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## **TMA802 MEDIA ANALYZER**

**SERVICE MANUAL**

**Tektronix, Inc.**  
**Communications Network Analyzer Division**  
**P.O. Box 1197**  
**Redmond, Oregon 97756-0227 U.S.A.**  
**Phone (503) 923-0333**

**070-6578-99**  
**Product Group 22**

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## SAFETY SUMMARY

### TERMS IN THIS MANUAL

**CAUTION** statements identify conditions or practices that could result in damage to the TMA802 or other property.

**WARNING** statements identify conditions or practices that could result in personal injury or loss of life.

### SAFETY CONSIDERATIONS

- Turn off the TMA802 and disconnect the battery leads before removing circuit boards or soldering/desoldering components.
- The TMA802 battery can vent potentially explosive hydrogen gas. See Section 3 for safety considerations when handling the battery.
- Static electricity can damage certain components in the TMA802. Use standard electronics anti-static handling procedures when servicing the TMA802.
- Burned fuses and other evidence of heat damage may indicate hidden problems. Be sure and trace any burning or overheating problem to its point of origin.

### ATTENTION

If the TMA802 will be shipped by air (passenger or cargo), follow the International Air Transport Association (IATA) Dangerous Goods Regulations, UN2800, currently in effect. The TMA802 has a sealed, non-spillable, lead-acid battery that contains sulphuric acid. Venting of hydrogen gas is possible during certain conditions.

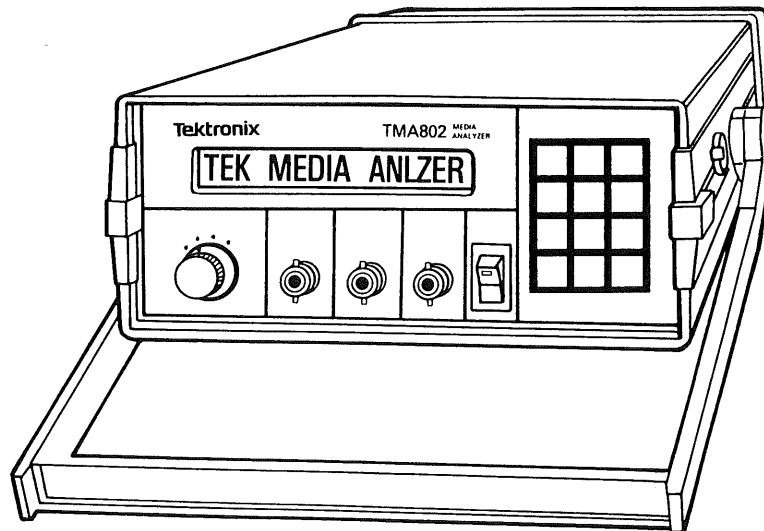
# Section 1. INTRODUCTION

## OUTLINE OF MANUAL

This manual is divided into five sections:

- Section 1** consists of a brief description of TMA802 features and specifications. For a complete description of how to operate the TMA802, refer to the TMA802 Operator Manual (070-6273-00).
- Section 2** describes TMA802 circuitry. This section may be used in conjunction with the circuit schematics and electrical parts list in Section 5 to trace circuit functions.
- Section 3** contains general maintenance information. Except for charging the battery and fuse replacement, maintenance of the TMA802 is minimal.
- Section 4** describes how to check the performance and adjust the TMA802 to meet operating specifications listed in the back of Section 1. *(NOTE: there is no established troubleshooting procedure for the TMA802).*
- Section 5** contains circuit schematics, electrical parts locators (circuit board drawings) and a list of replaceable electrical parts.
- Section 6** contains a list of replaceable mechanical parts and a mechanical parts locator (exploded view of the TMA802).

## PRODUCT DESCRIPTION



**TMA802 Media Analyzer**

The Tektronix TMA802 Media Analyzer is used to monitor the traffic load and detect faults on LANs (Local Area Networks). The TMA802 can operate in three user-selectable modes: Standalone, Scope or Monitor:

## **Standalone Mode**

In Standalone mode, the TMA802 tests the cable and reports the cable's status in plain English. Examples: [ OK To 02,117F<sub>t</sub> ], [ OPEN 00,400F<sub>t</sub> ], [ SHORT 00,615F<sub>t</sub> ]. In Standalone mode, the TMA802 reports only the first fault detected.

Standalone mode is suitable for users who may not be familiar with the intricacies of making complex cable measurements.

## **Scope Mode**

In Scope mode, the TMA802 is connected to an oscilloscope. It generates a complete graphical representation of the LAN cable and provides an accurate, detailed view of the entire network including transceivers, terminator and multiple faults.

The TMA802 is designed to work with the Tektronix 2225 50 MHz oscilloscope or 24XX family of oscilloscopes\*.

## **Monitor Mode**

In Monitor mode, the TMA802 provides a direct indication of network activity independent of the protocol or vendor that is generating the traffic. Network activity is reported without the confusion that would be added by the network controller or higher-layer protocol monitors.

Network activity is reported as average percentage of bandwidth used: 1) over the last two seconds, 2) over the last minute, and 3) since the TMA802 last began monitoring the network.

## **TEST CAPABILITIES**

The TMA802 provides four user-selectable impedance values used by most LANs and operates at voltage levels compatible with most LANs. Specific impedance values are:

- 50-ohm coax cable defined by IEEE 802.3 10Base5 yellow/orange trunk cable used by Ethernet networks and IEEE 802.3 10Base2 RG58 cable used by Cheapernet networks.
- 75-ohm CATV cable defined by IEEE 802.4 used by MAP Token Bus networks and IEEE 802.3 10Broad36 networks. *CAUTION: do not connect the TMA802 to CATV power cables. Excessive voltage may damage the TMA802.*
- 100-ohm unshielded twisted-pair cable defined by IEEE 802.3 1Base5 used by Starlan networks and IEEE 802.5 used by Token Ring networks. *NOTE: the TMA802 cannot test unshielded twisted-pair cable coiled on a reel because of excessive capacitance due to coiling.*
- 150-ohm shielded twisted-pair cable defined by IEEE 802.5 used by IBM Token Ring networks.

The TMA802 is powered by a rechargeable battery and has no high-voltage circuits.

## **SHIPPING NOTICE**

*If the TMA802 will be shipped by air (passenger or cargo), follow the International Air Transport Association (IATA) Dangerous Goods Regulations, UN2800, currently in effect. The TMA802 has a sealed, non-spillable, lead-acid battery that contains sulphuric acid. Venting of hydrogen gas is possible during certain conditions.*

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\* The TMA802 will work with any other manufacturer's oscilloscope with a bandwidth of at least 60 MHz.

## SPECIFICATIONS

### POWER CHARACTERISTICS

SUPPLY	CHARACTERISTIC
Battery	Operating Time: 3 hours Charging Time: 5 hrs minimum to full charge Type: Sealed lead-acid, 2.6 amp/hr, 750mA @ 15 VDC  Low Power Threshold Operational > 11.8 V 10.6 V to 11.8 V - warning indicator displayed. Non-operational < 10.6 V $\pm$ 0.5 V (low voltage indicator displayed)
Fuses	(2) 1.5 amp - F1 battery chg; F2 battery fuse

### ELECTRICAL SPECIFICATIONS

CHARACTERISTIC	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFO
Pulsewidth		15 ns, 150 ns, 1100 ns, 37 $\mu$ s
Pulse amplitude	-2 V $\pm$ 0.2 V	Unloaded $\geq$ -3 V Loaded $\geq$ -1.6 V
Pulse output impedance		50 $\Omega$ , 75 $\Omega$ , 100 $\Omega$ , 150 $\Omega$
Vmax input	$\pm$ 10 V	
Standalone threshold		
Short		+0.40 V $\pm$ 0.05 V
Open		-0.56 V $\pm$ 0.05 V
Accuracy	$\pm$ 4 feet to 1000 feet	IEEE 802.3 10base5 trunk cable RG58 coax cable IBM Type 2 data cable
Monitor % use accuracy		$\pm$ 0.05%
Min/Max		0.1% to 99.9%

### PHYSICAL SPECIFICATIONS

Weight with covers and accessories	8 lb 2 oz (3.68 kg)
Dimensions	
Without covers:	3.4" (86 mm) high; 9.3" (236 mm) deep; 9.8" (249 mm) wide
With covers:	3.5" (89 mm) high; 15.8" (401 mm) deep; 9.8" (249 mm) wide

ENVIRONMENTAL SPECIFICATIONS

CHARACTERISTIC	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFO
Temperature	Operational: -20° C to +50° C Storage: -30° C to +60° C	
Humidity	90% relative humidity 5-day noncondensing	MIL-STD 28800B
Altitude	Operating: 15,000 ft. Non-operating: 50,000 ft.	MIL-STD 28800C, Class 3
Electrostatic Discharge	15 kV no degradation of performance 20 kV no permanent damage	
Radiated & conducted EMI	FCC Part 15, Subpart J, Class A VDE 0871, Class B	
EMI Susceptibility	RS01: No degradation of performance when subjected to magnetic fields of 30 Hz to 50 kHz.  RS03: No degradation of performance with electrical fields of 1 V/m throughout frequency range of 14 kHz to 1 GHz.	Tek Std 062-2866-00
Vibration	0.025 inch peak-to-peak displacement, 25 minutes each axis including 15 minutes sweep of 10 to 55 Hz and 10 minutes dwell of 55 Hz.	Tek Class 3
Mechanical shock	50 Gs at 11 ms duration half sine including 3 drops on each of six faces.	Tek Class 3
Transportation package drop test	Freefall drop from 36 inches onto all surfaces, corners and edges.	Tek Class 3
Bench handling	Four-inch rotational drops of each of four top and bottom edges, and two side edges on the rear onto hard tile-over-concrete floor.	
Topple	Topple onto bottom and top on a hard floor. The handle also withstood topples onto floor in various positions.	
UL handle load test	Withstands ≥ four times equipment weight.	UL 1244



## ACCESSORIES

### STANDARD ACCESSORIES

*(included with each TMA802)*

ACCESSORY	PART NUMBER
TMA802 Operator Manual*	070-6273-00
Operator Manual includes:	
3-ring binder	016-0728-00
Cover insert	250-0575-00
Spine insert	250-0576-00
Text (8 sections/tabs)	062-9296-00
US Battery Charger	119-2731-00
50 $\Omega$ Terminator	011-0141-00
75 $\Omega$ Terminator	011-0142-00
100 $\Omega$ Terminator	011-0143-00
150 $\Omega$ Terminator	011-0144-00
BNC Accessory Cable (16' - 50 $\Omega$ )	174-0533-00
Spare fuses (2) 1.5 amp	159-0283-00
Carrying strap	346-0245-00
User Reference Card	062-9293-00

*\*Order part number 070-6273-00 when ordering the complete TMA802 Operator Manual.*

**OPTIONAL ACCESSORIES**

ACCESSORY	PART NUMBER
TMA802 Service Manual (Tek use only)	070-6578-99
Ethernet/Cheapernet Network Kit	016-0913-00
MAP Token Bus/Broadband/CATV Network Kit	016-0911-00
IBM Token Ring Network Kit	(Future availability)
Starlan Network Kit	(Future availability)
Scope Cable/Connector Kit	016-0912-00
2225 Scope Physical Adapter Kit	014-0066-00
Strap	346-0246-00
Frame	386-5348-00
24XX Scope Physical Adapter Kit	014-0067-00
Strap	346-0246-00
Frame	386-5349-00
C4 Scope Camera for scopes with illuminated graticules	See Tek Catalog
C7 Scope Camera for scopes with non-illuminated graticules	See Tek Catalog
Option 1C - European 220 V charger	119-2712-00
Option 2C - U.K. 240 V charger	119-2713-00
Option 4C - Canadian 110 V charger	119-3034-00
TMA802 Carrying Case	016-0817-00

**TMA802 OPTIONS**

OPTION	INCLUDES
Option 01	TMA802 and Scope Cable/ Connector Kit
Option 02	TMA802 and Ethernet/Cheapernet Network Kit
Option 03	TMA802 and MAP Token Bus/ Broadband/CATV Network Kit
Option 04	TMA802 and IBM Token Ring Network Kit
Option 05	TMA802 and Starlan Network Kit

## **Section 2.**

# **CIRCUIT DESCRIPTIONS**

This section describes circuitry in the TMA802. A circuit board locator is shown in Figure 2-2.

The functional parts of the TMA802 consist of four circuit boards and a rechargeable battery. Three of the circuit boards (Analog Board [A2], Interface Board [A3] and Processor Board [A4]) are repairable. This manual contains circuit descriptions and schematics for these three boards.

The Display Board [A1] is replaceable as a unit only. No circuit descriptions or schematics are included for the Display Board.

Refer to Figure 2-1 (block diagram) for an indication of circuit architecture and to individual circuit board schematics for circuit detail. In the text of the circuit descriptions, individual components are referred to by schematic location. Example: A4U14 means component U14 (the CPU) on schematic A4 (Processor Board).

### **CENTRAL PROCESSING UNIT**

The Central Processing Unit (A4U14), the "brain" of the TMA802, has an 8-bit upper address bus, 8-bit data bus and 18-bit control bus.

The 8-bit upper address bus contains the upper 8 bits of a 16-bit address for all ROM or RAM inputs and outputs. The 8-bit data bus is where all data is input or output from the CPU. The 18-bit control bus controls test, display status and data bus drivers that input/output at the CPU.

### **CONTROL SWITCHES**

The control switches circuit consists of a 12-button keypad (A2J6,J7) and data bus driver (A2U7). It has one input from data bus enable (A4U26) and seven returns to the data bus. The keypad is monitored by the CPU through the data bus.

### **DISPLAY PANEL**

The Liquid Crystal Display (A2J2) is a 16-character, one-line format containing an ASCII character generator, 80 locations of display RAM, 112 locations of character ROM and eight locations of character RAM, all of which can be read/written by the CPU.

The first 16 addresses of display RAM are addresses of the display characters. The display takes 8 bits of bidirectional data from the data bus, 2 bits from the upper address bus and 1 bit from data bus enable (A4U26).

### **LOWER ADDRESS LATCH**

The lower address latch circuit (A4U16) latches information from the data bus (under control of the CPU) to form the lower 8 bits of the 16-bit I/O address. The only circuit that uses the latched data is the program ROM.

## PROGRAM ROM

The program ROM circuit consists of a 27C64 EPROM (A4U17) that contains commands for the CPU.

## BATTERY LEVEL DETECTOR

The battery level detector circuit (A2U7 & A4U8) monitors the battery level when the TMA802 is turned on. It statuses the CPU when the battery level goes below 11.8 VDC and interrupts the CPU to terminate testing when the battery falls below 10.7 VDC.

## CPU CLOCK

The CPU clock circuit, the timer for the CPU, is a crystal oscillator (A4Y1) consisting of two capacitors and one inductor that oscillate at 6 MHz.

## DATA BUS ENABLER

The data bus enabler circuit (A4U26) enables individual circuits to put data on or take data off the bidirectional data bus. The circuit is under control of the CPU.

## ANALOG CIRCUIT

The analog circuit has two parts: the reflectometer part and 10 MHz monitor part.

The reflectometer part takes a TTL-level pulse and turns it into a current pulse that drives through the coaxial test cable having known impedance. A reflection caused by a short or open in the cable is captured by level detecting comparators (A2U1,U3). A negative reflection means an open. A positive reflection means a short.

These signals are then passed to the counter and counter control circuit (A3U7,U22,U20) that stop the counter. The number of counts multiplied by the cable's propagation factor result in the distance from the TMA802 to the open or short.

The 10 MHz monitor part takes an incoming square wave signal through the INPUT connector (A2J4) into a comparator circuit (A2U3,U6) that shapes the signal into a TTL-level square wave for the counter circuit (A3U9,U12).

## COUNTER AND COUNTER CONTROL

The counter and counter control circuit consists of seven parts: a 12-bit reference counter (A3U2,U4,U13), 8-bit input counter (A3U9,U12), delay line (A3U6), pulsewidth shaper (A3U19), counter clock control (A3U2,U21,U22), set of data bus drivers and a CPU counter clock synchronizer (A3U21).

The 12-bit counter can be set to any beginning value (000 to FFEH) and will count as long as there is a clock enabled or until it reaches a maximum count of FFEH.

The 8-bit input counter takes a maximum input of 16 MHz. It divides the input frequency by 256 so that the frequency input to the CPU is less than 500 kHz.

The delay line is used to delay the analog circuit signal to the cable connector so that it coincides with the sync pulse for the oscilloscope test mode.

The pulsewidth shaper produces four different pulsewidths: 15 ns, 150 ns, 1100 ns and 37  $\mu$ s. Pulsewidth selection is under control of the CPU.

The counter clock control consists of three latches (A3U2,U21,U22) and a four-input AND gate (A3U20). The three latches capture the pulses that come from the "short" comparator, "open" comparator and end-of-counter circuit. When a pulse is received, the AND gate goes false and the clocks to the counter stop. The latches are set and reset by the CPU. Data from the counters and test status are passed to the data bus through the data bus drivers which are under control of the CPU. The CPU synchronizer is a D-type flop-flop (A3U21) clocked by the 100 MHz clock to insure that the start command from the CPU coincides with the rising edge of the 100 MHz counter clock.

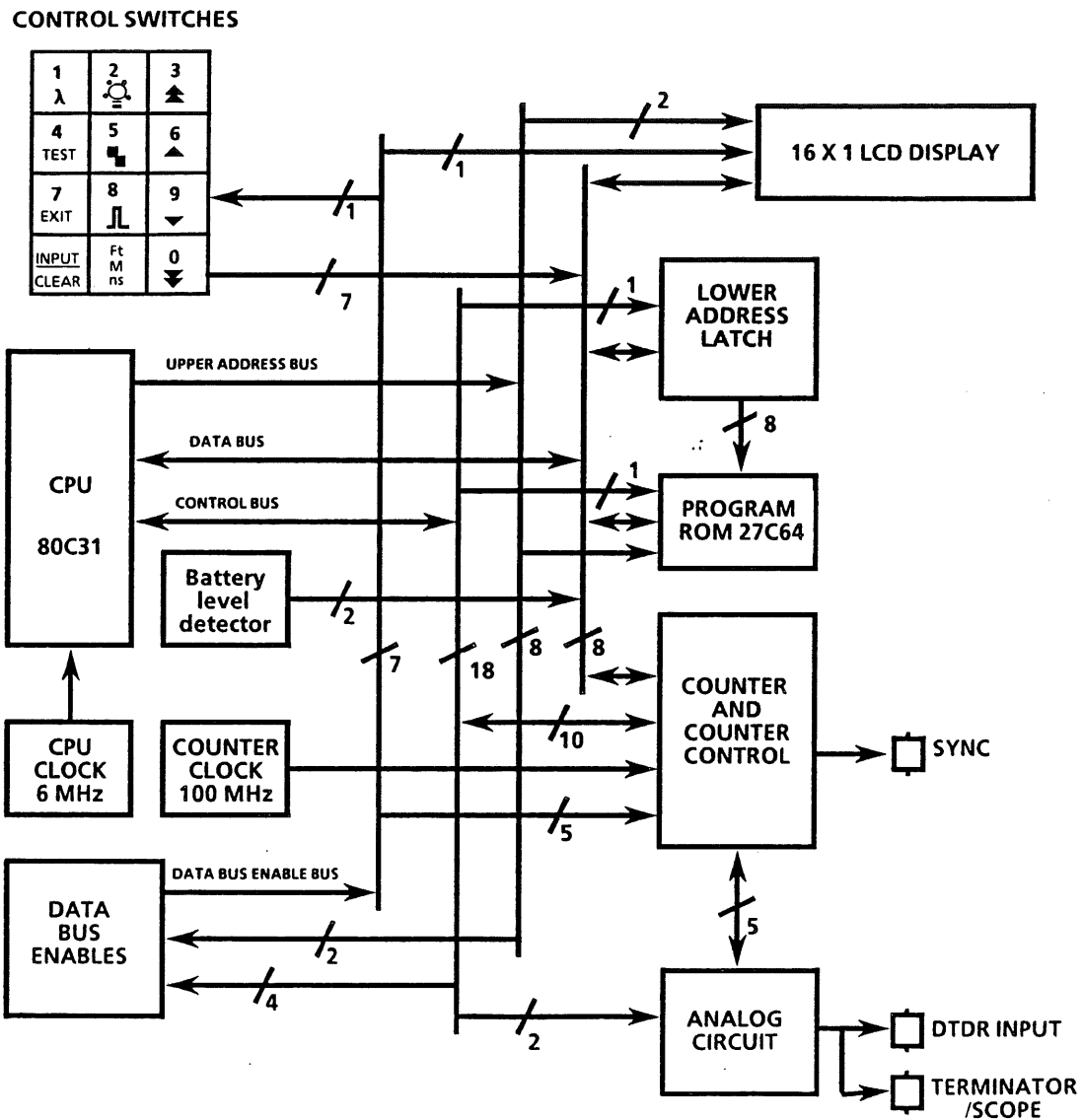
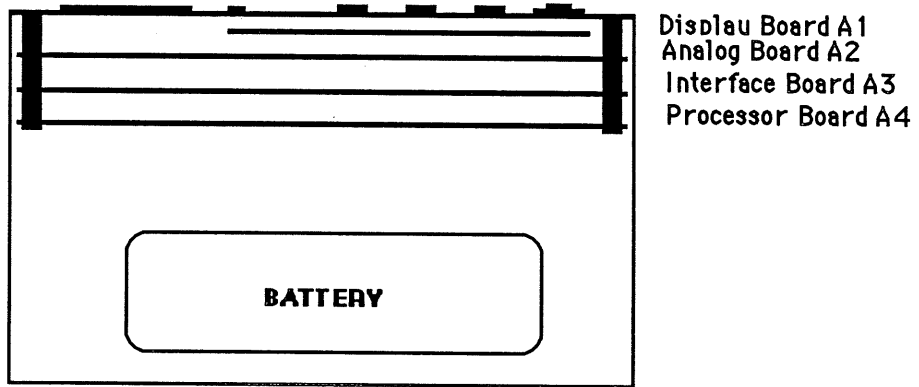


Figure 2-1. TMA802 Block Diagram.

**Circuit Descriptions - TMA802**



**Figure 2-2. TMA802 Circuit Board Locator.**  
*(Top View, Cover Off)*

## Section 3. MAINTENANCE

This section discusses repair procedures for the TMA802. Other than charging the battery, the TMA802 does not require periodic maintenance.

### CHARGING THE BATTERY

The TMA802 is powered by a rechargeable, maintenance-free, lead-acid battery. Battery discharge time is three hours of continuous operation. Recharge time is five hours minimum to full charge. The TMA802 can be operated while being recharged.

The battery is easily recharged by: (1) turning off the TMA802, (2) plugging the AC charger (standard accessory) into an AC power source, then (3) plugging the AC charger into the pin connector on the left side of the TMA802 (see Figure 3-1). To fully recharge the battery, allow it to recharge overnight.

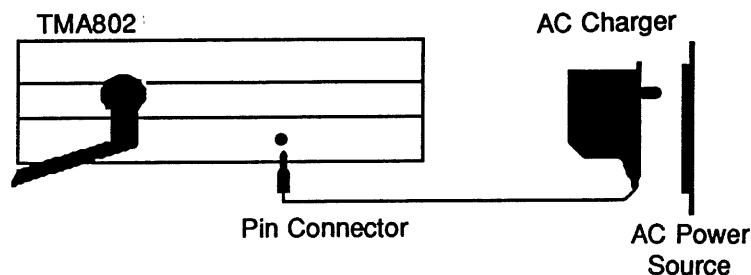


Figure 3-1. Battery Charger Connections.

### Low Battery Warning Symbol

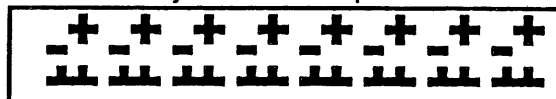
The following warning symbol will appear somewhere in the display when the battery begins to run low:



The symbol will not obscure test data on the display nor interrupt testing. The symbol merely warns you that the battery needs recharging.

### Battery Low-Power Symbols

When the battery runs low to the extent that the TMA802 can no longer operate within specification, the TMA802 will automatically switch to low-power state and the following set of symbols will be displayed:



In low-power state, available power is used only to preserve the low-power symbols as a reminder that the TMA802 needs immediate recharging.

## Blank Display at Power-Up

At power-up, if the display is blank and the green LED on the power switch does not turn on, the battery is probably fully discharged.

## Quick Charge

The TMA802 can be made operational quickly by turning the TMA802 off and recharging the battery for at least 15 minutes. Then power-up the TMA802 with the AC charger connected. The TMA802 should be fully operational although the low battery warning symbol may still be displayed.

## BATTERY/FUSE TROUBLESHOOTING

After fully recharging the battery, if the display remains blank and the green LED on the power switch remains off, or the low-power symbols still show, the problem may be (in order of most likely to least likely): (1) open fuse, (2) defective battery, or (3) defective AC charger.

### Open Fuse

To check the fuses:

- 1) Make sure the TMA802 is turned off and disconnected from the AC charger.
- 2) Turn the TMA802 upside down and remove four screws that secure the footpads (see Figure 3-2).
- 3) Turn the TMA802 rightside up and lift off top cover and side panels (with handle attached). The circuit boards and battery should now be easily accessible.

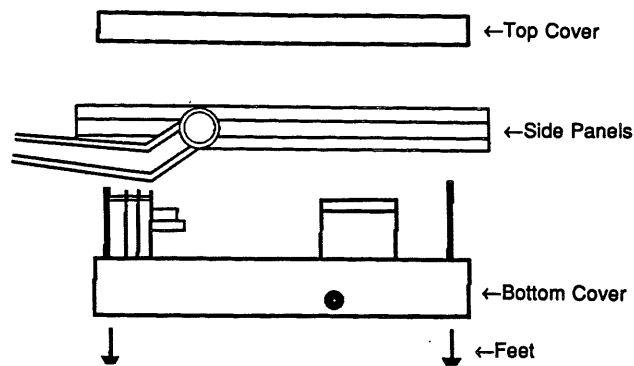


Figure 3-2. Cover/Panel Removal

- 4) Disconnect the J2 connector from left side of the Processor Board (see Figure 3-3). Note that this connector is keyed for proper reconnection.

The Processor Board is the board nearest the battery.

- 5) Two 1.5 amp resistor-type fuses (labeled F1 and F2 ) are located on the upper left corner of the Processor Board (see Figure 3-3).

The fuses are easily pulled out of their sockets using a pair of needle-nose pliers. If an ohmmeter is available, the condition of the fuses can be checked. Otherwise, simply replace the fuses.



Two spare fuses are in a plastic bag attached to the top of the battery. A package of two replacement 1.5 amp fuses is part numbered 159-0283-00.

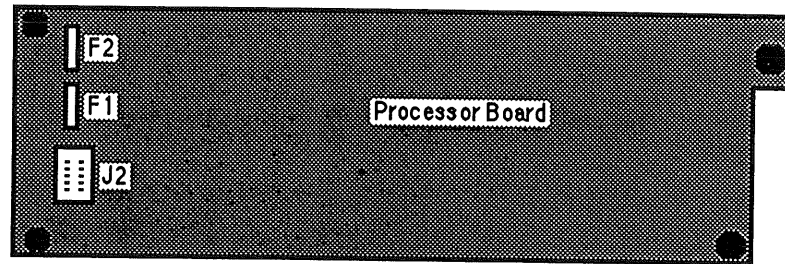


Figure 3-3. Fuse and J2 Connector Locations.

- 6) Reconnect the J2 connector on the Processor Board and replace the top cover and side panels in reverse order of removal.

### Defective Battery

If the battery has been discharged continuously for several days without being recharged or has been subjected to severe environmental conditions, it may lose its ability to be recharged and must be replaced.

The battery may also lose its ability to be recharged after it has gone through several hundred discharge/recharge cycles. The exact number of cycles depends upon variations in depth of discharge and environmental conditions.

### WARNING

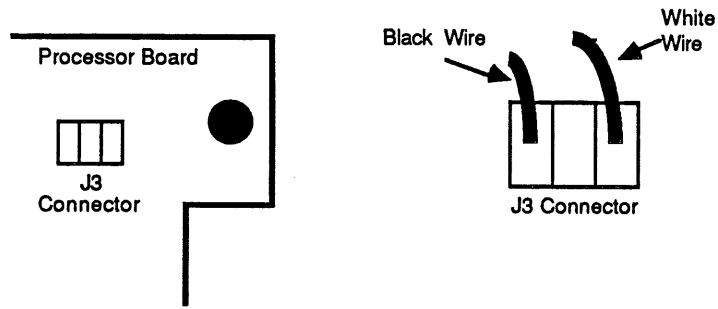
*Explosive gas (hydrogen) may be vented from the battery. Do not service battery in the presence of flames or sparks. Sparks can be created anytime the leads are disconnected from or connected to the battery. To avoid sparks, follow the battery replacement procedure exactly.*

*The battery contains sulphuric acid which can cause injury. Avoid contact with skin, eyes and clothing.*

To replace the battery:

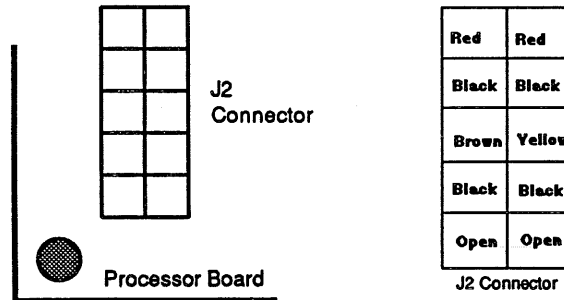
- 1) Remove covers and disconnect the J2 connector per steps 1, 2, 3 and 4 under "Open Fuse." The battery is strapped to a metal baseplate which is attached to the bottom cover (see Figure 3-4).

**Performance Check - TMA802**



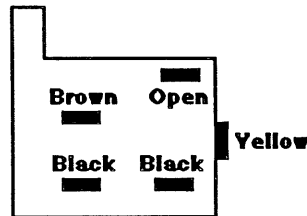
**Figure 4-1. J3 Connector Wiring Locations.**

- c) Note wiring harness that connects battery and AC charger connector to J2 connector on Processor Board (A4). *If necessary, refer to Figure 3-4 in Section 3 for location of AC charger connector.* The wiring locations on the J2 connector should be as follows:



**Figure 4-2. J2 Connector Wiring Locations.**

- d) Note wires that run out of the AC charger connector. The wiring positions should be as follows:



**Figure 4-3. AC Charger Connector Wiring Positions.**

- e) Visually check battery cables for proper polarity: red cables to positive terminal; black cables to negative terminal.

**CURRENT CHECKS**

- 1) Disconnect positive and negative cables from battery terminals.
- 2) Connect TMA802 battery cables, ammeter and power supply as follows:

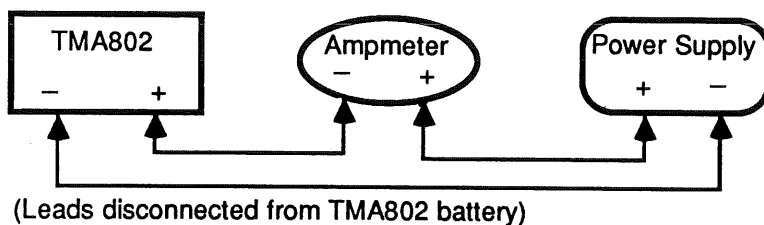


Figure 4-4. TMA802/Ammeter/Power Supply Setup.

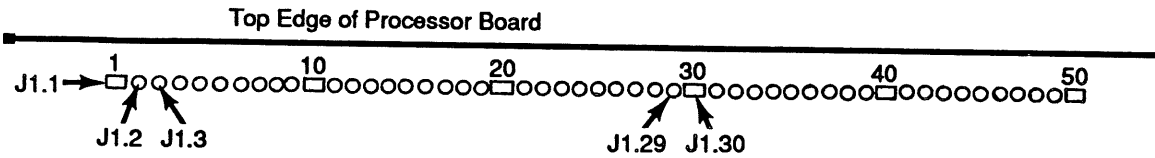
- 3) Set power supply to 13 VDC. Turn on power supply.
- 4) Turn on TMA802 power. Press key #4. TMA802 should flash [ λFoam = .7800c ], then [ OPEN 00,000F<sub>t</sub> ]. Ammeter should show approximately 60 mA.
- 5) Press key #7, then key #5. TMA802 should flash [ λFoam = .7800c ], then [ CUR 00,000F<sub>t</sub> ]. Ammeter should show approximately 600 mA.
- 6) Turn off TMA802. Disconnect ammeter. Connect power supply directly to TMA802 (leave TMA802 battery disconnected).

### POWER SUPPLY VOLTAGE MEASUREMENTS

- 1) Turn on TMA802.
- 2) Use the voltmeter to check the following test points on Processor Board (A4). See Figure 4-5 for test point locations.

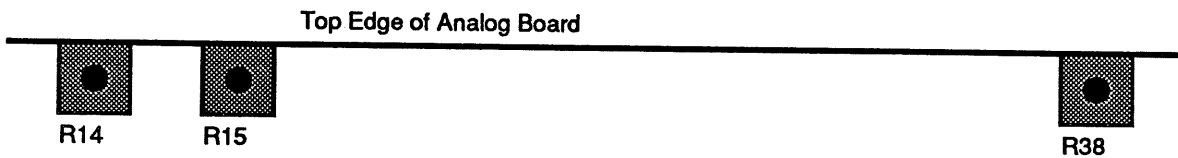
Test	TMA802 Mode	Power Supply Setting	Test Point	Reading
Ground P (CPU power).	50 Ω	13 V	J1.1 to J1.2	5 VDC ±0.25 V
Ground regulator Q3 & U8. Ground P tracks ground.	Press key #5	13 V	J1.2 to J1.3	< 0.02 VDC
Q5 out pin 2 for -5 V.	Press key #5	13 V	J1.3 to J1.29	5 VDC ±0.25 V
Proper saturation of Q2 when power down is low.	Press key #5	13 V	J1.30 to battery ground cable	< 0.3 VDC
Q1, Q2. Keep ground and -5 V powered down.	Press key #4	13 V	J1.1 to J1.3	< 1 VDC
Battery sense level	Press key #4	Reduce volts until single low battery symbol appears	+ & - TMA802 leads	11.6 VDC ±0.3 V
Battery sense level	Press key #4	Reduce volts until multiple low battery symbols appear	+ & - TMA802 leads	10.3 VDC ±0.3 V

**Performance Check - TMA802**



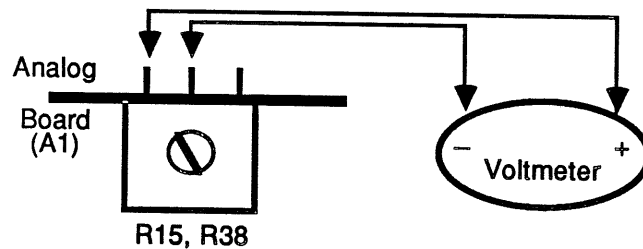
**Figure 4-5. Processor Board Test Point Locator.**

- 3) Turn TMA802 and power supply off. Disconnect power supply. Reconnect TMA802 battery. Turn TMA802 power back on.
- 4) Use voltmeter to check adjustable pots R14, R15 and R38 on Analog Board (A2). Pots are easily accessed along top edge of Analog Board (see Figures 4-6, 4-7, 4-8).



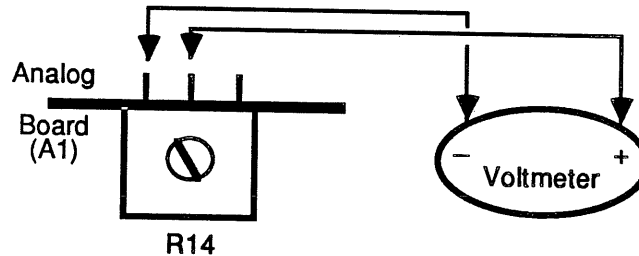
**Figure 4-6. R14, R15, R38 Locator.**

Voltmeter setup is as follows:



**Figure 4-7. R15, R38/Voltmeter Setup.**

- a) R38 - DISPLAY INTENSITY CHECK: Set IMPEDANCE CABLE switch to 50  $\Omega$ . Adjust voltage across R38 to 2.5 VDC  $\pm 0.25$  V.
- b) R15 - OPEN COMPARATOR CHECK: Press key #5 on frontpanel. Adjust voltage across R15 to 0.280 VDC  $\pm 0.025$  V.



**Figure 4-8. R14/Voltmeter Setup.**

**Performance Check - TMA802**

- c) R14 - SHORT COMPARATOR CHECK: Press key #5. Adjust voltage across R14 to 0.200 VDC  $\pm$ 0.025 V.

**END OF PERFORMANCE CHECK PROCEDURE  
TURN TMA802 OFF – REINSTALL COVER AND SIDE PANELS**

## EXTENDER BOARD

The following setup procedure for the Extender Board is provided for technicians who may want to disassemble the TMA802 circuit board pack and still maintain power to the boards. The Extender Board allows continuation of electrical continuity in the TMA802 when individual circuit boards are separated from one another.

The Extender Board is Tektronix part numbered 067-0171-99 and consists of:

- The Extender Board itself which is a 7/8" x 6" PCB with 50 long pins (P1) and 50 pin connectors (J1) on one side, and 50 short pins (P1) on the other side. The Extender Board connects directly to the Interface Board and Processor Board.
- Four 10-connector ribbon cables with harmonica connectors at each end. These ribbon cables connect the Analog Board to the Extender Board (i.e., Interface Board and Processor Board).
- Two 5-connector ribbon cables with harmonica connectors at each end. These ribbon cables connect all the circuit boards to the TMA802 battery for power.
- Two 32-pin pin strips. The pin strips are used to change certain female connectors to male connectors.

### EXTENDER BOARD SETUP

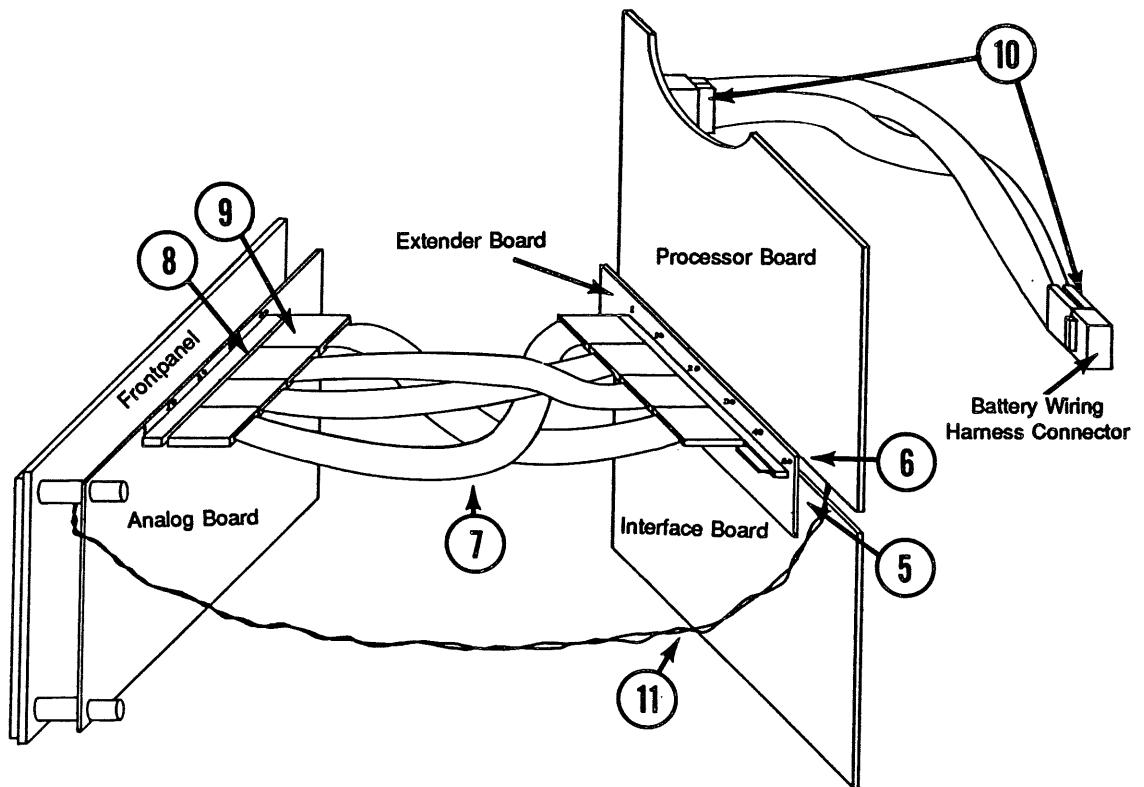


Figure 4-9. Complete Extender Board Setup.  
(numbers correspond to steps in setup procedure)

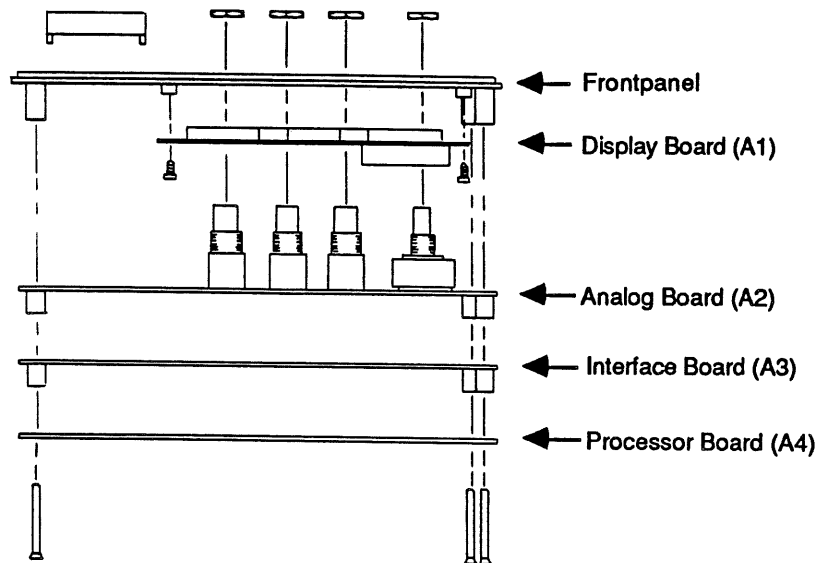
**CAUTION**

When setting up the Extender Board, it is important to avoid bending pins, or orientating pins and connectors incorrectly.

- 1) Remove the cover and side panels from the TMA802 to expose the circuit board pack.
- 2) Disconnect the J3 and J2 connectors on the Processor Board (A4).
- 3) Remove the circuit board pack from the TMA802. The circuit board pack consists of the TMA802 frontpanel, Display Board (A1), Analog Board (A2), Interface Board (A3) and Processor Board (A4). See Figure 4-10.
- 4) Separate only the Processor Board and Interface Board from the circuit board pack by removing the four corner screws that hold the pack together (Figure 4-10). Leave the Analog Board attached to the frontpanel assembly.

*NOTE: if the Analog Board (or Display Board) must be separated from the frontpanel assembly for repair or replacement, first remove four nuts that hold the frontpanel connectors and IMPEDANCE CABLE switch to the frontpanel (Figure 4-10), then pull the Analog Board away from the frontpanel assembly.*

*To separate the Display Board from the frontpanel, remove four screws that hold the Display Board to the frontpanel (Figure 4-10).*



**Figure 4-10. Circuit Board Pack Disassembly.**

- 5) Connect pins P1 through 50 on the Interface Board to connectors J1 through 50 on the Extender Board, orientating pin to connector.
- 6) Connect pins P1 through 50 (long pins) on the Extender Board to connectors J1 through 50 on the BACK SIDE of the Processor Board, orientating pin to connector.
- 7) Connect the four 10-connector ribbon cables to pins P1 through 40 (short pins on the exposed side of the Extender Board). Make sure that connectors 1 through 10 on EACH ribbon cable match the corresponding pins 1 through 10, 11 through 20, 21 through 30 and 31 through 40 on the Extender Board (pins 41 through 50 remain open).

## Performance Check - TMA802

- 8) Insert a strip of 40 pins (from the pin strips) into connectors J1 through 40 on the Analog Board.
- 9) Connect the loose ends of the four 10-connector ribbon cables to pins J1 through 40 on the Analog Board. *Make sure that the harmonica connectors on each end of the ribbon cables match pin for pin on both the Analog Board and Extender Board.*
- 10) **CAUTION:** Use great care in making the following power connectors to avoid shorting.
  - a) Note that both of the 5-connector ribbon cables have pins inserted in the connectors on one end (if pins are not inserted into one of the connector ends, insert them now using pins removed from the remaining pin strips).
  - b) Insert the non-pin ends of both 5-connector ribbon cables onto connector J2 on the Processor Board. Make sure that connectors 1 through 5 on the first ribbon cable matches pins 1 through 5 on the J2 connector, and that connectors 1 through 5 on the second ribbon cable matches pins 6 through 10 on the J2 connector.
  - c) Insert the pin ends of both 5-connector ribbon cables into the battery wiring harness connector that is wired to the battery and AC charger connector. Make sure that pins 1 through 5 on the first ribbon cable matches connectors 1 through 5 on the battery wiring harness connector, and that pins 1 through 5 on the second ribbon cable matches connectors 6 through 10 on the battery wiring harness connector.
- 11) Reconnect the J3 connector on the Processor Board (black and white wires leading from frontpanel).

### **THE TMA802 IS NOW CONNECTED AND READY FOR POWER-UP**

- 12) Disassemble the Extender Board setup in reverse order of assembly, making sure not to bend any pins.



# Section 5. REPLACEABLE ELECTRICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from your Tektronix Field Office or representative. When ordering parts, include the part number plus instrument type, serial number and modification number (if applicable).

If a part has been replaced with a new or improved part, your Tektronix representative will contact you regarding any change in part number.

### LIST OF ASSEMBLIES

A list of assemblies is found at the beginning of the Replaceable Electrical Parts list. Assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

### MFR. CODE NUMBER-TO-MANUFACTURER CROSS INDEX

The Mfr. Code Number-to-Manufacturer cross index provides codes, names and addresses of manufacturers of components listed in the Replaceable Electrical Parts List.

### ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

### COMPONENT NUMBER (Column 1 of Electrical Parts List)

A numbering method is used to identify assemblies, subassemblies and parts. An example of this numbering method and typical expansions is as follows:

A23A2R1234 = A23      A2      R1234  
                  ↑            ↑            ↑  
                  Assembly Subassembly Circuit  
                  number    number    number

*Read: resistor 1234 of subassembly 2 of assy 23*

Only circuit numbers appear on the schematics and circuit board illustrations, and Each schematic and illustration is marked with its assembly number. Assembly numbers are also marked on the mechanical exploded view located in the Replaceable Mechanical Parts list. A

component number is obtained by adding the assembly number prefix to the circuit number.

This parts list is arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts precedes A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are listed at the end of the Replaceable Electrical Parts list.

### TEKTRONIX PART NO. (Column 2)

This column lists the part number used when ordering a replacement part from Tektronix.

### SERIAL/MODEL NO. (Columns 3 and 4)

Column 3 lists the serial number of the first instrument in which the part was used. Column 4 lists the serial number of the last instrument in which the part was used. No entry indicates that the part is used in all instruments.

### NAME AND DESCRIPTION (Column 5)

In this parts list, the item name is separated from its description by a colon (:). Because of space limitations, the item name may appear to be incomplete. For further item name identification, refer to the U.S. Federal Cataloging Handbook, H6-1.

### MFR. CODE (Column 6)

This column lists the code number of the manufacturer of the part.

### MFR. PART NUMBER (Column 7)

This column lists the manufacturer's part number.

Replaceable Electrical Parts - TMA802

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
01295	TEXAS INSTRUMENTS SEMICONDUCTOR GROUP	13500 N.CENTRAL XPRSWY P.O.BOX 225012 M/S 49	DALLAS, TX 75265
04222	AVX CERAMICS/DIV OF AVX CORP	19TH AVE SOUTH P.O. BOX 867	MYRTLE BEACH, SC 29577
04713	MOTOROLA INC	5005 E. MC DOWELL RD	PHOENIX, AZ 85008
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIVISION	11901 MADISON AVE	CLEVELAND, OH 44101
08111	M F ELECTRONICS	10 RENEWAL PLACE	NEW ROCHELLE, NY 10801/5214
09353	C & K COMPONENTS % LD ELECTRONICS	115 RIVERDALE AVE	NEWTON, MA 02158
11236	CTS OF BERNE INC	406 PARR ROAD	BERNE, IN46711
22063	CYPRESS ELECTRONICS	15075 SW KOLL PKWY #D	BEAVERTON, OR 97006
24546	CORNING GLASS WORKS	550 HIGH STREET	BRADFORD, PA 16701
27014	NATIONAL SEMICONDUCTOR	2900 SEMICONDUCTOR DRIVE	SANTA CLARA, CA 95051
32997	BOURNES INC/TRIMPOT DIV	1200 COLUMBIA AV	RIVERSIDE, CA 92506
34649	INTEL CORPORATION	3065 BOWERS AVE	SANTA CLARA, CA 95051
47776	LANCA INSTRUMENTS INC	1350 JOHNSON LANE	ROUND ROCK, TX 78664
50364	MONOLITHIC MEMORIES	1165 E. ARQUES AVE	SUNNYVALE, CA 94086
55680	NICHICON (AMERICA) CORP	927 E. STATE PKWY	SCHAUMBURG, IL 60195
57668	ROHM CORP	16931 MILLIKEN AVE	IRVINE, CA 92713
75042	TRW INC/ELECTRONIC COMPONENTS IRC FIXED RESISTORS DIVISION	401 BROAD STREET	PHILADELPHIA, PA 19108
93539	SHELLEY RAGON	4219 SW CIRRRUS DRIVE	BEAVERTON, OR 97005

Replaceable Electrical Parts - TMA802

Ckt.No.	Tektronix Part No.	Serial/Model No. Eff. Dscont.	Name & Description	Mfr. Code	Mfr.Part Number
<b>CIRCUIT BOARDS</b>					
A1	119-2710-00		CKT BD ASSY:DISPLAY MODULE, LCD/SMD (REPLACEABLE AS A UNIT ONLY)	47776	14AS00114
A2	670-9969-00		CKT BD ASSY:ANALOG (DISCN)	47776	14AS00001
A3	670-9968-00	R010100 R010262	CKT BD ASSY:INTERFACE (TDRCN)	47776	14AS00003
	670-9968-01	R010263	CKT BD ASSY:INTERFACE (TDRCN)	47776	14AS00004
A4	670-9967-00		CKT BD ASSY:PROCESSOR (PR/PS)	47776	14AS00002

Replaceable Electrical Parts - TMA802

A2 - ANALOG (DISCN)

Ckt.No.	Tektronix		Serial/Model No. Eff. Dscont.	Name & Description	Mfr. Code	Mfr.Part Number
	Part No.					
A2	670-9969-00			CKT BD ASSY:ANALOG/DISCN	47776	14AS00001
A2C1	283-0204-00			CAP.,FXD,CER DI:0.01μF,20%,50V	04222	SR155E102MAA
A2C2	283-0204-00			CAP.,FXD,CER DI:0.01μF,20%,50V	04222	SR155E102MAA
A2C3	283-0204-00			CAP.,FXD,CER DI:0.01μF,20%,50V	04222	SR155E102MAA
A2C5	283-0846-00			CAP.,FXD,CER DI:0.001μF,200V	24546	CR115X7R102K200
A2C6	283-0846-00			CAP.,FXD,CER DI:0.001μF,200V	24546	CR115X7R102K200
A2C7	283-0846-00			CAP.,FXD,CER DI:0.001μF,200V	24546	CR115X7R102K200
A2C8	283-0846-00			CAP.,FXD,CER DI:0.001μF,200V	24546	CR115X7R102K200
A2C9	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
A2C10	283-0846-00			CAP.,FXD,CER DI:0.001μF,200V	24546	CR115X7R102K200
A2C12	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
A2C13	290-1095-00			CAP.,FXD,ELCTLT:22μF,35V	05397	T322E226K035AS
A2C14	290-1095-00			CAP.,FXD,ELCTLT:22μF,35V	05397	T322E226K035AS
A2C15	290-1095-00			CAP.,FXD,ELCTLT:22μF,35V	05397	T322E226K035AS
A2C16	283-0846-00			CAP.,FXD,CER DI:0.001μF,200V	24546	CR115X7R102K200
A2C17	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
A2C18	283-0847-00			CAP.,XD,CER DI:150pF,200V	05397	CK05BX151K
A2C19	290-1096-00			CAP.,FXD,ELCTLT:10μF,20V	05397	T322C106K02OAS
A2C20	283-0847-00			CAP.,XD,CER DI:150pF,200V	05397	CK05BX151K
A2C21	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
A2C22	283-0846-00			CAP.,FXD,CER DI:0.001μF,200V	24546	CR115X7R102K200
A2C23	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
A2C24	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
A2C25	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
A2C26	290-1095-00			CAP.,FXD,ELCTLT:22μF,35V	05397	T322E226K035AS
A2C27	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5U1CA
*A2CR1						
*A2CR2						
A2CR4	152-1010-00			SEMICON DVC:SCHOTTKY HOT CARRIER	04713	MBD201
A2CR5	152-1009-00			SEMICON DVC:SIGNAL SWITCHING	04713	IN4148
A2CR6	152-1010-00			SEMICON DVC:SCHOTTKY HOT CARRIER	04713	MBD201
*A2CR8						
*A2CR9						
A2Q3	151-0736-00			XSTR:NPN,SI,TO-92	04713	2N4401
*A2Q5						
*A1Q6						
A1Q9	151-0568-00			XSTR:PNP,SI,TO-92,	04713	2N4403
A1Q10	151-0568-00			XSTR:PNP,SI,TO-92,	04713	2N4403
A2R1	315-0102-00			RES.,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R2	315-0202-00			RES.,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25JE200E
A2R3	315-0511-00			RES.,FXD,FILM:510 OHM,5%,0.25W	57668	NTR25JE510E
A2R4	307-1236-00			RES.,PACK:1K OHM,5%,0.25W	11236	750-81-R1K
A2R5	307-1236-00			RES.,PACK:1K OHM,5%,0.25W	11236	750-81-R1K
A2R6	315-0392-00			RES.,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25JE03K9

CIRCUIT DESIGNATORS WITH AN ASTERISK (\*)  
ARE FOR FUTURE USE

A2 - ANALOG (DISCN) - cont.

Ckt.No.	Tektronix		Serial/Model No.		Name & Description	Mfr. Code	Mfr. Part Number
	Part No.	Eff.	Dscont.				
A2R7	315-0103-00				RES.,FXD,FILM:10K OHM,5%,0.25W	57668	NTR25JE10K0
A2R8	315-0150-00				RES.,FXD,FILM:15 OHM,5%,0.25W	57668	NTR25JE15E
A2R9	315-0681-00				RES.,FXD,FILM:680 OHM,5%,0.25W	57668	NTR25-E680E
A2R10	322-0222-00				RES.,FXD,FILM:2K OHM,1%,0.25W	75042	CEBTO-2001F
A2R11	322-0222-00				RES.,FXD,FILM:2K OHM,1%,0.25W	75042	CEBTO-2001F
A2R11	315-0242-00				RES.,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25JE02K4
A2R13	315-0102-00				RES.,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R14	311-2401-00				RES.,VAR,NONWW:1K OHM	32997	3386N-1-102
A2R15	311-2401-00				RES.,VAR,NONWW:1K OHM	32997	3386N-1-102
A2R16	322-0222-00				RES.,FXD,FILM:2K OHM,1%,0.25W	75042	CEBTO-2001F
A2R17	315-0681-00				RES.,FXD,FILM:680 OHM,5%,0.25W	57668	NTR25-E680E
A2R18	315-0102-00				RES.,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R19	322-0114-00				RES.,FXD,FILM:150 OHM,1%,0.25W	75042	CEBTO-1500F
A2R20	315-0102-00				RES.,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R21	307-1237-00				RES.,PACK:22K OHM,5%	75042	750-81-R22K
A2R22	322-0085-00				RES.,FXD,FILM:75 OHM,1%,0.25W	75042	CEBTO-75R00F
A2R23	322-0085-00				RES.,FXD,FILM:75 OHM,1%,0.25W	75042	CEBTO-75R00F
A2R25	322-0085-00				RES.,FXD,FILM:75 OHM,1%,0.25W	75042	CEBTO-75R00F
A2R26	322-0068-00				RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBTO-49R90F
A2R27	322-0068-00				RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBTO-49R90F
A2R28	322-0068-00				RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBTO-49R90F
A2R29	322-0114-00				RES.,FXD,FILM:150 OHM,1%,0.25W	75042	CEBTO-1500F
A2R30	322-0097-00				RES.,FXD,FILM:100 OHM,1%,0.25W	75042	CEBTO-1000F
A2R31	322-0097-00				RES.,FXD,FILM:100 OHM,1%,0.25W	75042	CEBTO-1000F
A2R32	322-0114-00				RES.,FXD,FILM:150 OHM,1%,0.25W	75042	CEBTO-1500F
A2R38	311-2401-00				RES.,VAR,NONWW:1K OHM	32997	3386N-1-102
A2R39	315-0391-00				RES.,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25JE390E
*A2R45							
*A2R46							
*A2R47							
A2R48	315-0511-00				RES.,FXD,FILM:510 OHM,5%,0.25W	57668	NTR25JE390E
*A2R49							
*A2R50							
*A2R59							
A2R60	322-0097-00				RES.,FXD,FILM:100 OHM,1%,0.25W	75042	CEBTO-1000F
A2R61	322-0114-00				RES.,FXD,FILM:150 OHM,1%,0.25W	75042	CEBTO-1500F
A2S1	260-2371-00				SWITCH:3P4T,4 POS	14340	A304-05-S-C-G
A2U1	156-0860-00				MICROCKT,DI:ECL,TRIPLE LINE RCVR	04713	MC10116L
A2U2	156-1019-02				MICROCKT,DI:DUAL 3 INP/OUTPUT	04713	MC10120PD/LD
A2U3	156-0316-00				MICROCKT,DI:ECL,QUAD 2-INP ECL TO TTL	04713	MC10125L
A2U4	307-1238-00				RES PACK:10K OHM	11236	750-81-R10K
A2U6	156-0860-00				MICROCKT,DI:ECL,TRIPLE LINE RCVR	04713	MC10116L
A2U7	156-3110-00				MICROCKY,DI:CMOS,OCTAL BFR	27014	MM74HC244
A2U8	156-0368-00				MICROCKT,DI:ECL,QUAD TTL TO CONV	04713	MC10124L

CIRCUIT DESIGNATORS WITH AN ASTERISK (\*) ARE FOR FUTURE USE

**Replaceable Electrical Parts - TMA802**

**A2 - ANALOG (DISCN) - cont.**

Ckt.No.	Tektronix Part No.	Serial/Model No. Eff. Dscont.	Name & Description	Mfr. Code	Mfr.Part Number
*A2VR1					
*A2VR2					
*A2VR3					
*A2VR4					
*A2VR5					
*A2VR6					
A2VR7	152-1013-00		SEMICON DVC:ZENER,3.9V,5W	04713	IN5228
A2VR8	152-1011-00		SEMICON DVC:ZENER,2.4V,5W	04713	IN5221B
A2K1					
A2K2					

**CIRCUIT DESIGNATORS WITH AN ASTERISK (\*)  
ARE FOR FUTURE USE**

**A3 - INTERFACE (TDRCN)**

Ckt.No.	Tektronix		Serial/Model No.		Name & Description	Mfr. Code	Mfr.Part Number
	Part No.		Eff.	Dscont.			
A3	670-9968-00 670-9968-01		R010100 R010262 R010263		CKT BD ASSY:INTERFACE/TDRCN CKT BD ASSY:INTERFACE/TDRCN	47776 47776	14AS00003 14AS00004
A3C1	283-0849-00				CAP.,FXD,CER DI:10pF,200V	24546	CRC115X7R100K200
A3C2	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C3	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C4	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C5	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C6	283-0848-00				CAP.,FXD,CER DI:100pF,200V	05397	CK05BX101K
A3C7	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C8	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C9	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C10	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C11	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C12	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C13	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C14	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C15	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C16	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C17	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C18	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C19	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C20	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C21	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C22	283-0111-00				CAP.,FXD,CER DI:0.1µF,20%,50V	04222	C330C104M5CUICA
A3C23	290-1095-00		R010100 R010262		CAP.,FXD,ELCTLT:22µF,35V TANT	05397	T322EE226K035AS
A3C24	290-1095-00		R010263		CAP.,FXD,ELCTLT:22µF,35V TANT	05397	T322EE226K035AS
A3C25	290-1095-00		R010263		CAP.,FXD,ELCTLT:22µF,35V TANT	05397	T322EE226K035AS
A3C26	290-1095-00		R010263		CAP.,FXD,ELCTLT:22µF,35V TANT	05397	T322EE226K035AS
A3P1	----				(SEE 1- RMPL)		
A3R3	315-0102-00				RES.,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25J-E01K0
A3R4	315-0102-00				RES.,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25J-E01K0
A3R5	315-0153-00				RES.,FXD,FILM:15K OHM,5%,0.25W	57668	NTR25J-E15K
A3R6	315-0153-00				RES.,FXD,FILM:15K OHM,5%,0.25W	57668	NTR25J-E15K
A3U1	156-0472-03				MICROCKT,DI:13 INP NAND GATE	01295	SN74S133NPS
A3U2	156-0629-01				MICROCKT,DI:30MHz,PRESET BIN CTR	01295	SN74LS197NPS
A3U3	156-3110-00				MICROCKT,DI:CMOS,OCTAL BFR,W/3-ST OUT	27014	MM74HC244
A3U4	156-0629-01				MICROCKT,DI:30MHz,PRESET BIN CTR	01295	SN74LS197NPS
A3U5	156-0323-00				MICROCKT,DI:HEX INVERTER	01295	SN74S04
A3U6	156-0956-02				MICROCKT,DI:OCTAL BFR W/3-ST	01295	SN74LS244NJ
A3U7	156-0690-03				MICROCKT,DI:QUAD 2-INP,NORGATE	01295	SN74S02(NP3 OR JP4)
A3U8	156-0733-02				MICROCKT,DI:DUAL MONOSTABLE	04713	SN74LS221NDS
A3U9	156-0629-01				MICROCKT,DI:30MHz,PRESET BIN CTR	01295	SN74LS197NPS
A3U10	119-2521-00				XTAL,OSC CLOCK:50MHz	08111	A1824-50.0
A3U11	156-3149-00				MICROCKT,DI:FREQUENCY DOUBLER	47776	TTLDFMM-100
A3U12	156-0629-01				MICROCKT,DI:30MHz,PRESET BIN CTR	01295	SN74LS197NPS

Replaceable Electrical Parts - TMA802

A3 - INTERFACE (TDRCN) - cont.

Ckt.No.	Tektronix Part No.	Serial/Model No. Eff. Dscont.	Name & Description	Mfr. Code	Mfr.Part Number
A3U13	156-3150-00		MICROCKT,DI:COUNTER LATCH	01295	74S197
A3U14	156-3110-00		MICROCKT,DI:CMOS,OCTAL BFR	27014	MM74HC244
A3U15	156-0436-00		MICROCKT,DI:CMOS OCTAL BFR	27014	MM74C244N
A3U16	156-3110-00		MICROCKT,DI:CMOS,OCTAL BFR	27014	MM74HC244
A3U17	156-0875-02		MICROCKT,DI:DUAL 2-W/2 INP	01295	SN74LS51(NP3 OR JP4)
A3U18	156-0459-02		MICROCKT,DI:QUAD,2-INP & GATE	01295	SN74S08(NP3 OR JP4)
A3U19	156-0798-02		MICROCKT,DI:DUAL,14/1 LINE SEL/MUX	01295	SN74LS153NP3
A3U20	156-3152-00		MICROCKT,DI:BUFFER	01295	74S40
A3U21	156-0331-02		MICROCKT,DI:STTL,DUAL D EDGE,TRIG FF	01295	SN54S74J
A3U21	156-0331-02		MICROCKT,DI:STTL,DUAL D EDGE,TRIG FF	01295	SN54S74J



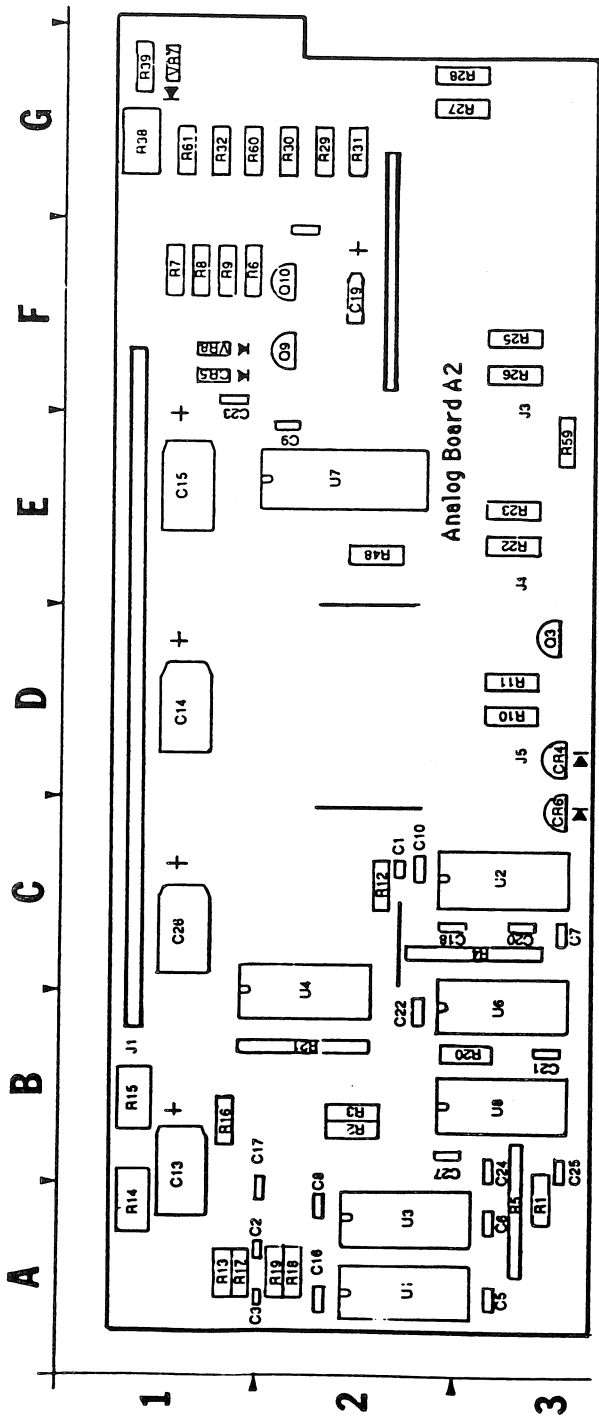
**A4 - PROCESSOR (PR/PS)**

Ckt.No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr. Code	Mfr.Part Number
		Eff.	Dscont.			
A4	670-9967-00			CKT BD ASSY:PROCESSOR PR/PS	47776	14AS00002
A4C1	283-0963-00			CAP.,FXD,CER DI:33pF,200V	05397	CK05BX330K
A4C2	283-0963-00			CAP.,FXD,CER DI:33pF,200V	05397	CK05BX330K
A4C3	290-1096-00			CAP.,FXD,ELCTLT:10μF,20V TANT	05397	T322C106K020AS
A4C4	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5CU1CA
A4C5	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5CU1CA
A4C6	290-1097-00			CAP.,FXD,ELCTLT:1μF,35V,TANT	05397	T322B105K035AS
A4C7	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5CU1CA
A4C9	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5CU1CA
A4C11	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5CU1CA
A4C12	290-0973-00			CAP.,FXD,ELCTLT:100μF,35V	55680	ULB1E101MEA
A4C13	290-0973-00			CAP.,FXD,ELCTLT:100μF,35V	55680	ULB1E101MEA
A4C14	290-0973-00			CAP.,FXD,ELCTLT:100μF,35V	55680	ULB1E101MEA
A4C15	290-0973-00			CAP.,FXD,ELCTLT:100μF,35V	55680	ULB1E101MEA
A4C16	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5CU1CA
A4C17	283-0111-00			CAP.,FXD,CER DI:0.1μF,20%,50V	05397	C330C104M5CU1CA
A4CR2	152-1009-00			SEMICON DVC:SIGNAL/SWITCHING	04713	IN4148
A4CR3	152-1009-00			SEMICON DVC:SIGNAL/SWITCHING	04713	IN4148
A4CR4	152-1009-00			SEMICON DVC:SIGNAL/SWITCHING	04713	IN4148
A4CR5	152-1014-00			SEMICON DVC:RECTIFIER POWER	04713	MR502
A4CR6	152-1014-00			SEMICON DVC:RECTIFIER POWER	04713	MR502
A4F1	159-0283-00			FUSE:TMA802	47776	25501.5
A4F2	159-0283-00			FUSE:TMA802	47776	25501.5
A4G1	119-1966-00			PANEL DRVR,INVERT:ELECTRO LUMINESCENT	93539	119-1966-00
A4J1	-----			(SEE 1- RMPL)		
A4J2	-----			(SEE 1- RMPL)		
A4J3	-----			(SEE 1- RMPL)		
A4Q1	151-0568-00			XSTR:PNP,SI,TO-98	04713	2N4403
A4Q2	151-0569-00			XSTR:TIP41A	04713	TIP41A
A4Q3	151-0570-00			XSTR:TIP116	04713	TIP116
A4Q4	151-1226-00			XSTR:	27014	LM320T-5
A4Q5	151-1226-00			XSTR:	27014	LM320T-5
A4Q6	151-0569-00			XSTR:TIP41A	04713	TIP41A
A4Q7	151-0736-00			XSTR:NPN,SI TO-92	04713	2N4401
A4Q8	151-0736-00			XSTR:NPN,SI TO-92	04713	2N4401
A4Q9	151-0568-00			XSTR:PNP,SI,TO-98	04713	2N4403
A4Q10	151-0568-00			XSTR:PNP,SI,TO-98	04713	2N4403
A4Q11	151-0736-00			XSTR:NPN,SI TO-92	04713	2N4401
A4R1	315-0822-00			RES.,FXD,FILM:8.2K OHM,5%,0.25W	57668	NTR25J-E8K2
A4R3	315-0512-00			RES.,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E5K1
A4R4	315-0392-00			RES.,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E3K9
A4R5	315-0511-00			RES.,FXD,FILM:510 OHM,5%,0.25W	57668	NTR25J-E510E
A4R6	315-0202-00			RES.,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E2K
A4R7	315-0392-00			RES.,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E3K9

Replaceable Electrical Parts - TMA802

A4 - PROCESSOR (PR/PS) - cont.

Ckt.No.	Tektronix	Serial/Model No.		Name & Description	Mfr. Code	Mfr. Part Number
	Part No.	Eff.	Dscont.			
A4R8	322-0276-00			RES.,FXD,FILM:7.32K OHM,1%,0.25W	75042	750-81-R7K32
A4R9	322-0709-00			RES.,FXD,FILM:4.99K OHM,15,0.25W	75042	750-81-R4K99
A4R10	315-0473-00			RES.,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K
A4R11	322-0160-00			RES.,FXD,FILM:453 OHM,1%,0.25W	75042	750-81-4530F
A4R12	315-0473-00			RES.,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K
A4R13	315-0103-00			RES.,FXD,FILM:10K OHM,5%,0.25W	57668	NTR25J-E10K0
A4R14	315-0244-00			RES.,FXD,FILM:240K OHM,5%,0.25W	57668	NTR25J-E240K
A4R15	315-0473-00			RES.,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K
A4R16	315-0241-00			RES.,FXD,FILM:240 OHM,5%,0.25W	57668	NTR25J-E240E
A4R17	317-0108-00			RES.,FXD,FILM:1 OHM,5%,0.125W	24546	CF-25-1
A4R18	317-0108-00			RES.,FXD,FILM:1 OHM,5%,0.125W	24546	CF-25-1
A4R19	317-0108-00			RES.,FXD,FILM:1 OHM,5%,0.125W	24546	CF-25-1
A4R20	315-0473-00			RES.,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K
A4R21	315-0821-00			RES.,FXD,FILM:820 OHM,5%,0.25W	57668	NTR25J-E820E
A4R22	315-0512-00			RES.,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E5K1
A4R23	315-0514-00			RES.,FXD,FILM:510K OHM,5%,0.25W	57668	NTR25J-E510K
A4R24	315-0514-00			RES.,FXD,FILM:510K OHM,5%,0.25W	57668	NTR25J-E510K
A4R25	303-0100-00			RES.,FXD,CMPSN:10 OHM,5%,1W	24546	FP1-FP3210
A4U8	156-0495-00			MICROCKT,LI:OPNL/AMPL	27014	LM324
A4U14	156-3269-00			MICROCKT:MICROCOMPUTER	34649	MM80C31
A4U15	156-0649-00			MICROCKT,DI:CMOS 3ST OUT	34649	MM80C97
A4U16	156-1398-00			MICROCKT,DI:CMOS,3ST OCTAL,D-TYPE	27014	MM74C373JA+
A4U17	160-4157-00			MICROCKT,EPRM,PRGM	80009	160-4157-00
A4U26	156-0541-02			MICROCKT,DI:DUAL 2 TO 4 LINE	04713	SN74LS139
A4U27	156-0350-05			MICROCKT,DI:QUAD 2-INP	04713	MC14011BCLD
A4U28	156-0853-02			MICROCKT,LI:DUAL,OP/AMP	04713	LM358J
A4VR1	152-1011-00			SEMICONDCVC:ZENER,2.4V,5W	04713	IN5221B
A4Y1	119-2708-00			XTAL UNIT,QTZ:6MHz	47776	MP-1-6,Q
<b>WIRE ASSEMBLIES</b>						
A2J8	179-2962-00			WIRING HARNESS:TMA802 (FROM A2J8 TO POWER ON SWITCH)	47776	14AS00012
A4J2	179-2961-00			WIRING HARNESS:TMA802 (FROM A4J2 TO BATTERY PACK) SEE PAGE 5-24 FOR WIRING DIAGRAM	47776	14AS00007



ANALOG BOARD (A2)  
(schematic 1 of 2)

CKT NO	SCHEM LOC	ECB LOC
C12	E7	G3
C17	G5	A1
C18	F2	C2
C19	D7	F2
C1	G3	C2
C20	F2	C3
C2	F4	A1
C3	G4	A1
CR1	C1	.
CR2	C1	.
CR4	E3	D3
CR5	C6	F1
CR6	D3	C3
CR7(VR8)	C7	F1
CR8	D3	.
CR9	D3	.
J1	A5-7	B1
J1	I2-4	B1
J4	A1	E3
J5	A2	D3
J8	A3-8	E1

ANALOG BOARD (A2)  
(schematic 2 of 2)

CKT NO	SCHEM LOC	ECB LOC
C10	A6	C2
C13	E6	B1
C14	C6	D1
C15	A6	E2
C16	B6	A2
C21	C6	B3
C22	B6	B2
C23	C6	F1
C24	B6	B3
C25	C6	B3
C26	C6	C1
C27	C6	B2
C5	B6	A3
C6	B6	A3
C7	B6	B3
C8	A6	A2
C9	D6	E2
J1	A7	B1
J1	H2-5	B1
J1	I5-7	B1
J2	G1-5	F2

CKT NO	SCHEM LOC	ECB LOC
R61	G5	G1
R6	C7	F1
R7	D7	F1
R8	D6	F1
R9	D6	F1
S1	E5-7	G3
U1	A4	A2
U1	H3	A2
U1	I6-7	A2
U2	D5	C3
U3	I2-4	A2
U6	C5	B3
U6	F1-2	B3
U6	H2	B3
U8	B4-5	B3
VR1	B2	.
VR2	D2	.
VR3	E1	.
VR4	E1	.
VR5	B2	.
VR6	D2	.
VR3	E1	C2
VR4	E1	C2

CKT NO	SCHEM LOC	ECB LOC
R29	E5	G2
R2	G2	B2
R30	E5	G2
R31	E5	G2
R32	G5	G1
R3	H2	B2
R4-3	D5	C3
R4-4	C5	C3
R4-5	C5	C3
R4-6	G1	C3
R4-7	D5	C3
R4-8	G1	C3
R45	B2	.
R46	D2	.
R47	B3	E2
R48	D3	E2
R49	B2	.
R50	C2	.
R5-2	H1	A3
R5-3	H1	A3
R5-4	H4	A3
R5-5	H4	A3
R5-6	H3	A3
R5-7	H3	A3
R60	G5	G1

CKT NO	SCHEM LOC	ECB LOC
Q10	D6	F2
Q3	E2	D3
Q5	C2	.
Q6	C2	.
Q9	C7	F2
R10	E2	D3
R11	E3	D3
R12	H2	C2
R13	F3	A1
R14	F4	A1
R15	G4	B1
R16	G3	B1
R17	F4	A1
R18	G4	A2
R19	H4	A2
R1	B5	A3
R20	E1	B3
R22	G6	E3
R23	G6	E3
R25	E6	F3
R26	E6	F3
R26	H6	F3
R27	G6	G2

CKT NO	SCHEM LOC	ECB LOC
J3	D8	F3
J6	A3-4	B2
J7	A5	B2
R21-2	C3	B2
R21-3	B3	B2
R21-4	C3	B2
R21-5	B3	B2
R21-6	B3	B2
R21-7	C3	B2
R21-8	D3	B2
R38	F2	G1
R39	E2	G1
R59	D8	E3
U1	F6	A2
U2	F6	C3
U3	G6	A2
U4	E3	B2
U6	G6	B3
U7	F3-7	E2
U8	H6	B3
VR7	E2	G1

\* component not on ECB (for future use)

Figure 5-1. Analog Board (A2) Parts Locator.

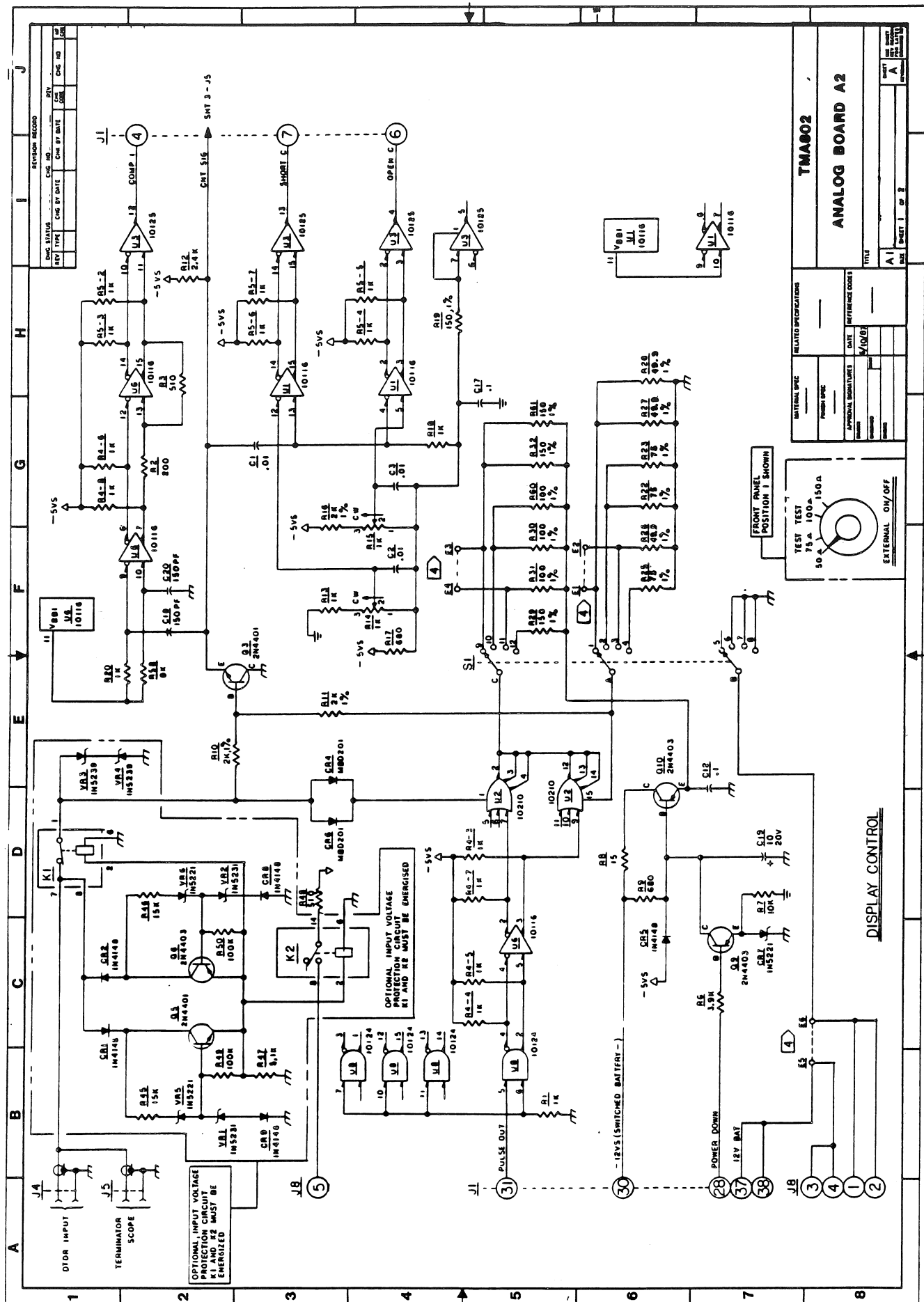


Figure 5-2. Analog Board (A2) Schematic 1 of 2.

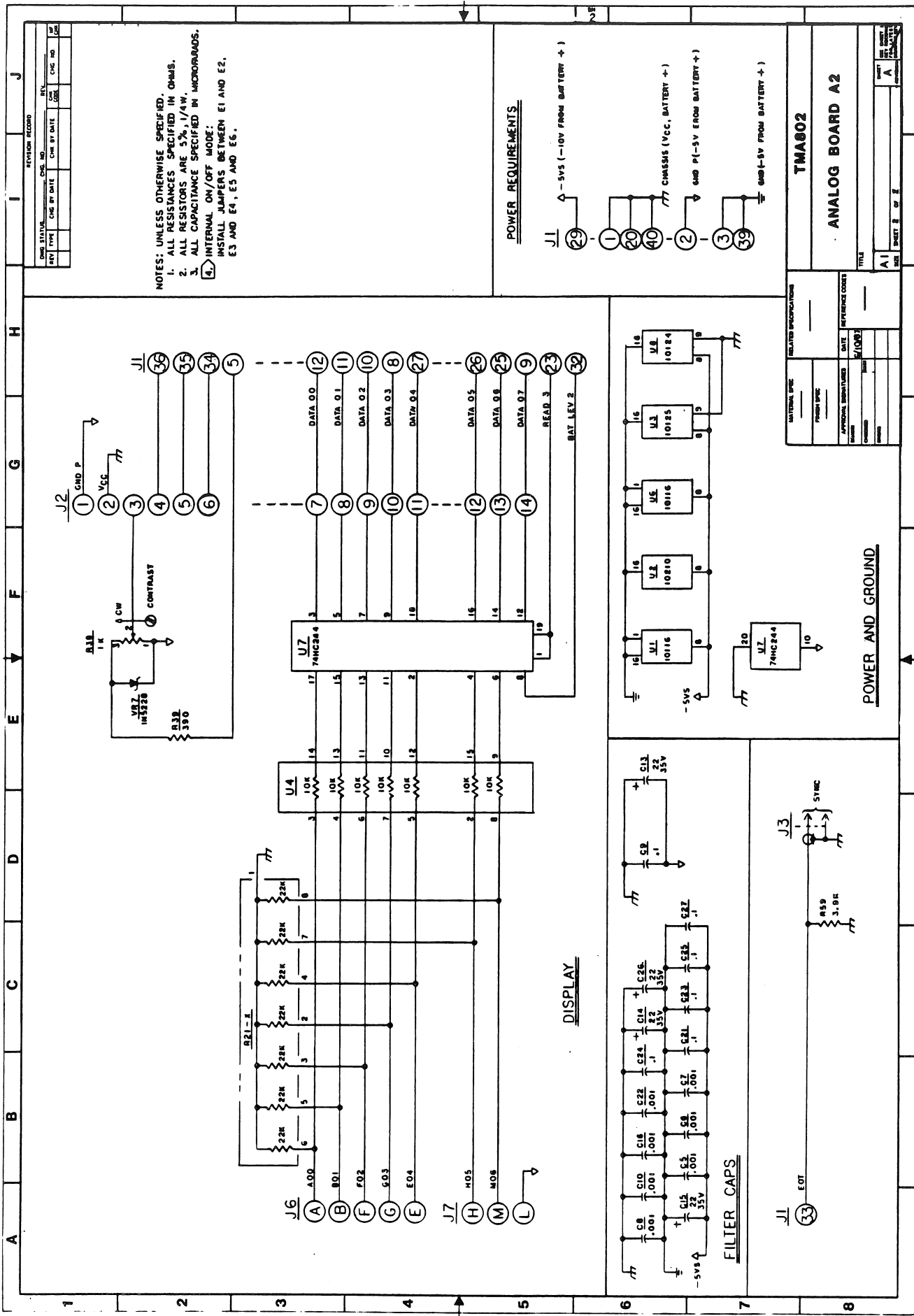
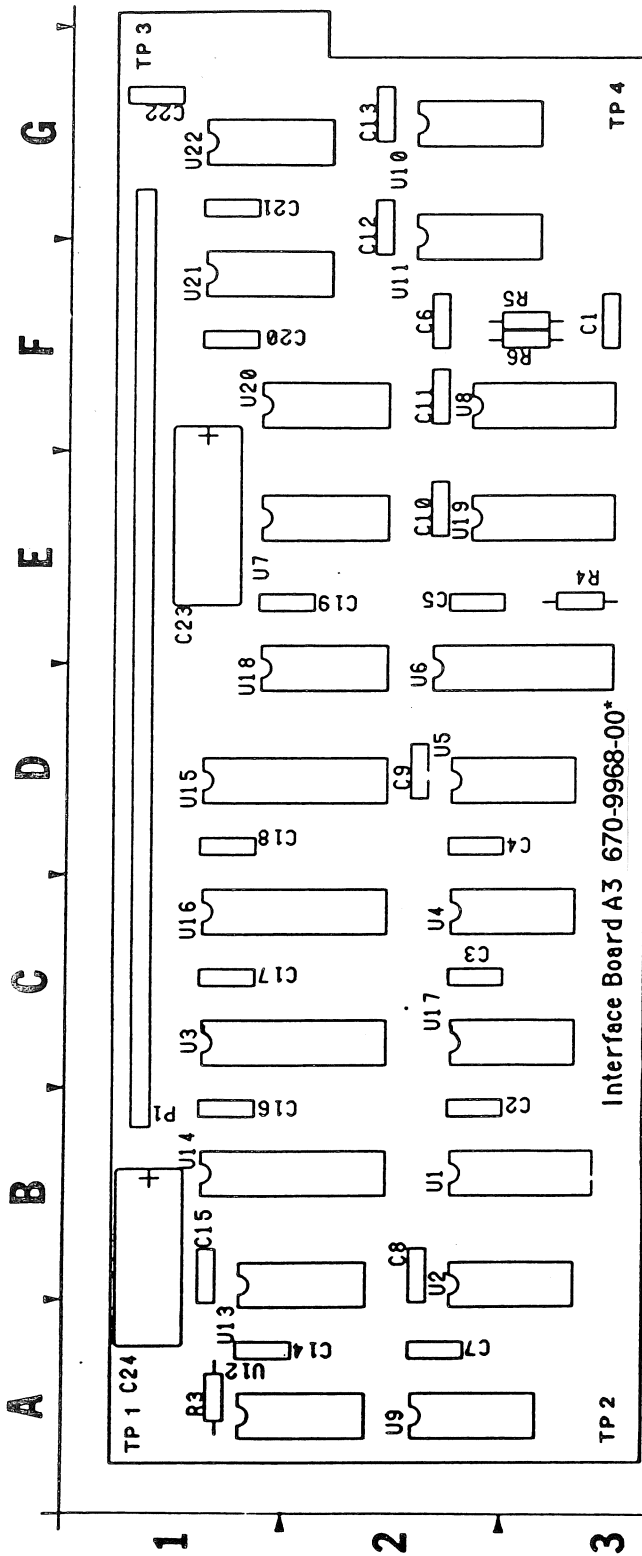


Figure 5-3. Analog Board (A2) Schematic 2 of 2.



\*Instrument SN R010100 to R010262

INTERFACE BOARD (A3)  
(schematic 1 of 4)

CKT NO	SCHEM LOC	ECB LOC
P1	A1-8	B1
P1	D4	B1
P1	G3-7	B1
U13	E1	B1
U14	H4	B1
U15	B1	D1
U16	B4	C1
U1	C7	B2
U2	E3	B2
U3	H1	C1
U4	E5	C2

INTERFACE BOARD (A3)  
(schematic 2 of 4)

CKT NO	SCHEM LOC	ECB LOC
C1	F2	A2
C6	F4	F2
P1	A1-6	B1
R5	F4	F3
R6	F2	F3
U17	G6	C2
U18	F8	D2
U20	H5	F1
U21	C6-D6	F1
U22	D1-2	G1
U5	B5-8	D2
U5	F6	D2
U7	D8	E1
U7	C1-3	E1
U8	G1-3	F2

INTERFACE BOARD (A3)  
(schematic 3 of 4)

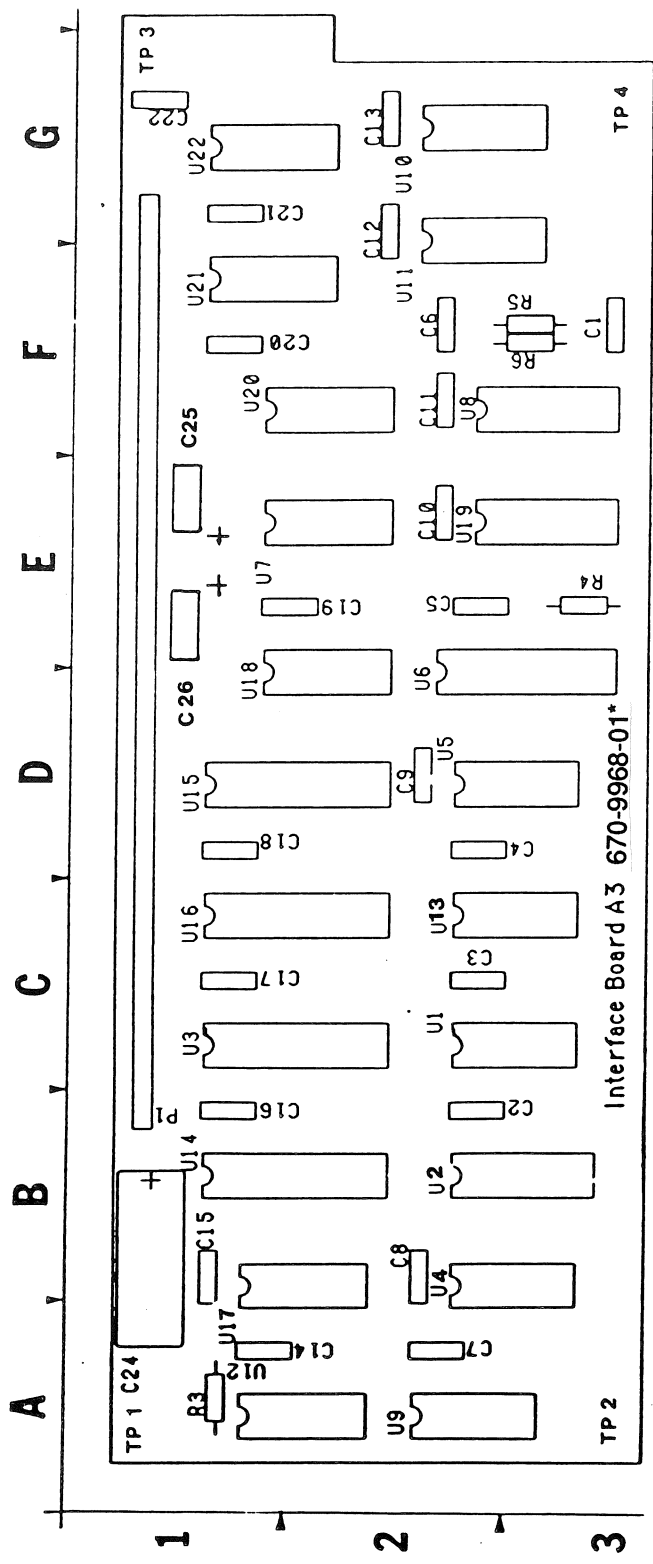
CKT NO	SCHEM LOC	ECB LOC
P1	D6	B1
P1	F7	B1
P1	I6	B1
U10	A7	G2
U11	C11	F2
U12	B3	A1
U18	G4-5	D1
U18	H3	D1
U19	G5	E2
U20	F1	F1
U5	E2	D2
U5	F4	D2
U5	H6	D2
U6	B2	D2
U6	C2	D2
U6	D2	D2
U6	F2	D2
U6	G1-2	D2
U7	H6	E1
U9	B5	A2

INTERFACE BOARD (A3)  
(schematic 4 of 4)

CKT NO	SCHEM LOC	ECB LOC
C10	D2	E2
C11	E2	F2
C12	D2	G2
C13	F2	G2
C15	C5	B1
C16	C5	B1
C17	C2	C1
C18	H2	D1
C19	H2	E2
C20	G2	F1
C21	G2	G1
C22	E2	G1
C24	D5	A1
C2	C2	B2

CKT NO	SCHEM LOC	ECB LOC
C3	F2	C2
C4	C2	D2
C4	D5	D2
C5	F2	E2
C7	E2	A2
C8	D5	B2
C9	D2	D2
P1	B2-6	B1
R3	F5	A1
R4	F6	E3
TP1	C7	A1
TP2	D7	A3
TP3	E7	G1
TP4	F7	G3

Figure 5-4. Interface Board (A3) Parts Locator.  
(SN 670-9968-00)



\*Instrument SN R010263 →

INTERFACE BOARD (A3)  
(schematic 1 of 4)

CKT NO	SCHEM LOC	ECB LOC
P1	A1-8	B1
P1	D4	B1
P1	G3-7	B1
U13	E5	C2
U14	H4	B1
U15	B1	D1
U16	B4	C1
U1	C7	B2
U2	E3	B2
U3	H1	C1
U4	E5	B2

INTERFACE BOARD (A3)  
(schematic 2 of 4)

CKT NO	SCHEM LOC	ECB LOC
C1	F2	A2
C6	F4	F2
P1	A1-6	B1
R5	F4	F3
R6	F2	F3
U17	G6	B2
U18	F8	D2
U20	H5	F1
U21	C6-D6	F1
U22	D1-2	G1
U5	B5-8	D2
U5	F6	D2
U7	D8	E1
U7	C1-3	E1
U8	G1-3	F2

INTERFACE BOARD (A3)  
(schematic 3 of 4)

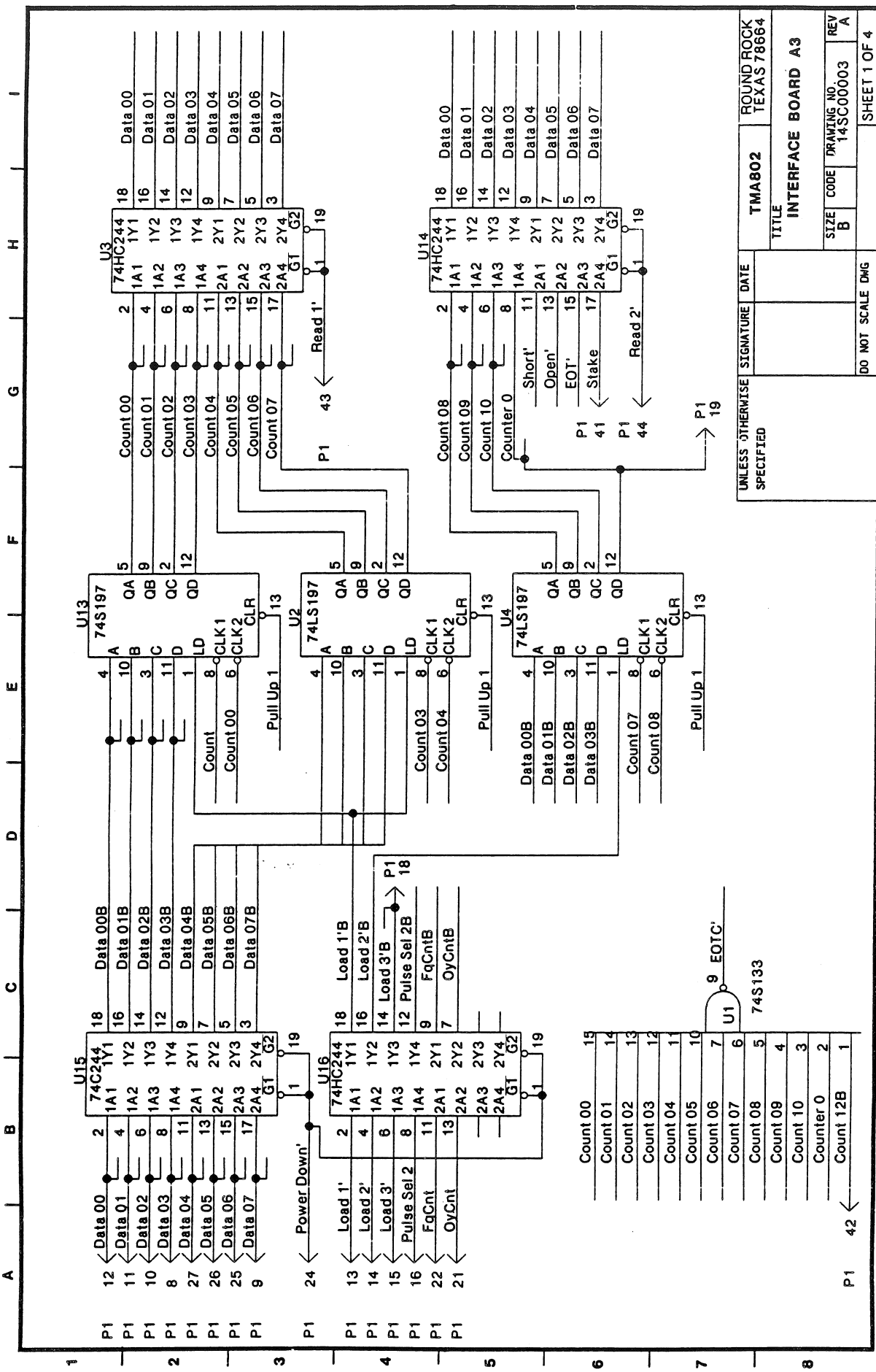
CKT NO	SCHEM LOC	ECB LOC
P1	D6	B1
P1	F7	B1
P1	I6	B1
U10	A7	G2
U11	C11	F2
U12	B3	A1
U18	G4-5	D1
U18	H3	D1
U19	G5	E2
U20	F1	F1
U5	E2	D2
U5	F4	D2
U5	H6	D2
U6	B2	D2
U6	C2	D2
U6	D2	D2
U6	F2	D2
U6	G1-2	D2
U7	H6	E1
U9	B5	A2

INTERFACE BOARD (A3)  
(schematic 4 of 4)

CKT NO	SCHEM LOC	ECB LOC
C10	D2	E2
C11	E2	F2
C12	D2	G2
C13	F2	G2
C15	C5	B1
C16	C5	B1
C17	C2	C1
C18	H2	D1
C19	H2	E2
C20	G2	F1
C21	G2	G1
C22	E2	G1
C24	D5	A1
C25	B2	E1
C26	B2	E1
C2	C2	B2

CKT NO	SCHEM LOC	ECB LOC
C3	F2	C2
C4	C2	D2
C4	D5	D2
C5	F2	E2
C7	E2	A2
C8	D5	B2
C9	D2	D2
P1	B2-6	B1
R3	F5	A1
R4	F6	E3
TP1	C7	A1
TP2	D7	A3
TP3	E7	G1
TP4	F7	G3

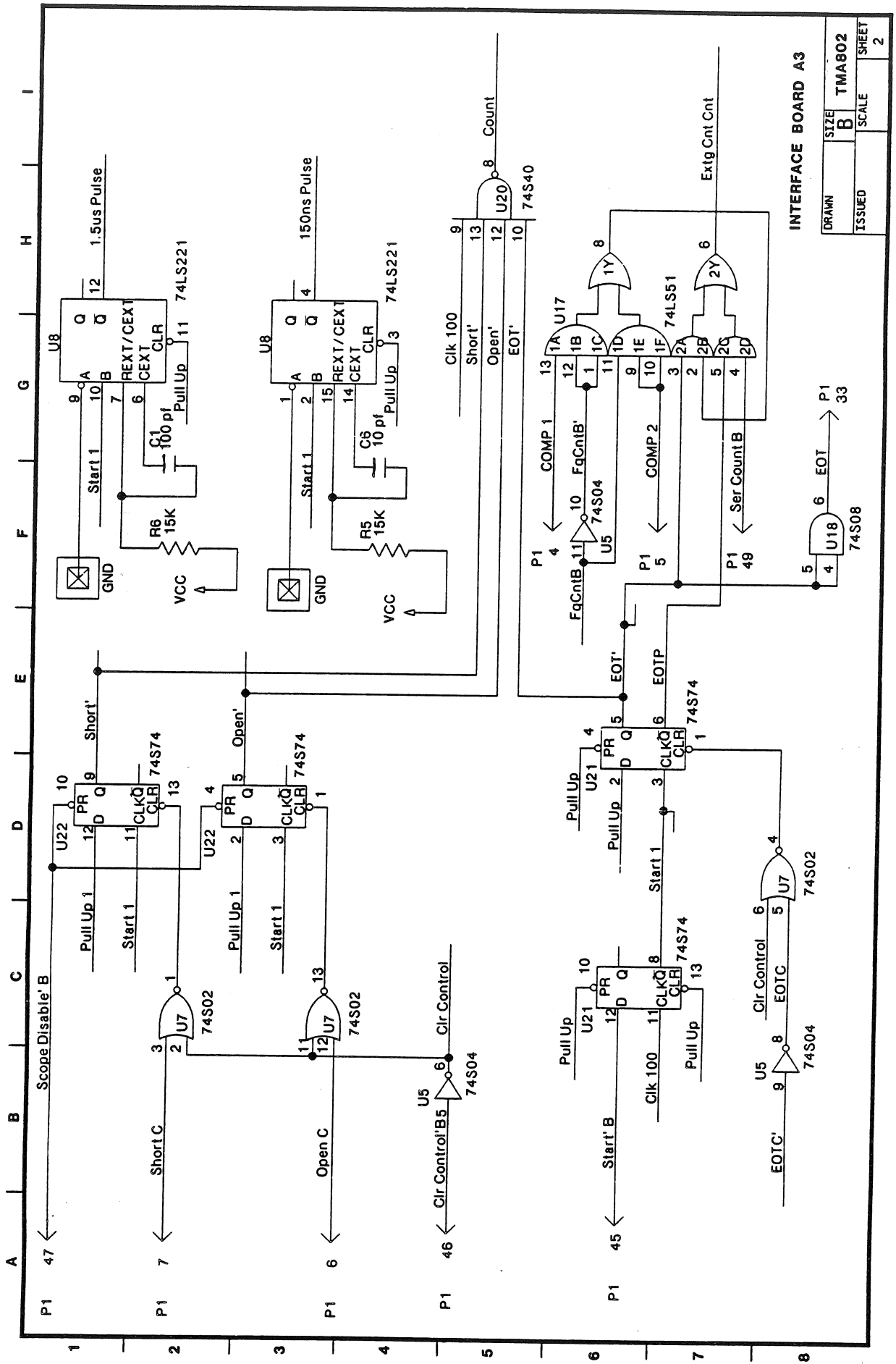
Figure 5-4a. Interface Board (A3) Parts Locator.  
(SN 670-9968-01)



UNLESS OTHERWISE SPECIFIED		SIGNATURE		DATE		TMA802		ROUND ROCK TEXAS 78664	
TITLE		INTERFACE BOARD A3		SIZE B		CODE DRAWING NO. 14SC00003		REV A	
DO NOT SCALE DWG								SHEET 1 OF 4	

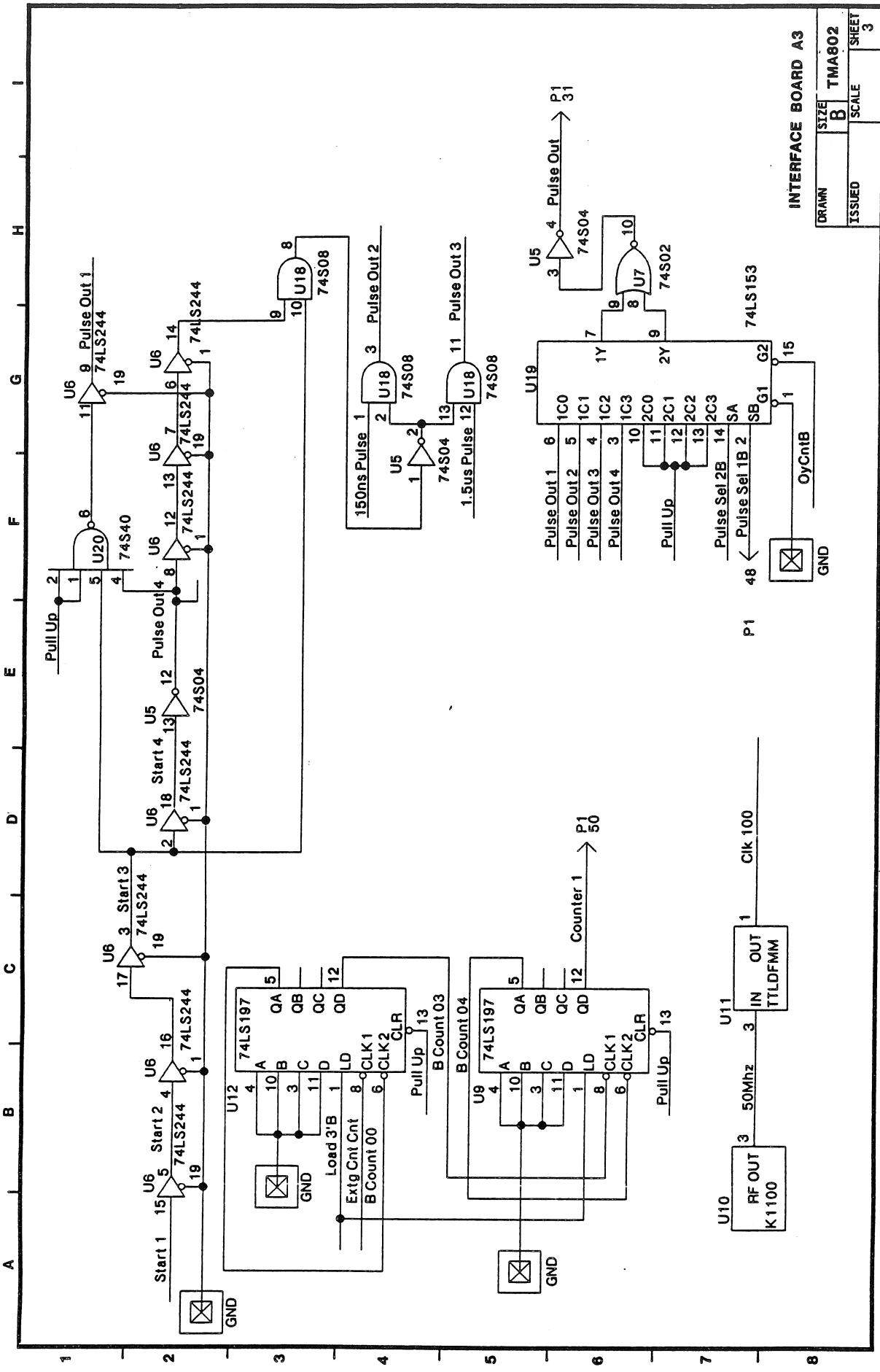
Figure 5-5. Interface Board (A3) Schematic 1 of 4.





DRAWN	SIZE	TMA802	SHEET
	B		2
ISSUED	SCALE		

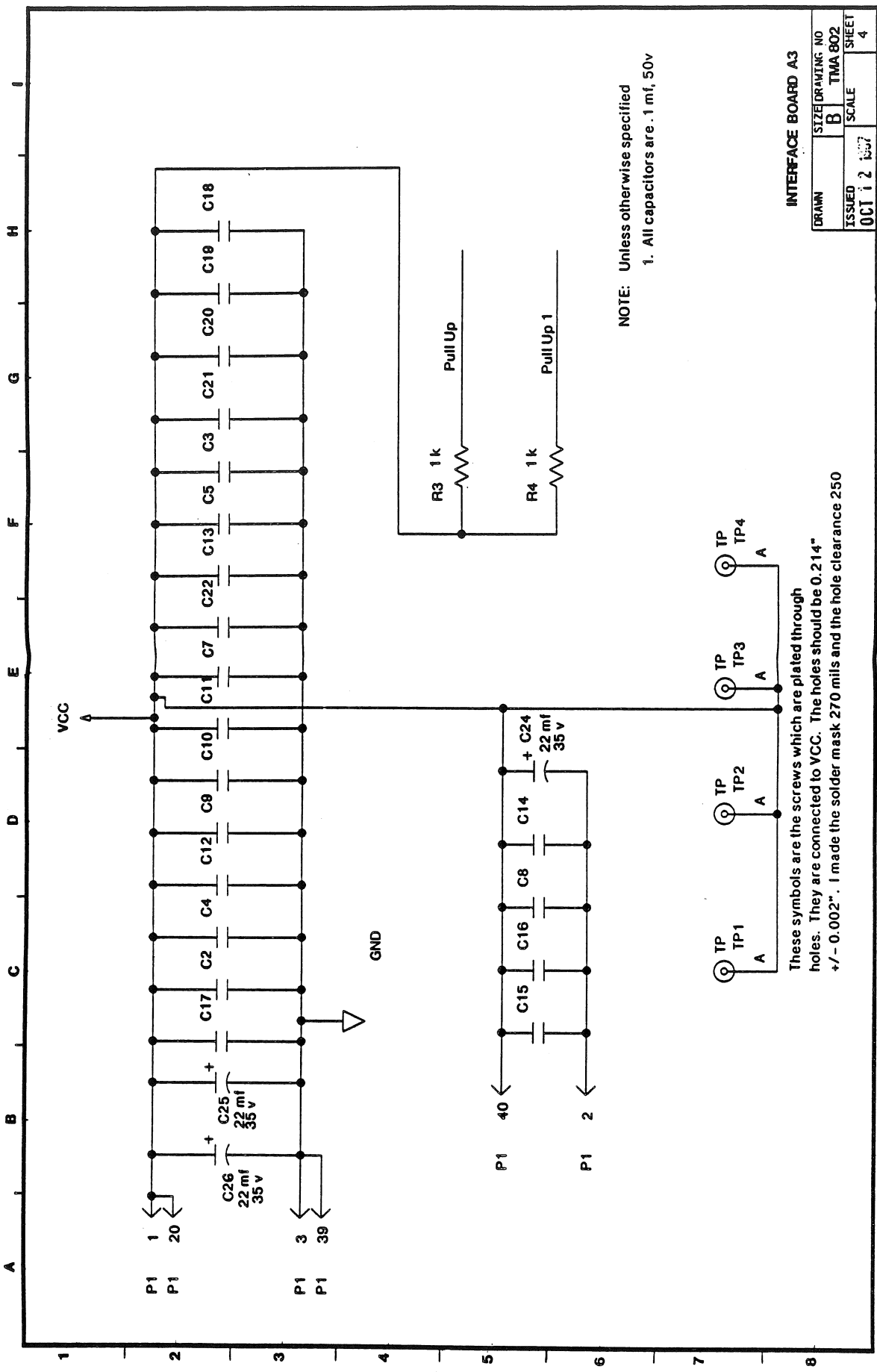
Figure 5-6. Interface Board (A3) Schematic 2 of 4.



DRAWN	SIZE	TMA802
ISSUED	SCALE	SHEET 3

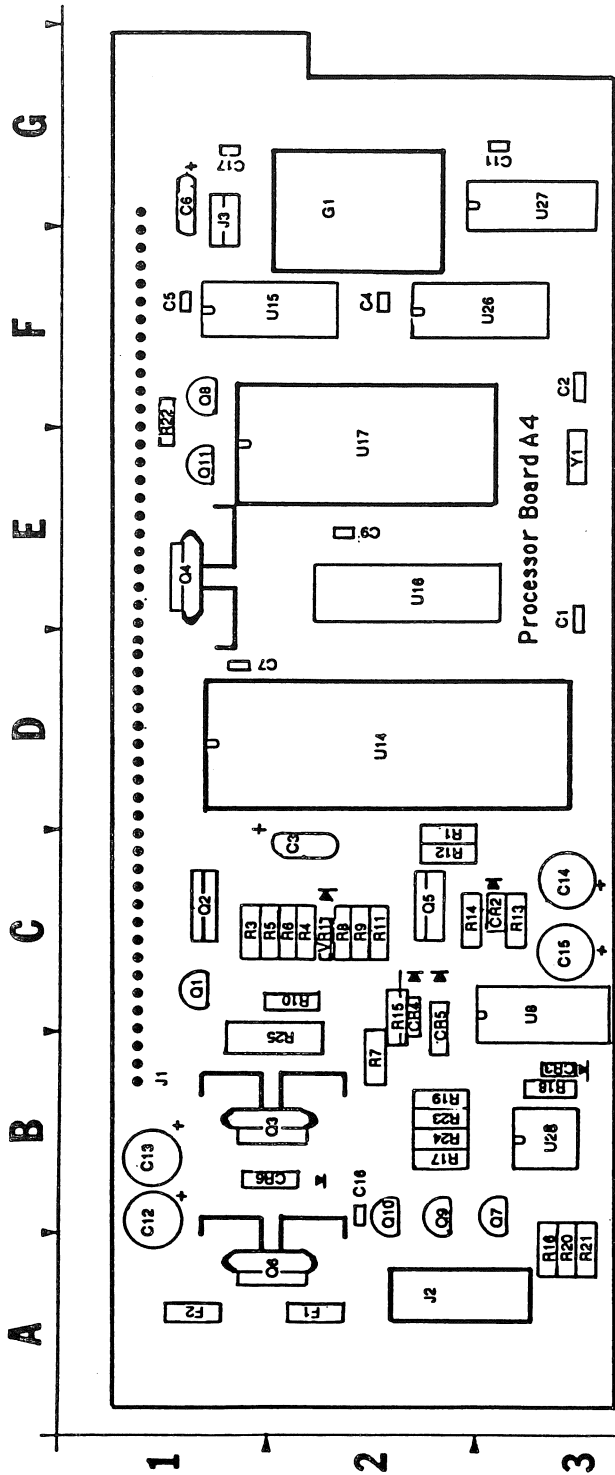
INTERFACE BOARD A3

Figure 5-7. Interface Board (A3) Schematic 3 of 4.



DRAWN	SIZE/DRAWING NO	INTERFACE BOARD A3	
B	TMA 802	SCALE	SHEET
ISSUED	0CT 12 1957		4

Figure 5-8. Interface Board (A3) Schematic 4 of 4.



PROCESSOR BOARD (A4)  
(schematic 3 of 3)

CKT NO	SCHEM LOC	ECB LOC
C11	E7	G3
C4	D7	F2
C5	D7	F1
C7	A5	D1
C9	E7	E2
J1	H5-7	B1
U14	A5	D2
U15	B5	F1
U16	C5	E2
U17	C5	E2
U26	D5	F2
U27	A7	G3
U27	E5	G3

CKT NO	SCHEM LOC	ECB LOC
R3	F2	C1
R4	F2	C2
R5	G2	C1
R6	G1	C2
R7	G3	B2
R8	D4	C2
R9	D5	C2
U26	D6	F2
U27	C1	G3
U8	D2	C3
U8	F3	C3
U8	G5	C3
U8	H5	C3
UR1	F2	C2

CKT NO	SCHEM LOC	ECB LOC
Q10	B5	B2
Q1	F2	C1
Q2	G2	C1
Q3	G3	B2
Q4	E3	E1
Q5	H3	C2
Q6	E6	A2
Q7	D6	B3
Q9	C4	B2
R10	F5	C2
R11	D4	C2
R12	E4	C2
R13	H5	C3
R14	I6	C2
R15	E4	C2
R16	D6	A3
R17	D7	B2
R18	E7	B3
R19	E7	B2
R20	C6	A3
R21	C6	A3
R23	B4	B2
R24	B5	B2
R25	I3	B2

PROCESSOR BOARD (A4)  
(schematic 2 of 3)

CKT NO	SCHEM LOC	ECB LOC
C12	G2	B1
C13	H3	B1
C14	E3	C3
C15	G3	C3
C16	C4	A3
CR3	I6	B3
CR4	G5	C2
CR5	E6	C2
CR6	C5	B2
F1	C3	A1
F2	E5	A2
GR2	H4	C3
J1	B2	B1
J1	J1-5	B1
J2	B3-7	A2

PROCESSOR BOARD (A4)  
(schematic 1 of 3)

CKT NO	SCHEM LOC	ECB LOC
C17	C7	G1
C1	C1	E3
C2	C1	F3
C2	C2	C2
C6	C7	G1
G1	B7	G2
J1	A4-5	B1
J3	A7	G1
Q11	B6	E1
Q8	C6	F1

Figure 5-9. Processor Board (A4) Parts Locator.

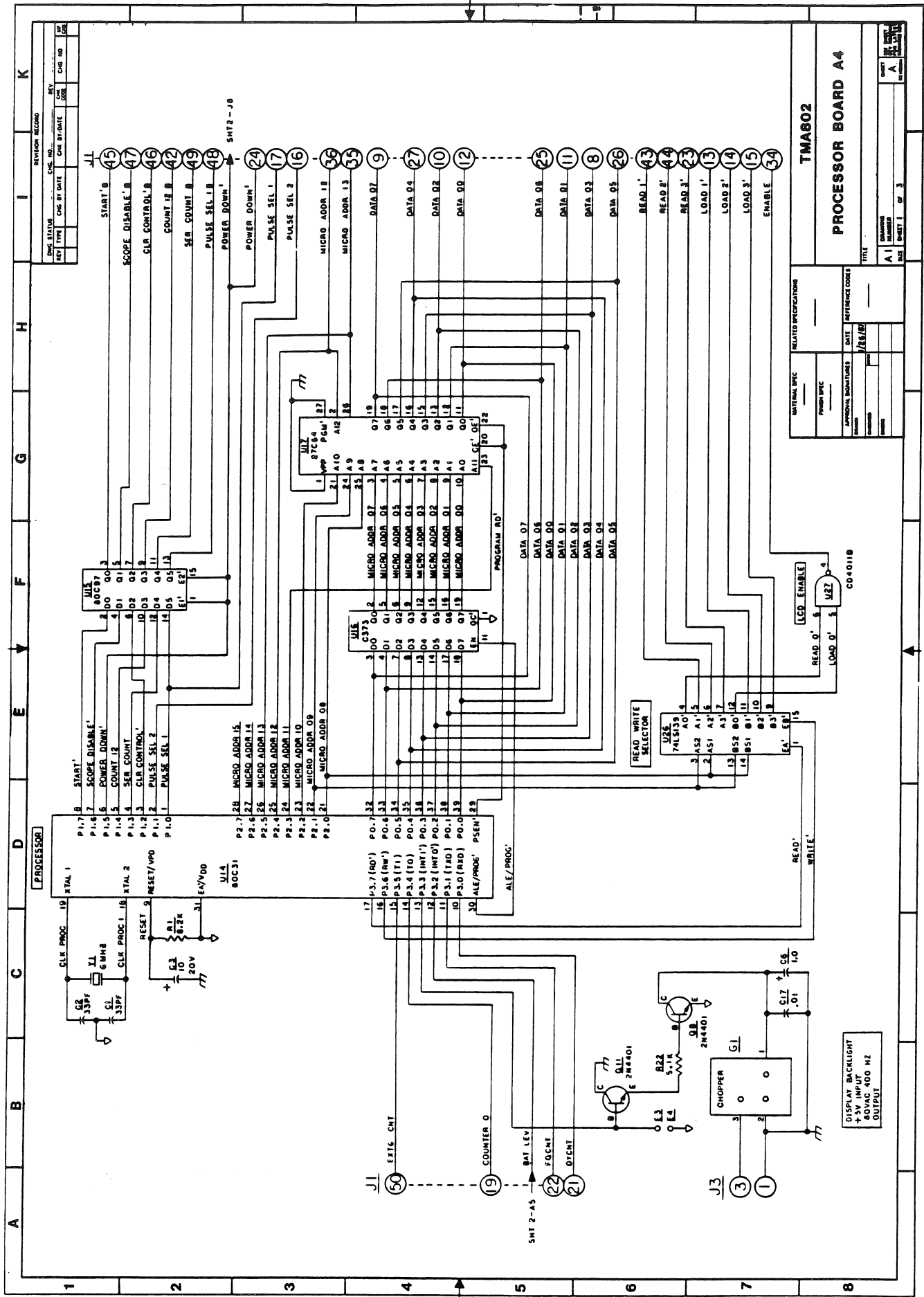
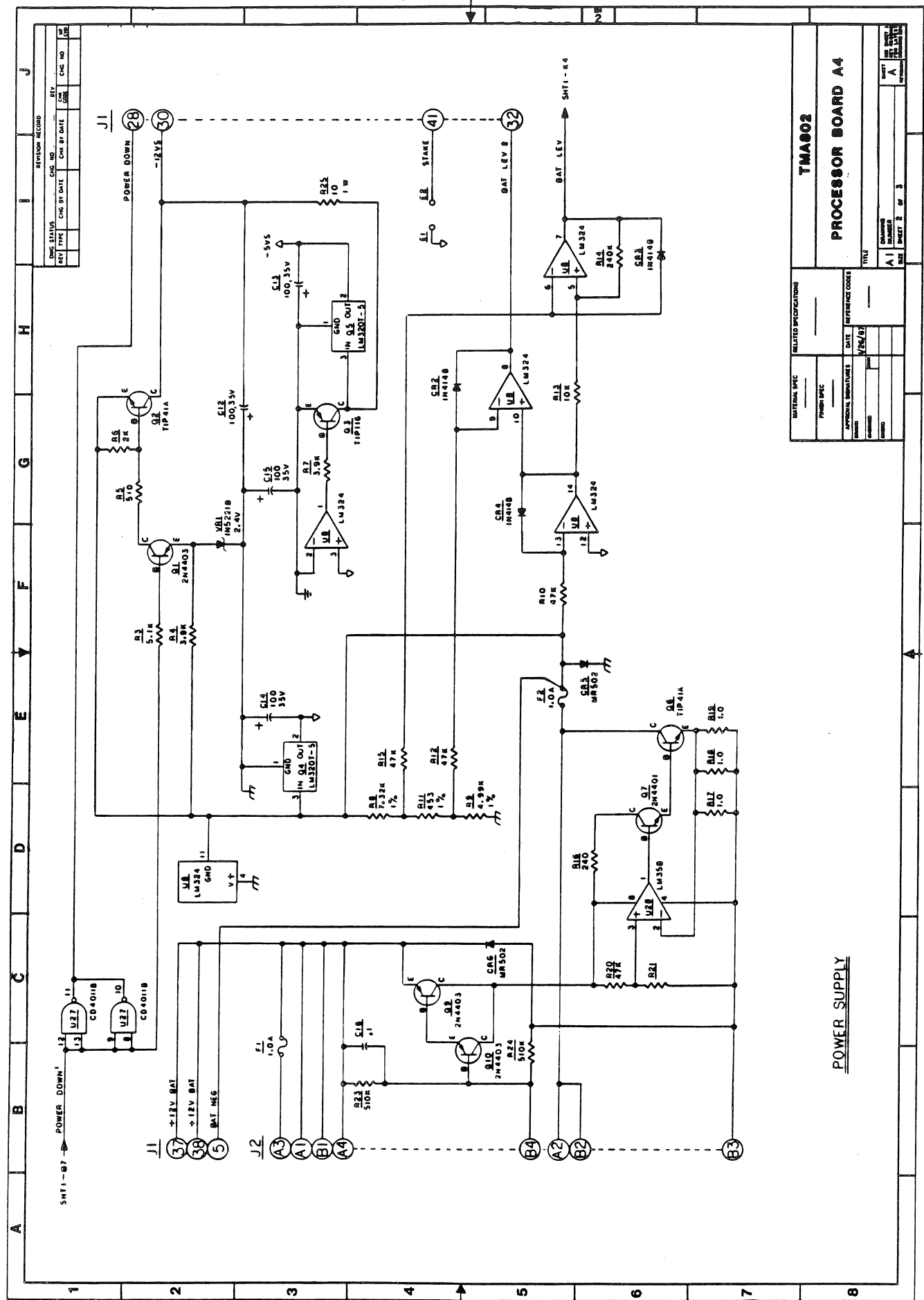


Figure 5-10. Processor Board (A4) Schematic 1 of 3.



<b>REVISED RECORD</b>		<b>REV</b>	
DATE	BY	REV	BY
<b>TMA802</b>			
<b>PROCESSOR BOARD A4</b>			
RELATED SPECIFICATIONS		REFERENCE CODES	
INTERNAL SPEC		DATE	
FORM SPEC			
APPROVAL SIGNATURE			
<b>TITLE</b>			
A1		A	

Figure 5-11. Processor Board (A4) Schematic 2 of 3.

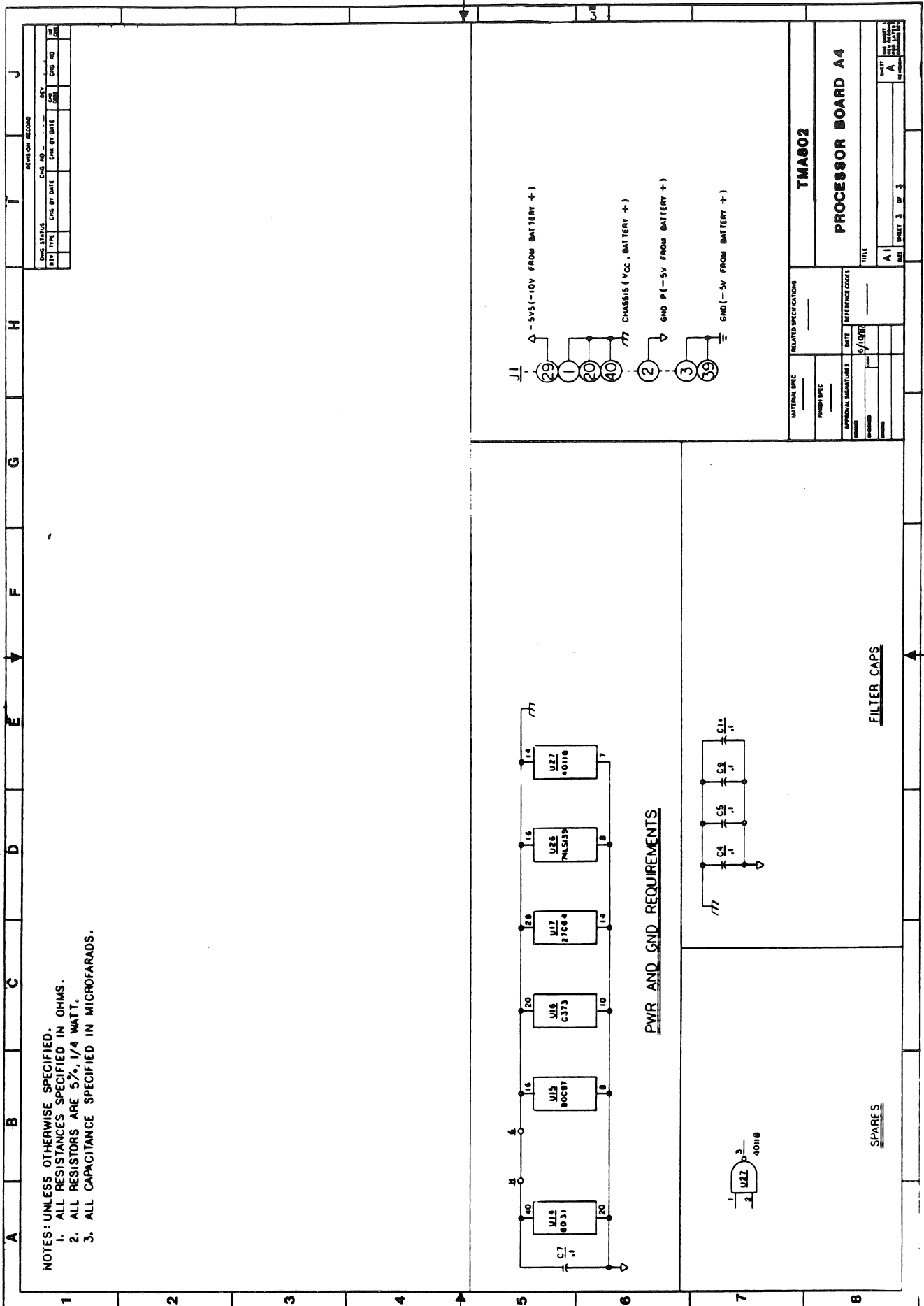


Figure 5-12. Processor Board (A4) Schematic 3 of 3.

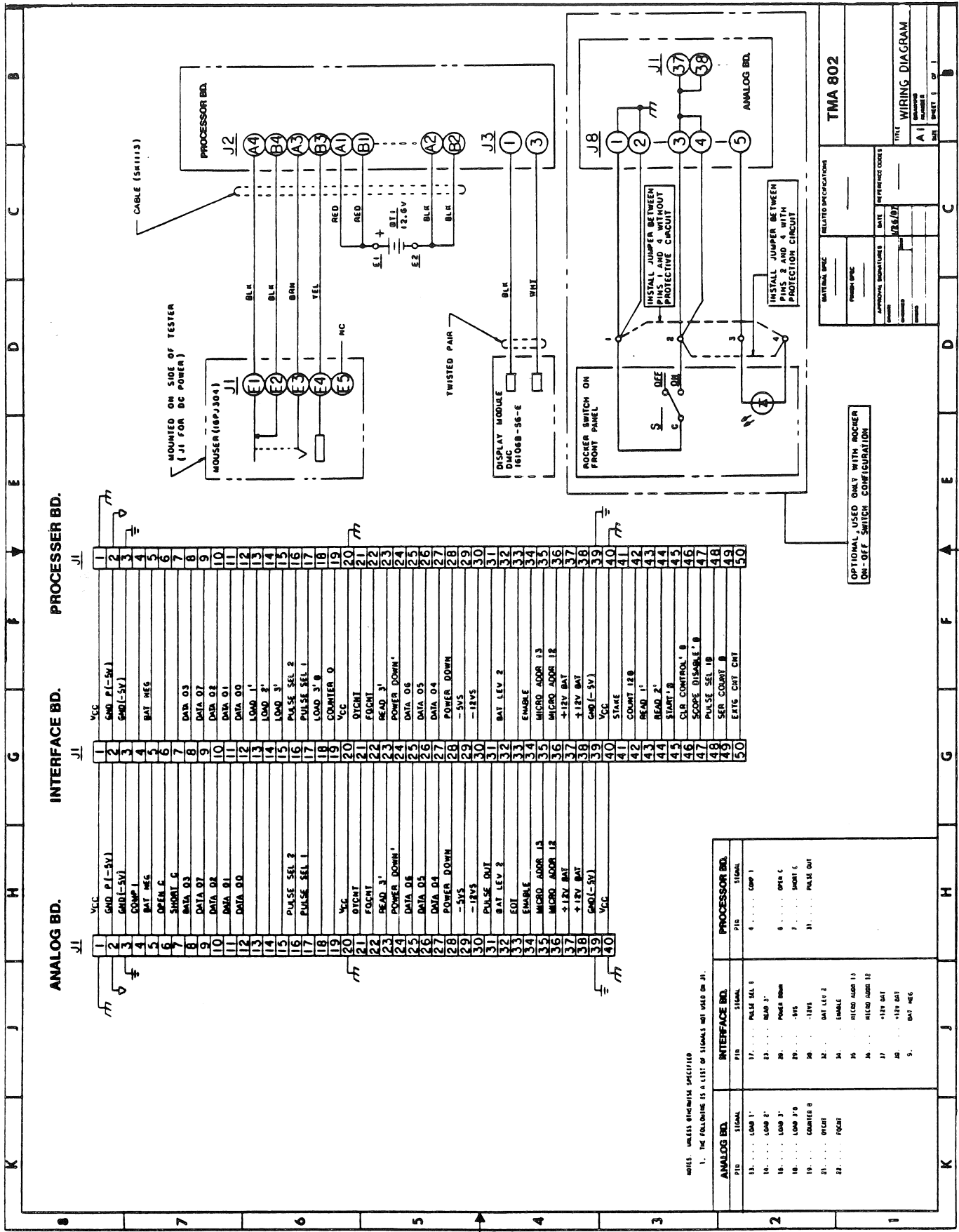


Figure 5-13. TMA802 Wiring Diagram



# Section 6. REPLACEABLE MECHANICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from your Tektronix Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to provide benefit of the latest circuit improvements developed by our engineering department. It is important when ordering parts to include the following information: part number, instrument type, serial number and modification number (if applicable).

If a part has been replaced with a new or improved part, your Tektronix Field Office or representative will contact you regarding any change in part number.

## SPECIAL NOTES AND SYMBOLS

- X000 Part first added at this serial number  
00X Part removed after this serial number

## FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations showing that part.

## INDENTATION SYSTEM

This parts list is indented to indicate item relationships. The following is an example of the indentation system:

### Name & Description

```

Assembly and/or component
Attaching parts for this assembly or component
  - - - * - - -
. Detail part of assembly or component
. Attaching parts for detail part
  - - - * - - -
.. Parts of detail part
.. Attaching parts for parts of detail part
  - - - * - - -
  
```

Attaching parts are indented the same as the host part; detail parts are indented to the right. Indented parts are part of and included with the next higher indentation. The separation symbol (- - - \* - - -) indicates the end of attaching parts.

*Attaching parts must be purchased separately unless otherwise specified.*

## ITEM NAME

In this parts list, an item name is separated from its description by a colon (:). Because of space limitations an item name may sometimes appear to be incomplete. For additional item name identification, refer to the U.S. Federal Cataloging Handbook H6-1.

## ABBREVIATIONS

"	INCH	DWR	DRAWER	IN	INCH	SCT	SECTION
#	NUMBER SIZE	ELECTRN	ELECTRON	INCAND	INCANDESCENT	SEMICON	SEMICONDUCTOR
ACTR	ACTUATOR	ELEC	ELECTRICAL	INSUL	INSULATOR	SHLD	SHIELD
ADPTR	ADAPTER	ELCTLT	ELECTROLYTIC	INTL	INTERNAL	SHLDR	SHOULDERED
ALIGN	ALIGNMENT	ELEM	ELEMENT	LPHLDR	LAMPHOLDER	SKT	SOCKET
AL	ALUMINUM	EPL	ELECTRICAL PARTS LIST	MACH	MACHINE	SL	SLIDE
ASSEM	ASSEMBLED	EQPT	EQUIPMENT	NIP	NIPPLE	SLVG	SLEEVING
ASSY	ASSEMBLY	EXT	EXTERNAL	NONWW	NOT WIREWOUND	SPR	SPRING
ATTEN	ATTENUATOR	FIL	FILLISTER HEAD	ORD BY DESCR	ORDER BY DESCRIPTION	SQ	SQUARE
AWG	AMERICAN WIRE GAUGE	FLEX	FLEXIBLE	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BD	BOARD	FLH	FLAT HEAD	OVH	OVALHEAD	STL	STEEL
BRKT	BRACKET	FLTR	FILTER	PHBRZ	PHOSPHOR BRONZE	SW	SWITCH
BRS	BRASS	FR	FRAME or FRONT	PL	PLAIN or PLATE	T	TUBE
BRZ	BRONZE	FSTNR	FASTENER	PLSTC	PLASTIC	TERM	TERMINAL
BSHG	BUSHING	FT	FOOT	PN	PART NUMBER	THD	THREAD
CAB	CABINET	GSKT	GASKET	PNH	PANHEAD	THK	THICK
CAP	CAPACITOR	HEX	HEXAGON	PWR	POWER	THSN	TENSION
CER	CERAMIC	HDL	HANDLE	RCPT	RECEPTACLE	TPG	TAPPING
CHAS	CHASSIS	HEXHD	HEXAGONAL HEAD	RES	RESISTOR	TRH	THRUSSHEAD
CKT	CIRCUIT	HEXSOC	HEXAGONAL SOCKET	RGD	RIGID	V	VOLTAGE
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RLF	RELIEF	VAR	VARIABLE
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RTNR	RETAINER	W/	WITH
CVR	COVER	HV	HIGH VOLTAGE	SCH	SOCKET HEAD	WSHR	WASHER
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCR	SCREW	XSTR	TRANSISTOR
DEG	DEGREE	IDNT	IDENTIFICATION	SE	SINGLE END		
	IMPLR	IMPELLER					

**CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER**

Mfr. Code	Manufacturer	Address	City, State,Zip
00779	AMP INC	P.O. BOX 3608	HARRISBURG, PA 17105
09353	C & K COMONENTS INC	15 RIVERDALE AVE	NEWTON, MA 02158
09922	BURNDY CORP	RICHRDS AVE	NORWALK, CT 06852
22526	DUPONT EI DE MOURS DUPONT CONNECTOR SYSTEMS	515 FISHING CREEK ROAD	NEW CUMBERLAND, PA 17070
30161	AAVID ENGINEERING INC	30 COOK COURT	LACONIA, NH 03246
55322	SAMTEC	1810 PROGRESS BLVD P.O. BOX 1147	NEW ALBANY, IN 47150
73743	FISCHER SPECIAL MFG CO	446 MORGAN ST	CINCINNATI, OH 45206
80009	TEKTRONIX INC	P.O. BOX 500	BEAVERTON, OR 97077
81073	GRAYHILL INC	56 P.O. BOX 373	HILL GROVE AVE
86113	MICRODOT MFG INC CENTRAL SCREW-KEENE DIVISION	149 EMERALD STREET	KEENE, NH 03431
86797	ROGAN CORP	3455 WOODHEAD DRIVE	NORTHBROOK, IL 60062
93907	TEXTRON INC/CAMCAR DIV	600 18TH AVE	ROCKFORD, IL 61101
TK0435		LEWIS SCREW CO	4114 SO PEORIA
TK1108	PAC-TEC	ENTERPRISE EXECUTIVE AVE	PHILADELPHIA, PA 19153

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff. Dscont.	Qty.	Name & Description	Mfr. Part Code	Number
1-				<b>COVER ASSEMBLY</b>		
	436-0206-00		1	TRAY,PLASTIC:ACCESSORY	47776	
	437-0334-00		1	CASE,ACCESSORY:FRONT	47776	XER-TP-3
	437-0336-00		1	CASE,ACCESSORY:REAR	47776	XER-PT-2
-1	390-0965-00		1	CABINET, TOP:TMA802	TK1108	61207-01
-2	361-1407-00		8	SPACER SLEEVE:TMA802	TK1108	61030-01
-3	367-0375-00		1	HANDLE (ATTACHING PARTS)	TK1108	60128-1
-4	211-0439-00		2	. SCREW:4-24 X 0.375,PNH BLK OXD	47776	09HW00005
-5	105-0958-00		2	. KEEPER BUTTON:TMA802	TK1108	60156-01-000
-6	214-3817-00		2	. SPRING:TMA802	TK1108	60157-01
	346-0245-00		1	STRAP:CARRYING CASE (ATTACHING PARTS)	TK1108	60529-501
-7	354-0686-00		2	. CONNECTOR RING:STRAP	TK1108	60532
-8	210-1422-00		2	. POST:CONNECTOR RING *****		TK1108
	-----		1	SWITCH(SEE A2S1 REPL) (ATTACHING PARTS)		
-9	366-0656-00		1	. KNOB:TMA02	86797	GI-65-SS-M
-10	210-0505-00		1	. NUT,PL HEX:0.375 X 0.5 HEX *****	73743	2X32032-402
-11	131-4031-00		3	CONN,RCPT,ELEC:CKT BD MT,BNC (EACH CONNECTOR INCLUDES:)	00779	227222-1
-12	220-0497-00		1	. NUT,PL HEX:0.5-28 X 0.562 HEX	80009	220-0497-00
-13	260-2367-00		1	SWITCH,PUSH:3 X 4,9 BUTTON	81073	83YY3412A-509
-14	333-3266-00		1	PANEL,FRONT:TMA802	47776	09HW00028
-15	-----		1	CKT BD ASSY:DISPLAY MODULE A1 (ATTACHING PARTS)		
-16	213-0141-00		4	. SCR,TPG,TF:4-40 X 0.25,PNH ,SPCL TYPE *****	93907	ORD BY DESCR
	-----		-	CKT BD ASSY:MODULE OF THREE CKT BDS: (ATTACHING PARTS)		
-17	213-0206-00		4	. SCR,TPG,TF:6-32 X 1.25,SPCL TYPE,PNH *****	86113	ORD BY DESCR
-18	-----		1	CKT BD ASSY:A2 INCLUDES		
-19	131-4176-00		2	. CONN,RCPT,ELEC:7-PIN(J-6,7)	55322	SSW-107-01-G-S
	131-4175-00		1	. CONN,RCPT,ELEC:14-PIN(J-2)	22526	65499-114
	131-4505-00		1	. CONN,RCPT,ELEC:5-PIN ,0.25 SQ(J-8)	00779	640457-5
	131-4507-00		1	. CONN,RCPT,ELEC:15-PIN (J-1)	55322	SSA-115-S-G
	131-4174-00		1	. CONN,RCPT,ELEC:36-PIN (J-1)	22526	65499-136
-20	-----		1	CKT BD ASSY: A3 INCLUDES		
-21	131-4175-00		1	. CONN,RCPT,ELEC:14-PIN (P-1)	22526	65499-114
-22	131-4176-00		1	. CONN,RCPT,ELEC:36-PIN (P-1)	55322	SSW-107-01-G-S
-23	-----		1	CKT BD ASSY:A4 INCLUDES		
-24	214-4057-00		3	. HEATSINK,AL,TO-220 (ATTACHING PARTS)	30161	559498
	211-0510-00		3	. . SCR,MACH:6-32 X 0.375,PNH,STL	TK0435	ORD BY DESCR
	210-0407-00		3	. . NUT,PL HEX:6-32 X 0.25,BRS *****	74373	3038-402

# Replaceable Mechanical Parts -TMA802

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff. Dscont.	Qty.	Name & Description	Mfr. Part Code	Number
1-25	131-4506-00		2	. CONN,RCPT,ELEC:25-PIN,(J-1)	55322	SSA-125-S-G
-26	131-0608-00		4	. TERM PIN:0.365 X 0.25 GOLD	22526	48283-036
	131-0993-00		1	. . BUS COND:SHUNT ASSY:BLACK	22526	65474-005
	131-4502-00		1	. CONN RCPT,ELEC:10-PIN HDR(J-2)	00779	640456-3
	131-4504-00		1	. CONN RCPT,ELEC:3 PIN HDR(J-3)	00779	640456-3
	136-0755-00		1	. SKT,PL-IN:MICROCKT,28 DIP (U17)	09922	DILB28P-108
	136-0757-00		1	. SKT,PL-IN,ELEC:MICROCKT,40-PIN (U-14)	09922	DILB40P-108
	136-0950-00		4	. SKT,PL-IN (FUSE),F-1,F-2	00779	380598-2
-27	146-0101-00		1	BTRY ASSY:W/STRAPS AND PLATES (ATTACHING PARTS)	47776	14AS00014
-28	213-0141-00		4	. SCR,TPG,TF:4-40 X 0.25 PNH,SPCL TYPE * * * * *	93907	ORD BY DESCR
-29	390-0968-00		1	EXPANDER,LEFT:CABINET	TK1108	61208-02
-30	390-0967-00		1	EXPANDER,RIGHT:CABINET	TK1108	61208-01
-31	348-0869-00		4	FOOT,CABINET:TMA802 (ATTACHING PARTS)	TK1108	60129-01
-32	211-0763-00		4	. SCR,MACH:6-32 X 3.0 L,HEX,STL * * * * *	47776	09HW0004
-33	333-3430-00		1	PANEL,REAR:TMA802	47776	09HW00029
-34	390-0966-00		1	COVER,BOTTOM:TMA802	TK1108	61206-01
	070-6273-00		1	MANUAL,TECH OPERATOR	80009	070-6273-00

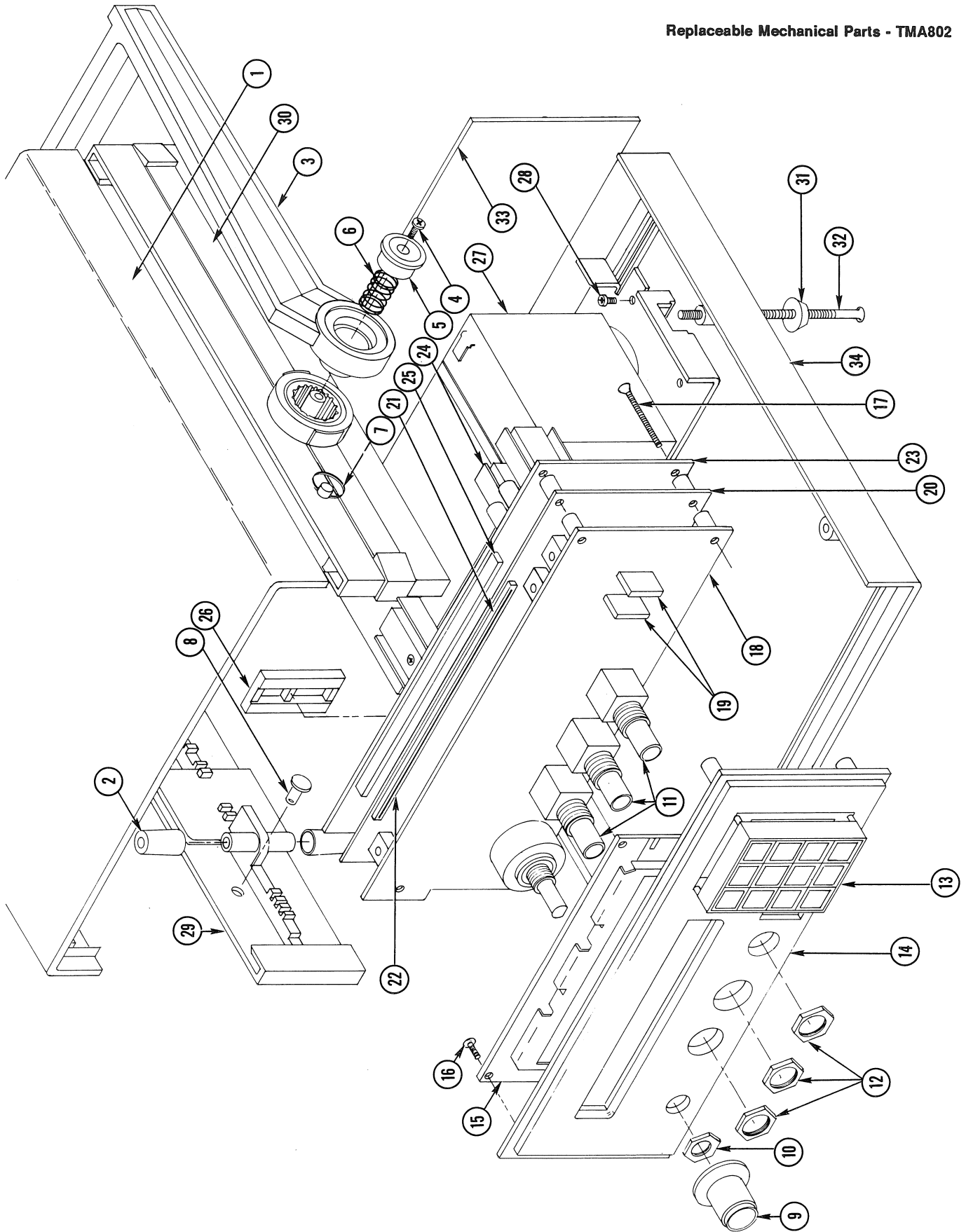


Figure 6-1. Mechanical Parts Locator.

