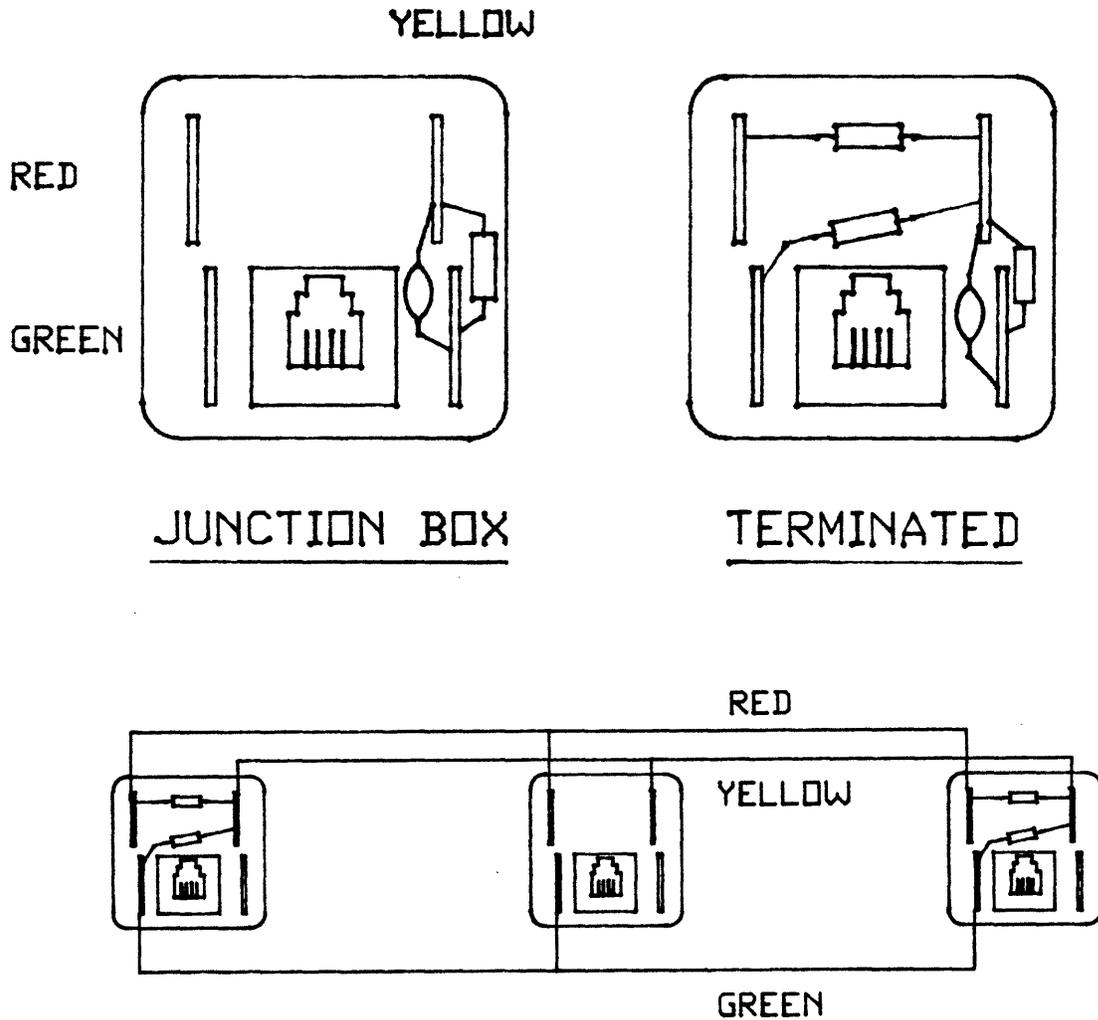
The cable may be run inside the wall, in metal or plastic conduit, stapled to the wall or baseboard, or in the space above suspended ceiling tiles. Be sure that you comply with any applicable construction or building codes in your area. In general, wire with PVC insulation, like the standard LAN/Pack cabling, cannot be installed above plenum ceilings. Refer to the section of this manual entitled "alternate cables" for plenum-cable equivalents to our standard cabling.

=====
THE FIRST TERMINATOR
=====

Begin installation at one of the ends of your planned transmission line. Pry the lid off of one of the junction boxes at the ends of the supplied preterminated cable. You'll see that it's an RJ-11 Surface Modular Jack similar to the ones the phone company installs, but modified with some special components.

The LAN/Pack is supplied with one junction box per workstation, including the two terminated junction boxes. Compare one of the ordinary junction boxes to the terminated box you're now installing: both contain a resistor/capacitor pair between the two sets of lugs on the right, but the terminated box contains two extra resistors--one from the red lug set to the yellow, and one from the green lug set to the yellow (this configuration, and the lug site naming convention, are clarified in the diagrams on page 7 below). These are the terminating resistors that prevent signal reflections on the transmission line. They are 68 K- (thousand) -Ohm resistors.

While you wire your transmission line, you must take special care to maintain uniform color-coding in the connection of each junction box to the network cable. You will be connecting red wires to red, green to green, and yellow to yellow. Although we are following a three-wire convention, we are using junction boxes with four terminals; as in the pre-connected terminator and the diagrams below, we'll always connect the yellow wire of the network cable to the lugs at the upper right of the junction box.



Cable Schematic

Four-wire cable of the appropriate characteristics and configuration may also be used in the transmission line. If using four-wire cable, **leave the fourth wire disconnected** at each junction box. If the third wire in your three-wire cable is not yellow, or if you're not working with red, green and yellow at all, just establish a color-coding of your own and be sure that the color wire connected to the red site at the first junction box is connected to the red site at all junction boxes--and so with green and yellow.

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CENTRAL JUNCTION BOXES

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Attach the terminator to the wall with the two screws provided, and replace its lid. Move to the intended location of the next junction box, unwinding the cable as you go. Note: If you're attaching the cable to a baseboard or wall molding, take care not to puncture or even severely dent the cable insulation or the individual colored inner wires. A nick in one of these wires can turn into a break, degrade network performance and be devilishly hard to track down. Use plastic cable clips to hold the cable in place, or round-topped staples. A regular staple gun, with flat-topped staples, will not do.

At the site of the next junction box, cut the cable that you've stretched from the first terminator, leaving about two inches slack to work with. Note: The network works best if no two junction boxes are connected by less than 20 feet of cable. If your junction boxes are to be closer together than that, leave the 20 feet, reeling up and tucking out of the way the extra slack.

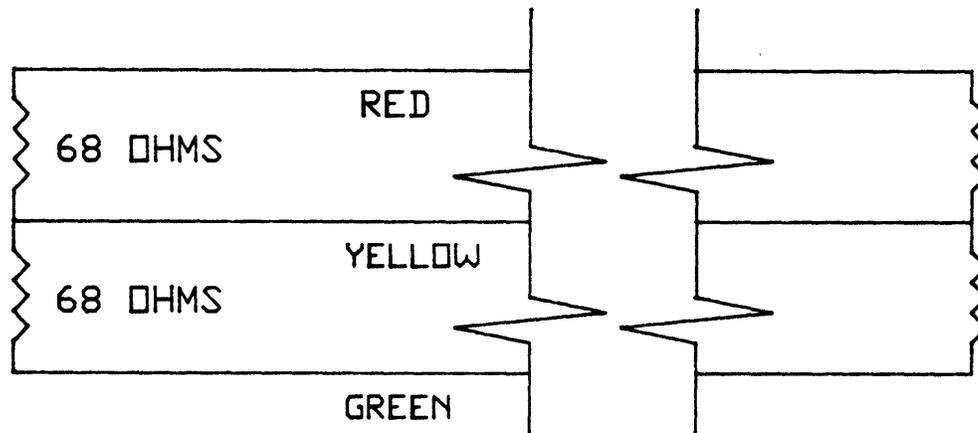
Use a knife to remove the last 1.5 inches of the outer covering of each end of the cable where you've cut it. Again, be very careful not to nick the inner wires.

The central junction boxes are wired essentially the same as the terminator box except that no resistors are used. Instead, each bank of lugs gets one incoming wire and one outgoing wire. Follow the example of the pre-connected terminators and the diagrams above. Follow color coding, try not to put more than one wire on any one lug, and solder all your connections. The greatest problems can be traced to the simplest causes; poor network performance can most often be traced to poor connections or incorrect wiring of the transmission line.

Once you've connected the incoming wires you can and should test the new junction box. Have a workstation connected to the first terminator; plug the Mobile Terminator into the junction box you've just installed and plug a second workstation into the mobile terminator. Run the network software on each machine and test the network by using the FLASH command from each workstation. See the User's Guide and the section of this manual on "preliminary testing" for details on running the network software and using the FLASH command. If this test is not successful, go no further. Recheck your installation up to this point for short circuits, breaks in the cable and mis- or un-connected wires. Refer to the "Troubleshooting" section of this manual for more help. If you can't perform these tests as you go, you'll just have to be as careful as possible in connecting the junction boxes.

Wire all the junction boxes on your network cable in this way. **Think:** After you install the last **unterminated** junction box before the second terminator, put the second terminator in place and run the cable **back** to that last junction box. If you haven't planned carefully, you might have to disconnect the second terminator from a too-short segment of the cable and reinstall it on a longer segment. Don't worry--you've probably gotten quite good at it by now.

When all the junction boxes, including the second terminator, have been connected, the network cable is complete. If you've followed the above instructions carefully, it's unlikely that you'll have any problems; if you've been able to test as-you-go at each junction box, you know that you won't! Otherwise, a quick check of the network cable and termination can be performed with a volt-ohm meter as follows:



Simplified Transmission Cable Diagram

LINE RESISTANCE @ 1000 FEET

Red/Green to Yellow	c. 35 Ohms
Red to Green	c. 69 Ohms

With no computers attached, the resistance between the red-green pair of wires should be about 68 ohms for short networks of less than 100 feet and about 74 ohms for networks of 1000 feet or more. If you discover a problem, first check for loose wires in the boxes. If you did not solder ALL connections, do so now.

If you find a short, check each box to assure proper internal wiring, then check the four gold wire connectors inside each of the junction and terminating boxes and be sure they are not bent, crossed or otherwise misaligned. If the problem still isn't located, it is probably in one or more of the strands of wire between junction boxes. A nail, staple or other sharp fastening device might have penetrated the cable and shorted two wires together. If this is the problem, remove the fastener and recheck the system. If that is not the problem, successively disconnect the strands and check them individually for shorts. Discard and replace problem wires.

When you're done wiring and checking all junction boxes, screw them to the wall or baseboard with the two wood screws provided and snap on the lids. Plug the individual workstations into their junction boxes and the network transmission line installation is complete.

The next phase in the normal installation process is final user software configuration.

SOFTWARE CONFIGURATION

The ADEVCO Lan/Rover model 110 uses The LAN/Scape network operating system, which allows most standard CP/M 1.4 and 2.2 programs to work in a network environment.

CP/M is designed as a single user system. While most programs will run on the network with no problems, others may give inadequate performance, or apparent problems. Be sure to analyze your application and test your particular program before creating or modifying valuable files.

NOTE: BEFORE NETWORKING LEARN TO USE YOUR MORROW and CP/M

=====

SOFTWARE NOTES

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Networking with The LAN/Rover(tm) allows a user to access other disk drives and files. It is critical to know proper backup and file management procedures for successful use of the system.

The LAN/Scape software and the ADEVCO network interface hardware are serialized together. It is a good idea to keep the master software diskette with the workstation in which the like numbered circuit board is installed. When making working diskettes, be sure to use the distribution diskette included with The LAN/Rover Local Area Network System by ADEVCO, Inc.

Software must only be used on the specific computer model for which it is intended. The MORROW computers have major hardware differences, and the CP/M which comes with MORROW computers has had numerous corresponding revisions, which make the different machines partially incompatible.

Throughout these instructions, all model MD-3 refer to the MORROW models using CP/M 2.2, REV. 2 main computer boards. These run on the LAN/Rover using **LANM3.COM** or **LANM3LP.COM**.

The HARD DISK models are referred to as the MD-5 though they may in fact be an MD-5, 11, 16, or 34. These models run on the network using CP/M 3.0 and the programs **LANM5.COM** or **LANM5LP.COM**.

NOTE: Mixing diskettes with different formats may degrade the performance on the network. So, when using a double-sided disk-drive MORROW, always use the SAME format diskettes in both the A: and B: disk drives.

=====

MASTER DISKETTE CONTENTS

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The LAN/Scape distribution diskette comes with all programs necessary for networking and for MORROW models MD-3 and the MD-5 family. The diskette is in the MORROW double-sided, double density format. The programs on the LAN/Scape A: distribution diskettes are:

(Files specific to models MD-3)

LANM3.COM - LAN program. (Remote printing.)
LANM3LP.COM - LAN program. (Local Printing.)

(Specific to model 5 family.)

LANM5.COM - LAN program. (Remote printing.)
LANM5LP.COM - LAN program. (Local printing.)

(Required files for all models.)

LANCCPR.OVL - File required on A: drive if on network.
SIGN.COM - Req'd. (A: Drive, User area 0) to sign on or off the LAN.

(Optional utilities common to all models.)

CHANGE.COM - To change disk drives on the network.
FLASH.COM - To send messages to screens of other stations.
MAIL.COM - To send or read mail from other stations.
PRINTER.COM - To control remote printing.
SETA.COM - To set file attributes.

(Special purpose files, test & auto-start examples.)

LANEX.COM - Req'd. on A: drive for auto-start SUBMIT files.
LANTEST1.COM - Network transmit diagnostic.
LANTEST2.COM - Network oscilloscope diagnostic.
LANTEST.SUB - Sample test routine using LANEX or Submit.
LANSTART.NO1 - auto-start SUBMIT file for station #1.
LANSTART.NO2 - auto-start SUBMIT file for station #2.
LANSTART.NO3 - auto-start SUBMIT file for station #3.
MANAGER.COM - To change user passwords & privileges.
 >> RESTRICT ACCESS! <<

```
=====
NETWORK UTILITY PROGRAMS
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The ADEVCO staff have selected and in some cases modified specific public domain programs and included them on the LAN/Scape distribution B: diskette.

```
(Public domain program useful with the LAN/Rover.)
DD.COM      - Enhanced directory utility.
DD.DOC      - Documentation.
FIND.COM    - Scans text files for desired words.
FIND.DOC    - Documentation.
READ.COM    - Permits browsing through text files.
READ.DOC    - Documentation.
RENAME.COM  - Rename utility with wildcards.
RENAME.DOC  - Documentation.
SPOOL.COM   - Permits directing print output to files.
SPOOL.DOC   - Documentation.
SWEEP.COM   - File management utility.
SWEEP.DOC   - Documentation.
UNSPPOOL.COM - Prints out formatted text files..
UNSPPOOL.DOC - Documentation.
```

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=====
WORKING DISKETTE PREPARATION
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Make a back-up of the master distribution diskette provided, then follow the instructions below to make one working diskette for each workstation to be used with the specific files as required for the computer type.

FOR MODEL MD-3

1. Use the MORROW COPY command from CP/M to COPY the distribution diskette onto a blank diskette in drive B: (see MORROW user manual for complete instructions.)
2. PIP the CP/M program PIP.COM from the CP/M diskette to your LAN/Scape working diskette in drive B:
3. Now put the disk you have just made on drive A: and the LAN/Scape distribution diskette in drive B:

```
Type:          <CTRL> C                      (Return)
Then:          PIP A:=B:*.*[ov]                (Return)
```

FOR MODELS MD-5, 11, 16 & 34

1. The CP/M program PIP.COM should already be on the A: drive of a model 5.
2. Insert the LAN/Scape distribution diskette in the floppy drive and type PIP all files onto the A: drive, user area 0.

Now use the same techniques described above to transfer the files on LAN/Scape distribution diskette B: which may you may find useful to your working diskette.

=====

AUTO-STARTING THE LAN/Rover

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MORROW MD-3: after you have made a working diskette, use the CP/M program to SYSGEN the working diskette on drive B:. You will be asked to enter a CCP command line. After the prompt enter:

==> <LAN/ Program name> (Return)

When you are through COPYING or PIPing the LAN/Scape programs to a working diskette or hard disk of a particular model, you may wish to ERASE the unusable programs designated for other model MORROWS.

=====

PRELIMINARY TESTING

=====

After the installation of the wiring is completed, you are ready to test the network.

Label each machine with a unique station number. Now label the software, the original and copy, with the same station number. For security reasons, you should put away the software distribution copy in a place accessible only to the network manager.

Now for some actual testing:

1. Be sure a working copy of the software is in the A: drive of each computer. If you elected to load the software automatically (auto-boot) when you copied it, then you only need to press the reset button.

ON THE MODEL MD-3

LANM3

(Return)

ON THE MODEL MD-5 family

LANM5

(Return)

FOR ALL MODELS

After several seconds the machine will respond with:

Welcome to:

The LAN Local Area Network-Version 1.1
Copyright (c) 1985 ADEVCO, Inc.
Copyright (c) 1984 Centram Systems, Inc.

To use the LAN, you must sign on -

3. The system will prompt and you should answer:

User Number: 0 (Return)

This tells the system that you are signing in as user 0, needed for this testing.

4. The system will prompt and you should answer:

Password: TEST (Return)

Your screen will look like this:

Password:****

You will note that as you type your password, "*"s" will appear on your screen instead of the letters you entered. This is to protect the password from other viewers.

If screen shows "invalid password" be sure you have entered in UPPER CASE.

Now repeat steps 1-4 for each machine to be connected to the network. Then proceed to the next step.

5. Type:

FLASH AL HI THERE (Return)

On all the remote stations should appear:

Message to all from 00

Hi there!

. . .

If the message appears at all stations, you know that the software, the hardware and the wiring installation passes this most basic test.

Now repeat step 5 from each machine and check the screens of all other machines.

In the previous planning stage you assigned each station a unique number. That number should be marked on both the working diskette and the station.

The workstation number may be changed by using the **MANAGER.COM** management program, as described in Section B.4, ACCESS. Remember, ONLY network managers should have access to this program.

Now, to access information on another workstation, a station must be MAPPED so that each remote drive may be accessed as if it were another disk drive on the local workstation.

Now assign the station number of the first workstation to # 1 using the **MANAGER.COM** program. Then enter:

MAP G:=A:02

Then assign the second Workstation as # 2, using the **MANAGER** program. Now enter:

MAP D:=A:01

For Workstation 3 assign the station number to # 3 using **MANAGER**. Then enter:

MAP D:=A:01

MAP G:=A:02

Now all three workstations are properly mapped and ready for use. Now for a quick test, from any workstation type:

FLASH AL HI THERE!

(Return)

And your system should respond with a bell from the destination station. If it doesn't, refer to the problem solving section.

Now verify the mapping of the disk drives by typing:

MAP

(Return)

Finally from a workstation MAPped for access to another station, as #2 or #3 above, type:

DIR D:

The network traffic LED should blink brightly for a short time on all workstations connected to the network during disk access.

If all this is working correctly, you are ready to start initializing the system. If there are any problems, reload the software on the problem machine and try again, then refer to the TECHNICAL GUIDE, MANUAL "C", Section 5, Problems, Causes & Solutions.

NETWORK APPLICATIONS

Before using a specific application program on the network, it is important to review the basic limits and procedures for using programs.

The LAN/Rover network using The LAN software currently relies on CP/M which is a single-user operating system. Therefore there may be certain undesirable interactions between the LAN software and application software which will require a measure of analysis to resolve.

While most applications programs will perform satisfactorily without modification on the network, a few will require special management procedures, software reconfiguration or user compromise.

=====

USER MEMORY AVAILABLE (TPA)

=====

In CP/M the amount of user memory available to run programs and process files is known as Transient Program Area (TPA). When using new or untried applications software in any network application first check the amount of user memory, or TPA used.

Most CP/M stand-alone programs require less than 48 k of TPA. Most multi-user system software in MP/M and OASIS require less than this. A few programs designed for stand-alone applications require 52 k or more of TPA and are generally not suitable for network use.

Programs which require more TPA than is available on a network may exhibit erratic performance, such as poorly formatted printing or interrupted execution. In more severe cases the program will simply not load or execute. But there are always options to gain the maximum TPA.

- The first is to run programs from computers with the most TPA. On MORROWS use hard disk models where tpa is critical.
- Use the LAN/Rover local printing option, and the the LANLP.COM programs. To provide an extra 1 k of TPA.
- Where possible use program modules rather than loading one large program. Create subfiles instead of one large file.

Most programs will operate on the network without problems. Please refer to the applications paragraphs in the rear of this section and to your computer or software documentation.

USER MEMORY AVAILABLE

MORROW MODEL		MD-3	MD-3	MD-5
NETWORK PRINTING		LOCAL	REMOTE	ALL
CP/M VERSION		2.2	2.2	3.0
TPA	Hex	C800	C400	F000
	K	50	49	60

```
=====
RUNNING A PROGRAM
=====
```

The LAN/Rover commands are virtually identical to those in CP/M, so you should quickly be able to use the LAN software. Before we look at the operation of the net, there are three conditions which must be met prior to running programs either locally or remotely:

1. Station numbers must be assigned and known.
2. The disk drive access must be provided through the **MAP** command.
3. If program overlayfiles are required (WordStar, dBASE, etc.) they must be located on the appropriate drive or user area.

Applications programs may be run as follows while on the LAN/Rover.

- Run the program locally while logged on to your local disk drive.
- Run the program from a remote disk drive while logged on to a local disk drive.
- Run the program from a remote disk drive while logged onto that remote disk drive.

When you sign on to the LAN/Rover, the system sets itself to the default drive, A:. To run a program on the A: drive, simply enter the name of the program.

If the program that you wish to use is on the local B: drive or on any other drive you have used the MAP command to

provide disk access, simply enter the file name as you would in standard CP/M.

For example:

E:ACCOUNTS (Return)

This tells the system to load a program called ACCOUNTS.COM that resides on the E: drive.

You may also log on to a remote drive just as you would in single user mode. From the prompt:

A0>

Type:

E: (Return)

and see:

E0>

Then to run the program you only need to enter the name:

ACCOUNTS (Return)

If the system cannot find the program on the logged drive and user area, it will search automatically for an entered program or .COM file name in this order:

- A) On the specified or logged drive in the logged user area,
- B) On the logged drive, user area 0 (zero),
- C) On the A: drive, user area 0.

=====
LOADING A REMOTE FILE
 =====

There are two ways to "get a file" in the LAN/Rover. By "file", we mean any binary, hex, text or COM file (e.g. program). In other words, anything that you can record on a disk. The two ways are:

- Load it from a remote disk drive, and
- Copy it from a remote disk drive to your own machine before using it.

Although the LAN/Scape software has the power to allow you to do all your activities over the net, it is better to move program, text, and data files locally than to use them remotely. Otherwise you could unnecessarily tie up the network with frequent remote disk access.

Generally, running a program on a remote disk or writing to a remote data file is allowed only under specific circumstances:

- When there is little activity on the net,
- When you need to use large data bases loaded on the hard disk drive of a remote KAYPRO 10,
- When you quickly want to review a file or run a short program without cluttering up your local disks and when that file or program is short.

The technique of running a file from a remote disk is the same as running it locally. Log on to the remote drive by typing its drive number followed by a colon. The system will respond with a prompt of **FO>** or whatever combination of drive and user number is appropriate. Then enter the name of the program that you want. The program will load and you're off and running.

You may also do a variety of operations over the net which are identical to those in CP/M. The **TYPE** command works exactly as you would expect. You do not have to log on to a remote drive to type a file. Simply enter **TYPE D:<MYFILE.TXT>**.

If you have a printer attached locally, a **CONTROL P** will toggle it on just as in CP/M. If the appropriate software is loaded, you may use **DUMP**, **DDT**, **STAT**, **PIP**, the **SAVE** function and other CP/M tools remotely with consistent accuracy.

Finally, accounting, word processing, spread sheet, and many other kinds of software allow data or text to be stored on disk for later use. When you first load such software, you are asked for the name of your old (or new) file and the drive on which it is stored. The exact language may vary. If you have **MAPPED** your drives using the **MAP** command, then you can answer the questions with the name of a remote drive and file name. This is usually in the form of:

F:<FILE.TXT>

(Return)

An example of such a program is WordStar. If you select WordStar's **L** option (note: to do this the WordStar overlays must be on your **A:** drive) and log on to a remote drive such as drive **F:**, you will be shown the **F:** menu. You will then be able to edit that remote file. **Be careful not to unintentionally change someone else's work.**

If you edit over the net by logging on to a remote drive, the edited file will be saved back to the remote drive, changing the original file. If that is not what you intend, it is far better to use the second method of "getting a file," and copy the file to your local drive.

```
=====
COPYING FROM A REMOTE DRIVE
=====
```

The alternative way to get a file is actually to move it from a remote drive onto your local disk drive. Again, a file may be anything recorded to disk including a program. If you have the file or program locally, your computer will not repeatedly need to go over the network to get information. This is particularly important in busy offices if you are using a "disk intensive" program that refers to disk frequently during operation.

There are several ways to move a file from a remote disk to your own. Many programs have a "copy" or file transfer feature which can be used over the network exactly as it is used locally. There are several file management programs which are designed to manipulate files with ease. A public domain program called NSWEEP.COM is particularly handy. CP/M's own PIP command also works as well over the network as it does locally. You may PIP between user areas over the net.

Let's say that you want to move a file from user area 8 on drive F: to your A: drive, user area 0 :

Type:

```
USER 0                                (Return)
PIP A:=F:<FILE.TXT[G8]>                (Return)
```

The "[G8]" at the end of the expression means "go to user area 8 to get the file."

For the technically oriented, other CP/M, PIP and STAT switches work as well, with the limitation that while in the LAN, no logical device should be set to the RS-232 serial I/O port as the LAN/Rover uses this port. Any device on this port may be left connected, but will only be usable when the station is used as a single-user computer.

```
=====
ERROR MESSAGES
=====
```

In the earlier sections, error messages have been described as appropriate. But here are a few general considerations.

Error messages can come from any combination of the following sources: The LAN/Scape software, the CP/M operating system, and your applications program.

The FIRST message displayed will best describe the problem, and will usually be the network error message. The LAN/Scape software error messages are always a combination of upper & lower case characters. Most other error messages are upper-case only.

For example, if you try to access a program on a MAPPED remote disk drive of a station NOT on the network, the LAN/Scape error message will be:

Remote station is not available now.

And the least significant CP/M error message will be:

No file

(Note the upper & lower-case CP/M error message.)

=====
APPLICATION SOFTWARE POTENTIAL PROBLEMS
=====

The following discussion will explore some of the considerations of using applications programs over the network. This should be applicable for most of the programs which LAN/Rover users will encounter.

=====
SOFTWARE CONTENTION
=====

1. TRAFFIC CONTENTION - Managing the network is the only route to operating your LAN/Rover network successfully. As you gain experience in using your net, you will probably discover other new techniques which will allow you to operate more efficiently in your own office. As you become more proficient in using the network, it should reward you with higher productivity through better office management. This document is not the final word on how to do things; rather, your own practical experience should always be your guide.

2. MEMORY CONTENTION - The LAN/Scape network software takes about an additional 7k of memory, recognizes and depends on the presence of a "standard" CP/M BIOS on each specific model, and operates in high memory. Therefore, any programs which require the maximum memory, alter the size or content of the BIOS of CP/M, or operate in high memory may not run with the LAN/Scape software.

Any computer system has limitations, and the best course is always to learn to use your system. Find the limitations within your own needs and then try to adapt procedures which will accomplish your goals within the limitations. For example, some ramdisk or memory-disk programs which modify the BIOS may run with the LAN/Scape software. Here's how:

First Log on to the network. Then run the memory-disk program, assigning the logical disk name as usual. Finally MAP the new logical disk to the LAN.

It is prudent to test all software before making a major commitment to using it for your office needs.

=====
NETWORK TRAFFIC
=====

Optimum use of the network can be ensured by minimizing inefficient use of the network. The less network traffic, the faster the network will operate.

This is true for all types of activity, and especially true of loading and running a program over the network from a remote drive. This should only be done if absolutely necessary. The best technique might be to make a local copy of the applications program or files to be used on your machine using the PIP command over the network or locally by using the COPY program provided by KAYPRO on the Master CP/M diskette.

If you notice that the network indicator light is on constantly, avoid initiating network activity until it stops. The network lines can be shared by two or more activities. If you accidentally do initiate activity at such times, nothing will be damaged. However, it may result in slower transmission of both your activity and that of your co-worker who was already on the line.

If someone is remotely accessing your local disk drives, it might be best to avoid simultaneously asking for a local directory or warm booting. Doing either of these operations can slow the system down. However, you may read or write to a disk while others are also accessing the same drive without significant degradation.

If you are going to PIP a program or a file to or from a remote drive, it will help to let the user of that station know that you plan to access their machine. You can do this by sending a message to them over the net using the **FLASH** command.

If you receive such a message, then ease off active input to your keyboard while your drives are accessed. If you continue to enter data quickly, you may slow down the transmission of the file to your co-worker and add to congestion on the net. You may also notice a slight delay in the keyboard to screen response. This is because the CPU of your computer is being "time shared" between the network and local processing.

The LAN/Scape software adds a "type ahead buffer" to the computer, however if you are a very fast typist, it is possible that you may lose an occasional character if a remote network user is accessing your disk drives.

* * * SPECIFIC PROGRAMS * * *

===== WORDSTAR =====

WordStar works normally over the network. There are only a few minor situations to avoid. Each is related to the way in which WordStar is designed to work.

===== WORDSTAR OVERLAYS =====

WordStar expects to find its "overlay" files in the same user area of the disk on which you are logged. Instead the overlays may reside on the A: disk in the same user area on which you are logged.

If WordStar does not find the overlays in these areas, you will be shown an error message. You must then exit the program and PIP the overlays to the correct area or disk by entering:

PIP <Destination>:=<Source>:WS*.OVL <Return>

if the files are in the same user area.

Otherwise enter:

PIP <Destination>:=<Source>:WS*.OVL [G<user area 0-15, location of the overlays>].

Refer to the CP/M manual for more detail about using PIP from different user areas.

The preferred method which is the least net intensive is to PIP the file from the remote drive to one of your local drives A: or B: and edit locally with WordStar running locally on your drive A: or B:

===== WORDSTAR LOCKING FILES =====

The second area to be aware of is the interaction of WordStar and the **Lockable** feature of the LAN/Scape software.

Normally, application programs open a file when they first read it from disk. They then close that file when they write back to disk. This sets and then releases the "in use" indicator, **I**, which blocks other access to the files (See section on **SETA.COM** above).

WordStar does not follow this pattern. Instead, when you edit a file, WordStar opens a temporary file, saves the new text to a temporary file name, and when it is closed, the original file is renamed to <FILENAME>.BAK and the temporary file is renamed to the original file name.

If the original file was set to **Lockable**, the system will not allow WordStar to rename the old file. The save operation is disrupted with error messages both from WordStar and from the LAN/Scape software.

Fortunately, nothing is actually lost if this occurs. The old file retains the old name and the newly edited file retains the extension <FILENAME>.\$\$\$, indicating a temporary status. You may then rename the old file to <FILENAME>.BAK and the new to its correct name. However, it is best not to use the **LOCKABLE** feature with WordStar.

If you do use the **LOCKABLE** feature with WordStar, remember to reset each file used to CLEAR after each use, as follows:

```
SETA <FILENAME> C (Return)
```

```
=====
WORDSTAR PRINTER CONFIGURATION
=====
```

When a printer is used on the network, the configuration may have to be altered. When "custom" printer configurations are used, both the TPA available and the control code sequences can create problems, which show up as lost spaces or margins, or inaccurate characters.

There are a great many possible combinations of printers and special attributes, and there is no set remedy for this problem. If it crops up, there are a number of possible solutions:

1. Use the WordStar program on a model 2 or 4 to print files which may be Local or Remote to a Remote printer. (Gives more TPA)
2. Do not print remotely. Use the Local printing network program LANLP.COM.
3. Use a "STANDARD" printer configuration, such as TTY printer without backspacing. This can be installed with special required control codes.
4. The NewWord word processing program in the "compact" configuration for networks and multi-user systems is said to work without problems.

=====
DISK ERRORS
=====

Occasionally you may be using WordStar on the network, and try to read a file from a disk drive which is not MApped. You will be faced with a network error message "drive not available. Default? (Y/N).

NOTE: If you answer Y (yes), your program and file will recover. If you type N (no), your program will abort, CP/M will Warm Boot, and your file will be lost. **BE CAREFUL WHEN YOU SEE THIS ERROR MESSAGE!**

=====
NewWord
=====

NewWord 2.0 and up should work on the network without problems, including opening and closing locked files. Earlier versions of NewWord require more TPA and may not load or run on the network. We recommend upgrading to version 2.0 or higher.

=====
PERFECT WRITER
=====

Perfect Writer works correctly under the LAN/Scape software. The only potential problem is in the use of the Perfect Formatter program on a computer with limited TPA.

=====
PERFECT WRITER MEMORY
=====

Due to the reduced TPA available on some computers in combination with the network, only very short files may be formatted. Perfect Software normally is not limited by RAM because of the use of the SWAP file.

The Perfect formatting program does not use the SWAP file, and is very RAM dependent. Formatting long files on a computer with limited TPA is best done off the network. The "Quick Print" option may be used at any time from any model on or off the network.

=====
PERFECT CALC
 =====

Perfect Calc works correctly over the network. You may load Perfect Calc from a remote drive and edit a Calc file locally, or vice versa. The only major concern is with the **Lockable** feature of the LAN.

Perfect Calc both opens and closes a file every time the file is read or written to. There is no effective way to block access to the Calc file using the **Lockable** feature of the network system. When using this type of spreadsheet program, it is best to move the file to your local drive. Designate it as **Exclusive** while you're working on it, then set it back to **Global** (see SETA.COM).

=====
MBASIC
 =====

Most MBASIC programs run without trouble. There are a couple of minor precautions to observe.

=====
MBASIC CONTENTION
 =====

Programs running under MBASIC must be considered "CPU intensive", keeping the computer busy processing the basic statements. (FOR - NEXT statements are particularly demanding of processor time.) Basic programs should be run **LOCALLY** and file access or printer access **FROM** other stations on the net should be minimized. Basic programs may always file or print remotely.

=====
MBASIC MEMORY
 =====

When using MBASIC, be aware of the TPA required. If your applications program is written in MBASIC and you have a TPA problem, there are at least three options.

1. The latest version of MBASIC takes over 7k more memory than the previous version, called OBASIC.COM supplied with some versions of MBASIC.

While this older version of MBASIC is not quite as powerful as the latest version, it may suit your requirements.

2. Use the Local Printing option of the network, LANLP.COM. This will save 1k of memory which may solve your problem.
3. If you have the source code for your basic program, you may be able to divide it into more than one module, thereby using less TPA at a time.

=====
dBASE
=====

One of the more popular data base programs currently supplied with certain computer models is dBASE II. This program works well over the network, but there is one area for consideration.

=====
dBASE FILE-LOCKING
=====

The use of the file locking feature of the LAN software requires special attention. Normally, application programs open a file when they first read it from disk. They then close that file when they write back to disk. When using the file lock feature, unless a change is made to a dBASE file, closing the file (with a CLEAR or USE command) does NOT write back to the disk, and therefore does not reset the file to unlocked.

There are a number of ways to prevent other users from overwriting files. You may have to experiment with your particular installation and application to get the best results.

1. Other users may only be allowed a READ-ONLY privilege.
2. After a lockable file has been used, just prior to closing the file use the dBASE command REPLACE <field 1 name> with <field 1 name>. This writes the identical field data back to the file, allowing the file to be released to other users.
3. A reliable method in which the user is writing a dBASE program and does NOT use the file lock feature SETA <filename> L . A "flag" file is created in CP/M by using the command SAVE 0 OPEN.DBF.

Immediately prior to opening the data file to be protected, use the dBASE command RENAME OPEN TO CLOSED. The data file is used normally. Then immediately after finishing with the file use the command RENAME CLOSED TO OPEN which then releases the file lock and the "in use" indicator. This technique will dump an operator out of a dBASE CMD file and leave them in dBASE.

4. Another method to achieve file locking within dBASE without dumping a user out of the CMD file would be to CREATE a .DBF file named LOCK to set a semaphore. LOCK would have one field, STATUS. A CMD program would test to see if STATUS is false, then open the target data file. If STATUS were TRUE, the program could indicate a message, and resume.
5. Finally the FILE command could be used to test for the presence of a LOCKED file. LOCKED files will appear to not be on the disk.

=====

PERSONAL PEARL

=====

The Personal Pearl data base management program normally requires over 52 k of TPA to run. and is not recommended in most network environments. If possible use an alternative, limit use only to those computers with adequate TPA, or only use in a stand-alone mode.

=====

DataStar

=====

Most modules used in DataStar will run without problem on the network. The Formgen module is too large to run and should only be used off the network. If problems are encountered, follow the suggestions below to maximize your available TPA.

=====

DIRECTORY PROGRAMS

=====

All directory and file management programs that we have seen, work normally on the LAN/Rover both locally and over the network. However be cautious. Some directory programs are not designed to be used in systems with multiple user areas, and give wrong data about disk space remaining. The public domain program **SWEEP.COM**, and others like it, are especially useful in moving multiple files back and forth over the network.

Our standard DIR command is the only directory which can show you the set file attributes for the network, though others may show graphic characters on the Models 10 & 84s. The DIR command is a resident program of the CCP and therefore is always available.

Some directory programs work correctly over the network but are inefficient and can cause unnecessary network activity. This is particularly true if such a program is used by two stations to simultaneously request the same directory. The system could be "tied up" for several minutes. Avoid using these programs when possible.

To compound the problem, some programs have no provision to halt their operation until complete. Therefore you can be stuck if this happens. You must wait or "cold boot".

We have included a more efficient directory program called DD.COM which gives the same information. Refer to the ADEVCO B: distribution diskette for documentation.

=====
DISK SPACE
 =====

Before using a program or filing data on another (remote) disk drive, find out if enough space is available on that drive for your purposes.

If you write to a full remote disk your station will show a "write" error and your operations may recover if your applications program forgives such an error. Otherwise your operations may be aborted.

DISK SPACE WARNING:

If you try to write to a write-protected disk on a remote station, you will show a write error, and the operations on the REMOTE station will be aborted just as your operations would be aborted when writing to a write-protected disk on a single-user CP/M system.

Inadequate free space on disk drives can cause a variety of errors in operations. Be careful. **CHECK SPACE AVAILABLE BEFORE STARTING TO WORK!**

PROBLEM SOLVING

=====

FAILURE AVOIDANCE

=====

It is said that the sure cure for a problem is to avoid having one. The following review presented in outline form might help insure that the "easy" (and easy to overlook) problems are not the bug in your system.

COMPUTER START-UP & USE

1. Check for grounded plug on AC line.
2. Check Keyboard cord for connection (do not stretch).
3. If diskettes are warm after use, turn off computer if it will not be in use for 15 minutes or longer.
4. Static electricity at the keyboard can cause a variety of erratic performance symptoms. When humidity is low:
 - Use a humidifier.
 - Spray the carpeted floor around the computer with a static charge eliminator. Try Downey in a spray bottle.

DISKETTE FORMAT

1. Demagnetize all diskettes before formatting.
2. Format diskettes on computer where they will most be used.
3. Label all diskettes with Computer # & density (SD,DD).
4. Use FINDBAD to verify all diskettes after format.
5. Do not use DISK COPY to FORMAT & COPY a diskette. Format then transfer needed file using verification (BOV).
6. Keep backups of all files you do not want to lose.
7. Use diskettes on computer where formatted whenever possible.

DATA Reading & Writing to diskettes.

1. NEVER write to an unread diskette.
2. NEVER change diskette densities (DS to SS) once in the LAN or SWEEP.
3. The boot disk drive should hold the "prime" diskette. Only Read from a diskette of a different density as the boot diskette. If you want to write to that diskette, change "prime" diskette density or copy the necessary files to a diskette of the same density.
4. For normal operations, only use diskettes of the same density in both disk drives.
5. Keep diskette in envelope when not in computer.
6. Keep diskette away from: Heat, sunlight, dust, smoke, & stray magnetism from scissors, paper clips, screw drivers, telephones, monitor power supplies, televisions and radios.

TESTING

1. Use FINDBAD on ALL diskettes when formatting or to verify integrity.
2. Learn the DU-V79, FIX or POWER programs.

Implement optimum option
 Frequency
 Cost benefits
 Ease of installation
 Contact installer/manager

To quickly and and accurately find and solve a problem in an office, adequate information is required.

Initial ID required:

Name
 Address
 City State Zip
 Status (Dealer, End user)
 Account #
 System (Demo, Sale)
 Net location (Address)

Network

HARDWARE:

Units by type
 Distance, each unit to unit:
 Printer(s) type, location.

SOFTWARE:

Version (on each processor)
 Configuration
 Station #,
 Map,
 Printer assignment:

The easy way to get much of the information described above is through a Failure Report, shown below as used in one office.

FAILURE REPORT

DATE

Operator (Name)

Computer(model, number, location)

Plug-in location (room, extensions, etc.)

Computer On time

Computer Failure time

Failure description (what happened)

Disk drive of failure (drive name, A: or B:)

Program in use (WordStar, Etc.)

Program diskette location (A: or B:)

Data diskette location (A: or B:)

Function in operation (Saving new data to disk)

With this information the cause of any problem can usually be narrowed down accurately... the first step to solution.

In response to a system problem, the technician should also keep an ACTION LOG identifying problem computers, location, user and time, date, description and solution. This will help to spot recurring problems; those caused by specific users or computers.

Category of Problem	Number
---------------------	--------

Date

Serial #

User name

Remedy

LAN/Rover problem solving:

The causes of any possible problems with the LAN/Rover network system are limited and predictable, and can originate in the following areas:

SOFTWARE
USER
HARDWARE

- A. The wiring;
 - In the junction box connections and cables going from one computer location to another,
 - In the connection or cable running between the junction box and the computer,
 - From the network connector box on the rear of the computer to the ADEVCO printer circuit (PC) board,
- B. The main network interface (PC) board components
- C. The interface between the ADEVCO PC board and the computer PC board,
- D. In the computer PC board components.

The following information will lead you through solving almost any problem encountered.

NOTE: It is easiest to find and correct a problem in a network by relocating or swapping components.

=====

LOCATING THE PROBLEM

=====

If a particular station is not transmitting properly, exchange that station with another (leaving the stub cable in the junction box of the first location and only relocating the computer).

If the problem persists at the same location with a different computer, the problem is most likely in the wiring at that location. Now change the stub cable connecting the station to the network junction box. If the same location gives problems, the problem is in the junction box connections.

If the problem follows the station, the problem is in the computer. First swap the network PC board with another. If the problem persists, the problem is either in the cabling to the PC board, (check the connectors, then the black and white power wires and the brown clock wire for proper connection), or in the connecting socket where the network PC board plugs into the computer PC board, or last but not least, in the main computer PC board itself.

The most basic function used to test network communications is the transmit mode using the **FLASH** command.

The **FLASH** command allows general system testing using **FLASH AL MESSAGE**. This transmits a message to the network and is a test of the transmit mode at the sending station and the receive mode only of the receiving station. Even with a station off of the net, if the ADEVCO interface board is properly installed, a **FLASH AL MESSAGE** command will result in a prompt Warm Boot.

FLASH also allows specific station testing by the **FLASH <Station #> MESSAGE**. This tests both the transmit mode and the receiving modes in both the sending and receiving stations. It transmits the message and waits for a response which verifies receipt of the message. To use this command, the stations must be properly numbered.

=====

TEST FILES

=====

Three files have been included in your disk to make trouble-shooting easier.

TEST1.SUB - This short submit file alternately flashes a message and asks for a directory over the network. Review this file with the **TYPE** command from CP/M before using, and modify as needed so that the station numbers are properly assigned. Initiate this file by typing **LANEX TEST1**. Be sure that **LANEX.COM** is on your A: drive.

NETEST1.COM - This program sends out a continuous message to any designated station on the network. It operates the same as **FLASH**. **NETEST1** can be initiated by typing:

NETEST1 (Return)

The screen responds with:

Station number:
Enter the target receiving station #:

2 (Return)

The screen responds with:

Text:

Enter any short message:

This is a test (Return)

If the message is successfully transmitted and received, station #2 will display a steady succession of messages with "bell" tones.

If the message does not get transmitted, received and verified, the sending station screen will show:

Station busy or unavailable.

And continue to retry.

This can be helpful tracing transmission & reception problems in the wires, cables and connectors by "testing" the connections while this program is transmitting. If an intermittent connection is found, the receiving station will at once sound and scroll the message.

NETEST2.COM - This program will send a steady stream of packets across the network cable, and is ideally used to trace line problems with an oscilloscope.

The program is initiated by entering:

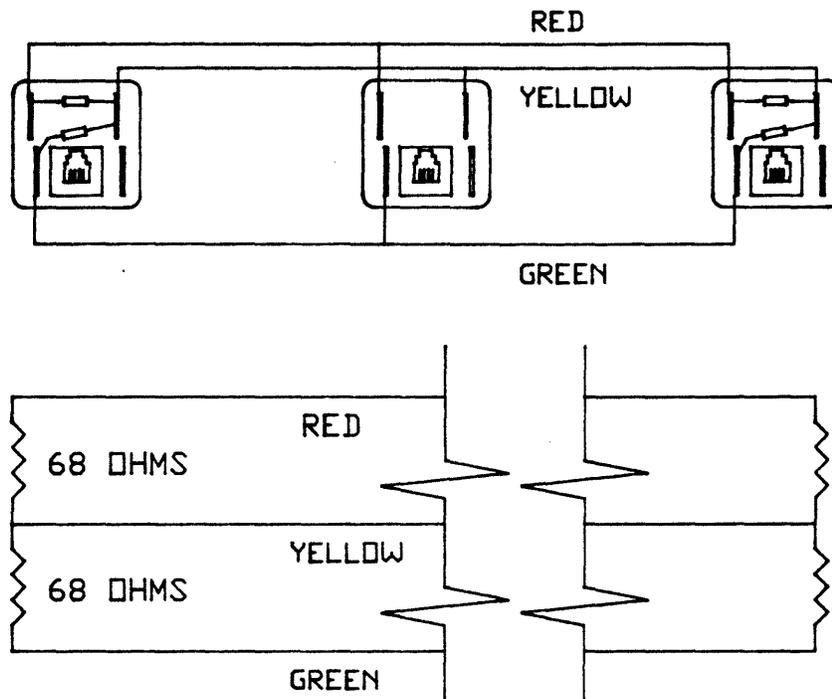
NETEST2 (Return)

The screen will be blank, now type in a short message:

THIS IS A TEST (Return)

Now touch the <ESC> key.

SIMPLIFIED WIRING DIAGRAM



Transmission Cable

RESISTANCE @ 1000 FEET

Red OR Green to Yellow	c. 35 Ohms
Red to Green	c. 69 Ohms

SCOPE SETTINGS:

AC, Auto-trigger

VOLTAGE (AC) Measured Red to Yellow.

20'	c. 3 vac
1000'	c. 2 vac
3000'	c. 1 vac

PACKET SIGNAL

1 Bit cycle = 2 uS wide. Full screen @ .2 uS.

Adjust the trigger and you should see a nominal square wave with some ringing. As the transmission cable length increases, capacitance will result in an accentuated sloped leading edge which degrades to a triangle wave. System will usually operate with a triangle wave.

1 Packet=300 uS wide. Full screen @ 50 uS.

Display will show a full packet with carrier and data bits distinct. The packets are 128 bytes long.

The network lights on all stations should now light up, and a steady, clean stream of packets will be sent across the complete network line, and a square wave should appear on the scope. If the wave is absent or less than the above voltage, a connection is most likely poor. If the wave is extremely ragged, the cable probably is not terminated or installed properly, or the wrong type of wire has been used. If the wave shows more as a triangle at less than 2000 feet, the network cable has too much capacitance.

The ADEVCO LAN/Rover testing Cable is also available to help diagnose problems. This cable allows two workstations to be DIRECTLY connected without a normal wired network cable and terminating junction boxes. A user should be able to isolate a problem which originates in the network wiring. Consult with ADEVCO technical support if you need a testing cable.

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USING THE PROBLEM SOLVING GUIDE

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The Troubleshooting Guide provides a matching of common failure conditions with a list of problems, their causes and solutions.

When troubleshooting, a great deal of time and trouble can be saved by isolating the site of the problem before you set out to remedy it. Once you're fairly sure where the problem is, use the troubleshooting guide to find causes without walking through the whole installation procedure step-by-step.

Find your problem symptom in the first list of PROBLEMS.

The numbers at the right margin refer you, in order, to the most probable entries in the CAUSES & SOLUTIONS list which follows.

Keep in mind that the problem conditions are listed in order from the most likely to the least likely cause; always pick the **first** error condition in the list that applies. Each item in the problem list may be considered a test of the network's functioning; therefore, each test assumes that the earlier tests have been passed.

For example, some failure modes in which remote directories cannot be obtained are not listed because they can be spotted and corrected when attempting to use the **FLASH** command, a more general test of network communication.

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START-UP PROBLEMS

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Following is a list of possible failures occurring immediately after the circuit board installation, as you just start to test the networking system. Beside each symptom is the number referring to the possible causes & recommended solutions which begin on Page 10.

SYMPTOM	SEE CAUSE #:
1. No A> CP/M prompt appears, and... Random characters displayed on screen: Computer "hangs". Does not "boot-up": Both disk drive lights on: Keyboard does not work:	A1-2
2. The TERM.COM program test does not work:	A3
3. The LAN.COM program does not run:	B1-B4

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COMMUNICATION PROBLEMS:

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After start-up failures, the next area of problems you could encounter would be communication failures. Following is a list of potential failure symptoms, and reference numbers for the causes listed below:

1. Machine refuses to FLASH (to ALL):	A4-9, C1, C3
2. Machine will not flash to a specific station:	A6-9, A14, B5
3. Machine will not accept a flash; receiving station hangs up:	A10-12
4. Machine will not take a directory of a remote station (Remote Station busy or not available)	B6-7
5. Network Overload Error -- Check Hardware:	A7, A12, C11

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ERRATIC NETWORK PERFORMANCE:

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The next symptoms you might encounter manifest as erratic network performance. Symptoms and references are listed below.

1. The "POWER" LED, (network traffic indicator) remains on constant	A9-11, A13, C1-3, C7-8
2. Or, never flashes to indicate data transmission:	A12, C2, C7

- | | | |
|----|--|----------------|
| 3. | Characters are being lost during typing: | B9 |
| 4. | A station is dumped out of the network: | B8, B14 |
| 5. | The network performs very slowly: | B6, B9-13, B15 |
| 6. | No communication is possible through the serial I/O (modem) port (without the LAN software in operation -- remember, the LAN disables this port while you are signed on to the network): | A11-12, C4 |
| 7. | The machine communicates perfectly on start-up, but after warming up, begins to fail to FLASH or take remote directories: | C1, C6-C7 |

=====

INSTALLATION CAUSES

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The following list of causes relates by number to the potential problems listed above.

-
- A1.** A pin or pins not making connection between the SIO chip and the socket, or network interface not fully plugged into the computer's SIO socket.
- REMEDY:** Remove all power from unit and carefully remove & reinstall network interface & SIO chip.
-
- A2.** Z-80 SIO IC is not installed on the network interface board.
- REMEDY:** Make sure you haven't mistaken a PIO IC for the SIO, used the wrong SIO (the one that controls the one-way printer port only), or forgotten to plug the SIO into the ADEVCO board. Check the installation instructions for the correct procedure.
-
- A3.** Pins 2 & 3 of the RS-232 serial I/O port not connected.
- REMEDY:** Following installation instructions, connect pins 2 & 3 then retest. Remember to remove this jumper when you're done with the test.
-
- A4.** Stub cable supplied connected directly from one workstation to another.
- REMEDY:** Install network wire as described in instructions with stub cable from workstation to junction box, net cable from that junction box to the next, and another stub cable from the second junction box to the second workstation, etc.
-

- A5.** Color coding not uniform on network cable installation.
- REMEDY:** Check wiring and compare with instructions for accuracy.
-
- A6.** Faulty continuity in wiring or cabling.
- REMEDY:** Use a DVM or other appropriate instrument to verify continuity. However, a continuity test gives only an indication of line integrity. A sub-standard connection can give a positive continuity reading and still not be adequate for data transmission. Be sure to solder all connections.
-
- A7.** Short circuit in wiring or junction box.
- REMEDY:** Check all wiring and connectors.
-
- A8.** Transmission reflections appearing on the network cable.
- REMEDY:** Be sure terminating resistors correctly installed. Suspect very short runs of network cable. See Technical Support.
-
- A9.** Connections in network junction boxes not soldered adequately (unsoldered or a cold solder joint).
- REMEDY:** Solder all connections in modular junction boxes.
-
- A10.** Red-dot connector to The ADEVCO interface board not fully connected or faulty.
- REMEDY:** Check both that the connector is seated on the board's 4-pin header and that the individual colored wires are fully seated in the connector. Correct or see TECHNICAL SUPPORT, below.
-
- A11.** Blue-dot connector to The ADEVCO interface board not fully connected or faulty.
- REMEDY:** Verify continuity & correct or see Technical support.
-
- A12.** Power not reaching network PC board.
- REMEDY:** Make sure that the black and white leads are connected as specified in the installation instructions.
-

A13. Interference is being picked up from heavy electronic equipment nearby.

REMEDY: Relocate network wire or use ADEVCO low-noise network cable.

A14. Interrupt Jumper not installed.

REMEDY: Install jumper as per MANUAL C, Section 1, Page 7.

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USER CAUSES
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B1. Polluted disk, possibly the LAN files were copied onto a disk which was too full.

REMEDY: Make space available and reinitialize working disk.

B2. Incorrect or mislabelled program called up.

REMEDY: The proper version of the LAN/Rover program must be used on the computer model and CP/M version for which it was intended.

LANCCPR.OVL must be used with all models.

B3.a New version of BIOS or monitor ROM installed.

REMEDY: The LAN/Rover will operate on KAYPRO or MORROW computers up to March 1985. If in doubt, call ADEVCO technical support.

B3.b Jumper not installed between pins 22 & 24 of the PIO socket of the model KAYPRO 2'84, or interrupt lines not properly installed on the MORROW MD-3.

REMEDY: Install as per instructions.

B4. Non-standard peripheral options installed.

REMEDY: Only standard KAYPRO or MORROW configurations are supported. Return computer to the standard configuration.

B5. Station numbers not properly assigned.

REMEDY: Read instructions for using the LAN management program LANMGR.COM to assign station numbers.

B6. Disk of mixed formats used on a station.

REMEDY: Use only diskettes formatted for single-sided on the model 2 and for double-sided on the models 4, 4'84 and 10.

B7. Remote disk drives not properly Mapped.

REMEDY: Read instructions about Mapping disk drives on other workstations.

B8. Another station has tried to write data to a write-protected diskette on the "dumped out" station.

REMEDY: Set office procedures to prevent using write-protected diskettes on drives accessible over the network.

B9. Another user is accessing one of your disk drives.

REMEDY: When your disk drive is being used intensively by a remote station, your typing should slow down until that activity is complete. Normally the type-ahead buffer in the LAN will minimize such problems, though the characters may be temporarily delayed in appearing on the screen.

B10. A program is in use which is very intensive in disk access.

REMEDY: Disk-intensive programs are best run out of the network. If they must be used on the network, the applications program and possibly even the files should be LOCAL. The network should be managed to minimize disk access on this station from other remote stations.

B11. A user has logged onto a remote workstation to run a disk-intensive program and may even be filing to a third remote station.

REMEDY: Efficient use of the network dictates minimizing network contention wherever possible. Never log onto a remote drive to run a program unless it is essential. Also, do not log onto one remote station and file to a third unless it is essential. Avoid network abuse.

B12. Other users are intensively using the network.

REMEDY: Watch the network indicator LED on the front panel of the KAYPRO, or on the MORROW LAN/Rover board. When it is continuously red, wait a few moments before initiating more network activity.

B13. Another user has simultaneously made a network request of a process-intensive activity.

NOTE: The simultaneous request from the same drive using the "D" directory program causes the greatest network contention, and to a lesser extent loading WordStar can cause similar delays.

REMEDY: Find out which user initiated the conflicting action and take steps to minimize repetition.

B14. A request has been made from a drive without a diskette.

REMEDY: Be sure to always keep diskettes in all drives to be used on the network.

=====
HARDWARE CAUSES
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C1. Stub cable.

REMEDY: Verify by "swapping out". See Technical Support, replace.

C2. LED drive circuit fault on ADEVCO interface board.

REMEDY: See Technical Support.

C3. Modular contacts in junction box damaged or shorted.

REMEDY: Check gold contact wires inside modular junction boxes for correct alignment.

C4. Faulty SIO IC on the main computer board.

REMEDY: The SIO may be damaged. Verify this by swapping the SIO on the network interface board with another SIO IC.

C5. "Weak" timing IC on the main computer board.

REMEDY: Verify by using component coolant. Be careful not to overheat IC when soldering the timing lead to the clock pin (Section C1.) Replace IC.

C6. Faulty floppy-disk controller on PC board.

REMEDY: This is an error which could have gone unnoticed in your computer until the installation of the LAN. It shows up when the Kaypro 4 and 10 will no longer read/write single-sided diskettes. FDC relies on signal from timing IC. Check with C5, service.

C7. "Failed" IC on network interface board.

REMEDY: Swap IC or swap interface board with another for verification. If you still have problems with your system, see Technical support.

C8. Defective LAN/Rover wiring package.

REMEDY: See Technical Support, below.

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TECHNICAL SUPPORT

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If you have gotten this far and your problem is still not resolved, it's time to phone the folks at ADEVCO, Inc. for technical support. Telephone number 415/493-7160.

If your problem cannot be resolved over the phone, you will be given a return authorization number to return your board to ADEVCO, Inc. The ADEVCO staff will check out your interface board, and assure it is up to specifications or replace as necessary within the terms of the warranty.

The LAN/Rover system is designed to be a foundation for a sophisticated local area network system. Once it is installed and running properly it should provide years of trouble-free service.

I N D E X

A

APPLICATIONS PROGRAMS,SPECIFIC, C.4,8
APPLICATION SOFTWARE POTENTIAL PROBLEMS, C.4,6
AUTO-STARTING, C.3,4

C

CABLE COMPONENTS, C.2,5
CABLING OPTIONS; C.2,1
CABLING PROCEDURE, C.2,5
COMMUNICATION PROBLEMS, C.5,9
COPYING FROM A REMOTE DRIVE, C.4,5

D

DATASTAR, C.4,13
DBASE, C.4,12
DBASE FILE,LOCKING, C.4,12
DIAGNOSING PROBLEMS, C.5,2
DIRECTORY PROGRAMS; C.4,13
DISK ERRORS, C.4,10
DISK SPACE, C.4-14
DROP CABLE, C.1,12 C.2,11

E

ERRATIC NETWORK PERFORMANCE, C.5,9
ERROR MESSAGES, C.4,5

F

FAILURE AVOIDANCE, C.5,1
FAILURE REPORT, C.5,3

H

HARDWARE CAUSES, C.5,14

I

INSTALLATION CAUSES, C.5,10
INSTALLATIONS INSTRUCTIONS, C.1,2

J

JUNCTION BOXES,
TERMINATING, C.2,6-7
CENTRAL, C.2,8

L

LOCATING THE PROBLEM, C.5,5
LOADING A REMOTE FILE, C.4,3

M

MANAGEMENT TASKS, C.4,1
MASTER DISKETTE, C.3,2
MBASIC, C.4,11
MORROW MD-3 HARDWARE, C.1,1
JAPANESE BOARD, C.1,7

KOREAN BOARD, C.1,9
MORROW MD-5, C.1,2 C.1,13-16

N

NETWORK DIAGRAM, C.2,1-2
NETWORK LAYOUT, C.2,3
NETEST1.COM, C.5,3
NETEST2.COM, C.5,4
NETWORK LIMITS, C.2,3
NETWORK TRAFFIC, C.4,7
NETWORK TRAFFIC INDICATOR, C.4,7
NETWORK UTILITY PROGRAMS, C.3-3
NEWWORD, C.4,10

P

PRELIMINARY BOARD TESTING:, C.1,17 C.2,11 C.3,7
PROBLEM SOLVING GUIDE, C.5,8
PERFECT CALC, C.4,11
PERFECT WRITER, C.4,10
PERFECT WRITER MEMORY, C.4,10
PERSONAL PEARL, C.4,13

R

RUNNING A PROGRAM, C.4,2

S

START,UP PROBLEMS, C.5,8
SOFTWARE CONTENTION, C.4,8
SOFTWARE NOTES, C.3,1

T

TECHNICAL SUPPORT, C.5,15
TEST FILES, C.5,5
TEST1.SUB, C.5,3
TOOLS NEEDED, C.1,2

U

USER CAUSES, C.5,12
USER MEMORY AVAILABLE (TPA), C.4,1

W

WORDSTAR, C.4,8-9
WORKING DISKETTE PREPARATION, C.3-5