

CUSTOMER ENGINEERING

MODEL 2247V-4 MODEM SHARING UNIT

PRELIMINARY MAINTENANCE MANUAL

WANG

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1.0 SCOPE

This preliminary manual supports the Model 2247V-4 Modem Sharing Unit, a VS data communications device that allows up to four 2246R Remote Standalone Workstations to share a single modem.

Topics treated in this manual include unit description, installation, hardware operation, and maintenance. Sufficient information is provided to enable Customer Engineering personnel to install, test, and maintain the unit.

The 2247V-4 Modem Sharing Unit is used only with the 2246R Remote Standalone Workstations. The workstations are supported by the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3), a companion to this manual.

The 2246R Workstation Manual contains certain procedures and testing information that is relevant to the 2247V-4 Modem Sharing Unit. Rather than repeat that information here, this manual will make reference to the appropriate sections.

2.0 GENERAL DESCRIPTION

The Model 2247V-4 Modem Sharing Unit (MSU), a new device for use on VS systems, allows up to four 2246R Workstations (with optional parallel printers) to share a single modem and data communications line. It eliminates the need for separate modems at remote sites where more than one 2246R workstation is used.

The 2247V-4 MSU is shown in Figure 1. Nine RS-232-C connectors are mounted in the front panel. One connector, the leftmost, is for the modem cable; and four of the remaining connectors, the rightmost ones, are for the workstation cables. Only four workstation ports are active in the 2247V-4; the remaining connectors are not used. Figure 2 shows a typical interconnection scheme for an MSU in service.

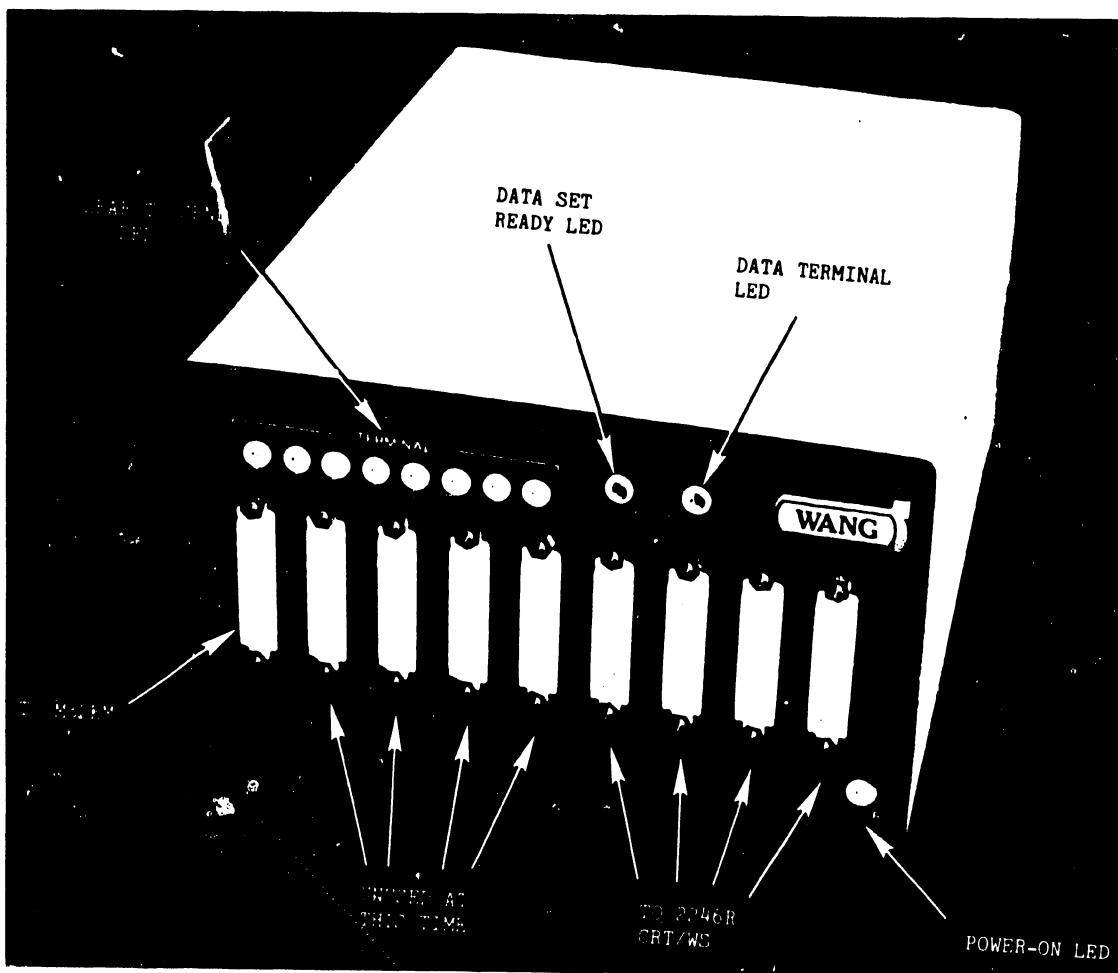


FIGURE 1 THE 2247V-4 MODEM SHARING UNIT

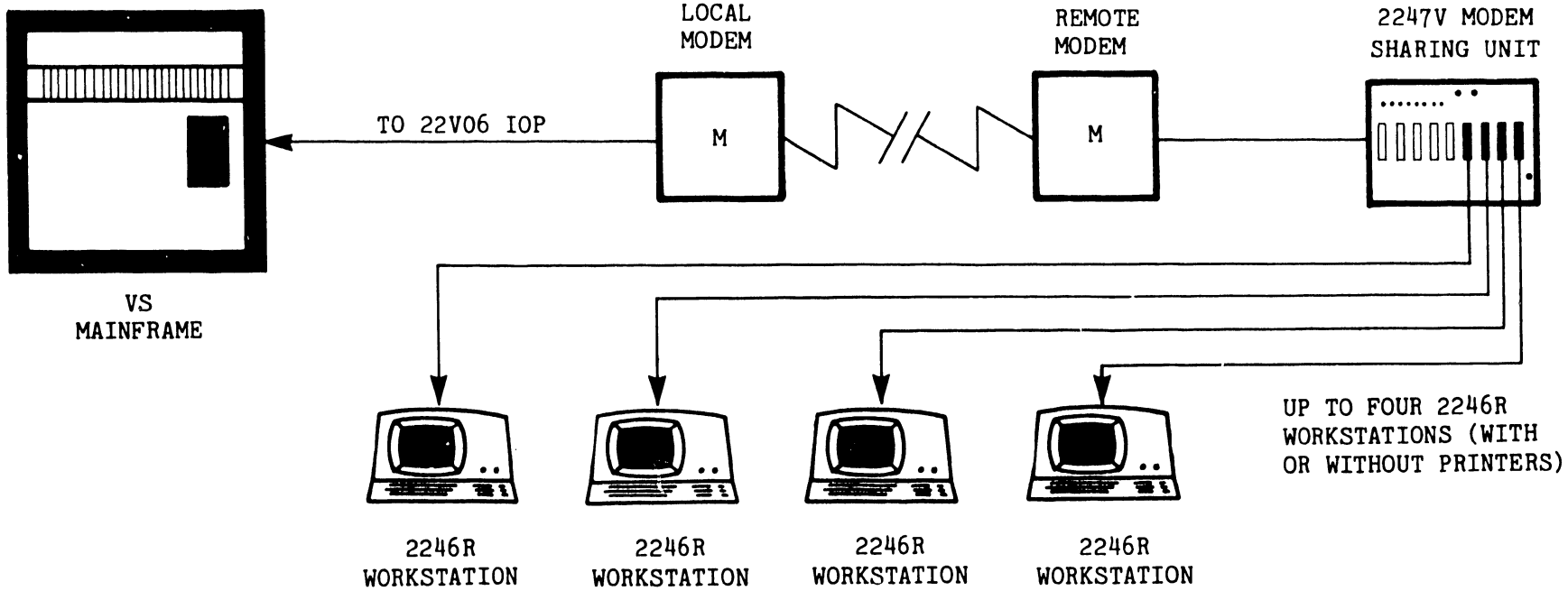


FIGURE 2 THE 2247V-4 MODEM SHARING UNIT IN SERVICE

The MSU can be located up to 50 feet from the modem. (A 25-foot RS-232-C cable is included with the unit.) Maximum allowable cable length from the MSU to the 2246R Workstations is 2000 feet.

Circuitry within the MSU is designed to scan the attached 2246R workstations, one at a time. When a Request-to-Send (RTS) signal is received from one of the workstations, the MSU stops scanning and makes the data communications line available to that workstation. During this time, other workstations connected to the MSU do not have access to the communications line.

A Model 2247V-8, with eight active workstation ports, will be released at some future time. This version will be physically identical to the current 2247V-4, and it will have software to support eight 2246R Workstations. With this version, all front panel indicators will be activated and all RS-232-C connectors will be used.

3.0 SPECIFICATIONS

PHYSICAL DIMENSIONS

Height	6 inches
Depth	12 inches
Width	8 inches

WEIGHT

8.5 lb (3.5 kg)

POWER REQUIREMENTS

115 VAC \pm 10%
60 Hz \pm 1 Hz
0.26 Amps @ 115 VAC
65 Watts

OPERATING ENVIRONMENT

50°F to 90°F (10°C to 32°C)
30% to 80% relative humidity, non-condensing

HEAT OUTPUT

200 BTU/hr (Maximum)

FUSE

2 Amp SB @ 115 VAC

FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS

On/Off Switch

11 LEDs: Power-on, DSR, Receive, CTS (8)

Nine RS-232-C Connectors for: modem (1), workstations (8)

WORKSTATIONS SUPPORTED

Up to four 2246R Remote Workstations with 2247V-4 (currently)

Up to eight 2246R Remote Workstations with 2247V-8 (future)

TRANSMISSION RATE

Bi-synchronous, up to 9600 baud (dependent on the modem used)

MAXIMUM CABLE LENGTH

50 feet from MSU to MODEM

50 feet (standard) from MSU to 2246R

2000 feet (optional) from MSU to 2246R

SIGNAL CABLES (MSU-to-MODEM and MSU-to-2246R)

25-pin RS-232-C 12 feet # 220-0113 (optional)

25-pin RS-232-C 25 feet # 220-0219 (standard cable)

25-pin RS-232-C 50 feet # 220-0220 (optional)

The 12' or 50' cable may be substituted for the standard 25' cable. Cable length must not exceed 50' with the RS-232-C cables.

The RS-232-C cables may not be joined with the special cables listed below.

SPECIAL CABLES (MSU-to-2246R)

These optional cables may be joined together to extend cable length, but the combined length must not exceed 2000 feet.

9-twisted-pair cable	(M-M)	25 feet	# 220-0247
9-twisted-pair cable	(M-F)	50 feet	# 120-2247-01
9-twisted-pair cable	(M-F)	100 feet	# 120-2247-02
9-twisted-pair cable	(M-F)	200 feet	# 120-2247-03
9-twisted-pair cable	(M-F)	300 feet	# 120-2247-04
9-twisted-pair cable	(M-F)	400 feet	# 120-2247-05
9-twisted-pair cable	(M-F)	500 feet	# 120-2247-06

When special cables are joined together, the resulting longer cable must have a male connector at each end to mate with the female RS-232-C connectors on the 2247V-4 MSU and 2246R Terminal. This is accomplished by using a 25' Male-to-Male (M-M) cable as the last one in the series.

4.0 SITE PREPARATION

The environment in which the 2247V-4 MSU operates can greatly affect its performance. To ensure trouble-free operation, this environment must be selected with care.

The location chosen for the MSU will depend to some degree on the locations of the modem and 2246R workstations, because of the limitations to cable length. In the most extreme case, the MSU may be stationed 50 feet from the modem and 2000 feet from the 2246R workstations. It is possible, therefore, that the environmental conditions at the installation site may be, initially, quite different from those specified for the computer room. The site criteria that applies to the computer room also applies all VS equipment at remote locations. The chosen location must conform to the electrical and environmental criteria set forth in the VS Physical Planning Guide (800-1106). For another reference, consult Section 2 of the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3), which specifically discusses environmental criteria for VS equipment at remote sites.

The Ideal Environment

The ideal environment is one in which temperature and humidity are controlled, airborne dirt and contaminants are reduced to a minimum, and the AC power line is regulated, grounded, and noise free.

The ideal environment is defined by the following parameters

Temperature: 60°F to 80°F (18°C to 24°C)

Relative Humidity: 30% to 80%, non-condensing

Dust: No accumulation should be obvious in a 24 hour period

Power: Grounded, noise-free, dedicated 115 or 230 VAC \pm 10%,
50 or 60 Hz \pm 1Hz

Interference: All sources of static electricity, magnetic fields, and electromagnetic interference must be controlled.

5.0 UNPACKING AND INCOMING INSPECTION

The 2247V-4 MSU is shipped in a cardboard container with Instapack for protection. The unit is shipped completely assembled, with the exception of the 210-7512-1 Modem Mux Driver Board, which must be inserted in the proper connector during installation.

1. UNPACKING

Before opening, visually inspect the shipping container for any indications of damage (crushed edges or corners, puncture holes, tears, etc.). Unpack the unit carefully. If any shipping damage is found, file an appropriate claim promptly with the transporter involved and notify the WLI Distribution Center (Dept. 90), Quality Assurance Department, Tewksbury, MA 01876 of the nature and extent of that damage, making arrangements for equipment replacement, as necessary.

NOTE:

Do not destroy the packing container; the cardboard container and Instapack forms are ideal for use in return shipment of the unit, should it become necessary.

2. DELIVERY CHECK

Look for the packing slip and the work-order number. Check the unit model (2247V-4) and serial number listed on the packing slip to ensure that the proper unit and all accessory equipment has been delivered. One twenty-five foot cable is included with each 2247V-4 MSU. Also check for customer ordered options, which may include special cables of various lengths.

6.0 OPERATOR CONTROLS AND INDICATORS

Refer to Figures 3 and 4 for the location of the following controls and indicators.

POWER SWITCH AND POWER-ON LED - The power switch, located on the rear panel, applies AC power to the unit. The power-on LED, located on the front panel, illuminates when the power switch is on.

DATA SET READY LED - The front-panel LED labeled READY illuminates when the modem signals a clear-to-send (CTS). The clear-to-send acknowledges the request-to-send (RTS) signal to the modem.

RECEIVE LED - This front-panel LED monitors the received line signal detector and illuminates when data terminal is ready. During normal operation, with several workstations in service, this indicator will be flashing intermittently.

RS-232-C CONNECTORS - Nine RS-232-C connectors are mounted on the front panel of the unit. The leftmost connector, labeled M, is for the modem cable. The unit has eight channel connectors, labeled 1 through 8. Connectors 1 through 4 are for the 2246R Workstation cables. Connectors 5 through 8 are not used at this time.

TERMINAL LED's - The Terminal LED's, labeled 1 through 8, correspond to the RS-232-C channel connectors. The LED's monitor the clear-to-send (CTS) signals from the modem to the 2246R Workstations. As with the RS-232-C connectors, LEDs 5 through 8 are not used at this time.

AC FUSE - The fuse holder on the rear panel of the unit contains the AC fuse: 2 Amp SB @ 115 VAC.

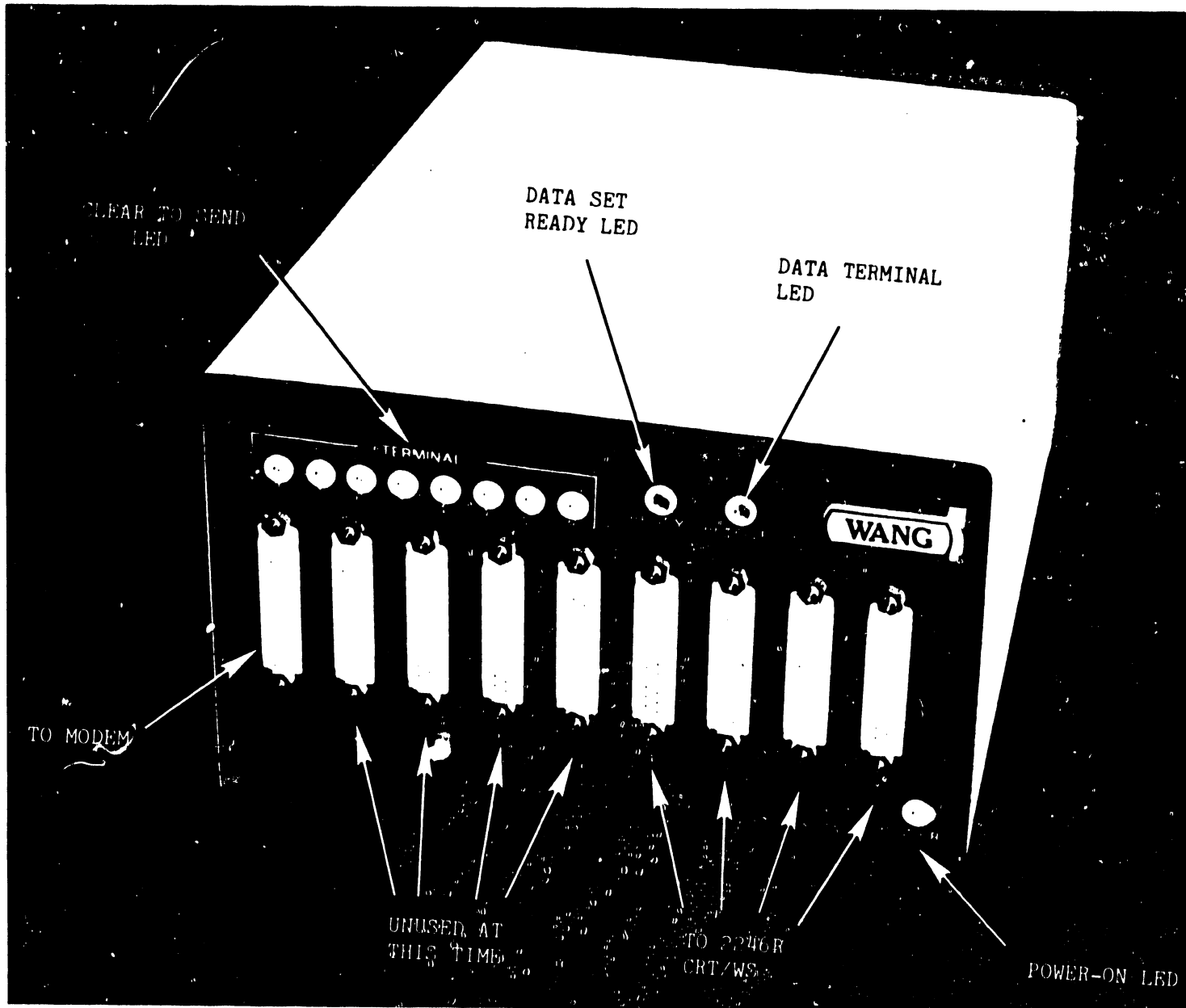
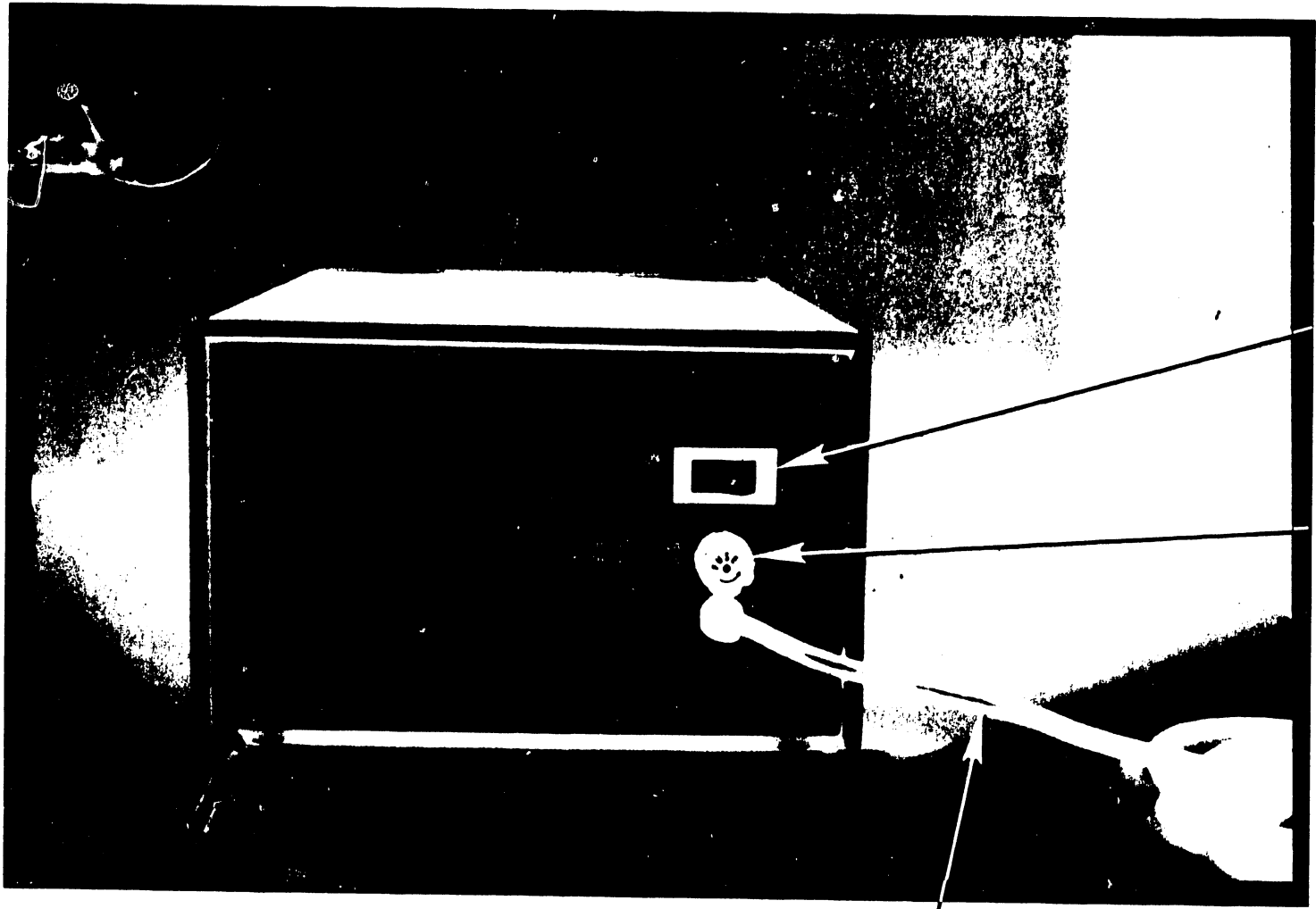


FIGURE 3 FRONT PANEL CONTROLS AND INDICATORS



POWER SWITCH

FUSE

AC LINE CORD

FIGURE 4 MSU REAR PANEL

7.0 INSTALLATION

The 2247V-4 Modem Sharing Unit is installed as part of a telecommunications system, along with remote workstations, modems, and the 22V06 IOP. The installation procedures presented here are meant to supplement those given in the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3). See Section 4 of that manual for details on the setup of the workstations, modems, and 22V06 IOP.

For a telecommunications system using the Modem Sharing Unit, the following steps must also be performed.

1. Remove the cover of the MSU, which is held in place by six phillips screws, three per side.
2. Carefully inspect the unit for damaged or loosened assemblies, solder splashes, and foreign material that may cause solder shorts.
3. Verify that the following PC assemblies are correctly installed in their proper locations.

210-7512-1	Modem Mux Driver Board
210-7513-1	Motherboard
210-7514	Connector Board

The driver board has been removed from the unit for shipping and must be installed at this time. Plug the driver board firmly into the forward-most motherboard connector, directly behind the 210-7514 Connector Board. See Figure 5.

NOTE:

There are two motherboard connectors behind the 7514 Connector Board. The forward one is labeled 7512 and the back one is labeled 7512-1. The driver board supplied with the MSU (7512-1) must be inserted in the forward connector (7512). The back connector is not used at this time.



PROPER LOCATION OF THE
7512-1 DRIVER BOARD

FIGURE 5 INSTALLATION OF THE 210-7512-1 DRIVER BOARD

4. Check the setting of the AC voltage select switch on the power supply assembly. The Modem Sharing Unit is presently for domestic use only, and in all cases this switch should be set to 115 VAC.
5. Attach the AC line cord to a convenient outlet, power on the MSU, and check the unit voltages. Voltages, tolerances, and test points are listed in Section 8 of this publication.
6. Reinstall the top cover of the MSU.
7. Route the RS-232-C cables from the 2246R Workstations to the MSU and from the MSU to the modem. Plug these cables firmly into the female connectors.
8. Follow the instructions given in Section 9.1 of this publication, Initial Requirements, pertaining to the setup of the 22V06 IOP and the 2246R Workstations.
9. Activate the remote workstations by following the instructions given in Section 9.2, Activating the Remote Workstations.
10. Test the telecommunications system in accordance with the instructions presented in Sections 4 and 5 of the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3).

8.0 POWER-ON CHECKOUT

Voltage Checks

Using a digital voltmeter, measure the DC voltages specified in the following table. Voltage test points are located on the 210-7513-1 Motherboard, as shown in Figure 6. Be sure to connect the COMMON lead of the voltmeter to TP4 (+0V), not to chassis ground, or erroneous readings will result.

<u>VOLTAGE</u>	<u>TOLERANCE</u>	<u>TEST POINT/LOCATION</u>
+5 VR	<u>+ 0.5 V</u>	TP1/Motherboard
+12 VR	<u>+ 1.2 V</u>	TP2/Motherboard
-12 VR	<u>+ 1.2 V</u>	TP3/Motherboard

The voltages are not adjustable; if the voltage is not within the specified limits, power supply replacement or troubleshooting will be necessary.

AC Test Points

Note that Figure 6 shows the location of two AC test points, for 12 VAC and for -12 VAC. These test points will be useful if power supply troubleshooting becomes necessary. The test points are located under the transformer/bracket assembly, and they can not be accessed unless the assembly is removed. Proceed as follows:

- a) Remove the four transformer bracket mounting screws, two on each side.
- b) Carefully lift the transformer/bracket away from the motherboard assembly, taking care not to strain the attached wires.
- c) Check the voltages as necessary.
- d) Reassemble by reversing this procedure.

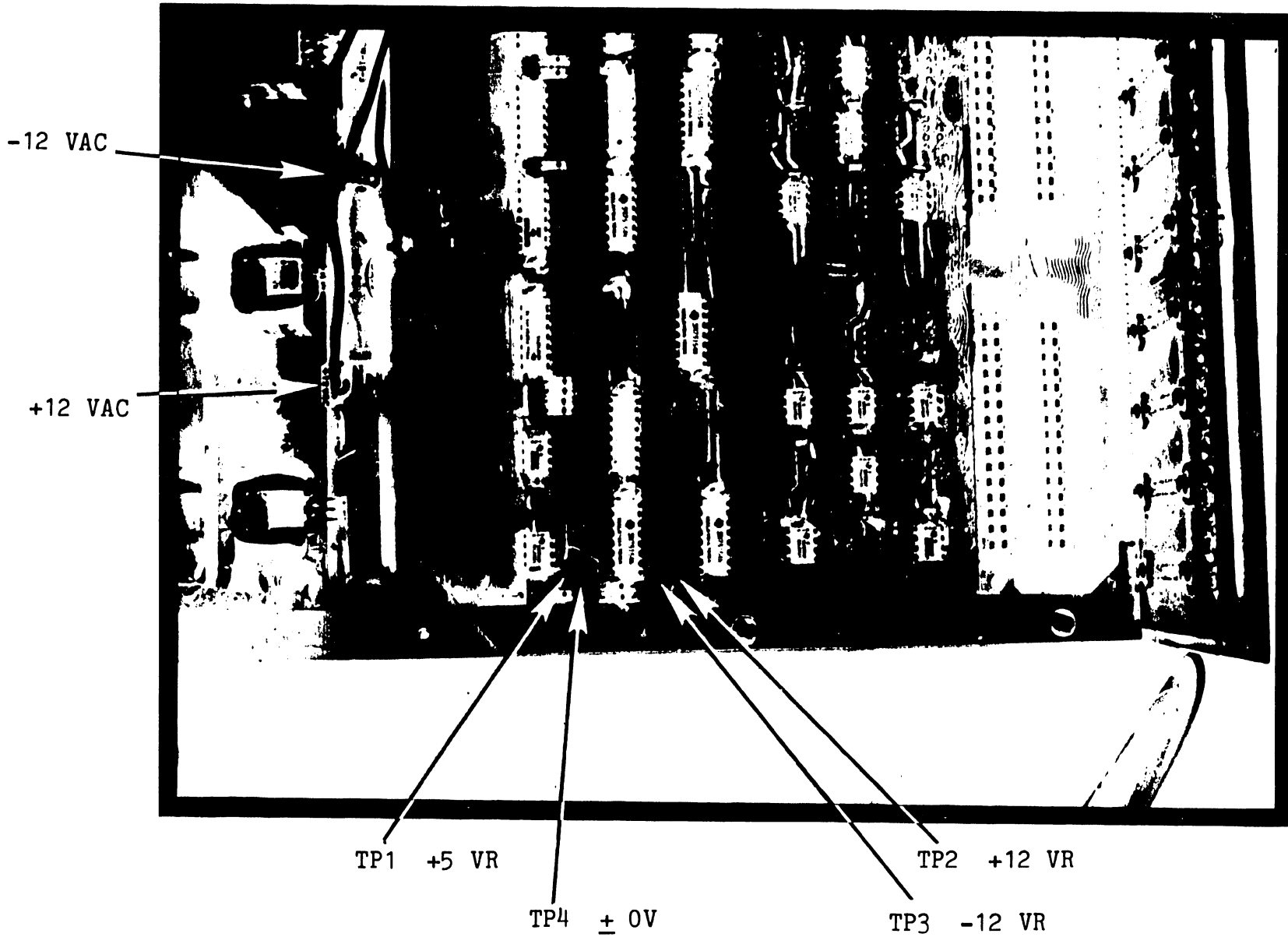


FIGURE 6 VOLTAGE TEST POINTS ON THE 210-7513-1 MOTHERBOARD

9.0 OPERATION

This section explains the procedure for the activating the 2246R Remote Workstations on the Wang VS. It is intended to supplement the information given in Section 6 of the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3). The information presented here concerns installation sites which use the 2247V-4 Modem Sharing Unit and multiple remote workstations, with or without attached printers.

9.1 INITIAL REQUIREMENTS

1. OPERATING SYSTEM - To support remote workstations, remote printers, and the 2247V-4 Modem Sharing Unit, the VS Operating System must be release 4.01.08 or higher.
2. MICROCODE FILES - Two microcode files, @MC2246R and @MCREMWS, must be loaded into library @SYSTEM@ on the system volume. These files are available on a single diskette from the Home Office. The file protection class should be set to "\$".
3. SETUP OF THE 22V06 IOP - As part of the installation of the 22V06 IOP in the VS Mainframe, switches S1 through S3 of device address switchbank SW1 on the 210-7426 Telecommunications IOP Motherboard must be set for the appropriate I/O port assignments.

Switchbank SW1 has eight individual switches. High-order switches S1 through S3 are used for specifying a range of allowable device numbers for the remote workstations and printers, as shown in the following table. Low-order switches S4 through S8 are not used and should be OFF (OFF = inactive).

SWITCHBANK SW1 SETTINGS								RESULTING
S1	S2	S3	S4	S5	S6	S7	S8	DEVICE RANGE
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	224 THRU 256
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	192 THRU 223
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	160 THRU 191
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	128 THRU 159
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	96 THRU 127
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	64 THRU 95
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	32 THRU 63

The actual setting of switches S1 through S3 corresponds to the starting device address of the 22V06 IOP.

$$\text{STARTING DEVICE ADDRESS} = (\text{DECIMAL VALUE OF S1 THROUGH S3}) \times 32$$

For example, when S2 is ON and all other switches are OFF, the starting address of the 22V06 IOP is $2 \times 32 = 64$. In this case, the lowest device number that may be assigned to a remote workstation or printer will be 64, and the highest device number will be 95.

4. SETUP OF THE 2246R WORKSTATIONS - Each 2246R Workstation has on its TC/Memory board (210-7478) an 8-bank switch in location L44. This is the Remote Address Selection Switchbank. Workstations connected to the Modem Sharing Unit are identified by the VS CPU with a unique device address that is specified by setting this switchbank.

Low-order switches S1 and S2 of the switchbank provide the remote address selection. High-order switches S3 through S8 are not currently used and should be OFF (OFF = inactive). For a more detailed explanation, see the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3), Section 7 & 10.5.

The Remote Address Selection Switchbank can be easily accessed by removing a plug button on the rear of the 2246R Workstation cabinet. Workstation addresses are defined by the following chart.

REMOTE ADDRESS SELECTION SWITCHBANK (L44)								WORKSTATION
S1	S2	S3	S4	S5	S6	S7	S8	ADDRESS
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	3

5. SYSTEM GENERATION - When more than one remote workstation is being installed with a 2247V-4 Modem Sharing Unit, additional device numbers must be assigned. This is accomplished during SYSGEN by modifying the IOP macro in the configuration file to specify a range of device numbers for the workstations and attached printers at the remote site. Devices numbers reserved in the configuration file must include all 2246R Workstations and printers that will be used on that TC line. The printout in Figure 7 shows a sample configuration file screen. In this example the device ranges for the three TC lines are specified by the statements DEVICES=64-65, DEVICES=66-69, and DEVICES=70-77.

```

*** WANG VS FILE DISPLAY UTILITY - VERSION 3.14.00 *** 01/10/80 15:22:23 PAGE 2
CONSECUTIVE FILE CONFIG IN LIBRARY $SYSTEM$ ON VOLUME 1

DEVICE NUMBER=12,CLASS=PRT,TYPE=22117-1 003000
DEVICE NUMBER=13,CLASS=PRT,TYPE=22117-1 004000
DEVICE NUMBER=14,CLASS=PRT,TYPE=22117-1 005000
DEVICE NUMBER=15,CLASS=PRT,TYPE=22117-1 006000
DEVICE NUMBER=16,CLASS=DISK,TYPE=2246V-1 007000
DEVICE NUMBER=17,CLASS=DISK,TYPE=2246V-1 008000
DEVICE NUMBER=18,CLASS=DISK,TYPE=2246V-1 009000
DEVICE NUMBER=20,CLASS=DISK,TYPE=2246V-1 010000
DEVICE NUMBER=23,CLASS=DISK,TYPE=2246V-1 011000
DEVICE NUMBER=24,CLASS=DC,TYPE=2246P 012000
DEVICE NUMBER=25,CLASS=4S,TYPE=2246P 013000
DEVICE NUMBER=26,CLASS=4S,TYPE=2246P 014000
DEVICE NUMBER=27,CLASS=PRT,TYPE=2246V-1 015000
DEVICE NUMBER=28,CLASS=4S,TYPE=2246P 016000
DEVICE NUMBER=29,CLASS=4S,TYPE=2246P 017000
DEVICE NUMBER=31,CLASS=4S,TYPE=2246P 018000
DEVICE NUMBER=31,CLASS=4S,TYPE=2246P 019000
DEVICE NUMBER=32,CLASS=WS,TYPE=2246P 020000
DEVICE NUMBER=33,CLASS=4S,TYPE=2246P 021000
DEVICE NUMBER=34,CLASS=4S,TYPE=2246P 022000
DEVICE NUMBER=35,CLASS=4S,TYPE=2246P 023000
DEVICE NUMBER=36,CLASS=4S,TYPE=2246P 024000
DEVICE NUMBER=37,CLASS=4S,TYPE=2246P 025000
DEVICE NUMBER=38,CLASS=WS,TYPE=2246P 026000
DEVICE NUMBER=39,CLASS=4S,TYPE=2246P 027000
IOP TYPE=TC 028000
PP 0,MCCLASS=TC,MCTYPE=2790 029000
LINE 0,NAME=A,DEVICES=64-65 030000
PP 1,MCCLASS=TC,MCTYPE=2790 031000
LINE 1,NAME=B,DEVICES=66-69 032000
PP 2,MCCLASS=TC,MCTYPE=2790 033000
LINE 2,NAME=C,DEVICES=70-77 034000
GENERATE JOBTASKS=3 035000
END

```

FIGURE 7 CONFIGURATION FILE DISPLAY SHOWING TC DEVICE ASSIGNMENTS

The following table shows a sample remote configuration. The first column shows the three TC communications lines of a 22V06-3 IOP. The second column shows the reserved device numbers; these are specified during SYSGEN. The third column shows the model numbers of the remote devices and their corresponding device numbers. The fourth column shows the workstation addresses; these are specified by setting switchbank L44 on the TC/Memory board of each 2246R Workstation.

22V06-3 TC LINES	DEVICE NUMBERS RESERVED	DEVICE MODEL & DEVICE NUMBER	W/S ADDRESS SETTINGS (SWITCHBANK L44)
0	64 THRU 65	2246R WORKSTATION (64)	0
		2246R WORKSTATION (65)	1
1	66 THRU 69	2246R WORKSTATION (66)	0
		2246R WORKSTATION (67)	1
		2246R WORKSTATION (68)	2
		2246R WORKSTATION (69)	3
2	70 THRU 77	2246R WORKSTATION (70)	0
		2246R WORKSTATION (71)	1
		2246R WORKSTATION (72)	2
		2246R WORKSTATION (73)	3
		2221V PRINTER (74)	-
		2221V PRINTER (75)	-
		2221V PRINTER (76)	-
		2221V PRINTER (77)	-

This sample remote configuration will be used in the discussion to follow on activating the remote workstations and printers.

9.2 ACTIVATING THE REMOTE WORKSTATIONS AND PRINTERS

After these requirements are met and the physical installation has been completed, the remote workstations and attached printers must be activated from the VS System command console (workstation #0). The steps necessary to activate the remote workstations are as follows:

1. IPL the VS system to establish normal operating conditions, and obtain the VS OPERATOR'S CONSOLE MENU on the command console screen.
2. Press PF7 (Control Device Status) to obtain the CONTROL DEVICE STATUS MENU.
3. Press PF9 (Control Remote Devices) to obtain the CONTROL REMOTE DEVICES MENU. See Figure 8. Move the cursor to the appropriate device assignment line and enter in each column the proper remote workstation or printer information, according to the following guidelines:
 - a. The "DEVICE" column will contain all the remote device numbers which were specified in the configuration file during SYSGEN.
 - b. The "TYPE" column must contain the model designation 2246R for each workstation address specified. When the menu comes on the screen, all device assignment lines will have "2246R" in the "TYPE" column. If a device is a remote printer, enter the model number of the printer in this column (2221V, for example). See Figure 9 for a sample.
 - c. For single remote workstation installations, the "CLUSTER" column must be a "0". For installations using a Modem Sharing Unit and multiple 2246R Workstations (and attached printers), enter the address of the remote workstation as specified by the setting of the device address switchbank (L44) in the remote workstation itself. The "CLUSTER" number will thus be 0, 1, 2, or 3. For remote printers, this column must contain the same "CLUSTER" number as the remote workstation it is attached to.

*** CONTROL REMOTE DEVICES ***
 1:19 PM THURSDAY JANUARY 10, 1980

DEVICE	LIVE	TYPE	CLUSTER	PORT	DEVICE-ON-PORT	STATUS
54	A	2245R***	**	*0	*0	
55	A	2245R***	**	*0	*0	
56	B	2245R***	**	*0	*0	
57	B	2245R***	**	*0	*0	
58	B	2245R***	**	*0	*0	
59	B	2245R***	**	*0	*0	
70	C	2245R***	*0	*0	*0	IN USE
71	C	2245R***	*1	*0	*0	IN USE
72	C	2245R***	*2	*0	*0	IN USE
73	C	2245R***	*3	*0	*0	IN USE

POSITION CURSOR TO INDICATE DEVICE AND PRESS PKEY TO PERFORM ACTION:

(3) LAST (5) NEXT (8) ACTIVATE
 (9) DEACTIVATE

FIGURE 8 CONTROL REMOTE DEVICES MENU SHOWING W/S ASSIGNMENTS

*** CONTROL REMOTE DEVICES ***
 1:59 PM THURSDAY JANUARY 10, 1980

DEVICE	LIVE	TYPE	CLUSTER	PORT	DEVICE-ON-PORT	STATUS
74	C	2221V***	*2	*0	*1	ATTACHED
75	C	2221V***	*3	*0	*1	ATTACHED
76	C	2221V***	*0	*0	*1	ATTACHED
77	C	2221V***	*1	*0	*1	ATTACHED

POSITION CURSOR TO INDICATE DEVICE AND PRESS PKEY TO PERFORM ACTION:

(2) FIRST (4) PREVIOUS (8) ACTIVATE
 (9) DEACTIVATE

FIGURE 9 CONTROL REMOTE DEVICES MENU SHOWING PRINTER ASSIGNMENTS

- d. The "PORT" column will contain a "0". This column is for future developments and should not be altered at this time.
 - e. The entry in the "DEVICE-ON-PORT" column identifies the remote device as either a remote workstation or a remote printer. The device assignment line for a remote workstation should have a "0" in this column. The device assignment line for remote printers should have a "1" in this column.
4. Dial the telephone number associated with the telecommunications modem at the remote site, and establish contact with the appropriate operating personnel. Explain that the 2246R Remote Workstations are being activated, and request that the following steps be performed at the remote site.
- a. Ensure that the power switch on each 2246R workstation and remote printer is set to the ON position.
 - b. Press the DATA pushbutton on the modem.
 - c. Confirm that the remote workstation becomes initialized, as indicated by display of the normal LOGON screen.

When a clear dial tone is heard, indicating that the remote operator has pressed the DATA pushbutton on the remote telecommunications modem, press the DATA pushbutton on the VS system modem connected to the 22V06 TC IOP. Confirm that the indicator light in the DATA pushbutton becomes lit, indicating establishment of the telecommunications service.

5. Press PF8 on the command console to pass the device assignment entries to the VS Operating System. At this time the Operating System will log an "IN USE" message in the "STATUS" column for the particular workstation being activated. When activating remote printers, an "ATTACHED" message will be displayed in the "STATUS" column.

After a delay of a few seconds, the 2246R Remote Workstation at the remote site should become activated, displaying the normal LOGON screen. From that point on, display and entry performance of the 2246R Workstation should be identical to that of any local workstation connected to the VS system.

NOTE:

To use a remote a printer, it must in the "ON-LINE" mode. This is specified by using the PF2 "SET USAGE CONSTANTS" function from any workstation on the system.

If for any reason data communications with the Remote Workstation becomes lost (by a power shutdown at the remote site, for example), an "ASSISTANCE REQUIRED" message will appear near the top of the CONTROL REMOTE DEVICES screen at the Command Console, together with the applicable device assignment number and the time at which communications was lost. Operator intervention will then be required.

10.0 HARDWARE OPERATION

The Modem Sharing Unit contains three major printer circuit assemblies: a 210-7513-1 Motherboard, a 210-7512-1 Driver Board, and a 210-7514 Connector Board. Basic hardware operation of these PC assemblies is explained in the next paragraphs.

It will become clear from this discussion that the MSU circuitry has been designed to support eight 2246R workstations; recall, however, that Model 2247V-4 supports only four workstations, using the current software.

10.1 210-7513-1 MOTHERBOARD

For the following discussion refer to drawing #7513, sheet 1, in the schematics section of this manual.

The 210-7513 Motherboard, consisting mainly of line drivers and line receivers, has the capability of interfacing eight remote workstations with a single modem and communications line.

The inputs to the 75154 line receivers in locations L33 and L34 consist of Request-to-Send (RTS) signals issued from the 2246R Workstations. Signal RTS0, for example, originates at remote workstation #1. This signal is routed through an RS-232-C cable to pin 4 of RS-232-C connector J0 on the 210-7514 Connector Board, and then to pin 12 of the Motherboard.

Chips L36, L40, and L41 poll the RTS lines and select the first RTS signal encountered. The selected RTS signal, on output pin 7 of L38 (75150 line driver), is routed to motherboard pin 93, and then to pin 4 of connector J8 (the modem connector) on the 210-7514 Connector Board.

The inputs to the 75154 line receivers in locations L26 and L27 consist of Transmitted Data (TD) from the remote workstations. Transmitted data is routed via RS-232-C cables to pin 2 of the RS-232-C connectors on the 210-7514 Connector Board, and then to motherboard pins 13, 21, 31, 39, 60, 67, 79, and 90. Chip L32 selects one of the eight TD signals. The selected TD signal, on output pin 6 of L37 (75150 line driver), is routed to motherboard pin 97, and then to pin 2 of connector J8 (the modem connector) on the 210-7514 Connector Board.

The inputs to the 75154 line receivers in locations L28 and L29 consist of Data Terminal Ready (DTR) signals issued from the remote workstations. DTR signals from the workstations are routed through RS-232-C cables to pin 20 of the RS-232-C connectors on the 210-7514 Connector Board, and then to motherboard pins 9, 18, 28, 34, 44, 61, 72, and 84. Any high input on these pins will generate a high DTR signal on output pin 7 of L37 (75150 line driver). The DTR output is routed to motherboard pin 89, and then to pin 20 of RS-232-C connector J8 (the modem connector) on the 210-7514 Connector Board.

For the following discussion refer to drawing #7513, sheet 2, in the schematics section of this manual.

The input signals to the 75154 line receivers in locations L25 and L31 are issued from the modem and are routed through the RS-232-C modem cable to the female RS-232-C connector J8 on the 7514 Connector Board, and then to the motherboard. These signals are: Data Set Ready (DSR), pin 6 of J8; Clear-to-Send (CTS), pin 5; Received Line Signal Detector (CF), pin 8; Received Data (RD), pin 3; Receiver Signal Element Timing (RXC), pin 17; and Transmitter Signal Element Timing (TXC), pin 15.

SIGNAL NAME	J8 (MODEM)	7513 CONN1	75154 L25 INPUT
DSR	6	98	} 4 5 6 7
CTS	5	91	
CF	8	96 (L25)	
RD	3	95	
RXC	17	94	} 5 4
TXC	15	92 (L31)	

Chip L30, a 74LS138, decodes the Clear-to-Send (CTS), which selects the proper channel for communication between the host computer and the selected remote workstation. The 75150's line drivers in locations L5, L6, L8, L9, L10, L11, L12, L21, L22, L23, and L24 drive the various DSR, RXC, and TXC signals to the attached workstations through the 210-7512-1 Driver Board.

10.2 210-7512-1 MODEM MUX DRIVER BOARD

The 210-7512-1 Modem Mux Driver Board, shown in Figure 10, contains line driver circuitry for workstation channels J0 through J3. The driver circuitry will support cable lengths up to 2000 feet (MSU-to-2246R). The 210-7512-1 plugs into the forward slot of the motherboard connector, directly behind the 7514 Connector Board.

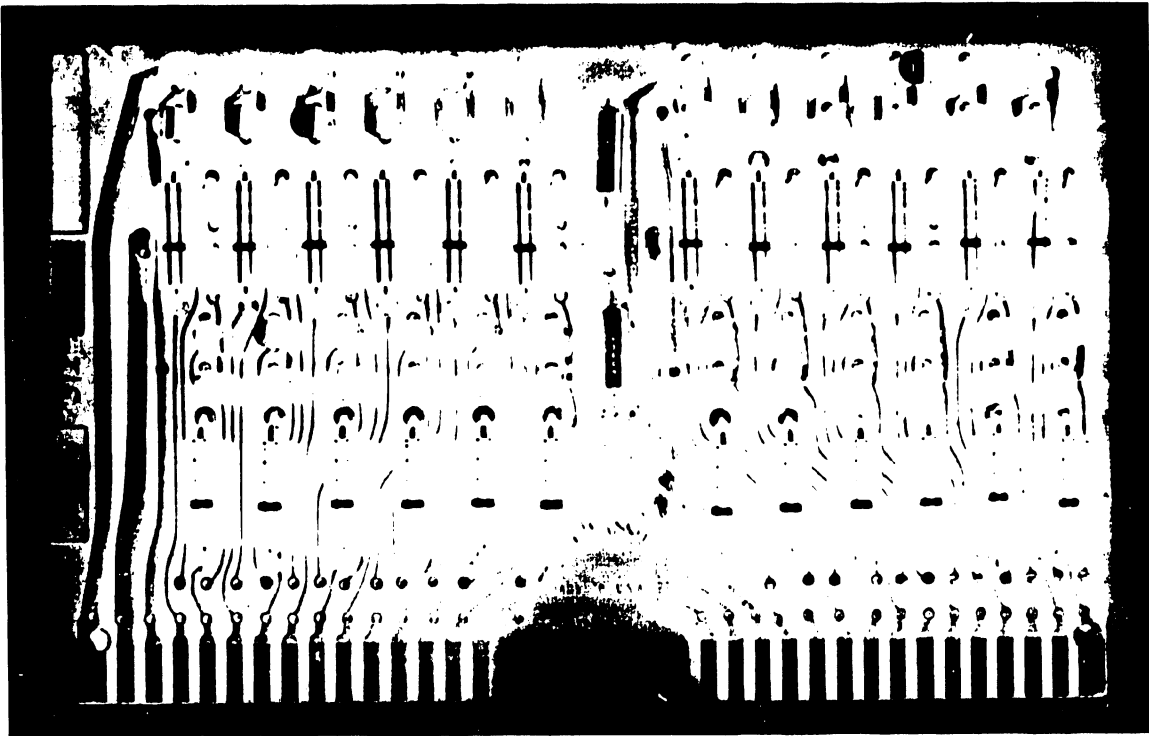


FIGURE 10 210-7512-1 MODEM MUX DRIVER BOARD

10.3 210-7514 CONNECTOR BOARD

The 210-7514 connector board plugs into the motherboard slot directly behind the front panel, as shown in Figure 11. It consists of the following:

- a. Eight female RS-232-C connectors, J0 through J7, that connect to the 2246R Workstations by means of RS-232-C cables.
- b. One female RS-232-C connector, J8, that connects to the modem by means of an RS-232-C cable.
- c. Eleven indicator LEDs:

- | | |
|---------|---|
| LED 1: | Power Indicator |
| LED 2: | Data Set Ready |
| LED 3: | Received Line Signal Detector (CF) |
| LED 4: | CTS0 (Clear-to-Send for Remote Workstation 1) |
| LED 5: | CTS1 (Clear-to-Send for Remote Workstation 2) |
| . | . |
| . | . |
| . | . |
| LED 11: | CTS7 (Clear-to-Send for Remote Workstation 8) |

CONNECTOR BOARD
210-7514

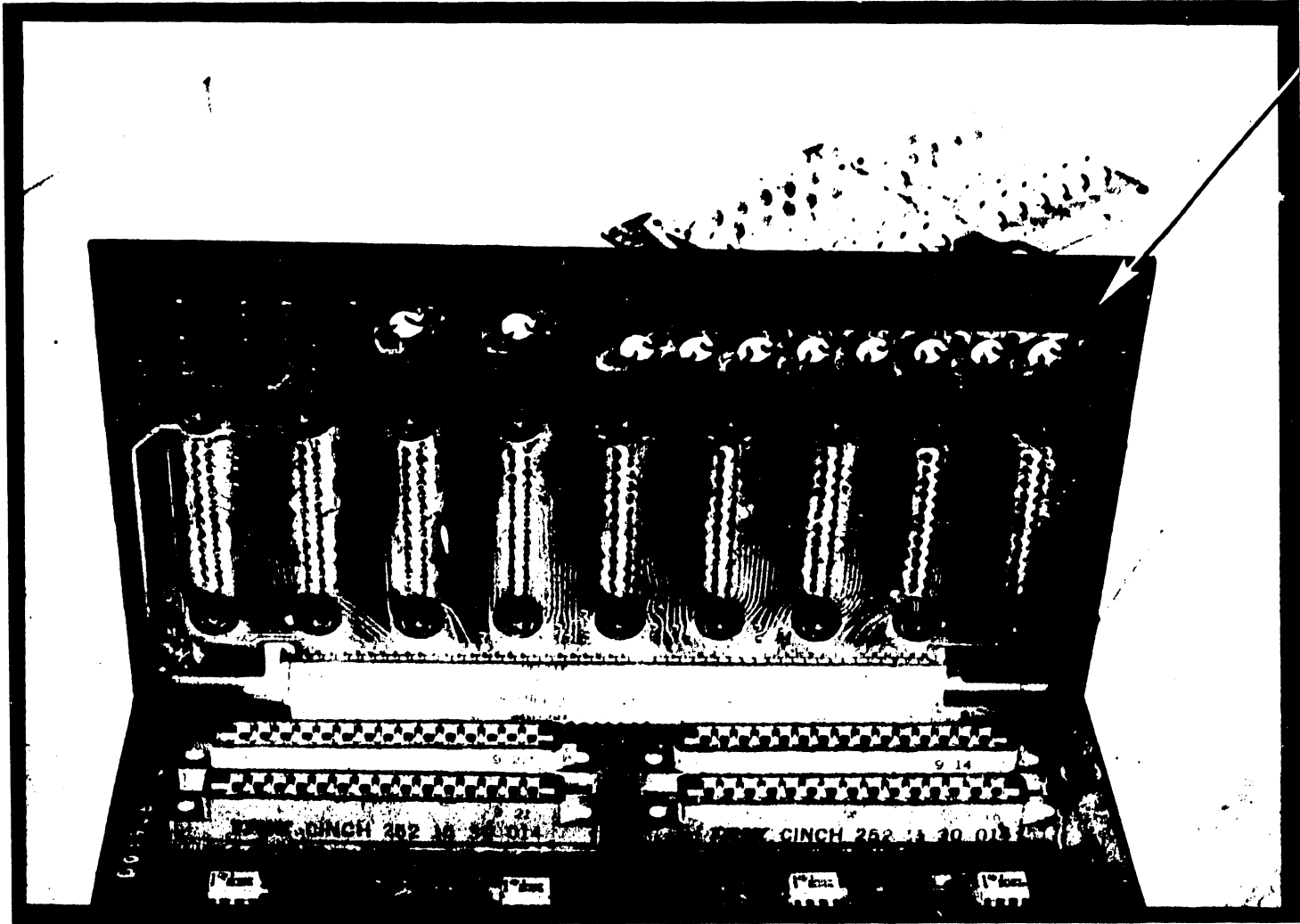


FIGURE 11 THE 210-7514 CONNECTOR BOARD

11.0 MAINTENANCE AND TROUBLESHOOTING

This section provides limited information on troubleshooting and unit disassembly, along with a description of the MSU test set, which is currently being designed.

11.1 TROUBLESHOOTING

The subject of troubleshooting is treated with detail in the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3), and that information will not be repeated here. Section 11 of the 2246R Manual contains a discussion of general telecommunications troubleshooting, together with a troubleshooting checklist and a full description of RS-232-C interface and control signals. Consult Section 11 of the 2246R Manual to isolate failure conditions associated with the telecommunications system.

Additional troubleshooting hints are provided below to further aid the CE in isolating MSU problems.

1. The Modem Sharing Unit has several front panel LED's which may provide clues for troubleshooting. Verify that the Data Set Ready LED, the Received Line Signal Detector LED, and the Clear-to-Send LED's are operating correctly, as described in Section 6.0, Operator Controls and Indicators.
2. Check the unit voltages. Voltages, tolerances, and test points are listed in Section 8 of this publication.
3. Verify the switch settings on the 22V06 IOP and the 2246R Remote Workstations. This subject is treated in Section 9 of this publication.
4. Check the configuration file and verify that the device numbers are specified correctly. This subject is treated in Section 9 of this publication.

5. Check all cables to see that they are properly installed.
6. Run the diagnostic TCTEST, an on-line diagnostic for the 22V06 Telecommunications I/O processor. This diagnostic is described in Computer Systems Newsletter #103.
7. Run the 2246R Workstation diagnostics. Diagnostic testing for the 2246R workstations is covered in detail in Section 8 of the 2246R Manual.
8. Check the TR (terminal ready) light on the modem, at both the local and the remote site.
9. Check the modem for proper operation by using the modem self-testing procedures given in the modem operator's manual. Modem testing is also covered in Section 11 of the 2246R Manual.
10. If only one Workstation does not work, install that workstation on another port.

11.2 UNIT DISASSEMBLY

All assemblies and electrical components of the MSU can be accessed by the following removal procedures.

TOP COVER - The unit top cover is held in place by six phillips screws, three per side. Remove these screws and lift off the cover.

BOTTOM PANEL - For accessing the non-component side of the motherboard, a removable panel is provided on the bottom of the unit. Remove the two screws securing the panel and slide the panel out. See Figures 12 and 13.

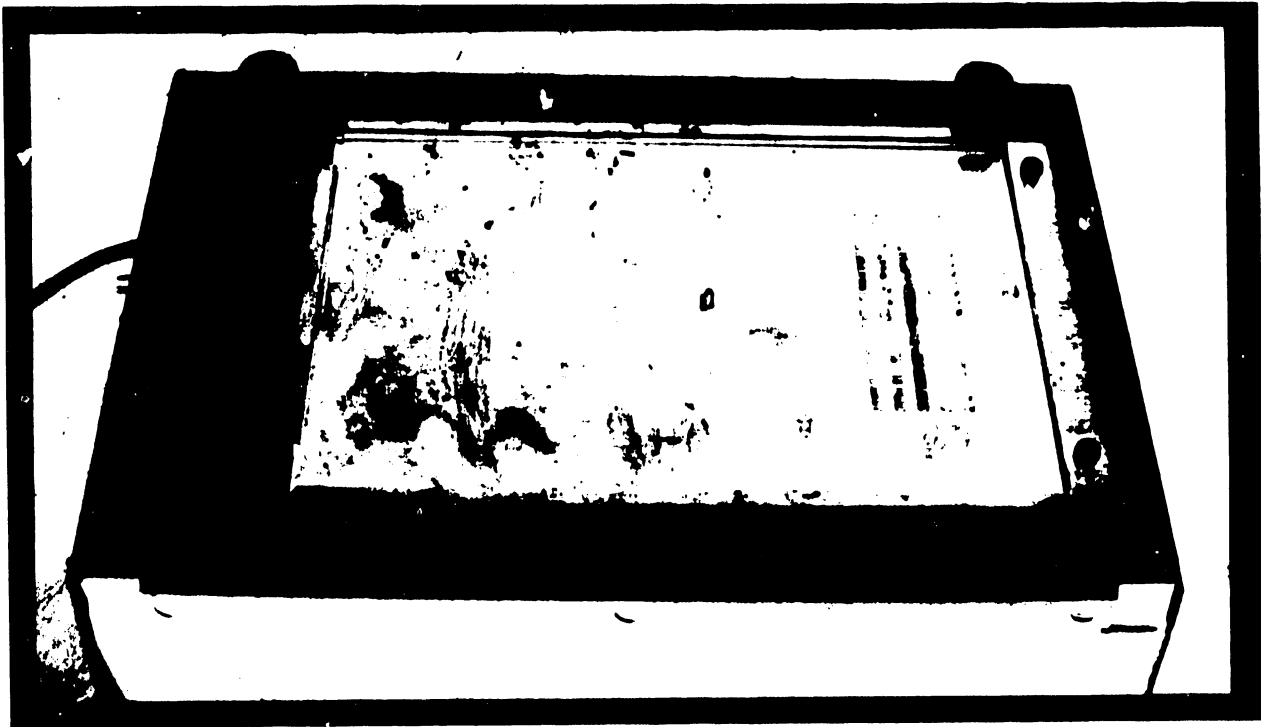


FIGURE 12 BOTTOM VIEW SHOWING REMOVABLE PANEL



FIGURE 13 BOTTOM VIEW WITH PANEL REMOVED

BRACKET TRANSFORMER ASSEMBLY - This assembly, which contains the transformer and line voltage select switch, is attached to the motherboard by four screws, two per side. Remove this assembly to gain access to the power supply circuitry and AC voltage test points, shown in Figure 6. Carefully lift off the assembly, while taking care not to strain the attached wires.

11.3 MSU TEST SET

A Modem Multiplexer Test Set is currently being designed and will be released at some time in the future. This microprocessor-based unit will provide for the testing and exercising of the Modem Sharing Unit. Although this unit is still in the prototype stage, some of the testing functions can be summarized here.

- a. Testing and exercising individual channels of the MSU in both the transmitting and receiving modes, with verification of data and error reporting.
- b. Loop-back testing to aid in troubleshooting the MSU.
- c. Testing channels by random selection.
- d. Testing at different baud rates.

The above is advance information, and it may be subject to change. The release date and availability information of the Modem Multiplexer Test Set is not firm at this time; more details will be published at a future date.

12.0 ENGINEERING CHANGES

This section documents recent ECN's for the 2247V-4 Modem Sharing Unit, the 2246R Remote Standalone Workstation, and the 22V06 Telecommunications IOP.

The ECN's on the 2247V-4 MSU are included for information only, and account for E-Rev changes made prior to delivery of the first production units.

Recent ECN's for the 2246R Remote Workstation and 22V06 IOP are included to assist CE personnel in updating the units to the required levels. Some of the ECN's given here will be issued in a more detailed form in forthcoming PSN's.

12.1 ENGINEERING CHANGES FOR THE 2247V-4 MODEM SHARING UNIT

The ECN's for the 2247V-4 MSU are included for information only; all affected boards have been modified in house, before release to the field.

E-Rev 1 ECN #13540 210-7512-1 DRIVER BOARD

REASON FOR CHANGE:

To improve slew rate.

PROCEDURE:

Replace capacitors C1 through C24 with 680pf capacitors.

E-Rev 2 ECN #13749 210-7512-1 DRIVER BOARD

REASONS FOR CHANGE:

1. To eliminate signal cross-talk on the 25 foot standard Remote Workstation cable.
2. To provide adequate slew rate for a 2000 foot twisted pair cable.

PROCEDURE:

Replace 680 pf capacitors C1 through C24 with .0015 Mfd. caps.

N/A ECN #13943 MODEM MUX DRIVER BOARD

REASON FOR CHANGE:

To provide the line driver board with the capability for driving cable lengths up to 2000 feet.

PROCEDURE:

Change the standard Modem Mux Driver board from a 210-7512 to a 210-7512-1.

NOTE:

The 210-7512, supporting cable lengths up to 50 feet (MSU-to-2246R), was formerly the standard Modem Mux Driver Board for the 2247V-4 MSU. ECN 13943 eliminates this board and substitutes the 210-7512-1 in all units. The 210-7512-1 Modem Mux Driver board, which was formerly optional, supports cable lengths up to 2000 feet.

12.2 ENGINEERING CHANGES FOR THE 2246R REMOTE STANDALONE WORKSTATION

E-Rev N/A ECN #13177 and #13550 210-7479 PCB

REASON FOR CHANGE:

To enable the 210-7479 Workstation/CPU board to work with plotters.

PROCEDURE:

1. Cut the etch between L92 pin 8 and L16 pin 3.
2. Install a jumper from L92 pin 8 to L31 pin 3.
3. Install a jumper from L31 pin 4 to L16 pin 3.

NOTE:

ECN 13177 mistakenly specified L50, an inverter gate that was already in use. ECN 13550 corrects this error.

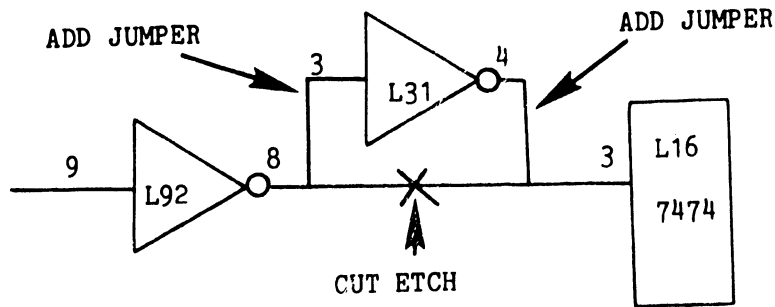


FIGURE 14 ECN 13177 and 13550

E-Rev 1 ECN #12609 210-7478 PCB

REASON FOR CHANGE:

To confirm correction of early-model manufacturing errors on the 210-7478 Remote Telecommunications Workstation Controller Board by ensuring that critical bus-control shift registers are high-speed devices and ensuring that both switchbank devices have the correct orientation.

NOTE:

ECN 12609 is fully explained in COMPUTER SYSTEMS NEWSLETTER NO. 160.

E-Rev 2 ECN #13437 210-7478 PCB

REASON FOR CHANGE:

To have the data & timing slew rate meet RS-232-C requirements.

PROCEDURE:

Change C133, C134, C135, and C136 from 560pf ceramic capacitors (WL #300-1560) to 680pf ceramic capacitors (WL #300-1680).

12.3 ENGINEERING CHANGES FOR THE 22V06 IOP

E-Rev 5 ECN #13403 210-7426 PCB

REASONS FOR CHANGE:

1. To ensure proper termination of DMA transfers, thus preventing the destruction of data in Main Memory.
2. To correct undershoot on the Bus Processor Z80 clock.

PROCEDURE:

1. Remove (do not discard) the 82 ohm resistor R12 located between L29 and L30. Refer to Figure 16.
2. Add the 82 ohm resistor between L51 pin 6 and +5V, using the feed thru and the +5V etch shown in Figure 17. Use tubing around the resistor to prevent electrical shorts.
3. Remove the jumper between L24 pin 11 and L10 pin 9.
4. Add a jumper from L24 pin 11 to L10 pin 8.

REMOVE 82 OHM
RESISTOR R12

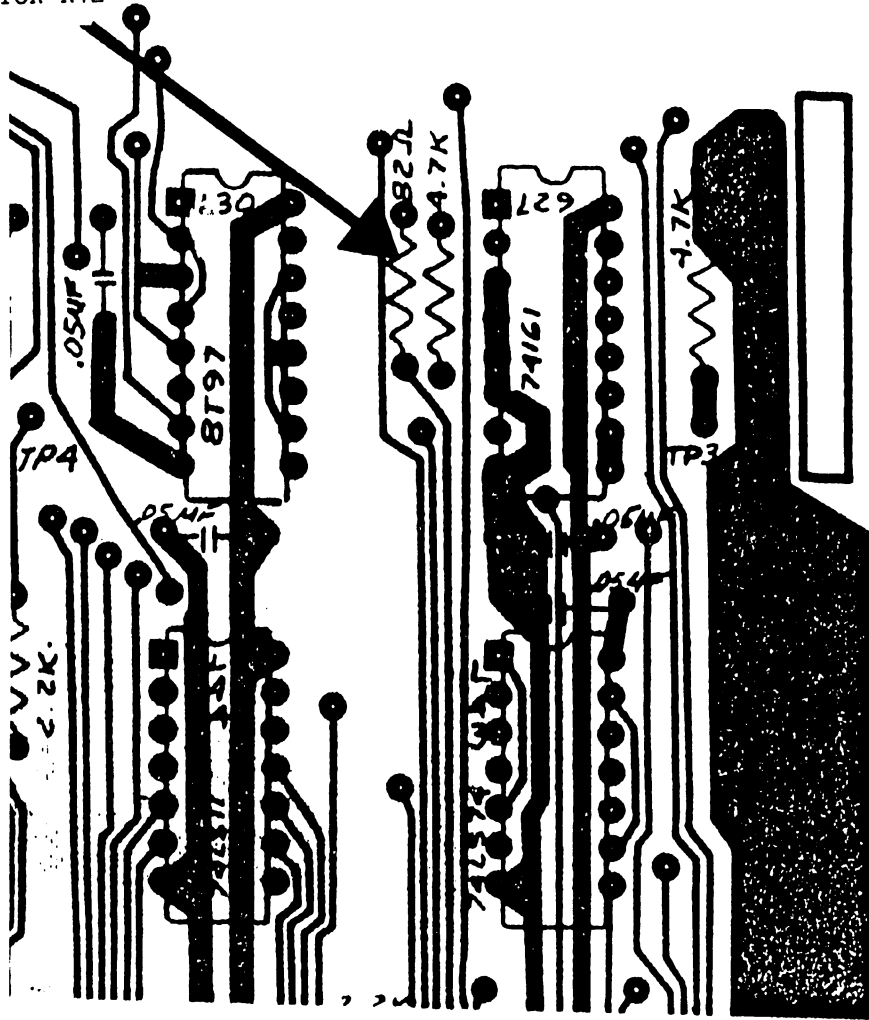


FIGURE 16 ECN 13403 FOR 210-7426 PCB

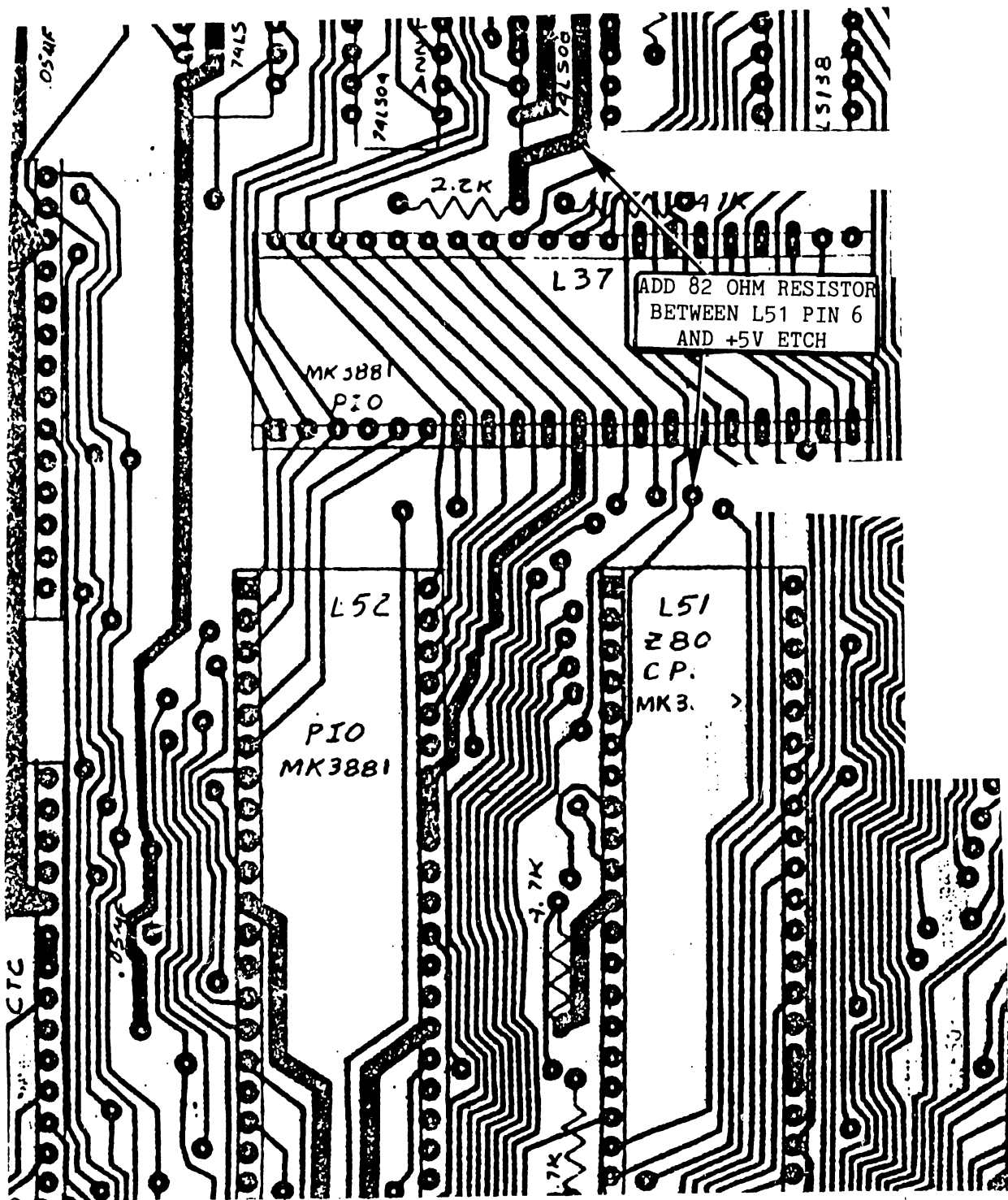


FIGURE 17 ECN 13403 FOR 210-7426 PCB

13.0 DIAGNOSTIC TESTING

At the present time, no diagnostics are available to verify proper operation of the Modem Sharing Unit. However, diagnostics are available for other components in the telecommunications system, and these can be helpful in isolated TC problems. See the following publications:

Diagnostic testing for the 2246R workstations is covered in detail in Section 8 of the 2246R Remote Standalone Workstation Manual (03-0089, III.D.3).

Computer Systems Newsletter #103 gives a description of the TCTEST diagnostic, an on-line diagnostic for the 22V06 Telecommunications I/O processor.

14.0 ELECTRICAL SCHEMATICS

This section contains electrical schematics for the following PC assemblies:

<u>DESCRIPTION</u>	<u>WANG PART NUMBER</u>	<u>DRAWING NUMBER</u>
Modem Mux Motherboard	210-7513A	D7513
Connector Board	210-7514A	D7514
Modem Mux Driver Board	210-7512-1	D7512

THE SCHEMATICS, WHEN AVAILABLE, ARE ON THE LAST FICHE IN THIS SET.

ASSEMBLY PART NUMBER 187-22VS-77- -

LEGEND

ASSEMBLY DESCRIPTION 2247V-4 4 PORT MODEM SHARING UNIT 1: P-PHANTOM; 2: ITEM MASTER DELY CODE; 3: *-TAGGED OUT OF KIT(PKUD STR)

POSITION IN STRUCTURE	LEGEND 1 2 3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T	UNIT COST	EXTENDED COST
1	IN	210-7512- - -	PCA 2200VS MODEM MUX DRIVER BOARD		1.0000	EACH	00010	77,777.777	.0000
2	IN	510-7512- - -	PCB 2200VS MODEM MUX DRIVER BOARD		1.0000	EACH		19.650	19.6500
2	FS	600-9012- - -	24 GA YELLOW SOLID TEFLON WIRE	E12602	6.0000	FFET		.024	.1440
1	IN	210-7513- - -	PCA 2200VS 4 CHANNEL MODEM MUX MB		1.0000	EACH	00010	77,777.777	.0000
2	IN	300-1900- - -	CAP .05 UF +80-20% 12 V CERAMIC D	PATREL	15.0000	EACH		.032	.4800
2	IN	300-1930- - -	.1 UF 50V +80-20% CERAMIC CAP(HIFREQ)	PATREL	24.0000	EACH		.075	1.8000
2	IN	300-3079- - -	2.6K UF 30V FLECT CAP(AXIAL LEAD)		1.0000	EACH		.910	.9100
2	IN	300-3080- - -	4K UF 30V ELECT CAP(AXIAL LEAD)		1.0000	EACH		1.090	1.0900
2	IN	300-4002- - -	CAP .1 UF 35 V 10% TANT AXIAL		3.0000	EACH	00001	.155	.4650
3	FS	300-4002-R - -	CAP .1 UF 35V 10% TANT AXIAL T&R		1.0000	EACH		.155	.1550
	P FS	330-3010-4P- -	RES 1K OHM 1/4W 10% FIXED COMP	E12035	11.0000	EACH		.017	.1870
3	FS *	330-3010- - -	RES 1K OHM 1/4W 10% FIXED COMP		1.0000	EACH		.017	.0170
2	IN	334-0002- - -	15 OHM 11W FIXED RESISTOR		1.0000	EACH		.480	.4800
2	IN	334-0003- - -	20 OHM 11W FIXED RESISTOR		2.0000	EACH		.270	.5400
2	IN	350-0060- - -	CONN LOOP .100 CTRS PC DIF SLDR TL	E11820	1.0000	EACH		4.103	4.1030
2	IN	374-0001- - -	IC REG UA 7805 +5V TO-220		1.0000	EACH		.564	.5640
2	IN	374-0006- - -	IC REG UA 7912 -12V TO-3		1.0000	EACH		.921	.9210
2	IN	374-0007- - -	IC REG LA 7812 +12V TO-3		1.0000	EACH		.948	.9480
2	IN	375-9018- - -	722 HEATSINK THERMALLOY E107-W/C-77	E11948	3.0000	EACH		.000	.0000
2	IN	376-0011- - -	IC 7493N 4 BIT BINARY COUNTER		1.0000	EACH		.180	.1800
2	IN	376-0031- - -	IC 7430 P I POS NAND GATE	E12035	1.0000	EACH		.106	.1060
2	IN	376-0076- - -	IC 75150P 2 LINE DRIVER	E12035	16.0000	EACH		.540	8.6400
2	IN	376-0077- - -	IC 75154 4 LINE REC	E12035	5.0000	EACH		.720	3.6000
2	IN	376-0155- - -	IC 74LS74 2 D TYPE EDGE TRIG FF	E12035	1.0000	EACH		.152	.1520
2	IN	376-0180- - -	IC 74LS04 HEX INVERTER	E12035	1.0000	EACH		.114	.1140
2	IN	376-0211- - -	IC 74LS32 4 2 IN POS OR GATE	E12035	1.0000	EACH		.112	.1120
2	IN	376-0214- - -	IC 74LS151 1 OF 8 DATA SELC MX	E11996	1.0000	EACH		.250	.2500
2	IN	376-0249- - -	IC 74LS70 8 IN POS NAND GATE	E12035	1.0000	EACH		.105	.1050
2	IN	376-0294- - -	IC 74LS138 3-B LINE DECODER/MPX		1.0000	EACH		.290	.2900
2	FS	380-4000- - -	DIO 1N4004 400V 1A RECT S D041		4.0000	EACH	00001	.034	.1360
3	FS	380-4000-R - -	EM403 / 1N4004 RECTIFIER (REEL)		1.0000	EACH		.034	.0340
2	IN	510-7513- - -	PCB 2200VS 8 CHANNEL MODEM MUX MB		1.0000	EACH		77,777.777	.0000
2	IN	654-1192- - -	TER. INAL,SINGLE NECK PMP 103-W/C-77	E12035	4.0000	EACH		.022	.0880
1	IN	210-7514- - -	PCA 2200VS CONNECTOR BOARD		1.0000	EACH	00010	77,777.777	.0000
2	P FS	330-2018-4P- -	RES 180 OHM 1/4W 10% FIXED COMP	PATREL	1.0000	EACH		.017	.0170
3	FS *	330-2018- - -	RES 180 OHM 1/4W 10% FIXED COMP		1.0000	EACH		.017	.0170
2	P FS	330-2022-4P- -	RES 220 OHM 1/4W 10% FIXED COMP	PATREL	2.0000	EACH		.017	.0340
3	FS *	330-2022- - -	RES 220 OHM 1/4W 10% FIXED COMP		1.0000	EACH	00000	.017	.0170
2	P FS	330-2033-4P- -	RES 330 OHM 1/4W 10% FIXED COMP	PATREL	1.0000	EACH		.017	.0170
3	FS *	330-2033- - -	RES 330 OHM 1/4W 10% FIXED COMP		1.0000	EACH		.017	.0170
2	IN	350-2504- - -	CONN 25 POS RCPT STR POST TYPE D	E12479	9.0000	EACH		77,777.777	.0000
2	IN	370-0026- - -	LAMP,RED (LED) MV5024	E12479	9.0000	EACH		.157	1.4130
2	IN	370-0027- - -	LAMP,ORANGE(LED)MV5154	E12479	2.0000	EACH		.230	.4600
2	IN	376-0056- - -	IC 7407 HEX BUF DRIVER HV OUTPUT	PATREL	2.0000	EACH		.131	.2620

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15.0 BILL OF MATERIALS

ASSEMBLY PART NUMBER 187-22VS-77- -

LEGEND

ASSEMBLY DESCRIPTION 2247V-4 4 PORT MODEM SHARING UNIT

1: P=PHANTOM; 2: ITEM MASTER DELY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1 2 3	COMPONENT PART NUMBER	DESCRIPTION	F C N	QUANTITY PER ASSY	U/M	L/T	UNIT COST	EXTENDED COST
2	IN	510-7514- - -	PCB 2200VS CONNECTOR BOARD		1.0000	EACH		19.500	19.5000
1	IN	220-0219- - -	TC MODEM CABLE 22V-06 25FTIC64F2-402		1.0000	EACH	00010	30.958	30.9580
2	IN	000-0004- - -	SUB-SYSTEMS		1.4490	EACH	00000	4.020	6.6290
2	IN	000-0011- - -	LABOR QUALITY CONTROL		.3300		00000	5.280	1.7424
2	IN	350-1030- - -	DB-25P CH CONN 6000 SERIES		2.0000	EACH		1.210	2.4200
2	IN	350-4250- - -	MALE SCR RETAINER FOR CABLE SHELL		2.0000	EACH		.105	.2100
2	IN	350-4251- - -	CABLE SHELL CLAMP ASSY		2.0000	EACH		.930	1.8600
2	FS	420-0053- - -	24 COND 26 GA SHIELDED CABLE	E11333	25.1660	FEET		.210	5.2849
2	IN	458-0361- - -	GROUND STRAP C6P15-28		2.0000	EACH		.020	.0400
2	FS	605-0002- - -	TUBING #15 CLEAR		.9000	FEET		.088	.0792
2	FS	605-0143- - -	TUBING 1/2" HEATSHRINK PVC BLACK		.4200	FEET		.115	.0483
2	IN	606-0219- - -	1/2" DIA WHT SHRINK PLK NU 220-0219	E11840	1.0000	EACH	00001	.080	.0800
1	IN	270-0602- - -	2247V-4 CHASSIS ASSY		1.0000	EACH	00010	77,777.777	.0000
2	IN	220-1370- - -	POWER CORE ASSY E6482-536		1.0000	EACH	00010	77,777.777	.0000
3	IN	420-1096- - -	POWER CORD,10 FT 19AWG		1.0000	EACH		.771	.7710
3	IN	606-1370- - -	1/2" DIA WHT SHRINK PLK NU 220-1370		1.0000	EACH	00001	77,777.777	.0000
3	FS	654-0050-R - -	#6 RING TONGUE RED EA16-6M(2K/REEL)		1.0000	EACH		.038	.0380
3	FS	654-0133-R - -	FASTON TERM 18-22 RED AMP2-350803-2		1.0000	EACH		.039	.0390
2	IN	220-1372- - -	WIRE & LUG ASSY PO 156 C6482-12		1.0000	EACH	00010	77,777.777	.0000
3	P FS	600-0000- - -	WIRE 18 GA BLACK UL		.2900	FEET		.014	.0041
3	FS	654-0133-R - -	FASTON TERM 18-22 RED AMP2-350803-2		1.0000	EACH		.039	.0390
2	IN	270-0603- - -	2247V-4 XFMF CHASSIS ASSY		1.0000	EACH	0010	77,777.777	.0000
3	IN	220-1369- - -	AC CABLE ASSY E6482-535		1.0000	EACH	110	3.601	3.6010
4	IN	000-0004- - -	SUB-SYSTEMS		.2500	EACH	0000	4.020	1.0050
4	IN	000-0011- - -	LABOR QUALITY CONTROL		.0500		0000	5.280	.2640
4	P FS	600-0000- - -	WIRE 18 GA BLACK UL		.5800	FEET		.014	.0081
4	FS	600-0009- - -	WIRE 18 GA WHITE UL		.5800	FEET		.011	.0064
4	FS	605-0012- - -	TUBING #4 CLEAR		.3700	FEET		.021	.0078
4	IN	605-1011- - -	TY-WRAP IDENT MARKFF		1.0000	EACH		.052	.0520
4	FS	654-0133-R - -	FASTON TERM 18-22 RED AMP2-350803-2		2.0000	EACH		.039	.0780
3	IN	325-2112- - -	SLIDE SW.115/230 VAC		1.0000	EACH		.180	.1800
3	IN	410-0110- - -	MMC 5793 XFMR(WANG CRT)C5068-10R		1.0000	EACH		7.976	7.9760
3	IN	451-4868-XA - -	BRACKET TRANSFORMER C68F9-5005		1.0000	EACH		77,777.777	.0000
3	IN	510-6749- - -	6749 PRINTED CIRCUIT BOARD		1.0000	EACH		.320	.3200
3	IN	650-4120- - -	8-32 X 3/8 PAN HD PHL MS SS SEMS		2.0000	EACH		.009	.0180
3	IN	651-0405- - -	3/16 X 3/8 POP RIVET		2.0000	EACH		.013	.0260
3	IN	654-1008- - -	#8 GROUND LUG		1.0000	EACH		.014	.0140
2	IN	325-0021- - -	SWITCH, ROCKER SPST		1.0000	EACH		.323	.3230
2	IN	360-0000- - -	FUSE HOLDER 90 DEGREE CONTACT		1.0000	EACH		.333	.3330
2	IN	360-9000- - -	RUBBER WSHR FOR 360-0000 / 360-Q001		1.0000	EACH		.007	.0070
2	IN	360-9002- - -	HEX NUT FOR 360-0000 / 360-0001		1.0000	EACH		.039	.0390
2	IN	360-9003- - -	LOCK WSHR LF#905023(FOR 360-0000/1)		1.0000	EACH		.012	.0120
2	IN	370-1055- - -	LAMP HOLDER 2 PIECE FOR 370-0026		9.0000	EACH		77,777.777	.0000
2	IN	370-1056- - -	LAMP HOLDER 2 PIECE FOR 370-0027		2.0000	EACH		77,777.777	.0000
2	IN	380-5001- - -	250 VOLT VARISTOR V250LA20		1.0000	EACH		.470	.4700
2	IN	410-2005- - -	LINE FILTER 5 AMP CORCOM 5K1		1.0000	EACH		3.344	3.3440

ASSEMBLY PART NUMBER 187-20VS-77- -

LEGEND:

ASSEMBLY DESCRIPTION 2247V-4 4 PORT MODEM SHARING UNIT 1: PHANTOM; 2: ITEM MASTER DELY CODE; 3: *-TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1 2 3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T	UNIT COST	EXTENDED COST
2	IN	451-113R-XA- -	CHASSIS (SILKSCREEN)	66889-5003	1.0000	EACH		77,777.777	.0000
2	IN	451-2272-XA- -	COVER FILTER	66889-5006	1.0000	EACH		77,777.777	.0000
2	IN	45P-0745-XA- -	DOOR BOTTOM	66889-5007	1.0000	EACH		77,777.777	.0000
2	P FS	600-0000- - -	WIRE 18 GA BLACK UL		.2700	FEET		.014	.0038
2	FS	605-0010- - -	TUBING PVC BR CLEAR		.0600	FEET		.016	.0010
2	FS	605-0014- - -	TUBING #5 CLEAR		.1500	FEET		.019	.0029
2	FS	605-0124- - -	TFELON TUBING #20 PHANTOM#1-116		.0830	ROLL		.042	.0035
2	IN	650-3120- - -	6-32 X 3/8 PAN HD PHL MS SS SEMS		2.0000	EACH		.008	.0160
2	IN	651-0402- - -	RIVET AVOEL 1121061 3/16 X 7/16 LG		4.0000	EACH		.047	.1880
2	IN	652-3004- - -	NUT #8-32UNC HEY SMALL FAT SS		3.0000	EACH		.008	.0240
2	IN	653-3001- - -	WASH #6 .150ID .2950D INT T ST		2.0000	EACH		.001	.0020
2	IN	653-3003- - -	WASH #6 .141ID .2910D FLTT SS		1.0000	EACH		.001	.0010
2	IN	654-1238- - -	HEXCN STRAIN RELIEF SKSP-4		1.0000	EACH		.018	.0180
2	IN	655-0202- - -	FEET BR LG WITH WSHR REC 2084 W		4.0000	EACH		.120	.4800
1	IN	270-0603- - -	2247V-4 XEMF CHASSIS ASSY		1.0000	EACH	00010	77,777.777	.0000
2	IN	220-1369- - -	AC CABLE ASSY	66480-535	1.0000	EACH	00010	3.601	3.6010
3	IN	000-0004- - -	SUB-SYSTEMS		.2500	EACH	00000	4.020	1.0050
3	IN	000-0011- - -	LABOR QUALITY CONTROL		.0500		00000	5.280	.2640
3	P FS	600-0000- - -	WIRE 18 GA BLACK UL		.5800	FEET		.014	.0081
3	FS	600-0009- - -	WIRE 18 GA WHITE UL		.5800	FEET		.011	.0064
3	FS	605-0012- - -	TUBING #4 CLEAR		.7700	FEET		.021	.0078
3	IN	605-1011- - -	TY-WRAP IDENT MARKER		1.0000	EACH		.052	.0520
3	FS	654-0133-F - -	FASTON TERM 18-22 RED AMP-35003-2		2.0000	EACH		.039	.0780
2	IN	325-2112- - -	SLIDE SW.115/230 VAC		1.0000	EACH		.180	.1800
2	IN	410-0110- - -	HMC 5793 YEMRCWANC CRTIC506P-10P		1.0000	EACH		7.976	7.9760
2	IN	451-486P-XA- -	BRACKET TRANSFORMER	66889-5005	1.0000	EACH		77,777.777	.0000
2	IN	510-6749- - -	6749 PRINTER CIRCUIT BOARD		1.0000	EACH		.320	.3200
2	IN	650-4120- - -	8-32 X 3/8 PAN HD PHL MS SS SEMS		2.0000	EACH		.009	.0180
2	IN	651-0405- - -	3/16 X 3/8 POP RIVET		2.0000	EACH		.013	.0260
2	IN	654-1008- - -	#8 GROUND LUG		1.0000	EACH		.014	.0140
1	FS	360-1020-SR- -	FUSE 2.0 AMP 250V SF CLASS 3A		1.0000	EACH		.220	.2200
1	IN	450-0904- - -	WANG NAME TAG C6R15-97		1.0000	EACH		.128	.1280
1	IN	451-2049- - -	703 COVER ASSY D6100-6		1.0000	EACH		17.240	17.2400
1	IN	462-0454-XA- -	SPACER 2200VS 66889-5008		18.0000	EACH		77,777.777	.0000
1	IN	650-20R7- - -	4-40X1/4 PAN HD PHL MS SS MAG. SFMS		18.0000	EACH		.010	.1800
1	IN	650-3120- - -	6-32 X 3/8 PAN HD PHL MS SS SEMS		8.0000	EACH		.008	.0640
1	IN	650-3125- - -	6-32X3/8 FL HD PHL MS PARKERIZE		6.0000	EACH		.006	.0360
1	IN	653-0003- - -	WASHER NO.4 NYLON 1/8 ID X 3/8 OD		18.0000	EACH		.004	.0720
1	IN	653-4004- - -	WASH #8 .170ID .3750D .062 FL NYL		8.0000	EACH		.005	.0400

55

ASSEMBLY PART NUMBER 187-22VS-77- -

LEGEND

ASSEMBLY DESCRIPTION 2247V-4 4 PORT MODEM SHARING UNIT

1: P=PHANTOM; 2: ITEM MASTER DFLY CODE; 3: *=TAGGED OUT OF KIT(PROD STR)

POSITION IN STRUCTURE	LEGEND 1 2 3	COMPONENT PART NUMBER	DESCRIPTION	E C N	QUANTITY PER ASSY	U/M	L/T	UNIT COST	EXTENDED COST
			RAW MATERIAL		17.9800				
			MAT. OVERHEAD 10%		1.7980				
			SPOILAGE 5%		.9889				
			ASSEMBLIES		30.9580				
			SUBTOTAL		51.7249				
			DIRECT LABOR		.0000				***
			OVERHEAD 170%		.0000				***
			TOTAL COST		51.7249				

END OF REPORT MB0080-A

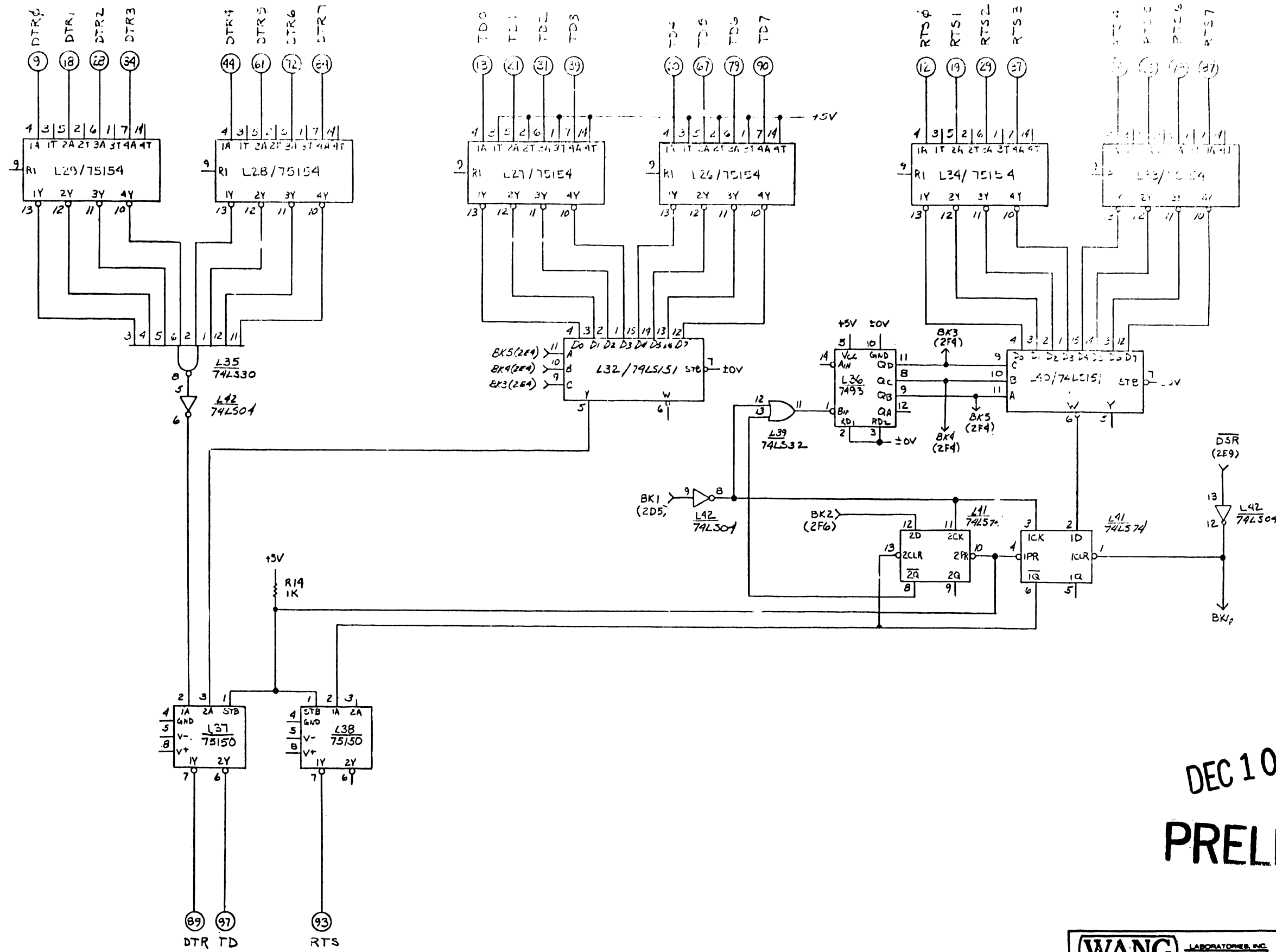
SCHE- MATICS

14.0 ELECTRICAL SCHEMATICS

This section contains electrical schematics for the following PC assemblies:

<u>DESCRIPTION</u>	<u>WANG PART NUMBER</u>	<u>DRAWING NUMBER</u>
Modem Mux Motherboard	210-7513A	D7513
Connector Board	210-7514A	D7514
Modem Mux Driver Board	210-7512-1	D7512

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DEC 10 1979
PRELIMINARY

REV	DATE	BY

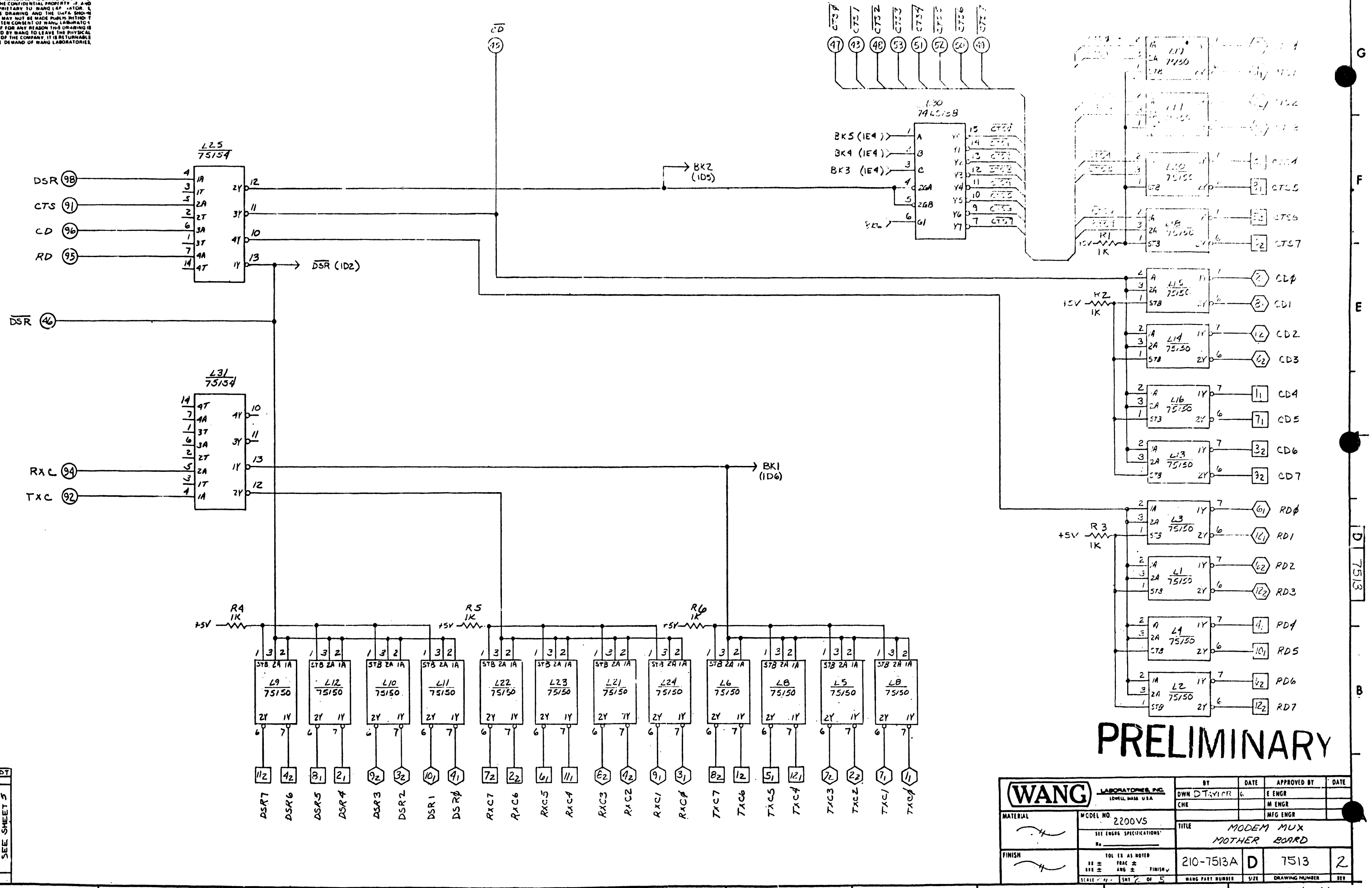
SEE SHEET 5

(WANG) LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
MATERIAL		DWN D TAYLOR	12-27-79	E ENGR	
MODEL NO. 2200VS		CHK		M ENGR	
SEE ENGR. SPECIFICATIONS				MFG ENGR	
FINISH		TITLE			
TOL EX AS NOTED		MODEM MUX			
.XX ±		210-7513A			
.XXX ±		D			
.XXX ±		7513			
SCALE		WANG PART NUMBER			
SMT 1 OF 25		DRAWING NUMBER			
		REV			
		2			

D 7513

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DO NOT SCALE



PRELIMINARY

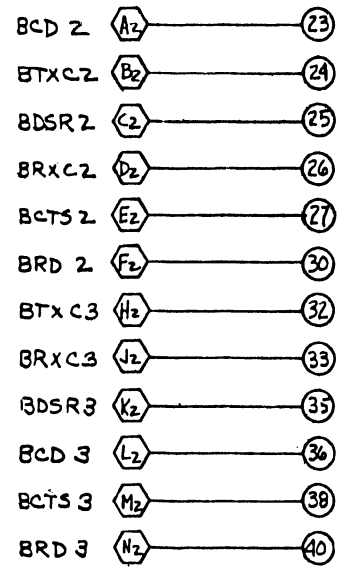
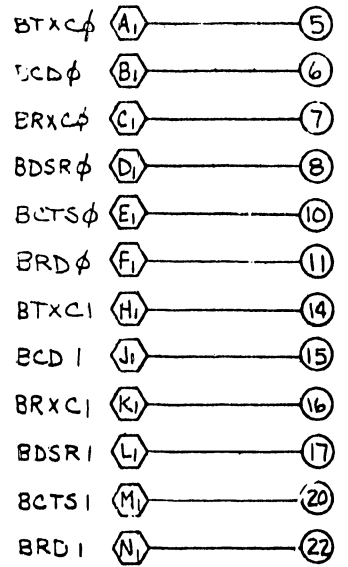
REVISION	DT
SEE SHEET 5	

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
MATERIAL		DWN DT:VJ:CR	6	E ENGR	
MODEL NO. 2200VS		CHR		M ENGR	
SEE ENGR SPECIFICATIONS		TITLE			
FINISH		MODERN MUX MOTHER BOARD			
TOL EX AS NOTED		210-7513A	D	7513	2
FRAC ±		WANG PART NUMBER	SIZE	DRAWING NUMBER	REV
ANG ±					
SCALE 1/8" = 1"		SHT 2 OF 5			

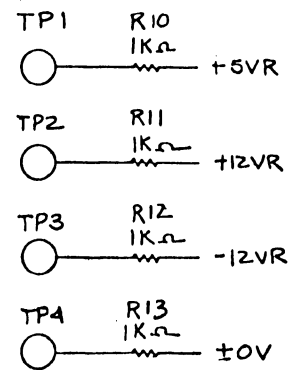
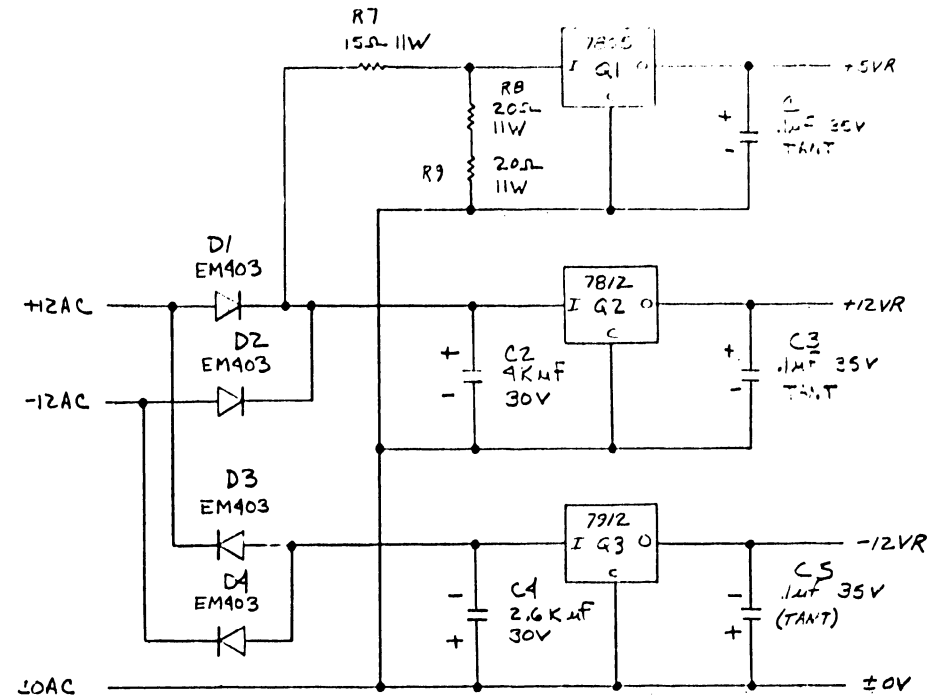
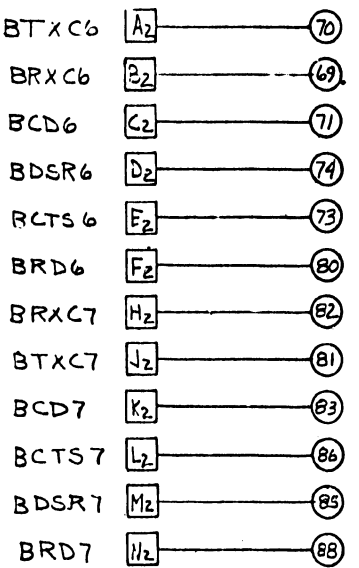
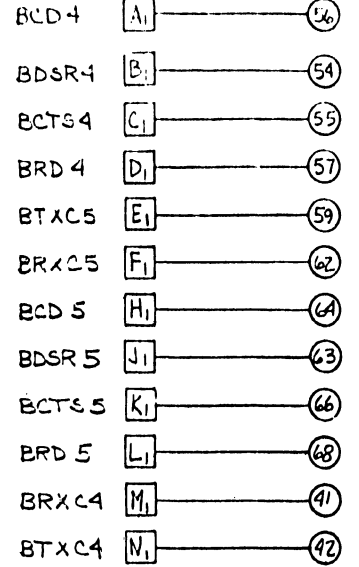
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DO NOT SCALE

7512-1 7513



7512 7513



DEC 10 1979

PRELIMINARY

NO.	REV.	DATE	BY

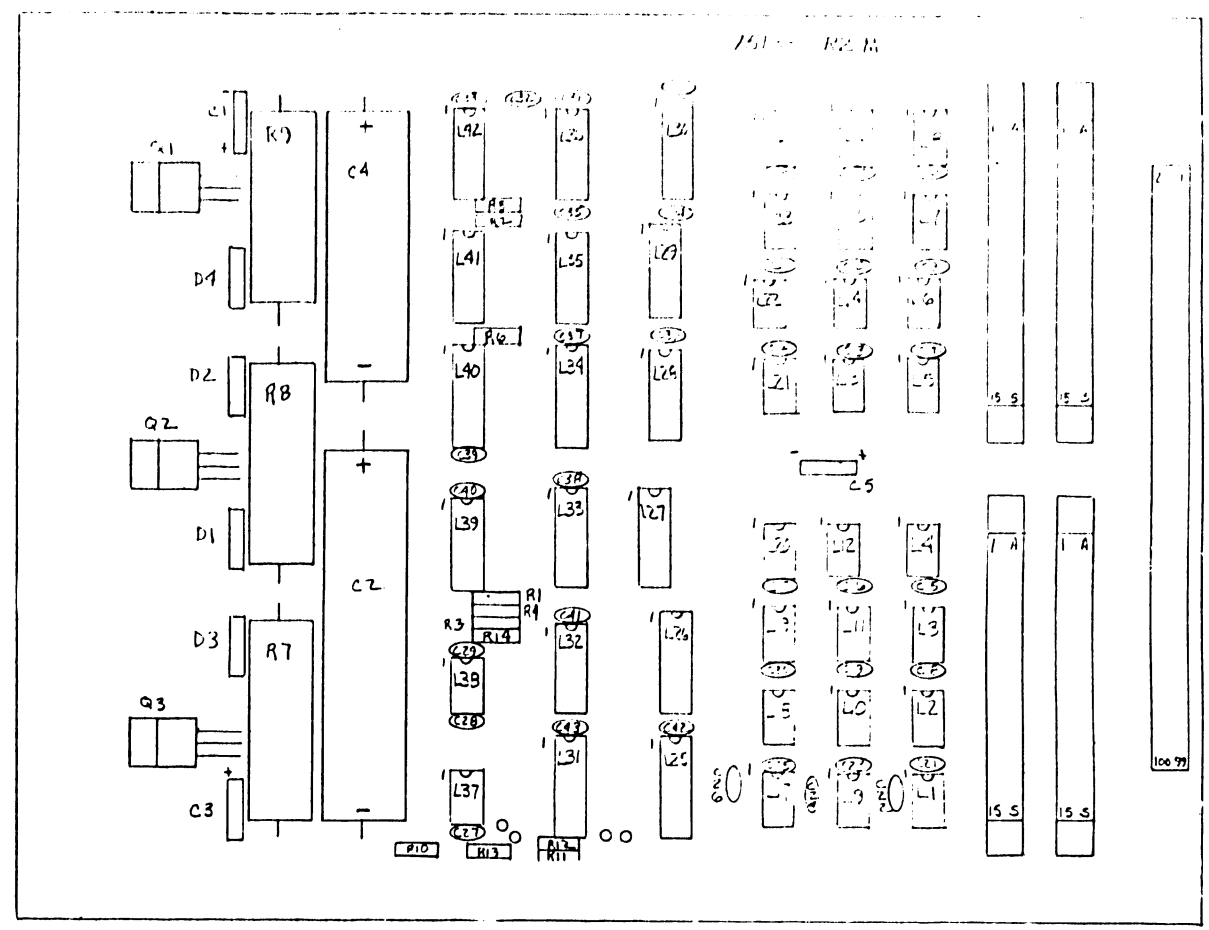
SEE SHEET 5

WANG LABORATORIES, INC. LOWELL, MASS., U.S.A.		BY DWN D. TAYLOR	DATE	APPROVED BY E ENGR	DATE
MATERIAL ~		CHE		M ENGR	
MODEL NO. 2200 VS SEE ENGR SPECIFICATIONS		TITLE MIDEM MUX MOTHER BOARD			
FINISH ~		210-7513A D		7513	2
SCALE: 1:1		SHEET 3 OF 5		WANG PART NUMBER	SIZE

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DO NOT SCALE

Conn 1 7512-1		Conn 2 7512-1		Conn 1 7512		Conn 2 7512	
CD1	1 A	BTXC6	1 A	BTXC6	1 A	BCD2	1 A
DSP1	2 B	BRXC6	2 B	BRXC6	2 B	BTXC2	2 B
CTS4	3 C	BCD6	3 C	BCD6	3 C	BDSR2	3 C
RD4	4 D	BDSR6	4 D	BDSR6	4 D	BRXC2	4 D
TXC5	5 E	BCTS6	5 E	BCTS6	5 E	BCTS2	5 E
RXC5	6 F	BRD6	6 F	BRD6	6 F	BRD2	6 F
CDS	7 H	BRXC7	7 H	BRXC7	7 H	BTXC3	7 H
DSP5	8 J	BTXC7	8 J	BTXC7	8 J	BRXC3	8 J
CTS5	9 K	BCD7	9 K	BCD7	9 K	BDSR3	9 K
RDS	10 L	BCTS7	10 L	BCTS7	10 L	BCD3	10 L
RXC4	11 M	BDSR7	11 M	BDSR7	11 M	BCTS3	11 M
TXC4	12 N	BRD7	12 N	BRD7	12 N	BRD3	12 N
+12V	13 P	+12V	13 P	+12V	13 P	+12V	13 P
±0V	14 R	±0V	14 R	±0V	14 R	±0V	14 R
-12V	15 S	-12V	15 S	-12V	15 S	-12V	15 S



7513
CONN. 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
CH GND	+5V	BTXC6	BRXC6	DTR6	BRD6	TD6	BCD1	BDSR1	RTS1	TD1	BCD2	BDSR2	BCTS2	RTS2	TD2	BRXC3	BDSR3	RTS3	TD3	BRXC4	CTS1	CD	CTS6	CTS7	CTS4	BDSR4	BCD4	RTS4	TD4	BRXC5	BDSR5	RTS5	TD5	BRXC6	BRD6	BCD6	RTS6	BRD6	BRXC7	BDSR7	RTS7	DTR	CTS	RTS	CD	DTR	TD	±0V																																																			

DEC 10

PRELIMINARY

NO.	REV.	DATE

(WANG) LABORATORIES, INC. LOWELL, MASS. U.S.A.	BY	DATE	APPROVED BY	DATE
	CHK			
MATERIAL	MODEL NO. 2200 VS	TITLE		
	SEE ENGR. SPECIFICATIONS	MODEM MUX		
		MOTHER BOARD		
FINISH	TOL EX AS NOTED	210-7513A	D	7513
	10 ±	WANG PART NUMBER	SIZE	DRAWING NUMBER
	100 ±	SCALE	SHT 2 OF 3	46
	ANG ±			

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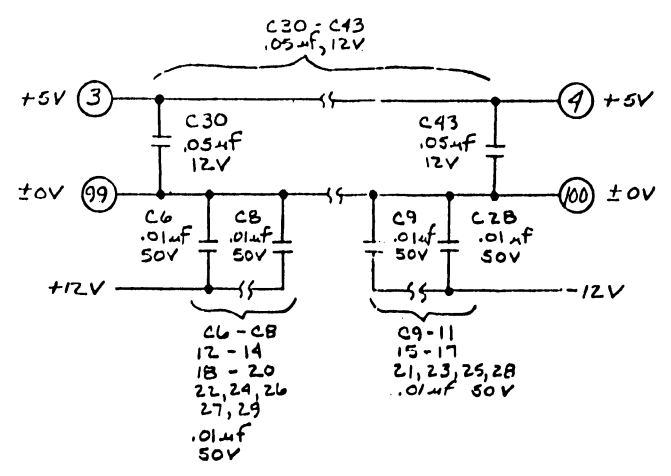
DO NOT SCALE

COMPONENT	W.L. #	TYPE
R2-6, 10-14	350-5010	1K
R7	334-0002	15Ω 11W
R4, 9	334-0003	20Ω 11W
C6-29	300-1920	.01μF 50V
C30-43	300-1900	.05μF 12V
C1, 3, 5	300-4002	1μF 35V (7)
C2	200-3080	4K 30V
C4	300-3079	2.6K 30V
D1-4	380-1000	5M1 403
Q1	374-0001	7805
Q2	374-0006	7912
Q3	374-0007	7812
CONN 1	350-0060	100 PIN CONN.
CONN 2-5	350-0011	30 PIN CONN.

7513	DO NOT LOAD
7513-1	LOAD

MEMORICUS	COMPONENT
C-D	2F11
CD	2A7
CLV-CLV7	2F1
CTS	2F11
CTS7-CTS7	2A1
CTS7-CTS7	2A4
USR	2F11
USR7	2F11
USR7-USR7	2A6
DTR	1A9
DTR7-DTR7	1G0
RXC	2D11
RXC0-RXC7	2A6
RD	2E11
RD7-RD7	2C1
RTS	1A8
RTS7-RTS7	1G4
TXC	2D11
TXC7-TXC7	2A4
TD	1A9
TD7-TD7	1G7

LOCATION	W.L. PART#	TYPE
L1-24, 37, 38	376-0076	75150
L25-29, 31, 33, 34	376-0077	75154
L30	376-0294	74LS13B
L32, 40	376-0214	74LS151
L35	376-0219	74LS30
L36	376-0011	7493
L39	376-0211	74LS32
L41	376-0155	74LS74
L42	376-0180	74LS04



TYPE	LOCATION	SPARE
74LS04	L42	3
74LS32	L39	3

DEC 10 1979
PRELIMINARY

E-REV
0

REV	DATE	BY	DESCRIPTION
1	11/20/79	DWR	REVISED PER ECN # 11820, 11848, 11969, 11986, 12035
2	11/20/79	DWR	REVISED PER ECN # 12806

(WANG) LABORATORIES, INC. LOWELL, MASS. USA		BY DWN D. TAYLOR	DATE 7/23/79	APPROVED BY E ENGR	DATE
MATERIAL	MODIF 2200 VS	CHK		MFG ENGR	
FINISH	SEE ENGR SPECIFICATIONS	TITLE MODEM MUX MOTHER BOARD			
	101 EX AS NOTED XX ± FRAC ± XXX ± ANG ± FINISH	210-7513A	D	7513	2
SCALE	SHT. 5 OF 5	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

D 7513

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DO NOT SCALE

7514										
SIGNAL	C1	J0	J1	J2	J3	J4	J5	J6	J7	J8
BCD ϕ	4	8								
BCD 1	15	8								
BCD 2	23		8							
BCD 3	36			8						
BCD 4	56				8					
BCD 5	64					8				
BCD 6	71						8			
BCD 7	83							8		
BCTS ϕ	10	5								
BCTS 1	20		5							
BCTS 2	27			5						
BCTS 3	38				5					
BCTS 4	55					5				
BCTS 5	66						5			
BCTS 6	73							5		
BCTS 7	86								5	
BDSR ϕ	8	6								
BDSR 1	17		6							
BDSR 2	25			6						
BDSR 3	35				6					
BDSR 4	54					6				
BDSR 5	63						6			
BDSR 6	74							6		
BDSR 7	85								6	
BRD ϕ	11	3								
BRD 1	22		3							
BRD 2	36			3						
BRD 3	40				3					
BRD 4	57					3				
BRD 5	68						3			
BRD 6	80							3		
BRD 7	88								3	
BTXC ϕ	5	15								
BTXC1	14		15							
BTXC2	21			15						
BTXC3	32				15					
BTXC4	42					15				
BTXC5	59						15			
BTXC6	70							15		
BTXC7	81								15	
BRXC ϕ	7	17								
BRXC1	16		17							
BRXC2	26			17						
BRXC3	33				17					
BRXC4	41					17				
BRXC5	62						17			
BRXC6	69							17		
BRXC7	82								17	

7514										
SIGNAL	C1	J0	J1	J2	J3	J4	J5	J6	J7	J8
CU	96									8
CTS	91									5
DSR	98									6
DTR ϕ	9	20								
DTR 1	18		20							
DTR 2	28			20						
DTR 3	34				20					
DTR 4	44					20				
DTR 5	61						20			
DTR 6	72							20		
DTR 7	84								20	
DTR	89									20
RXC	94									17
RD	95									3
RTS	93									4
RTS ϕ	12	4								
RTS 1	19		4							
RTS 2	29			4						
RTS 3	37				4					
RTS 4	58					4				
RTS 5	65						4			
RTS 6	78							4		
RTS 7	87								4	
TXC	92									15
TD	97									2
TD ϕ	13	2								
TD1	21		2							
TD2	31			2						
TD3	39				2					
TD4	60					2				
TD5	67						2			
TD6	79							2		
TD7	88								2	
CHASSIS GND	1,2	1	1	1	1	1	1	1	1	1
GND	99,100	7	7	7	7	7	7	7	7	7
+5V	3,4									

NO	REVISION	DATE	BY	CT
	SEE SHEET 2			

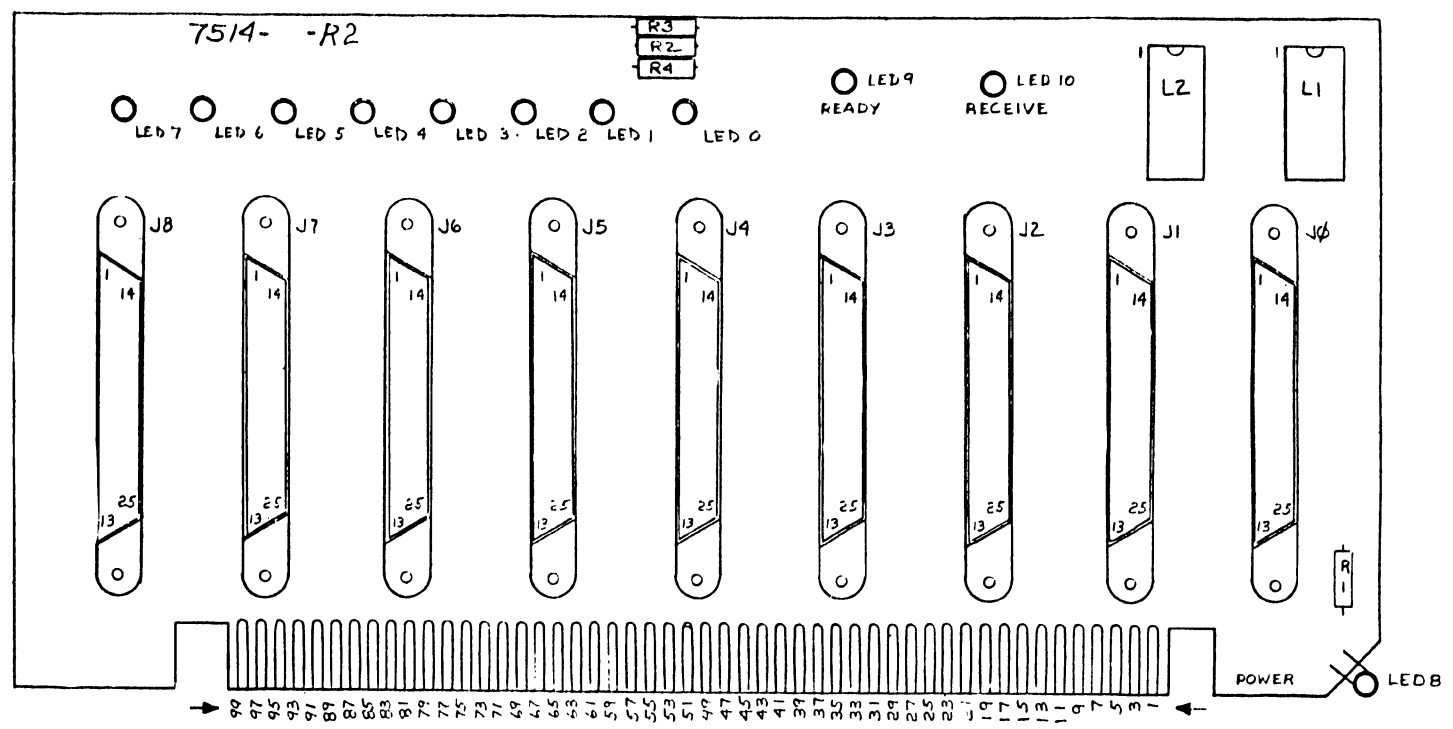
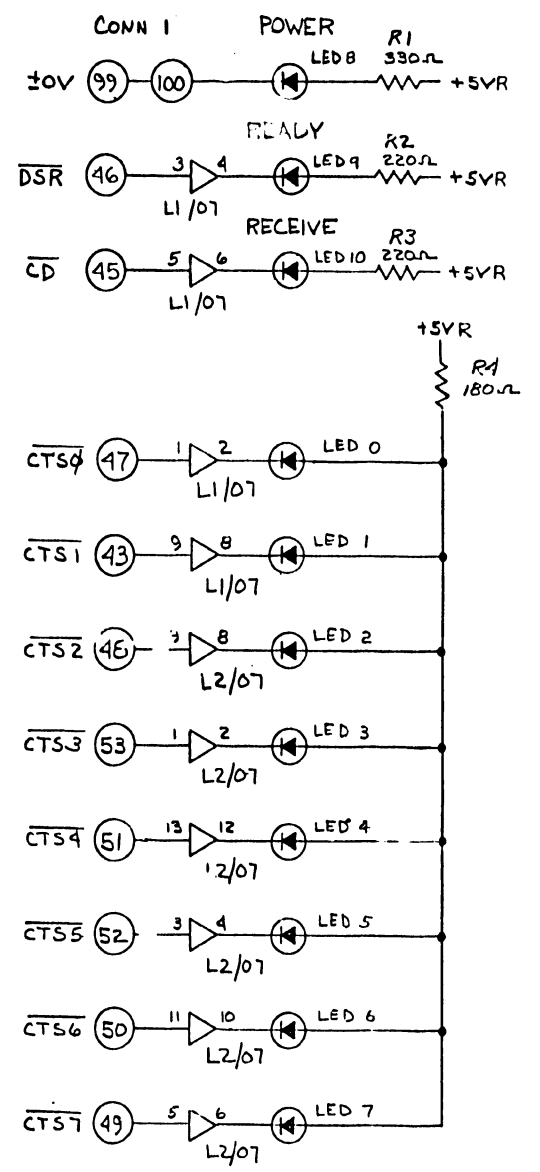
WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY DWN	DATE 7/20/73	APPROVED BY E ENGR	DATE
MATERIAL —	MODEL NO. 2200 VS SEE ENGRG SPECIFICATIONS	CHK		M ENGR	
FINISH —		TITLE CONNECTOR BOARD		MFG ENGR	
TOL ER AS NOTED XX ± FRAC ± FINISH XX ± ANG ±		210-7514	D	7514	2
SCALE 1/4" = 1" SH 1 OF 2		WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

7514

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DO NOT SCALE

MNEMONIC	COORD.
CD	2 F 11
CTS0 - CTS7	2 E 11
DSR	2 F 11
±0V	2 G 11



I.C. LOCATION	TYPE	W.L. #
L1,2	7407	376-0056

LOCATION	TYPE	SPARES
L1	7407	2

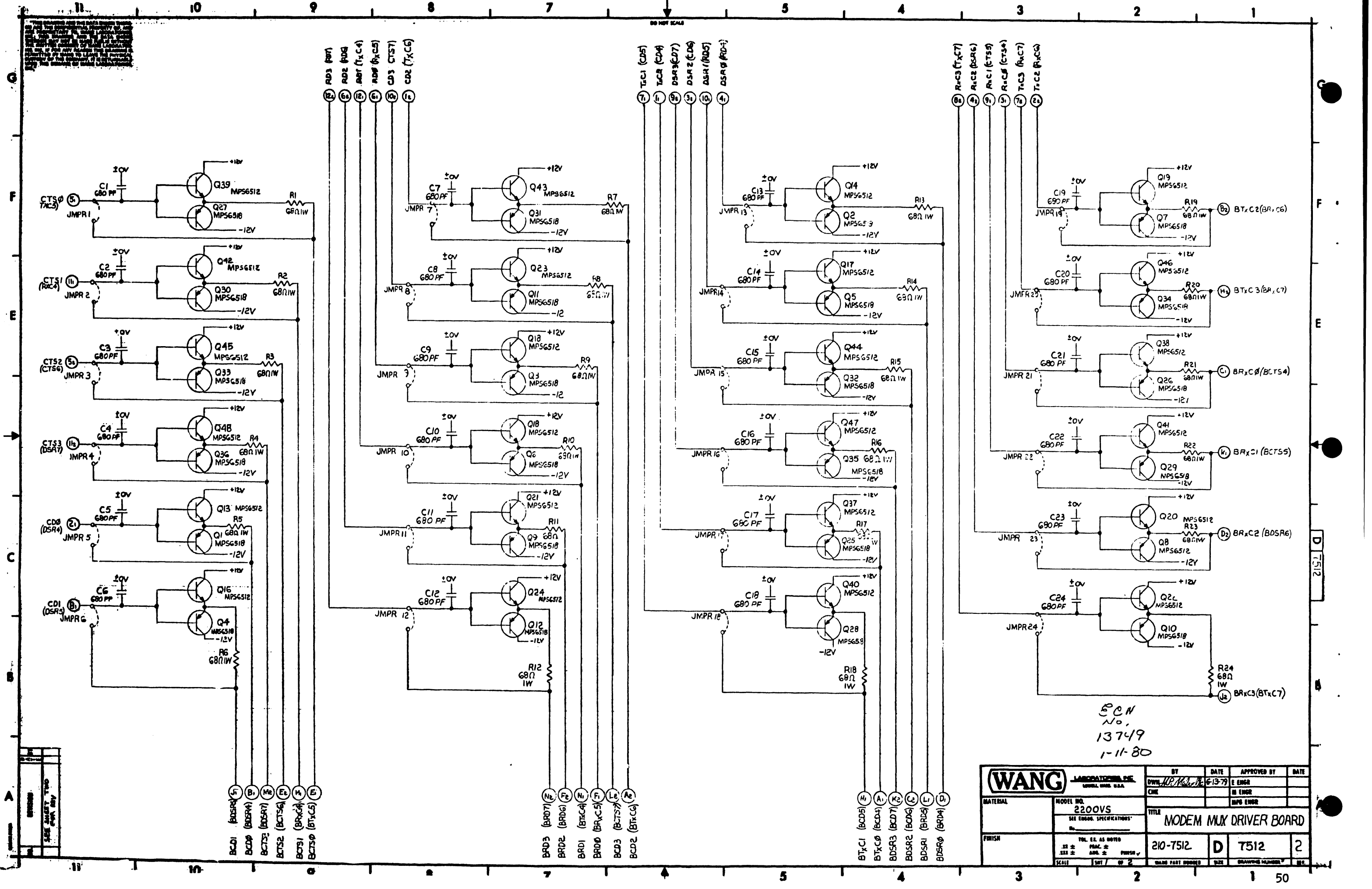
COMPONENT	TYPE	W.L. #
R1	330Ω 1/4 W 10%	330-2033
R2,3	220Ω 1/4 W 10%	330-2022
R4	180Ω 1/4 W 10%	330-2018
LED0-8	LAMP, PED	370-0026
LED9,10	LAMP, CFM	370-0027
J0-J8	CONN 25 POS	350-2504-M

E-REV

NO.	REVISION	DATE	BY	APPROVED BY
1	REVISED PER	11/23/73
2

WANG LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
MATERIAL		DWN D TAYLOR	6/24/73	E ENGR	...
MODEL NO.		CHK	7-17-73	M ENGR	...
2200VS SEE ENGRG SPECIFICATIONS		TITLE CONNECTOR BOARD			
FINISH		TOL EX AS NOTED		210-7514 D 7514 49	
		33 ± 0.15 ± 0.05 ± 0.025 ± 0.0125 ± 0.00625 ± 0.003125			

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ECN
No.
13749
1-11-80

(WANG) LANGFORDVILLE, N.Y. <small>GENERAL INSTRUMENTS DIV.</small>		BY	DATE	APPROVED BY	DATE
		<small>CHK</small> <small>IN ENGR</small> <small>MFG ENGR</small>	<small>6-13-79</small>	<small>E ENGR</small>	
MODEL NO. 2200VS <small>SEE ENGR. SPECIFICATIONS</small>		TITLE MODEM MUX DRIVER BOARD			
FINISH <small>TOL. EX. AS NOTED</small> <small>FIN. AS SHOWN</small>		210-7512	D	7512	2
SCALE <small>SMT / 2</small>		QUANTITY ORDERED	SIZE	DRAWING NUMBER	REV.

D 7512

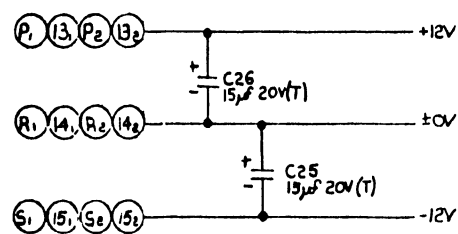
DO NOT SCALE

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7512-1	7512	CONN 1	7512	7512-1	7512-1	7512	CONN 2	7512	7512-1
BCD4	BTxC0	A 1	TxC0	C04	BTxC5	BCD2	A 1	CD2	TxC6
BDSR4	BCD0	B 2	CD0	DSM4	BRxC6	BTxC2	B 2	TxC2	RxC0
BCT54	BRxC0	C 3	RxC0	CT54	BCD6	BDSR2	C 3	DSR2	CD6
BRD4	BDSR0	D 4	DSR0	RD4	BDSR6	BRxC2	D 4	RxC2	DSR6
BTxC5	BCT50	E 5	CT50	TxC5	BCT56	BCT52	E 5	CT52	CT56
BRxC5	BRD0	F 6	RD0	RxC5	BRD6	BRD2	F 6	RD2	RD6
BCD5	BTxC1	H 7	TxC1	CD5	BRxC7	BTxC3	H 7	TxC3	RxC7
BDSR5	BCD1	J 8	CD1	DSR5	BTxC7	BRxC3	J 8	RxC3	TxC7
BCT55	BRxC1	K 9	RxC1	CT55	BCD7	BDSR3	K 9	DSR3	CD7
BRD5	BDSR1	L 10	DSR1	RD5	BCT57	BCD3	L 10	CD3	CT57
BRxC4	BCT51	M 11	CT51	RxC4	BDSR7	BCT53	M 11	CT53	DSR7
BTxC4	BRD1	N 12	RD1	TxC4	BRD7	BRD3	N 12	RD3	RD7
+12V	+12V	P 13	+12V	+12V	+12V	+12V	P 13	+12V	+12V
±0V	±0V	R 14	±0V	±0V	±0V	±0V	R 14	±0V	±0V
-12V	-12V	S 15	-12V	-12V	-12V	-12V	S 15	-12V	-12V

COMPONENT	PART NO	TYPE
C1-24	300-1600	680 PF 500V
R1-24	332 1068	68R 1W 10%
Q13-24, 37-48	375-1012	MPS6512
Q1-12, 25-36	375-1014	MPS6518
C26, 26	300-4022	15 μF 20V(T)

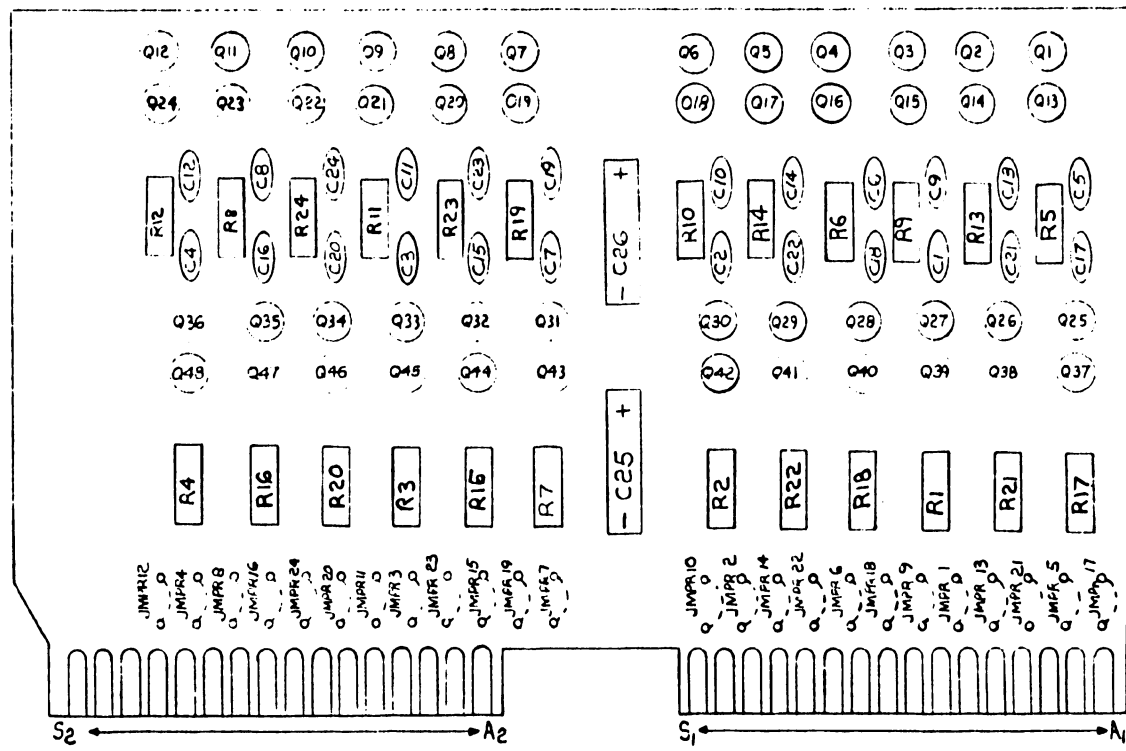
7512	LOAD JUMPERS ONLY
7512-1	LOAD COMPONENTS ONLY



MNEMONIC	COORD
BCD0	1A10
BCD1	1A10
BCD2	1A6
BCD3	1A6
BCD4-BCD7	1A4
BCT50-BCT53	1A7
BCT54	1E1
BCT55	1D1
BCT56	1A9
BCT57	1A6
BDSR1-BDSR3	1A4
BDSR4, BDSR5	1A0
BDSR6	1C1
BDSR7	1A9
BRD0-BRD3	1A7
BRD4, BRD5	1A4
BRD6-BRD7	1A7
BRxC0	1E1
BRxC1	1D1
BRxC2	1C1
BRxC3	1C1
BRxC4	1A9
BRxC5	1A7
BRxC6	1F1
BRxC7	1E1

MNEMONIC	COORD
BTxC0, BTxC1	1A4
BTxC2	1F1
BTxC3	1E1
BTxC4	1A7
BTxC5	1A9
BTxC6	1E1
BTxC7	1E1
CD0, CD1	1E1
CD2, CD3	1E1
CD4-CD7	1E1
CT50	1F1
CT51, CT52	1E1
CT53	1D1
CT54, CT55	1E1
CT56	1E1
CT57	1E1
DSR0-DSR3	1E1
DSR4, DSR5	1C1
DSR6	1E1
DSR7	1D1
RD0-RD3	1E1
RD4, RD5	1E1
RD6, RD7	1E1
RxC0-RxC3	1E1
RxC4	1E1

MNEMONIC	COORD
RxC5	1E1
RxC6, RxC7	1E1
TxC0, TxC1	1E1
TxC2, TxC3	1E1
TxC4	1E1
TxC5	1F1
TxC6	1E1
TxC7	1E1



ECN No. 13749 1-11-80

REV	DESCRIPTION	DATE	BY	APP'D
1	ORIGINATED PER WANG 6-30-77	7-17-77		
2	REVISED PER WANG 12-15-77	12-15-77		
3	REVISED PER WANG 12-15-77	12-15-77		
4	REVISED PER WANG 12-15-77	12-15-77		

WANG LABORATORIES, INC. WALTHAM, MASS. U.S.A.		BY	DATE	APPROVED BY
MODEL NO. 2200VS		WANG	6/5/79	WANG
SEE ENGR. SPECIFICATIONS		CMR	2/1/79	WANG
TITLE		MODEM MUX DRIVER BC		
FINISH		210-7512 D 7512		
SCALE 1:1		WANG PART NUMBER 51		



LABORATORIES, INC

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851. TEL (617) 459-5000. TWX 710 343-6769. TELEX 94-7421

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END