

TEKTRONIX®

153
Calculator Instrumentation
Interface

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97005

Serial Number _____



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All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

All requests for repairs and replacement parts should be directed to the TEKTRONIX Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument Type Number or Part Number and Serial Number with all requests for parts or service.

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POWERING UP

Before you start...

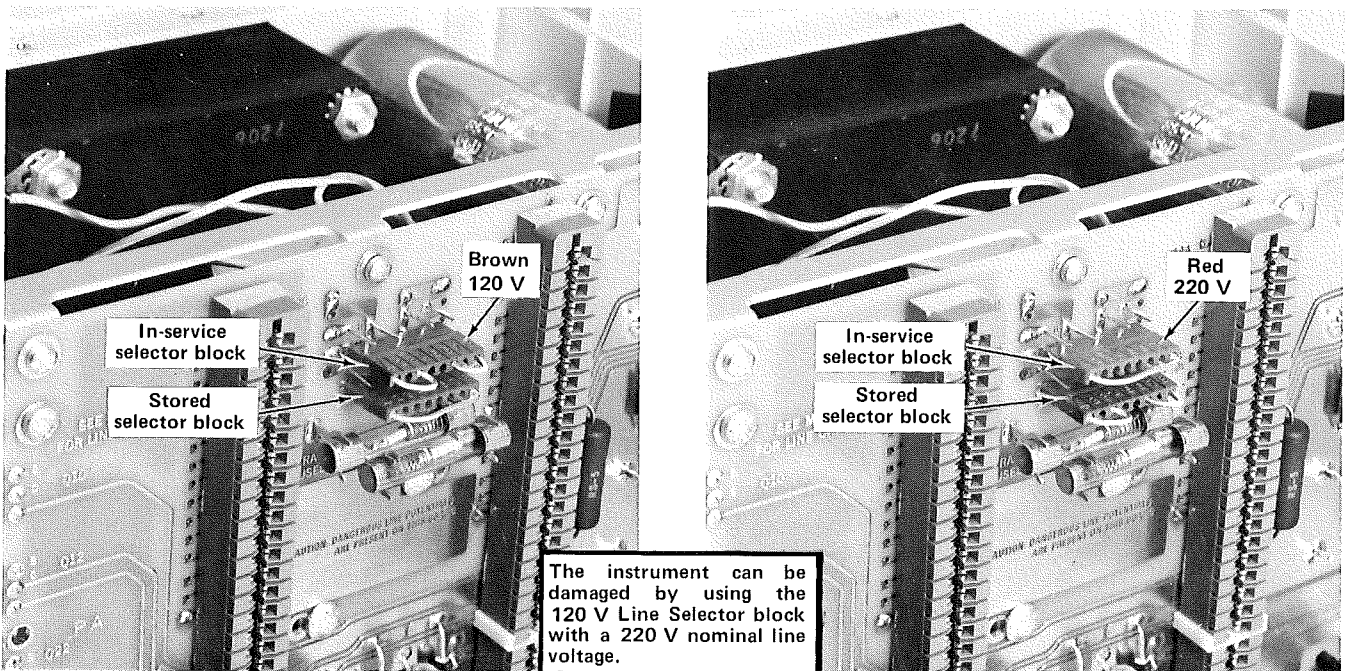
1. Check the rear panel markings. If the factory settings are compatible with the available line voltage and frequency, insert the desired plug-ins. Use the bail to raise the front of the instrument.

...go to Operating Instructions...

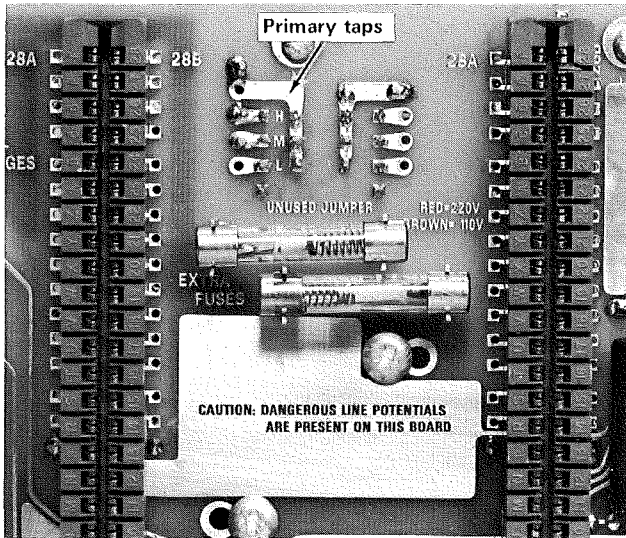
2. If a change is needed, follow these steps:

a. Line Selector Block(s)

Remove the five hold-down screws on the top of the dust cover cabinet and lift the cabinet off. This gives easy access to the Line Selector blocks located on the main circuit board.



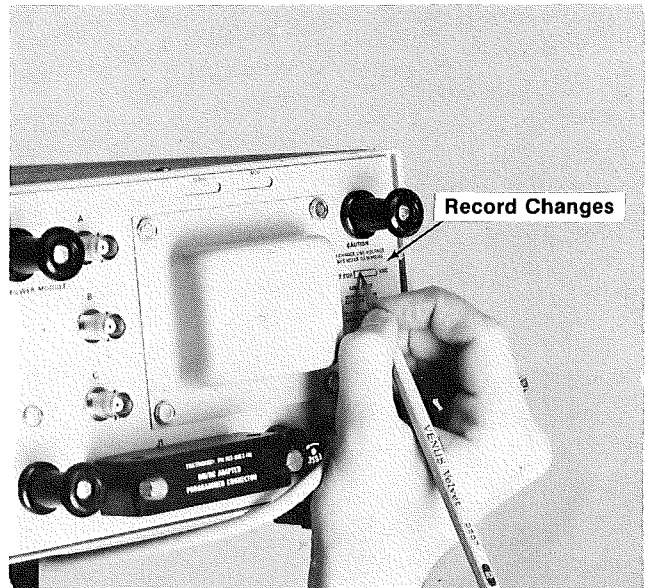
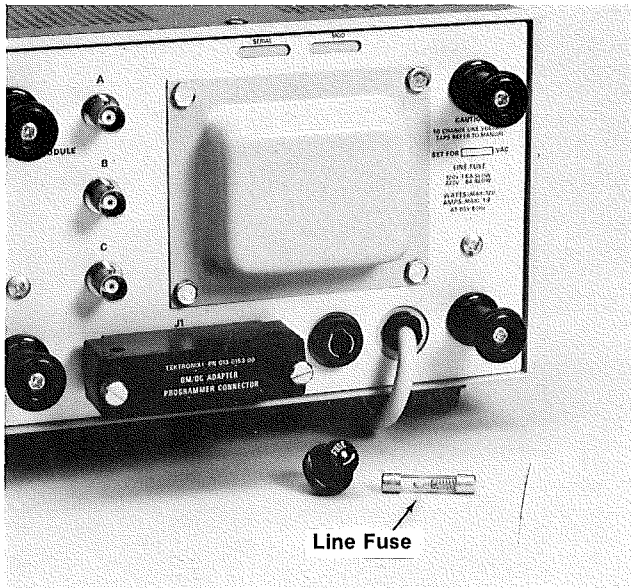
b. Line Range Taps



Universal Transformer

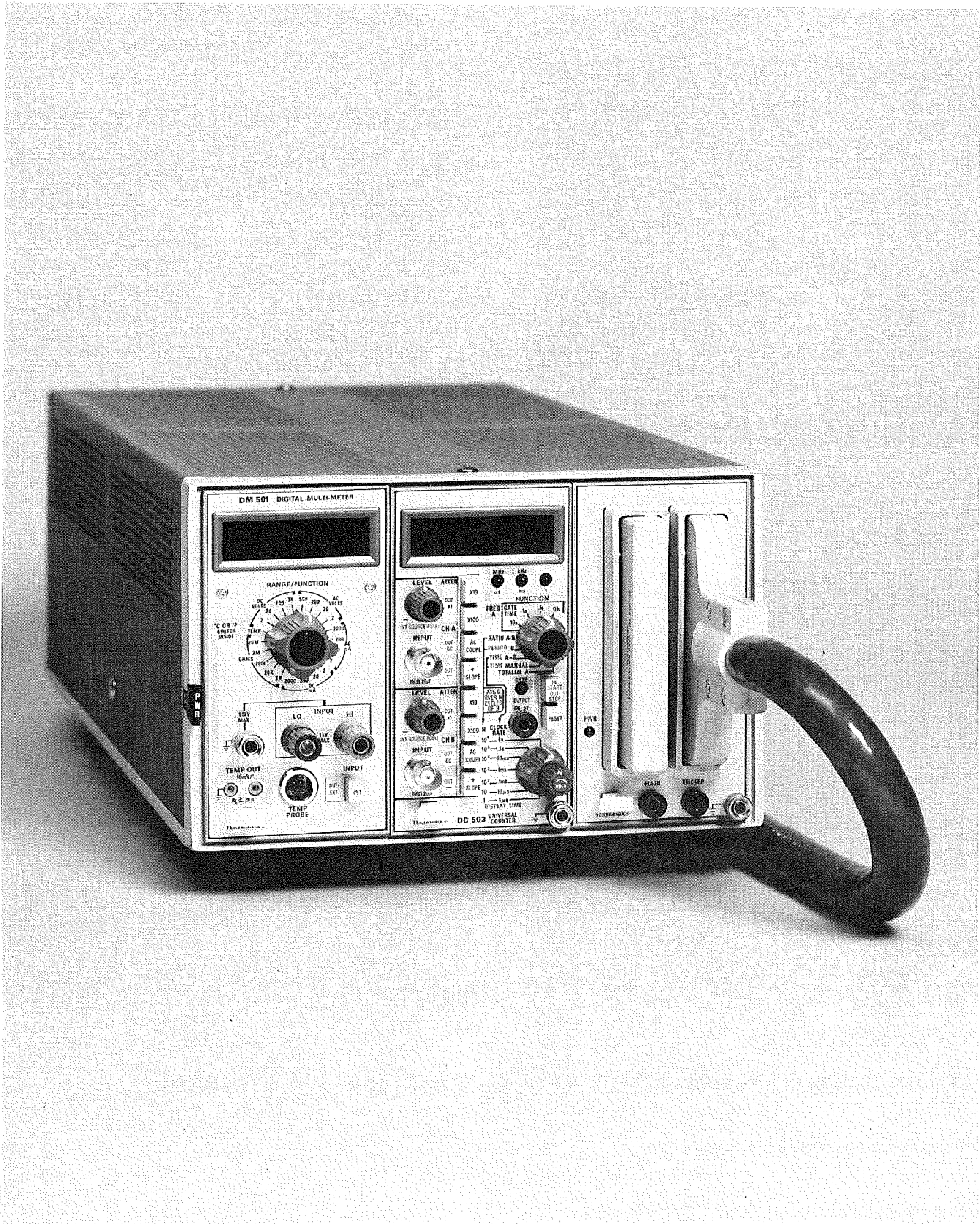
Line Selector Block Position	Regulating Ranges	
	120-Volts Nominal	220-Volts Nominal
L	90 VAC to 110 VAC	180 VAC to 220 VAC
M	99 VAC to 121 VAC	198 VAC to 242 VAC
H	108 VAC to 132 VAC	216 VAC to 264 VAC
Line Fuse Data	1.6 A slow-blow	0.8 A slow-blow

c. Rear Panel



3. Replace the cabinet.
4. If necessary, change the line cord power plug to match the power source receptacle or use an adapter.
5. Plug the cord into the power source.
6. Use the bail to raise the front of the instrument.

...go to **Operating Instructions...**



OPERATING INSTRUCTIONS

INTRODUCTION

System Description

The 153 is part of a Tektronix 31/53 Calculator-based instrumentation system. See Fig. 2-1. The focal point of the system is the Tektronix 31 Programmable Calculator. The calculator operates like a computer by fetching program instructions from memory and then executing these instructions. Just by selecting a desired operation and starting the execution of the program instructions, the system becomes a slave to the user's needs. He may obtain data from the test and measurement part of the system.

Then he may manipulate that data by selecting another operation provided on the calculator keyboard.

The 31/53 System must have a mediator between the measurement plug-ins and the calculator. That device is located in the right-side of the Power Module and is called the Interface Plug-In. The Interface Plug-In performs its function by converting the data signals from the measurement plug-ins into a data format that is compatible with the calculator. The Interface Plug-In also interprets calculator commands.

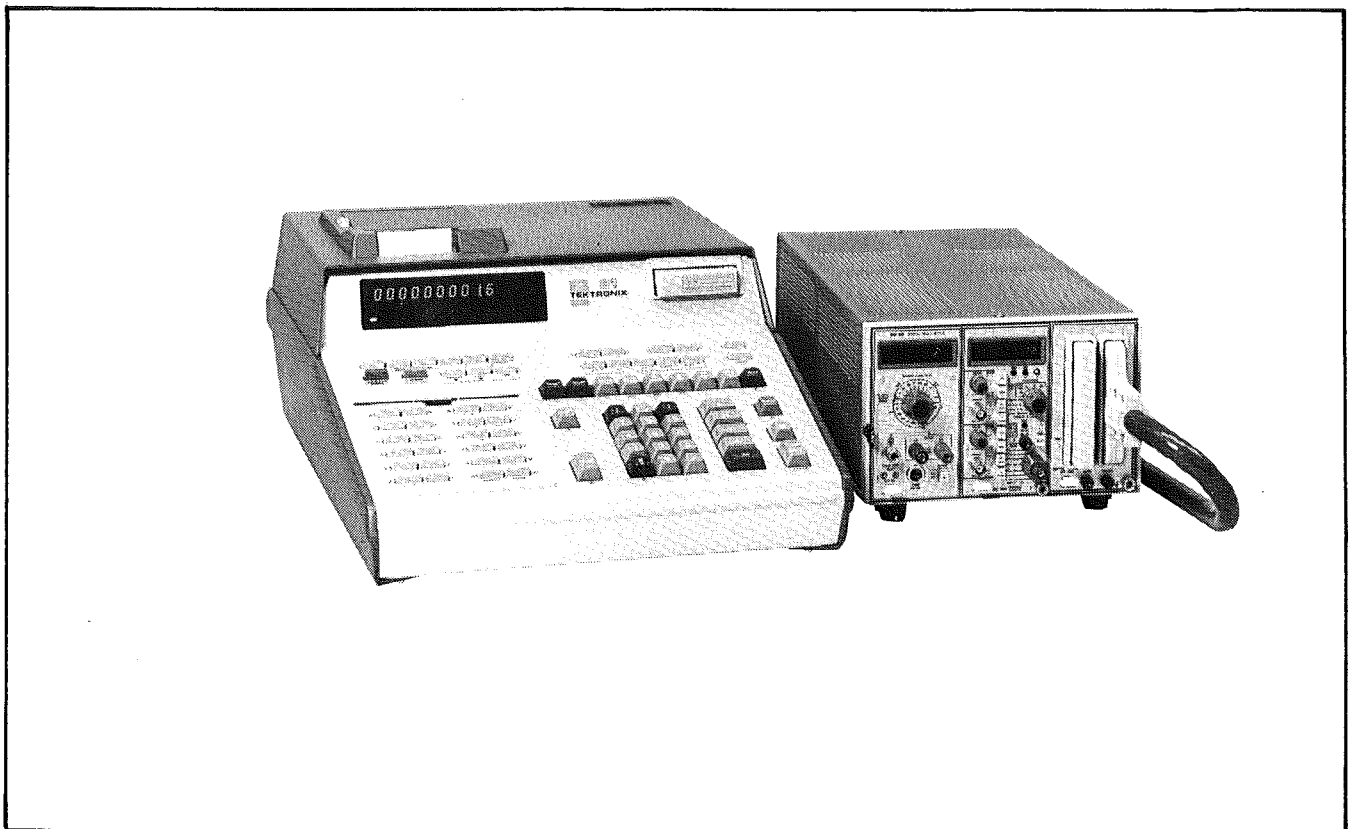


Fig. 2-1. Tektronix 31/53 Calculator Instrumentation System.

Operating Instructions—153 Interface

Any combination from the following list will fit in a Power Module. However, only two slots are available in each mainframe. Up to ten mainframes may be connected to the same calculator.

- a. DM 501 Digital Multimeter
- b. DC 501 Digital Counter¹
- c. DC 502 Digital Counter¹
- d. DC 503 Digital Counter¹

Other compatible measurement plug-ins will become available at a later time.

Interface Plug-In Description

This plug-in instrument interfaces the Tektronix 31 calculators with compatible plug-in units having serial-character, parallel-bit, data outputs. Two front-panel connections also permit calculator control of external circuitry; this allows, for example, multiple analog inputs to the interfaced plug-ins.

The Interface Plug-In connects to the calculator through a fifty-pin edge connector and interconnecting cable. Connections to the plug-ins are made via the rear interface connectors in the Power Module.

For example, data may be acquired from a DM 501 and a DC 503, or from two of each. An additional edge connector is provided on the front panel. This allows interconnection of up to ten 153 Calculator Instrumentation Interface Systems and a maximum of twenty compatible plug-in units for additional data acquisition capability.

¹These instruments require Option 4 before they are compatible with the 31/53 System. A field modification kit is available (Tektronix Part Number 040-0713-00).

Power Requirements

The Power Module is designed to operate from a power source with its neutral at or near earth (ground) potential with a separate safety-earth conductor. It is not intended for operation from two phases of a multi-phase system, or across the legs of a single-phase, three-wire system.

Power Usage

Actual power consumption depends on the particular module combination and operation mode selected at any one time.

The Power Module provides each plug-in module with access to a pair of heat-sinked, chassis-mounted transistors, one npn and one pnp. These series-pass transistors allow the plug-in modules to operate in power ranges not possible if the power had to be dissipated in the modules themselves. Refer to the specifications section of this manual and the individual plug-in manuals for power consumption information.

Operating Temperatures

The Power Module can be operated in an ambient air temperature of 0°C to +50°C. Thermal cutout devices protect the system by disconnecting the power to the Power Module when internal temperatures rise above a safe operating level. These devices automatically return power to the Power Module when the internal temperatures return to a safe level.

Since the interface units can be stored in temperatures between -40°C and +75°C, allow the instrument's chassis to return to within the operating limits before applying power.

BASIC OPERATION

Introduction

The Interface Plug-In is addressed from the calculator by a REMOTE and two-digit command. The tens digit in the address is user-selected. This digit selects the Interface Plug-In from which data is taken. The units digit is pre-defined, and has the following functions for each interface. A one addresses the plug-in unit in the left or A compartment of the Power Module, a two the middle or B compartment, a three provides a negative trigger at the front panel TRIG OUT jack, and a four a negative trigger at the bnc connector labeled A on the rear panel of the Power Module.

A front panel connector labeled FLASH, connected to the bus ERRORSET (ERST), causes the calculator display to flash when enabled with a two nanoseconds or longer negative pulse. See Fig. 2-2.

Setting Up

Before these plug-ins may be operated, it is necessary to install the proper patch connectors on the rear of the Power Module. See Fig. 2-2. The patch connector goes in the receptacle provided. One of three patch connectors is required. Type I (Tektronix Part Number 013-0153-00) is normally supplied, and is for use with a digital multimeter installed in the left compartment and a counter in the middle compartment (DM/DC). Type II, Option 30 (Tektronix Part Number 013-0153-01) is used with two digital multimeters (DM/DM) and Type III, Option 31 (Tektronix Part Number 013-0153-02) is for use with two counters (DC/DC).

There are several jumper wires on the Interface Plug-In printed-circuit board. Each jumper wire provides a particular function. Two of these functions are user-selectable, regardless of the type of instruments in the system. The remainder must be in certain locations, depending on the combination of counters or multimeter plug-ins used.

Figs. 2-3, 2-4 and 2-5 show locations and provide descriptions of the user-selected jumper wire functions mentioned earlier in this section. The other non-selectable jumper wire functions are not described, but are shown in the exact position to match the type of instruments in the system.

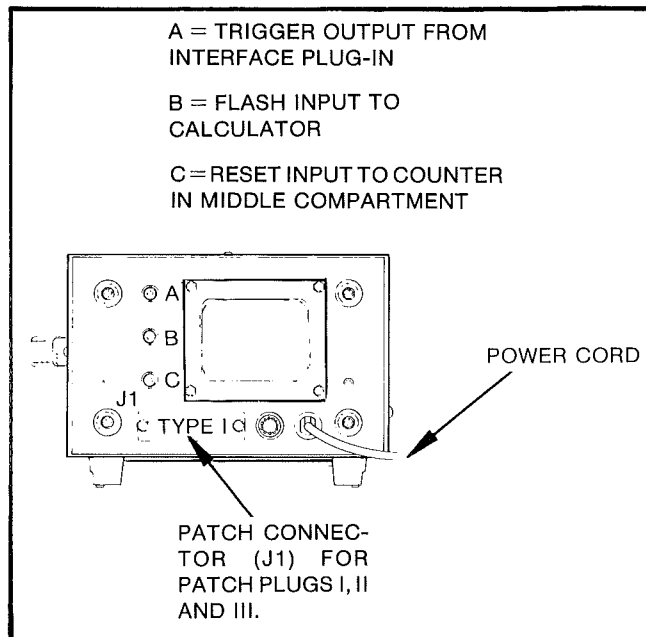
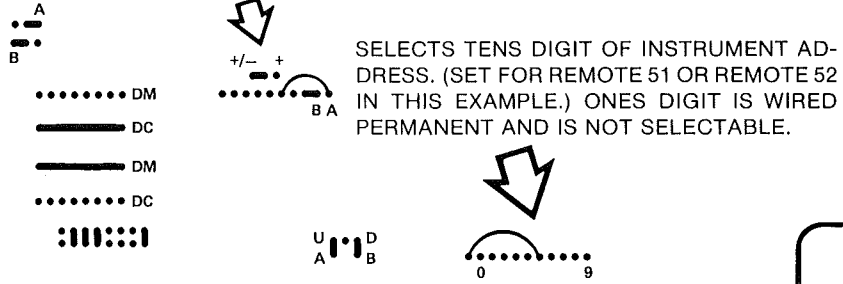


Fig. 2-2. Power Module rear panel detail.

DM/DC (DIGITAL MULTIMETER/DIGITAL COUNTER)
USE TYPE I PATCH CONNECTOR

+/- POSITION ALLOWS + OR - CALCULATOR DISPLAY. IF NO SIGN AT INSTRUMENT (AC & Ω), - DISPLAYED BY CALCULATOR. + POSITION ALWAYS RESULTS IN + CALCULATOR DISPLAY REGARDLESS OF INSTRUMENT DISPLAY.

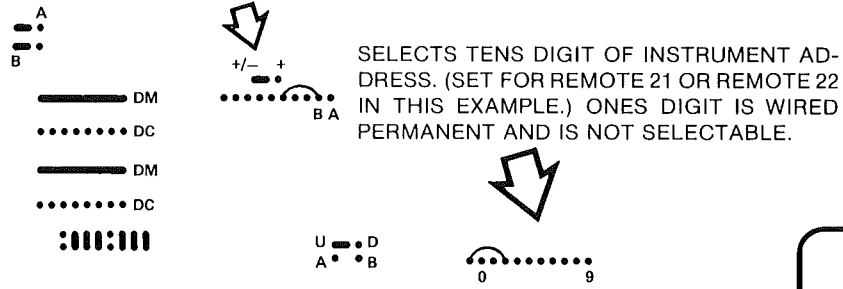


COMPONENT SIDE

Fig. 2-3. DM DC Jumper connections.

DM/DM (DIGITAL MULTIMETER/DIGITAL MULTIMETER)
USE TYPE II PATCH CONNECTOR

+/- POSITION ALLOWS + OR - CALCULATOR DISPLAY. IF NO SIGN AT INSTRUMENT (AC & Ω), - DISPLAYED BY CALCULATOR. + POSITION ALWAYS RESULTS IN + CALCULATOR DISPLAY REGARDLESS OF INSTRUMENT DISPLAY.



COMPONENT SIDE

Fig. 2-4. DM DM Jumper connections.

Operating Instructions—153 Interface

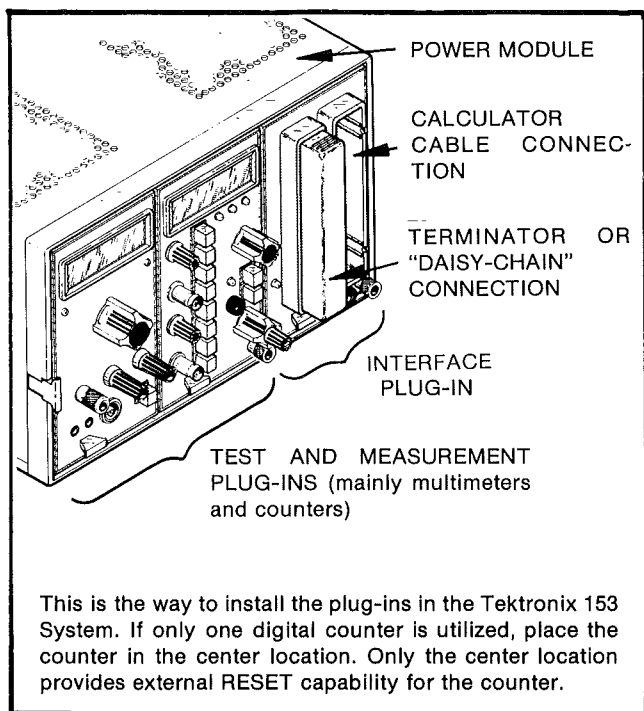


Fig. 2-7. Power Module and plug-Ins Installed.

Install the cable (Tektronix Part No. 012-0499-01 supplied) between the calculator and the Interface Plug-In. Also install the termination (Tektronix Part Number 016-0567-00) in the blank hole in the Interface Plug-In. The connector on the calculator (see insert) is keyed to ensure correct installation. The interface cable connectors are also keyed. As long as the keys match, either end of the cable may be inserted into the Interface Plug-In connector. The termination may be installed in any manner as long as the connecting pins mate. See Fig. 2-8.

When power is applied to the Power Module, the pilot lamp labeled PWR should light.

The fastest way to check if the system is operational is to try and acquire data from the measurement plug-ins. This is accomplished by addressing the instruments from the calculator keyboard as follows:

1. Press REMOTE key
ADDR INCOMP light turns on.
2. Enter numeric value of instrument address.

The data displayed on the measurement plug-in addressed should now appear on the calculator display.

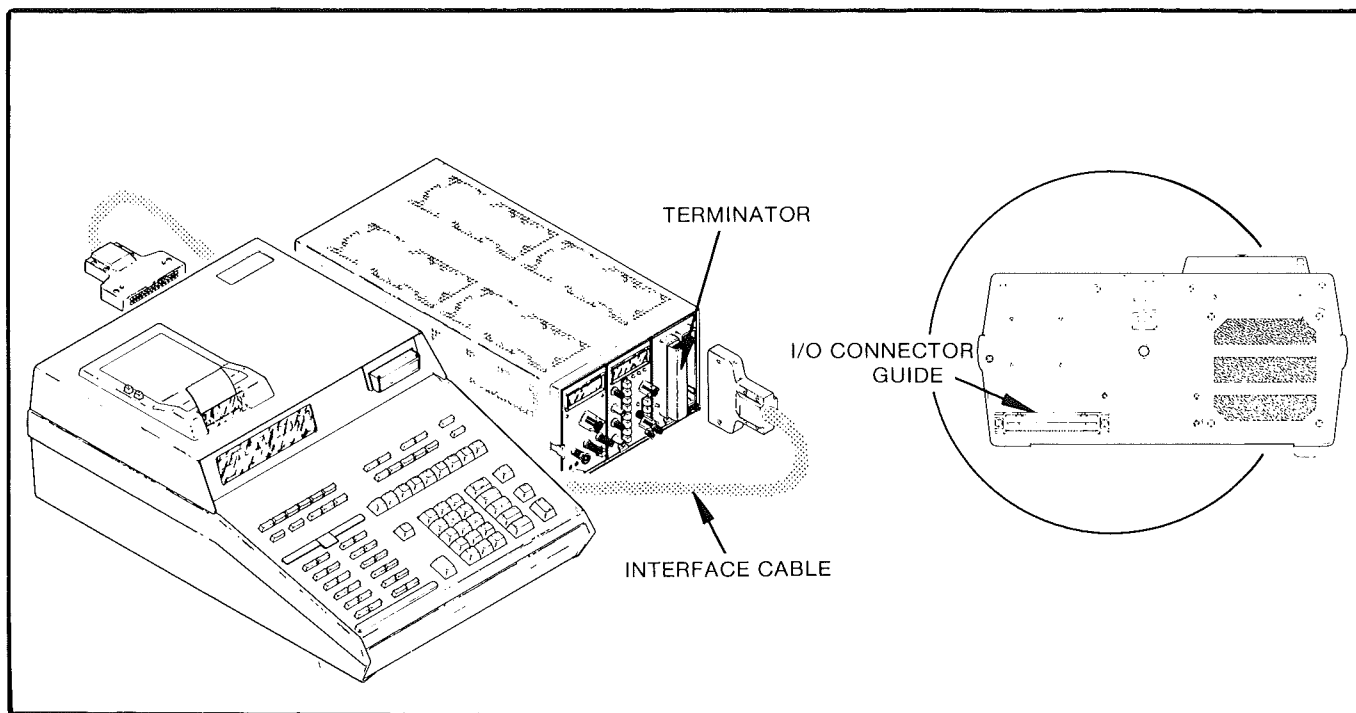


Fig. 2-8. Interfacing calculator and plug-Ins.

Three types of malfunctions may indicate improper jumper wire configurations.

- 1. Incorrect digits in calculator display.
- 2. Incorrect decimal point location in calculator display.
- 3. After addressing one of the instruments, the calculator remains in the busy mode as indicated by the BUSY light.

NOTE

An incorrect patch connector at the back of the Power Module may place the calculator in the busy mode. Also, if an empty compartment is addressed by the calculator, the calculator goes into the busy mode. To take the calculator out of the busy mode, turn off the power switch on the Power Module. (The calculator keys are disabled during the busy mode; consequently, keystrokes are of no use.)

Instrument Compatibility

Mechanically, the plug-in modules are very similar to other Tektronix product families. However, they are not electrically compatible. Therefore, the interface has barriers on the mating connectors between pins 6 and 7 to ensure that incompatible plug-ins cannot be inserted. See Fig. 2-9. A compatible plug-in will have a matching slot between pins six and seven of its main circuit board edge connector. This slot and barrier combination is the primary keying assignment.

For extra barriers, order Tektronix Part Number 214-1593-02.

Another identifier for compatible plug-in modules is the white color of the release latch.

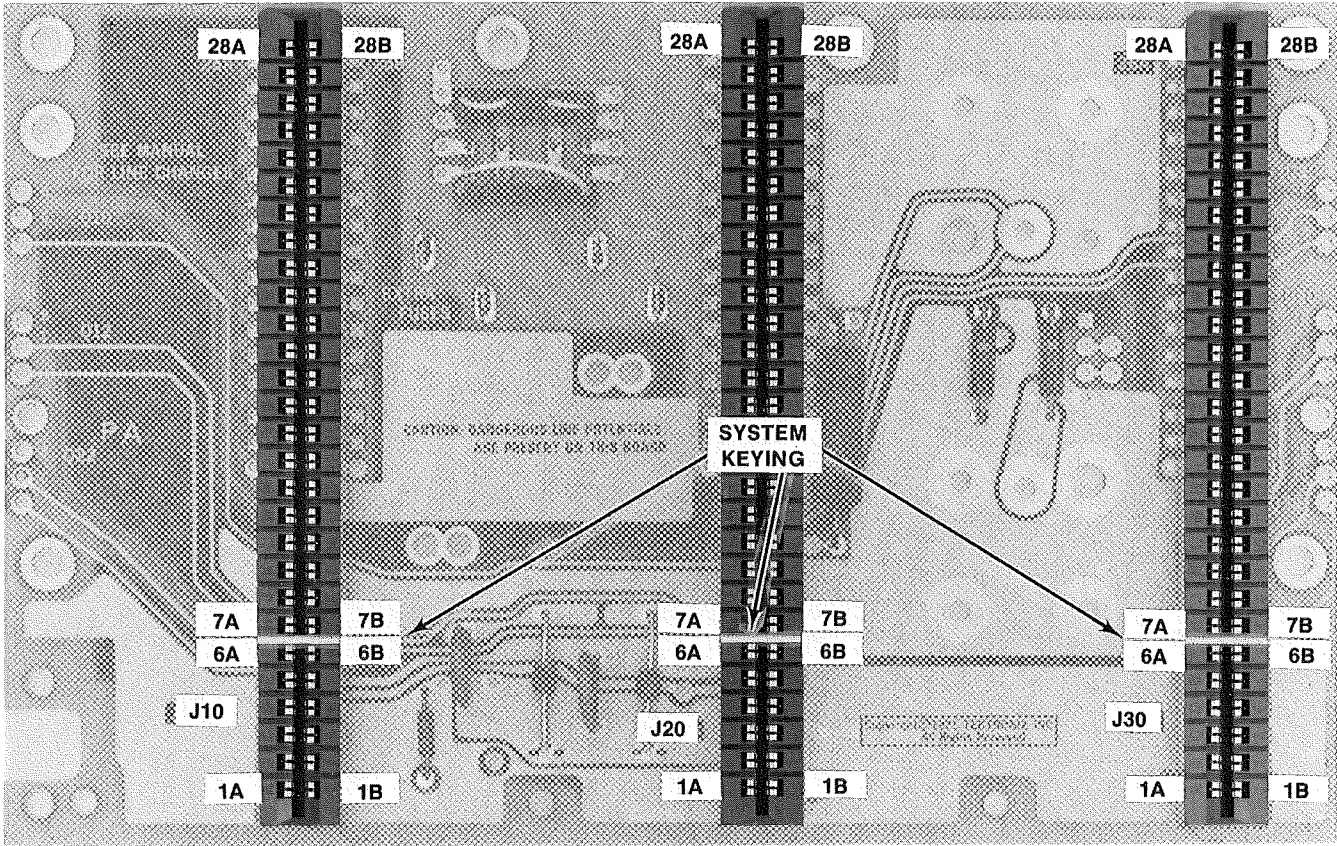


Fig. 2-9. Keying assignments for system functions.

Operating Instructions—153 Interface

Stacking and Rackmounting

Power Modules with their cabinets and feet in place may be stacked upon one another. The feet provide clearance for the lower unit's handle and at the same time give adequate spacing for the necessary ventilation.

The Power Module is designed to be half-rack width. Field conversion kits with slide-out tracks are available to mount one or two Power Modules in a standard nineteen-inch rack. Vertical space needed is 5-1/4 inches.

For the necessary hardware and instructions to mount two Power Modules side-by-side with slide-out assemblies, order Tektronix Part Number 040-0616-00.

To mount a single Power Module with a half-rack assembly and slide out tracks, order Tektronix Part Number 040-0617-00.

SPECIFICATIONS

Power Requirements

Line Voltage Ranges: Universal Transformer, 100, 110, 120, 200, 220, 240 Vac, all within 10%. Range changing for transformer accomplished with quick-change line-selector block.

Line Frequency Ranges: Universal Transformer, 48 Hz to 440 Hz.

Power Consumption: Maximum primary power, approximately 120 W at high line. Actual power consumption depends on plug-in selection and operating modes.

Supplies (Unregulated)

Two 25 Vac windings, 500 mA each, supplied to each compartment, independently.

+33.5 V and -33.5 V, 1 A maximum each supply, shared by all compartments.

17.5 Vac and +11.5 V, 3.6 A maximum, shared in any combination between these two supplies and shared among all compartments.

NOTE

Current and voltage ratings are for mainframe maintenance only. In practice, not all available power may be used at once. More detailed information is supplied with blank plug-in kit 040-0652-00.

Temperature Range

Operating: 0°C to +50°C. Nonoperating: -40°C to +75°C.

Altitude Range

Operating: to 15,000 feet. Nonoperating: to 50,000 feet.

Other

Dimensions with feet and bail: H 6.0 in., W 8.7 in., L 15.3 in.

Weight without plug-ins: Approximately 9.5 lbs.

Interface Plug-In

Logic Levels: TTL.

Power Consumption: ≈11.5 watts.

Weight: ≈1.5 lbs.

SYSTEM MAINTENANCE

GENERAL

Introduction

This section of the manual is meant to support the entire family of modules with a general coverage of the most commonly-needed service information pertinent to preventive maintenance, troubleshooting, ordering parts, and replacing components and sub-assemblies.

Cabinet Removal

WARNING

Dangerous potentials exist at several points throughout the system. When the system must be operated with the cabinet removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect power before cleaning the system or replacing parts.

Five screws on the top secure the cabinet to the Power Module frame. Remove them and lift the cabinet straight up. Do not operate the system with the cabinet removed any longer than necessary for troubleshooting and calibration. Re-install the cabinet to protect the interior from dust and to remove personnel shock hazards.

Cleaning

CAUTION

Avoid using chemical cleaning agents which might damage plastic parts. Avoid chemicals containing benzene, toluene, zylene, acetone, or similar solvents.

Exterior. Loose dust may be removed with a soft cloth or a dry brush. Water and a mild detergent may be used; however, abrasive cleaners should not be used.

Interior. Cleaning the interior of a unit should precede calibration since the cleaning processes could alter the settings of calibration adjustments. Use low-velocity compressed air to blow off accumulated dust. Hardened dirt can be removed with a soft, dry brush, cotton-tipped swab, or a cloth dampened in a solution of water and mild detergent.

Preventive Maintenance

Preventive maintenance steps performed on a regular basis will enhance the reliability of the instrumentation system. However, periodic checks of the semiconductors in the absence of a malfunction are not recommended as preventive maintenance measures. See the semiconductor checking information under Troubleshooting Techniques which follow. A convenient time to perform preventive maintenance is just before instrument calibration.

System Maintenance—153 Interface

Calibration

To insure accurate signal generation and measurement, the performance of individual units comprising the system should be checked periodically. Refer to the Instruction Manual for each unit for complete calibration and verification procedures.

There is one calibration adjustment of the Interface Plug-In. Connect the positive lead of a voltmeter, set to read +5Vdc, to the point labeled +5Vdc shown in Fig. 3-1. Connect the negative lead to the chassis ground. Adjust R22, +5V Adj. for a reading of $5V \pm 0.2V$.

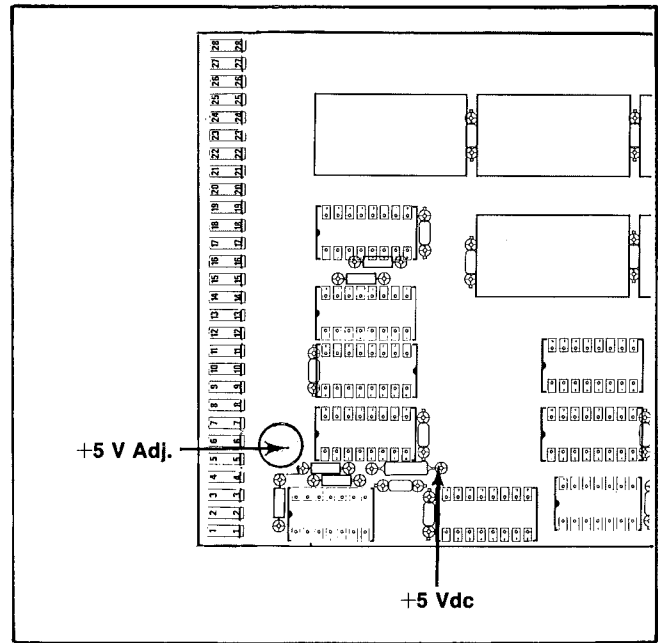


Fig. 3-1. Calibration adjustment location.

TROUBLESHOOTING AIDS

Introduction

The following is provided to augment information contained elsewhere in this and other instrument manuals when troubleshooting becomes necessary.

Circuit Description

Each manual has a section devoted to explaining circuit operating theory. Used conjointly with the schematics, this can be a powerful analytic tool.

Diagrams

Block diagrams and detailed circuit schematics are located on foldout pages in the service section of most of the instrument manuals. The schematic diagrams show the component values and assigned circuit reference numbers of each part necessary to the circuit design. Usually the first page of the service sections defines the circuit symbols and reference designators used in that particular instrument. Major circuits are usually identifiable by a series of component numbers. Important waveforms and voltages may be shown within the diagrams or on adjoining aprons. Those portions of the circuits located on circuit boards are enclosed with a blue tint outline.

Cam Switch Charts

Cam switches shown on the diagrams are coded on comprehensive charts to locate the cam number of the switch contact in the complete switch assembly, counting from the front, or knob end, toward the rear of the switch. The charts also indicate with a solid dot when each contact is closed.

Circuit Board Illustrations

Line illustrations showing component locations keyed with a grid scheme for each circuit board are usually placed on the back of a foldout page and sequenced as close as possible to an associated schematic. The GRID LOC column in the Electrical Parts Lists or adjacent to the components location illustration keys each component to the Location illustrations.

Component and Wiring Color Codes

Colored stripes or dots on electrical components signify electrical values, tolerances, etc., according to EIA standards. Components not color-coded usually have information printed on the body. The wiring coding follows the same EIA standards with the exception of the ac power cord of the Power Modules. It is coded like this:

Black	Line
White	Neutral
Green with a Yellow stripe	Safety Earth or Ground

Testing Equipment

Generally, a wide-band oscilloscope, a probe, and a multimeter are all that is needed to perform basic waveform and voltage checks for diagnostic purposes. The calibration procedures in the manual for each plug-in module list specific test equipment and the features necessary to adequately check out that particular module.

TROUBLESHOOTING TECHNIQUES

Introduction

This troubleshooting procedure is arranged in an order which checks the simple trouble possibilities before proceeding to extensive troubleshooting.

Control Settings

Incorrect control settings can indicate a trouble that does not exist. If there is any question about the correct function or operation of any control, see the Operating Instructions section of the manual for the instrument involved.

System and Associated Equipment

Before proceeding with troubleshooting the system, check that the instruments in the system are operating correctly. Check for proper interconnection between the Power Module and the plug-in modules. Check the line voltage at the power source. Check that the signal is properly connected and that the interconnecting cables and the signal source are not defective.

The associated plug-in modules can be checked for proper operation quickly by substituting other like units known to be operating properly. If the trouble persists after substitution, then the Power Module is probably at fault.

Visual Check

Inspect the portion of the system in which the trouble is suspected. Many troubles can be located by visual clues such as unsoldered connections, broken wires, damaged circuit boards, damaged components, etc.

Instrument Calibration

Check the calibration of the suspected plug-in module or the affected circuit if the trouble is obviously in a certain circuit. The trouble may only be a result of misadjustment or may be corrected by re-calibration. Complete calibration instructions are given in the manual for each instrument in the system.

Circuit Isolation

Note the symptom. It often identifies the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, check the affected circuits by making waveform and voltage measurements.

Incorrect operation of all circuits often means trouble in the power supplies. Using a multimeter, check first for correct voltages of the individual regulated supplies according to the plug-in module schematics and calibration procedures. Then check the unregulated supplies of the Power Modules. Defective components elsewhere in the instruments can appear as power supply problems. In these instances, suspected circuits should be disconnected from apparently bad power supplies one at a time to narrow the search.

Voltages and Waveforms

Often defective components can be located by using waveform and voltage indications when they appear on the schematic or in the calibration procedures. Such waveforms and voltage labels are typical indications and will vary between instruments. To obtain operating conditions similar to those used to take these readings, refer to the service sections of the manuals.

Component Checking

If a component cannot be disconnected from its circuit, then the effects of the associated circuitry must be considered when evaluating the measurement. Except for soldered-in transistors and integrated circuits, most components can be lifted at one end from the circuit board.

Transistors and IC's. Turn the power switch off before removing or replacing any semiconductor.

A good check of transistor operation is actual performance under operating conditions. A transistor can most effectively be checked by substituting a new component for it (or one which has been checked previously). However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check operation under simulated operating conditions. A suction-type desoldering tool must be used to remove soldered-in transistors; see component replacement procedure for details.

Integrated circuits can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of the circuit description is essential to troubleshooting circuits using IC's. Operating waveforms, logic levels, and other operating information for the IC's are given in the circuit description information of the appropriate manual. Use care when checking voltages and waveforms around the IC's so that adjacent leads are not shorted together. A convenient means of clipping a test probe to the 14- and 16-pin in-line IC's is with an integrated-circuit test clip. This device also doubles as an extraction tool.

Diodes. Do not use an ohmmeter that has a high internal current. High currents may damage the diode.

A diode may be checked for an open or shorted condition by measuring the resistance between terminals.

With an ohmmeter scale having an internal source of between 800 mV and 3 V, the resistance should be very high in one direction and very low when the leads are reversed.

Resistors. Check the resistors with an ohmmeter. Resistor tolerances are given in the Electrical Parts List in every manual. Resistors do not normally need to be replaced unless the measured value varies widely from the specified value.

Capacitors. A leaky or shorted capacitor can be detected by checking resistance with an ohmmeter on the highest scale. Use an ohmmeter which will not exceed the voltage rating of the capacitor. The resistance reading should be high after initial charge of the capacitor. An open capacitor can best be detected with a capacity meter, or by checking whether it passes ac signals.

PARTS ORDERING AND REPLACING

Ordering

Standard Parts. All electrical and mechanical replacement parts can be obtained through the local Tektronix Field Office or Representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the Parts Lists for value, tolerance, rating and description. When selecting replacement parts, it is important to remember that the physical size and shape of the component may affect its performance in an instrument. All replacement parts should be direct replacements unless it is known that a different component will not adversely affect the instrument performance.

Special Parts. Some parts are manufactured or selected by Tektronix, Inc. to satisfy particular requirements, or are manufactured for Tektronix, Inc. to our specifications. Most of the mechanical parts used in this system have been manufactured by Tektronix, Inc. Order all special parts directly from the local Tektronix Field Office or Representative.

Ordering Procedure. When ordering replacement parts from Tektronix, Inc., please include the following minimum information:

1. Instrument Type
2. Instrument Serial Number (For example, B010250)
3. A description of the part (if electrical, include the circuit number)
4. Tektronix Part Number

Please do not return any instruments or parts before receiving directions from Tektronix, Inc.

A listing of Tektronix Field Offices, Service Centers, and Representatives can be found in the Tektronix Product Catalog and Supplements and in the rear of this manual.

Replacing

The exploded view drawings associated with the Mechanical Parts Lists, located to the rear of most manuals, may be especially helpful when disassembling or re-assembling individual components or sub-assemblies.

Circuit Boards. If a circuit board is damaged beyond repair, either the entire assembly including all soldered-on components, or the board only, can be replaced. Part numbers are given in the mechanical parts lists for either the completely wired (670 prefix) or the unwired board (388 prefix).

NOTE

Even though unwired boards are available without components, use of the completely wired replacement board is recommended due to the large number of components mounted on most of the boards.

To remove or replace a board, proceed as follows:

1. Disconnect all leads connected to the board (both soldered lead connections and solderless pin connections).
2. Remove all screws holding the board to the chassis or other mounting surface. Some boards may be held fast by plastic mounting clips around the board edges. For these, push the mounting clips away from the circuit board edges to free the board. Also, remove any knobs, etc., that would prevent the board from being lifted out of the instrument.
3. Lift the circuit board out of the unit. Do not force or bend the board.
4. To replace the board, reverse the order of removal. Use care when replacing pin connectors; if forced into place incorrectly positioned, the pin connectors may be damaged.

Transistors and IC's. Transistors and IC's should not be replaced unless they are actually defective. If removed from their sockets during routine maintenance return them to their original sockets. Unnecessary replacement or switching of semiconductor devices may affect the calibration of the instruments. When a transistor is replaced, check the operation of the part of the instrument that may be affected.

Replacement semiconductors should be of the original type or a direct replacement. Fig. 3-2 shows the lead configuration of the semiconductors used in this instrument system. When removing soldered-in transistors, use a suction-type de-soldering tool to remove the solder from the holes in the circuit board.

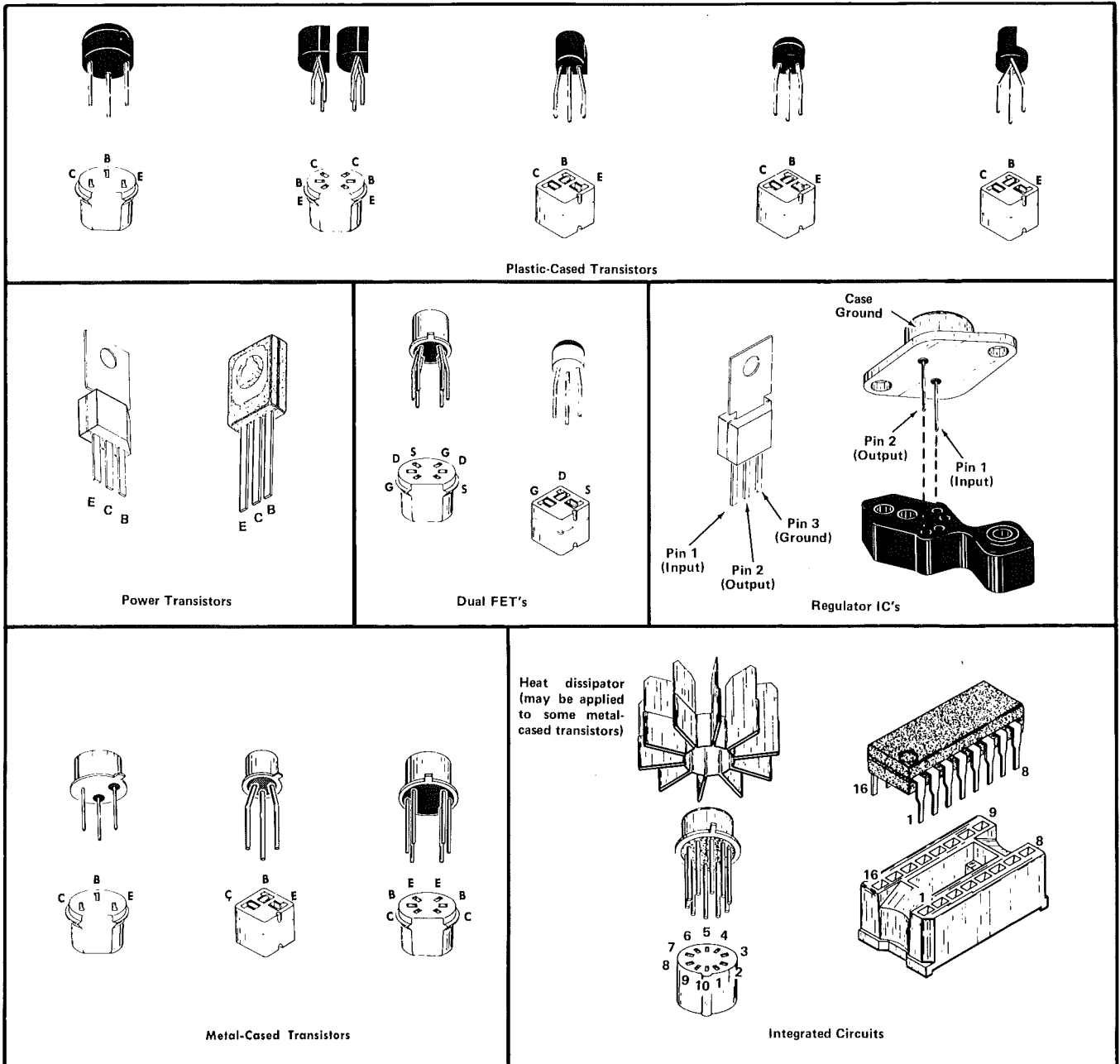


Fig. 3-2. Semiconductor device lead configurations found in the TM 500 family.

System Maintenance—153 Interface

An extracting tool should be used to remove the 14- and 16-pin integrated circuits to prevent damage to the pins. This tool is available from Tektronix, Inc. Order Tektronix Part No. 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the IC. Try to avoid having one end of the IC disengage from the socket before the other end.

To replace one of the power transistors mounted on the Power Module chassis adjacent to the interface circuit board, first unsolder the leads. Then, loosen the nuts which clamp the transistor to the chassis. Remove the defective transistor. When replacing the transistor, use a mica washer and silicone grease to increase heat transfer from the transistor to the chassis.

Interconnecting Pins. To replace a pin which is mounted on a circuit board, first disconnect any pin connectors. Then, unsolder the damaged pin and pull it out of the board with a pair of pliers. Be careful not to damage the wiring on the board with too much heat. Ream out the hole in the circuit board with a 0.031-inch drill. Remove the ferrule from the new interconnecting pin and press the new pin into the hole in the circuit board. Position the pin in the same manner as the old pin. If the old pin was bent at an angle to mate with a connector, bend the new pin to match the associated pins.

NOTE

A pin replacement kit including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order Tektronix Part No. 040-0542-00.

Cam Switches. Repair of cam-type switches should be undertaken only by experienced maintenance personnel. Switch alignment and spring tension of the contacts must be carefully maintained for proper operation of the switch. For assistance, contact your local Tektronix Field Office or Representative.

NOTE

A cam-type switch repair kit including necessary tools, instructions, and replacement contacts is available from Tektronix, Inc. Order Tektronix Part No. 040-0541-00.

The cam-type switches consist of rotating cam drums which are turned by front-panel knobs, and sets of spring-leaf contacts mounted on adjacent circuit boards. The

contacts are actuated by lobes on the cams. These switches can be disassembled for inspection, cleaning, repair, or replacement as follows:

1. Remove the screws which hold the metal cover on the switch, and lift the cover off the switch. The switch is now open for inspection or cleaning.

2. To completely remove a switch from the circuit board, first remove any knobs or shaft extensions. Loosen the coupling at the potentiometer at the rear of the switch, and pull the long shaft out of the switch assembly.

3. Remove the screws (from the opposite side of the circuit board) which hold the cam drum to the board.

4. To remove the cam drum from the front support block, remove the retaining ring from the shaft on the front of the switch and slide the cam drum out of the support block. Be careful not to lose the small detent roller.

5. To replace defective switch contacts, follow the instructions given in the switch repair kit.

6. To re-install the switch assembly, reverse the above procedure.

Pushbutton Switches. The pushbutton switches are not repairable and should be replaced as a unit if defective. Use a suction-type de-soldering tool to remove solder from the circuit board when removing these switches.

Incandescent Bulbs. Most of these light bulbs are mounted on the sub-panel using plastic sleeve stand-offs. Unsolder the lead wires and pull the bulb out of the sleeve from the rear of the sub-panel.

Light-Emitting Diodes. LED's used as indicators are mounted on the sub-panels with plastic sleeve sockets similar to the incandescent bulb mountings, or they are soldered directly to a sub-assembly and so mounted that they protrude through holes in the panel. In these cases, the sub-assembly must be exposed and the anode and cathode lead orientations carefully noted before unsoldering the defective LED. See Fig. 3-3 for LED lead identifying information.

Power Transformer. Replace the transformer only with a Tektronix direct replacement transformer. Refer to the exploded view drawing at the rear of this manual for disassembly of the rear panel to expose the power transformer. Refer to the schematic diagram color-coding information for correct wiring. After replacement, check out the power supply voltages before installing a plug-in module.

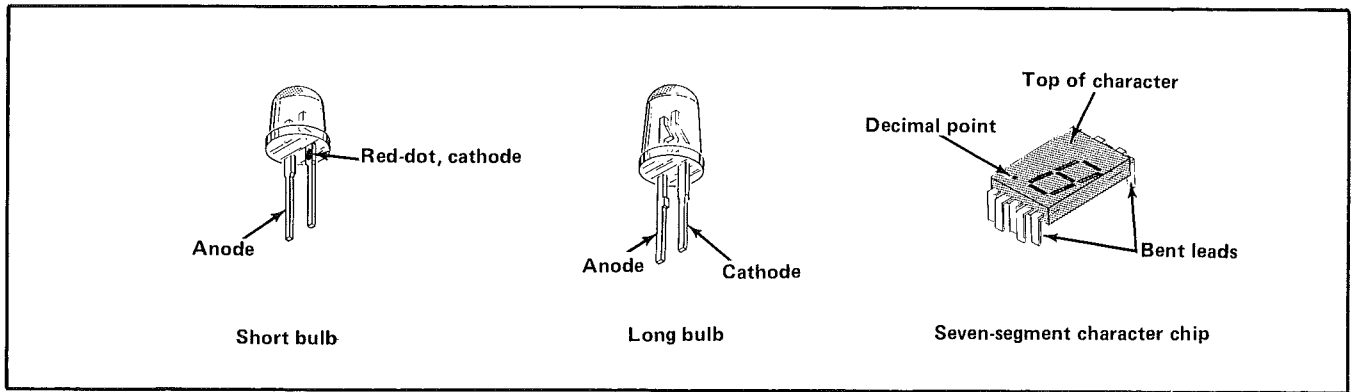


Fig. 3-3. Light emitting diode (LED) lead orientation illustration.

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THEORY OF OPERATION

CIRCUIT DESCRIPTION

Introduction

The circuit description for the Power Module is included with the block diagrams at the rear of this manual. Refer to the block diagram, timing diagrams, and the schematic diagrams also in the pull-out pages at the rear of this manual, along with this discussion, for a complete understanding of the operation of the Interface Plug-In. See the front panel and rear interface connector assignment page in the pull-out pages for the connector assignments. For the front panel connector assignments, both the mnemonic and signal names are given. If the mnemonic name is true when the named signal is in the low state, it is shown with a bar over the name. Unless otherwise noted, the high level is referred to as the one state.

General

The Interface Plug-In circuitry can be considered as eight blocks or groups. A brief summary of each group follows.

The power-up clearing circuitry prepares the Plug-In to receive an address from the calculator on power-up.

The address circuitry receives and processes a BCD address from the calculator. If the address is valid, as determined in this circuitry, a command is sent to the calculator, telling it that there is a peripheral on the line, and that data in BCD format will soon follow.

As the peripherals operate at different clock frequencies, the Interface clock circuitry provides internal time control for the data acquisition circuit.

The data acquisition circuitry receives the digital and decimal location data from the peripherals. This circuitry arranges the data in the proper order for transmission to the calculator. The data is then stored in the latches and released upon command from the calculator.

The data transfer circuitry transmits the digital data stored in the latches to the calculator.

The decimal point circuitry (with respect to DC units) provides binary decimal location data from decimal location data for storage in the latches. Decimal location (with respect to DM units) is determined by an internal counter synchronized with the DM clock and enabled by the peripheral when the decimal location is reached during a data scanning or latching process.

The polarity indicating circuitry transmits the sign information, positive or negative, to the calculator during the proper time slot.

The power supply circuitry provides +5 Vdc, derived from +11.5 Vdc, for operation of the logic circuitry.

Power-Up Clearing Circuitry

U35A is a D flip-flop used for reset purposes at power up. When power is applied, and the unit has not been addressed by the calculator, U35A, pin 6, is high. This connects to NOR gate U36A, pin 2. U36A inverts the high. This pulse resets flip-flops U27A, U27B, U32A and U32B; the Plug-In is now ready to receive an address from the calculator.

Address Circuitry

Three calculator key strokes address this unit: A REMOTE key and two digits. The units digit is pre-defined, and the tens digit is selected by a jumper. The address signals from the calculator, in BCD format (positive logic), pass through the respective gates, U17 and U38, and their associated inverters. TENS DIGIT ADDRESS BIT (TD) 1, 2, 4 and 8 are the tens digit address input lines. UNITS DIGIT ADDRESS BIT (UD) 1, 2, 4 and 8 are the units digit address lines. The digit addresses pass to U23 (units) and U37 (tens). These are BCD four-line to ten-line (BCD to Decimal) decoders. They decode the digit address from a four-bit BCD character to a single-line decimal code. A low on pin 2 of U23 addresses the left compartment of the Power Module and pin 3 addresses the middle compartment. A low on pin 4 causes a low at the front panel TRIG OUT jack, and pin 5 causes a low at the rear panel BNC connector. These actions occur on the pulse ADDRESS VALID STROBE (\overline{AVS}), which is calculator asserted at times T9 to T15. See the timing diagrams at the rear of this manual.

Theory of Operation—153 Interface

For discussion, assume an address to the left compartment (REMOTE 21). The one (low) passes through the inverter U29C at pin 5 to the D input, pin 2, on flip-flop U33A. This address also places a high on the D input (pin 2) of U35A. Both D flip-flops now have highs on their D inputs.

\overline{AVS} from the calculator passes through the gate in U17F and transfers the highs on the D inputs to the Q outputs (pins 5 of U33A and U35A) on a low to high transition. The high on pin 5 of U35A is inverted by gate U15B and C. This causes $\overline{CALCULATOR\ RECEIVE}$ (\overline{CRCV}) and $\overline{ADDRESS\ COMPARE}$ (\overline{AC}) to go low. These signals inform the calculator that a properly addressed peripheral is on line, and that data will follow. The above action also causes the outputs of U14B and U15D to go low. These outputs stay low until \overline{FXTTP} is asserted. This action prevents transfer of new data into the latches in the peripherals and eliminates data updating during the period of data capture by the Interface Plug-In. The high on pin 5 of U33A indicates that data will be acquired from compartment A. With any other address (REMOTE 22, 23 or 24) pin 5 of U33A remains low.

The calculator stays in the busy mode until $\overline{FIXED\ POINT\ DATA}$ (\overline{FXTTP}) is asserted. \overline{FXTTP} tells the calculator that data has been acquired from the peripheral. It is the last function in the data acquisition cycle before data transmission to the calculator. When troubleshooting this unit, look for difficulties in the Interface Plug-In or the peripheral is on line, and that data will follow. If an empty Power Module compartment is addressed, the calculator will stay in the busy mode. This may be cleared by momentarily removing power from the Power Module.

System Clock

U22A and U32A and B compose the system clock. Because the DM and DC units, as well as the calculator, operate at different clock frequencies, it is necessary to provide an internal time control for the Plug-In. At the time \overline{CRCV} and \overline{AC} assert, U35A pin 1, and U35B pin 9 switch to the high state. Pin 9 connects to pin 2 of U22A. A high on pin 2 of U22A enables this NAND gate. U22A is now ready to receive clock pulses from the peripheral in compartment A.

Clock pulses from the peripherals pass through a two-line to one-line controlled multiplexer, U10. Pins 2, 5, 14 and 11 are inputs from the A compartment; pins 3, 6, 13 and 10 are from the B compartment. Clock pulses from either compartment output at pin 4. Pin 7 is the Least Significant Digit, LSD, (DM) or Time Slot Zero, TSO, (DC), depending on whether a DM or DC unit is interfaced. The LSD and TSO pulses occur at the beginning of the data transfer cycle. Pin 12 of U10 provides the sign information, and pin 9 is the enable decimal (ED).

Negative-going clock pulses appear at pin 1 of U22A. As discussed previously, U22A was enabled at \overline{AC} and \overline{CRCV} with a high on pin 2. The clock pulses are inverted by U22A, whose output is connected to pin 1 of U32A.

Prior to the occurrence of the clock pulse from the peripheral, at pin 1 of U32A, both flip-flops cleared on power-up. Pins 8 and 13 (\overline{Q}) are in the high state. The high on pin 8 is connected to pin 14. The negative-going transition of a clock pulse transfers the high on pin 14 to pin 12. Pin 13 goes low. This is the $\overline{LOAD\ A}$ pulse.

The next clock pulse causes a transition from high to low on pin 5 of U32B. This causes pin 8 (\overline{Q}) to go low. Pin 9 of U32B (LOAD DATA) goes high. Pin 2 of U27A also goes high, enabling this D flip-flop. The low on pin 8 transfers to pin 14. This action latches input flip-flop U32A, so that no further transitions can take place until U32 is reset. U32 is reset through U35A, pin 6, after \overline{FXTTP} is asserted. \overline{FXTTP} removes the address from the calculator to the Plug-In address lines.

Data Acquisition

The $\overline{LOAD\ A}$ pulse transfers to pin 11 of U26, an up-down counter. The $\overline{LOAD\ A}$ pulse also goes to pins 1 and 13 of U1, U11, U12 and U13, clearing these latches of any previous data, and readying them to receive valid data.

When the Least Significant Digit (LSD) positive-going pulse from a DC peripheral, or the Time Slot Zero (TSO) pulse from a DM peripheral, arrives at pin 3 of U27A, the LOAD DATA pulse on pin 2 transfers to pin 5. This causes a high on pin 1 of U28A. U28A was enabled with a high on pin 13, through the action of U27B (pin 8). Clock pulses from the peripheral are inverted by U29B to pass through NAND gate U28A (previously enabled with highs on pins 1 and 13). These clock pulses appear as negative-going pulses on pin 12 of U28A.

For a REMOTE 21 command, U34B (pin 4) is enabled (high). The peripheral clock pulses pass through U34B, are inverted and sent to the square pin connectors. These connectors are set to determine whether U26 counts up or down. If a DM unit is in the A compartment, pin 6 of U34B connects to pin 5 of U26. U26 counts up since the least significant digit in the DM is displayed first. If a DC unit is in the B compartment, pin 3 of U34A connects to pin 4 of U26, because the DC unit displays the most significant digit first. If the units in both compartments are the same type, gates U34A and B are bypassed. The clock pulses are applied to the correct terminal (DM up, DC down) of U26 directly from pin 12 of U28A.

U31, a two-input multiplexer, sets the starting count for U26. When pin 1 of U31 is low, as in REMOTE 21, the logic levels on pins 2, 5, 14 and 11 determine the starting count. With pin 1 high, the levels on pins 3, 6, 13 and 10 determine the starting count. This starting count is selected by jumpers, and depends on whether the peripheral counts the most significant or the least significant digit first.

The output from U26, at the start of the count, is sent to U20, a four-line binary to ten-line decimal decoder. If U26 is counting up, the first count causes $\overline{E2}$ pin 3 to go true (low). (The counter is set with $\overline{E1}$ pin 2 low.) The second count causes $\overline{E3}$ to go low, and so on until the count reaches the highest character contained by the peripheral. For example, the DM 501 has five characters. $\overline{E6}$, pin 7 is strapped to A, pin 1 of U29A. If the DM was in the center or B compartment, the strap would go to pin 9 of U34C.

When $\overline{E6}$ is reached in the counting cycle, pin 1 of U29A goes low. U34D was enabled by a high on pin 13. The high at pin 12 passes through U34C and triggers U27B, causing pin 8 to go low. This low disables U28A, preventing further peripheral clock pulses from entering the data acquisition control circuitry. This low also enables U14C at pin 8.

Each of the $\overline{E1}$ through $\overline{E8}$ outputs are also enabling inputs to one of the dual four bit latches U1, U11, U12 and U13. Each \overline{E} signal is a signal which, when low, places the BCD input information in the latches. The \overline{E} signals from U20 are used to determine which latch the particular data is loaded in. To allow for any problems due to time delays through the circuitry, the latches are also enabled with a 300 ns low pulse, generated by U21, pin 9.

U9 serves as a data multiplexer. U9 selects the compartment from which data is acquired. For compartment A pins 2, 5, 14 and 11 are used. Pins 3, 6, 13 and 10 are used for compartment B.

Assuming data is now in the latches, pin 8 of U27B is low. The low is transmitted to pin 8 of U14C. A low also exists on pin 9 of U14C. Pin 10 of U14C goes high. There are two highs on U15A, causing $\overline{FXT\overline{P}}$ to go low. This signal tells the calculator that data is in the Interface Plug-In latches, and is ready to be sent to the calculator.

Data Transfer

A command $\overline{DATA\ WORD}$ (\overline{DW}) is sent by the calculator to pin 13 of U38E from calculator time T0 to T15. See Table 4-1. U38E inverts \overline{DW} to a high signal. The command passes through enabled gate U22C, resets U35B, enables U14C and is inverted by U8B to a high signal. Gates U6A, B, C and D are now enabled from pin 4 of U8B. These gates are connected to the calculator input bus.

Data transfers from the latches to the calculator via the sixteen-line to one-line multiplexers, U2, U3, U4 and U5. The inputs are multiplexed in character-serial format to the outputs under the control of counter U7. $\overline{EXTERNAL\ CLOCK\ PHASE\ 2}$ ($\overline{ECP2}$) starts and steps counter U7 whose output, is in binary format. \overline{DW} stops the count at the time T15 by disabling NAND gate U14D. $\overline{EXTERNAL\ SYNC}$ (\overline{ESYNC}) resets U7 to zero.

TABLE 4-1
Data Transfer Format

TIME	FUNCTION	CONNECTIONS TO U2, U3, U4, U5
T0	Status Bits DI01 = 0 (High), positive exponent DI02 = 0 (High), ordinary notation DI04 = 0 (High), positive mantissa DI04 = 1 (Low), negative mantissa DI08 = 1 (Low), decimal point displayed	Hard wired, low, U5 pin 8 Hard wired, low U4 pin 8 U3, low, pin 8 U3, high, pin 8 Hard wired, high, U2 pin 8
T1	Defines the decimal point location in the display, zero through six. Position zero is the right-most position in the display. Position six is the left-most position in the display.	Pins 7
T2	Not used	Hard wired, low, pins 6
T3	Not used	Hard wired, low, pins 5
T4	Not used	Hard wired, low, pins 4
T5	Not used	Hard wired, low, pins 3
T6	LSD of display in BCD	Pins 2
T7 through T12	Display digits in BCD	Pins 1, 23, 22, 21, 20, 19
T13 through T15	Not used	Hard wired, low, pins 18, 17, 16

T0 is the start of a calculator word. T time is the interval from the leading edge of ECP2 to the next ECP2. See the TEKTRONIX 21/31 Calculator Interfacing Information Manual for more information.

Theory of Operation—153 Interface

Decimal Point Circuitry

Data indicating decimal point location is presented to the Interface Plug-In in two formats. The DC format places the exact location, with a low signal, on the inputs of U18 (B compartment) or U25 (A compartment). When pin 3 is low, the decimal is located to the left of the least significant digit in the display. Placing lows on pins 2, 1, 13, 12 and 11, in this order, moves the decimal point in the display one place to the left. This decimal information is encoded in binary form; pin 9 is the least significant bit and pin 6 is the most significant bit. See Table 4-2. These data are transferred to the two line to one line multiplexer, U19.

U19 selects the compartment from which the decimal information is taken. A low on pin 1 selects decimal location data from U25. The binary decimal location code is now present at the input to latch U1. When \overline{ED} goes low, the decimal location data is placed in the latches in the same manner as the digital data. In the case of a DC peripheral, \overline{ED} is moved low by the action of U28B and C through U25 and U18.

Zero decimal location has a slightly different logic format. All inputs to U18 and U25 are high, causing their outputs to be low. This causes lows on the outputs of U28B and C. These are three input NAND gates. The lows at the outputs of U28 prevent \overline{ED} from going low, thus inhibiting the decimal display.

For the DM case, the counter U26 provides a binary count, synchronous with the DM clock, used primarily to enable the latches, as previously described. This binary count is also applied to the input of U19. When the count reaches the location of the decimal point, \overline{ED} is pulled low by the peripheral and the decimal point location, in binary format, is transferred to the calculator.

TABLE 4-2

Truth Table for DC Decimal Decoders U18 and U25

DC DECIMAL POSITION	INPUT (Pins)						OUTPUTS (Pins)		
	3	2	1	13	12	11	6	7	9
0	H	H	H	H	H	H	H	H	H
1	L	X	X	X	X	X	L	L	H
2	H	L	X	X	X	X	L	H	L
3	H	H	L	X	X	X	L	H	H
4	H	H	H	L	X	X	H	L	L
5	H	H	H	H	L	X	H	L	H
6	H	H	H	H	H	L	H	H	L

Zero decimal position is the right-most position in the display. Position six is the left-most position in the display. Zero decimal logic is a special case. See text. L = low logic level. H = high logic level. X = irrelevant.

Polarity Indication

The polarity of the calculator display, when interfaced with a DC unit, is always positive. This is determined by a low (hard-wired at the patch connector on the rear of the Power Module) on pins 14 (A compartment) and 13 (B compartment) of U10. Output from U10 for these pins is pin 12. In the DM case, the peripheral controls the polarity indication. The user may also cause a positive notation in any case by connecting the appropriate jumper to ground.

Power Supply

U30 is the power supply regulator integrated circuit. This integrated circuit supplies +5 Vdc to the Plug-In from 11.5 Vdc supplied by the Power Module. R22 sets the level of the +5 V. Current to the Power Module circuitry flows through the pnp series pass transistor in the main frame. U30 controls the conduction of the series pass transistor and consequently, the level of the +5 V. If the load on the +5 V increases, pin 11 of U30 goes more negative. This increases current through the series pass transistor and restores the voltage to the preset level. If the current through R28 exceeds about 2 A, the resulting voltage drop causes pin 11 of U30 to move in the positive direction. This limits available current, to the Plug-In circuitry, to a safe level.

Q32, VR30 and F10 provide overvoltage protection for the logic circuitry. Should the +5 V exceed about 6.5 V, the zener diode, VR30 conducts causing sufficient voltage drop across R30 to trigger Q32. This action shorts the +5 V supply to ground and opens the fuse.

SERVICE INFORMATION

SYMBOLS AND REFERENCE DESIGNATORS

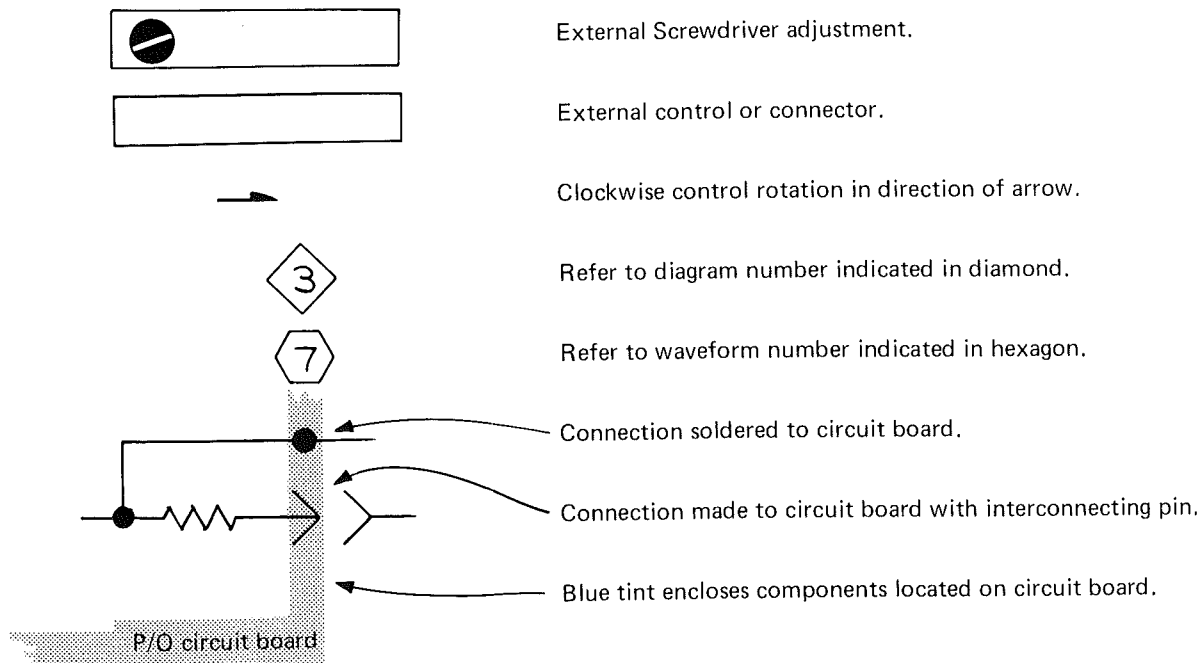
Electrical components shown on the diagrams are in the following units unless noted otherwise:

- Capacitors = Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μ F).
- Resistors = Ohms (Ω)

Symbols used on the diagrams are based on ANSI Y32.2 — 1970.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



ELECTRICAL REPLACEABLE PARTS LIST

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

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

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

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

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	SEP	SEPARATELY
FXD	FIXED	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY, STATE, ZIP
01121	Allen-Bradley Co.	1201 2nd St. South	Milwaukee, WI 53204
01295	Texas Instruments, Inc., Components Group	P.O. Box 5012	Dallas, Texas 75222
04713	Motorola, Inc., Semiconductor Products Div.	5005 E. McDowell Road	Phoenix, AZ 85008
07263	Fairchild Semiconductor, A Div. of Fairchild Camera and Instrument Corp.	464 Ellis St.	Mountain View, CA 94040
27014	National Semi-Conductor Corp.	2900 San Ysidro Way	Santa Clara, CA 95051
28480	Hewlett-Packard Co., Corporate Hq.	1501 Page Mill Road	Palo Alto, CA 94304
56289	Sprague Electric Co.		North Adams, MA 01247
71400	Bussman Mfg., Division of McGraw Edison Company	2536 W. University St.	St. Louis, MO 63107
72982	Erie Technological Products, Inc.	644 W. 12th St.	Erie, PA 16512
80009	Tektronix, Inc.	P.O. Box 500	Beaverton, Oregon 97005
80294	Bourns, Inc., Instrument Div.	6135 Magnolia Avenue	Riverside, CA 92506
81483	International Rectifier Corp.	9220 Sunset Blvd.	Los Angeles, CA 90069
91637	Dale Electronics, Inc.	P.O. Box 609	Columbus, NB 68601

Electrical Parts List—153 Interface

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-2750-00		CKT BOARD ASSY:POWER SUPPLY	80009	670-2750-00
C2	283-0022-00		CAP.,FXD,CER DI,1400VDC-AC	91418	TYPEU-02GMV1400V
C10	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C12	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C14	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C20	290-0520-00		CAP.,FXD,ELCTL:4500 UF, +100%-0%,40VDC	56289	68K10474
C22	290-0520-00		CAP.,FXD,ELCTL:4500 UF, +100%-0%,40VDC	56289	68D10474
C30	283-0002-00		CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C32	283-0002-00		CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C35	290-0321-00		CAP.,FXD,ELCTL:11000UF,+100-10%,15V	90201	FPC20-24012
C40	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C42	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C44	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
CR10	152-0488-00		SEMICONV DEVICE:SILICON,200V,1500MA	14936	KBP-02-8
CR30	152-0198-02		SEMICONV DEVICE DI:SILICON,200 V,3A	14099	3SM2
CR32	152-0198-02		SEMICONV DEVICE DI:SILICON,200 V,3A	14099	3SM2
F2	159-0003-00		FUSE CARTRIDGE:1.6A,250 V SLOW-BLOW	71400	MDX16-10
J10	131-1078-00		CONNECTOR,RCPT:28/56 CONTACTS	95238	K600-11-56VAMCD
J20	131-1078-00		CONNECTOR,RCPT:28/56 CONTACTS	95238	K600-11-56VAMCD
J30	131-1078-00		CONNECTOR,RCPT:28/56 CONTACTS	95238	K600-11-56VAMCD
Q10	151-0373-00		TRANSISTOR:SILICON,PNP	04713	SJE925
Q12	151-0349-00		TRANSISTOR:SILICON,NPN SEL FROM MJE2801	80009	151-0349-00
Q20	151-0373-00		TRANSISTOR:SILICON,PNP	04713	SJE925
Q22	151-0349-00		TRANSISTOR:SILICON,NPN SEL FROM MJE2801	80009	151-0349-00
Q30	151-0373-00		TRANSISTOR:SILICON,PNP TO-127, MJE2901	04713	SJE925
Q32	151-0349-00		TRANSISTOR:SILICON,NPN SEL FROM MJE2801	80009	151-0349-00
R2	308-0704-00		RES.,FXD,WW:8.8K OHM, 5%, 5 W	91637	RS-5
R20	301-0202-00		RES.,FXD,COMP:2K OHM,5%,0.50W	01121	EB2025
R22	301-0202-00		RES.,FXD,COMP:2K OHM,5%,0.50W	01121	EB2025
R30	302-0102-00		RES.,FXD,COMP:1K OHM,10%,0.50W	01121	EB1021
R35	315-0511-00		RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
S2	260-1222-00		SWITCH,PUSH-PUL:10A,250VAC	91929	2DM301
S3	260-0551-00		SW,THERMOSTATIC,NC,OPEN 86.1 DEG,CL 73.9 DEG	81439	SE11S639
S4	260-0551-00		SW,THERMOSTATIC,NC,OPEN 86.1 DEG,CL 73.9 DEG	81439	SE11S639
T1	120-0793-00		XFMR,PWR,STPDN:50-400 HZ	80009	120-0793-00

Electrical Parts List—153 Interface

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A2	670-3802-00			CKT BOARD ASSY:PROTECTION	80009	670-3802-00
F10	159-0021-00			FUSE, CARTRIDGE:3AG, 2A, 250V, FAST-BLOW	71400	AGC2
Q32	151-0515-01			THYRISTOR:50V, 8A	04713	2N4441
R30	316-0102-00			RES., FXD, COMP:1K OHM, 10%, 0.25W	01121	CB1021
VR30	152-0166-00			SEMICONV DEVICE:ZENER, 0.4W, 6.2V, 5%	81483	69-9035
A3	670-3237-00			CKT BOARD ASSY:DIGITAL TRANSLATOR	80009	670-3237-00
C1	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C2	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C3	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C4	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C7	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C9	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C10	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C11	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C12	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C13	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C14	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C18	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C25	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C26	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C29	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C30	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C31	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C32	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C38	283-0010-00			CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
DS35	150-1001-00			LAMP, LED:RED, 2V, 100MA	28480	5082-4403
R10	315-0102-00			RES., FXD, COMP:1K OHM, 5%, 0.25W	01121	CB1025
R12	315-0102-00			RES., FXD, COMP:1K OHM, 5%, 0.25W	01121	CB1025
R14	315-0102-00			RES., FXD, COMP:1K OHM, 5%, 0.25W	01121	CB1025
R15	315-0102-00			RES., FXD, COMP:1K OHM, 5%, 0.25W	01121	CB1025
R16	315-0102-00			RES., FXD, COMP:1K OHM, 5%, 0.25W	01121	CB1025
R18	315-0303-00			RES., FXD, COMP:30K OHM, 5%, 0.25W	01121	CB3035
R20	315-0751-00			RES., FXD, COMP:750 OHM, 5%, 0.25W	01121	CB7515
R22	311-1261-00			RES., VAR, NONWIR:500 OHM, 10%, 0.50W	80294	3329P-L58-501
R24	315-0222-00			RES., FXD, COMP:2.2K OHM, 5%, 0.25W	01121	CB2225
R26	315-0620-00			RES., FXD, COMP:62 OHM, 5%, 0.25W	01121	CB6205
R28	308-0244-00			RES., FXD, WW:30 OHM, 10%, 2W	91637	RS2B162ER3000K
R35	315-0101-00			RES., FXD, COMP:100 OHM, 5%, 0.25W	01121	CB1015
U1	156-0220-00			MICROCIRCUIT, DI:DUAL 4-BIT LATCH	07263	U6N93L0859X
U2	156-0299-00			MICROCIRCUIT, DI:16 BIT DATA SEL	01295	SN74150N
U3	156-0299-00			MICROCIRCUIT, DI:16 BIT DATA SEL	01295	SN74150N
U4	156-0299-00			MICROCIRCUIT, DI:16 BIT DATA SEL	01295	SN74150N
U5	156-0299-00			MICROCIRCUIT, DI:16 BIT DATA SEL	01295	SN74150N
U6	156-0045-00			MICROCIRCUIT, DI:QUAD 2-INPUT POS NAND BFR	01295	SN7438N
U7	156-0017-00			MICROCIRCUIT, DI:SINGLE 4-BIT BIN COUNTER	01295	SN74161N
U8	156-0385-00			MICROCIRCUIT, DI:HEX INVERTER	01295	SN74L204N
U9	156-0488-00			MICROCIRCUIT, DI:QUAD 2-LINE TO 1-LINE DATA MUX	07263	93L22PC
U10	156-0488-00			MICROCIRCUIT, DI:QUAD 2-LINE TO 1-LINE DATA MUX	07263	93L22PC
U11	156-0220-00			MICROCIRCUIT, DI:DUAL 4-BIT LATCH	07263	U6N93L0859X
U12	156-0220-00			MICROCIRCUIT, DI:DUAL 4-BIT LATCH	07263	U6N93L0859X

Electrical Parts List—153 Interface

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U13	156-0220-00			MICROCIRCUIT,DI:DUAL 4-BIT LATCH	07236	U6N9310859X
U14	156-0383-00			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	01295	SN746502N
U15	156-0045-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NAND BUFFER	01295	SN7438N
U16	156-0385-00			MICROCIRCUIT,DI:HEX INVERTER	01299	SN74LS04N
U17	156-0455-00			MICROCIRCUIT,DI:HEX BUS VEC	27014	DM8837N
U18	156-0347-00			MICROCIRCUIT,DI:10-LINE TO 4-LINE ENCODER	01295	SN74147N
U19	156-0488-00			MICROCIRCUIT,DI:QUAD 2 TO 1-LINE DATA MUX	07263	93222PC
U20	156-0490-00			MICROCIRCUIT,DI:BCD TO DECIMAL DECODER MV	27014	DM74L42AN
U21	156-0487-00			MICROCIRCUIT,LI:DUAL RETRIG MONOSTABLE	07263	96L02PC
U22	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74LS00N
U23	156-0490-00			MICROCIRCUIT,DI:BCD TO DECIMAL DECODER	27014	DM74L42AN
U24	156-0385-00			MICROCIRCUIT,DI:HEX INVERTER	01299	SN74LS04N
U25	156-0347-00			MICROCIRCUIT,DI:10-LINE TO 4-LINE ENCODER	01295	SN74147N
U26	156-0245-00			MICROCIRCUIT,DI:DECADE CNTR W/UP DOWN CLK	01295	SN74L192N
U27	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	01295	SN74LS74N
U28	156-0386-00			MICROCIRCUIT,DI:TRIPLE 3-INPUT NAND GATE	01295	SN74LS10N
U29	156-0385-00			MICROCIRCUIT,DI:HEX INVERTER	01295	SN74LS04N
U30	156-0071-00			MICROCIRCUIT,DI:VOLTAGE REGULATOR	07263	U6E7723393
U31	156-0488-00			MICROCIRCUIT,DI:QUAD 2 TO 1-LINE DATA MUX	07263	93L22PC
U32	156-0387-00			MICROCIRCUIT,DI:DUAL J-K NEG EDGE TRIG FF	01295	SN74L573N
U33	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	01295	SN7474N
U34	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74LS00N
U35	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	01295	SN74LS74N
U36	156-0383-00			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	01295	SN74LS02N
U37	156-0490-00			MICROCIRCUIT,DI:BCD TO DECIMAL DECODER	27014	DN74L42AN
U38	156-0455-00			MICROCIRCUIT,DI:HEX BUS VEC	27014	DM8837N



MECHANICAL REPLACEABLE PARTS LIST

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

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

Change information, if any, is located at the rear of this manual.

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.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5           Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
    --- * ---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
    --- * ---
Parts of Detail Part
Attaching parts for Parts of Detail Part
    --- * ---
  
```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items 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 the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

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

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR. CODE	MANUFACTURER	ADDRESS	CITY, STATE, ZIP
00779	AMP, Inc.	P. O. Box 3608	Harrisburg, PA 17105
06928	Teledyne Kinetics	410 S. Cedros Avenue	Solana Beach, CA 92075
12136	Philadelphia Handle Co., Inc.	1643 Haddon Ave.	Camden, NJ 08103
22526	Berg Electronics, Inc.	Youk Expressway	New Cumberland, PA 17070
24931	Specialty Connector Co., Inc.	3560 Madison Ave.	Indianapolis, IN 46227
28520	Heyman Mfg. Co.	147 N. Michigan Ave.	Kenilworth, NJ 07033
45722	USM Corp., Parker-Kalon Fastener Div.	1 PeeRay Drive	Clifton, NJ 07014
46384	Penn Engineering and Mfg. Corp.	Old Easton Highway	Doylestown, PA 18901
57771	Stimpson, Edwin B., Co., Inc.	900 Sylvan Ave.	Bayport, NY 11705
70903	Belden Corp.	415 S. Kilpatrick	Chicago, IL 60644
71400	Bussman Mfg., Division of McGraw Edison Co.	2536 W. University St.	St. Louis, MO 63107
71785	TRW Electronic Components, Cinch Connector Operations	1501 Morse Ave.	Elk Grove Village, IL 60007
73743	Fischer Special Mfg. Co.	446 Morgan St.	Cincinnati, OH 45206
75915	Littelfuse, Inc.	800 E. Northwest Hwy	Des Plaines, IL 60016
78189	Illinois Tool Works, Inc. Shakeproof Division	St. Charles Road	Elgin, IL 60126
78471	Tilley Mfg. Co.	900 Industrial Rd.	San Carlos, CA 94070
78584	Stewart Stamping Corp.	630 Central Park Ave.	Yonkers, NY 10704
80009	Tektronix, Inc.	P. O. Box 500	Beaverton, OR 97005
81439	Therm-O-Disc, Inc.	Rt. 13 & Logan Rd.	Mansfield, OH 44907
83385	Central Screw Co.	2530 Crescent Dr.	Broadview, IL 60153
87308	N. L. Industries, Inc., Southern Screw Div.	P. O. Box 1360	Statesville, NC 28677
91929	Honeywell, Inc., Micro Switch Div.	Chicago & Spring Sts.	Freeport, IL 61032
95238	Continental Connector Corp.	34-63 56th St.	Woodside, NY 11377

Mechanical Parts List—153 Interface

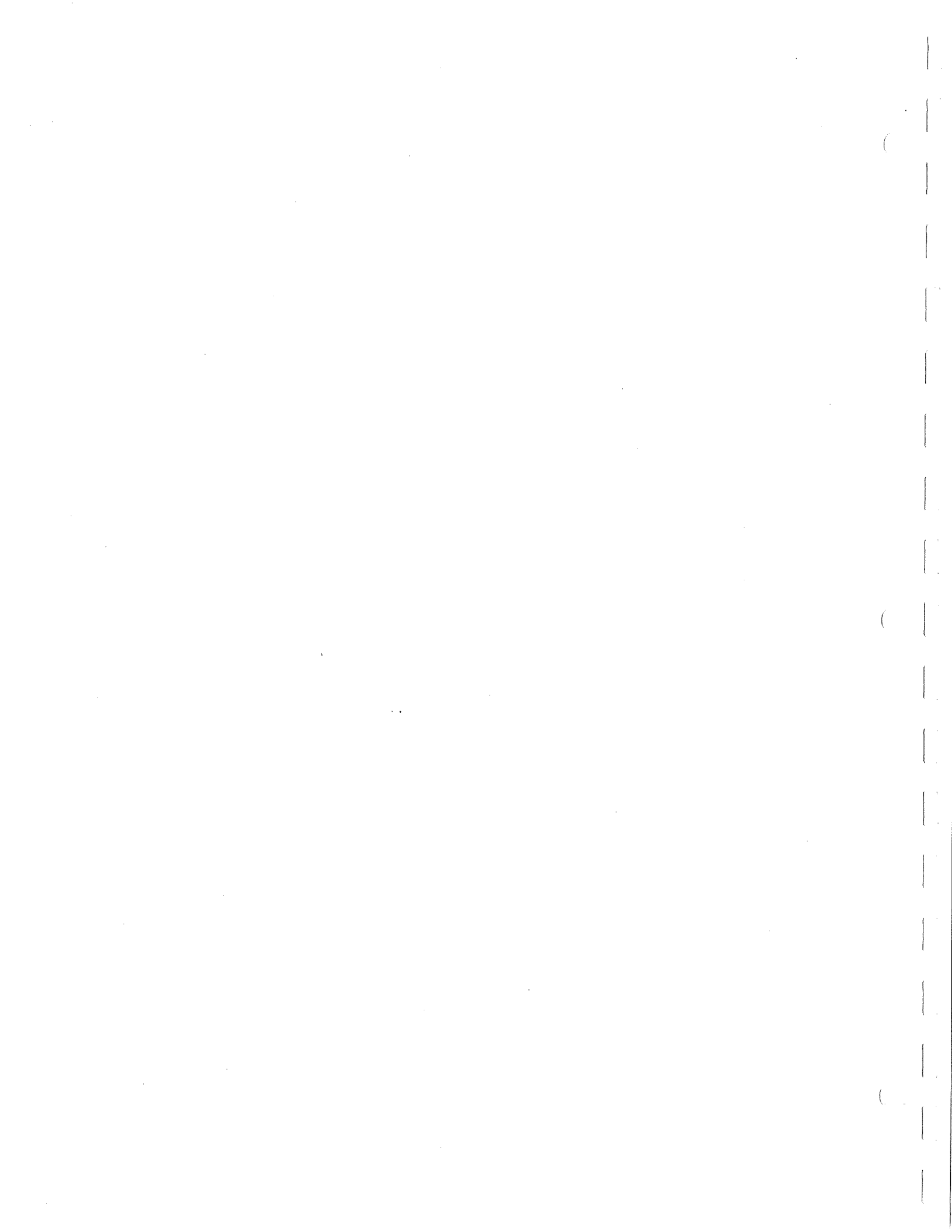
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	Name & Description					Mfr Code	Mfr Part Number
				1	2	3	4	5		
1-	620-0242-00		1	POWER SUPPLY:ASSEMBLY					80009	620-0242-00
			-	POWER SUPPLY INCLUDES:						
-1	390-0285-02		1	. CAB.,WRAPAROUND:					80009	390-0285-02
				(ATTACHING PARTS)						
-2	211-0622-00		4	. SCREW,MACHINE:6-32 X 0.188 INCH,TRH SST					83385	OBD
	212-0075-00		1	. SCREW,MACHINE:8-32 X 0.250 INCH,TRH STL					83385	OBD
				- - - * - - -						
-3	367-0171-00		1	. . . CABINET INCLUDES:						
				. . . HANDLE,CARRYING:7.5 INCH LONG,W/HARDWARE					12136	845-R-372-370
				(ATTACHING PARTS)						
-4	210-0586-00		2	. . . NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL					78189	OBD
-5	210-0958-00		2	. . . WASHER,FLAT:0.115 ID X 0.469 INCH OD,STL					78471	OBD
-6	211-0012-00		2	. . . SCREW,MACHINE:4-40 X 0.375 INCH,PNH STL					83385	OBD
				- - - * - - -						
-7	348-0073-00		2	. SPT PIVOT,FLIP:LEFT FRONT AND RIGHT REAR					80009	348-0073-00
				(ATTACHING PARTS)						
-8	210-0457-00		2	. NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL					83385	OBD
-9	211-0532-00		2	. SCREW,MACHINE:6-32 X 0.75 INCH,FLH STL					83385	OBD
				- - - * - - -						
-10	348-0208-00		2	. FOOT,CABINET:LEFT FRONT AND RIGHT REAR					80009	348-0208-00
-11	348-0074-00		2	. SPT PIVOT,FLIP:RIGHT FRONT AND LEFT REAR					80009	348-0074-00
				(ATTACHING PARTS)						
	210-0457-00		2	. NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL					83385	OBD
	211-0532-00		2	. SCREW,MACHINE:6-32 X 0.75 INCH,FLH STL					83385	OBD
				- - - * - - -						
-12	348-0207-00		2	. FOOT,CABINET:RIGHT FRONT AND LEFT REAR					80009	348-0207-00
-13	348-0275-00		1	. FLIP-STAND,CAB:5.67 X 3.75 INCH,SST					80009	348-0275-00
-14	390-0438-00		1	. CABINET,BOTTOM:POWER SUPPLY					80009	390-0438-00
				(ATTACHING PARTS)						
-15	211-0105-00		4	. SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL					83385	OBD
				- - - * - - -						
-16	384-1166-01		1	. EXTENSION SHAFT:POWER SWITCH					80009	348-1166-01
				(ATTACHING PARTS)						
-17	211-0105-00		2	. SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL					83385	OBD
				- - - * - - -						
-18	214-1790-00		1	. ACTUATOR, SWITCH:POWER					80009	214-1790-00
-19	351-0286-02		3	. GUIDE,PLUG-IN:BOTTOM					80009	351-0286-02
				(ATTACHING PARTS FOR EACH)						
-20	211-0038-00		1	. SCREW,MACHINE:4-40 X 0.312"100 DEG,FLH STL					83385	OBD
				- - - * - - -						
-21	351-0379-01		3	. GUIDE,PLUG-IN:TOP					80009	351-0379-01
				(ATTACHING PARTS FOR EACH)						
-22	211-0087-01		1	. SCREW,MACHINE:2-56 X 0.188" 82 DEG,FLH STL					83385	OBD
				- - - * - - -						
-23	-----		1	. CKT BOARD ASSY:POWER INTERFACE(SEE A1 EPL)						
				(ATTACHING PARTS)						
-24	211-0511-00		2	. SCREW,MACHINE:6-32 X 0.50 INCH PNH STL					83385	OBD
-25	220-0546-00		2	. NUT,SLEEVE:6-32 X 0.312 OD X 0.312 INCH LONG					83385	OBD
				- - - * - - -						
				. . . CKT BOARD ASSY INCLUDES:						
-26	131-1078-00		3	. . . CONNECTOR,RCPT:28/56 CONTACTS DOUBLE ROW					95238	K600-11-56VA
-27	214-1593-02		3	. . . CONNECTOR,KEY:POLARIZING					80009	214-1593-02
-28	344-0154-00		4	. . . CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE					80009	344-0154-00
-29	131-0608-00		14	. . . CONTACT,ELEC:0.365 INCH LONG					22526	47357
-30	386-1938-00		1	. . . STIF,CKT BOARD:INTERFACE BOARD					80009	386-1938-00
	131-1199-00		1	. . . LINK,TERM. CONN:					80009	131-1199-00
				LINK INCLUDES:						
-31	131-0707-00		2	. . . CONTACT,ELEC:0.48"L,22-26 AWG WIRE					22526	47439
-32	352-0166-02		1	. . . HOLDER,TERM.CON:8 WIRE RED					80009	352-0166-02
	131-1200-00		1	. . . LINK,TERM. CONN:					80009	131-1200-00
				LINK INCLUDES:						
	131-0707-00		4	. . . CONTACT,ELEC:0.48"L,22-26 AWG WIRE					22526	47439
	352-0166-01		1	. . . HOLDER,TERM.CON:8 WIRE BROWN					80009	352-0166-01

Mechanical Parts List—153 Interface

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Model No. Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-33	352-0322-00			1	.					HLDER,CAPACITOR:HORIZ MT FOR 1.375 DIA CAP (ATTACHING PARTS)	80009	352-0322-00
-34	211-0534-00			2	.					SCREW,MACHINE:6-32 X 0.75 INCH,FLH STL	83385	OBD
-35	210-0407-00			2	.					NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-36	-----			6	.					TRANSISTOR:(SEE Q10,12,20,22,30,32 EPL) (ATTACHING PARTS FOR EACH)		
-37	210-0407-00			1	.					NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-38	210-0071-00			1	.					WASHER,SPR TNSN:	80009	210-0071-00
-39	342-0136-00			6	.					INSULATOR,WSHR:0.812 OD X 0.0025 INCH THK	80009	342-0136-00
-40	214-1764-00			1	.					HEATSINK,XSTR:RIGHT	80009	214-1764-00
-41	214-1791-00			1	.					HEATSINK,XSTR:LEFT	80009	214-1791-00
-42	260-0551-00			2	.					SW,THERMOSTATIC:OPEN 861 DEG,CLOSE 73.9 DEG (ATTACHING PARTS FOR EACH)	81439	SE 1186369
-43	210-0586-00			2	.					NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
-44	211-0008-00			2	.					SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-45	334-2037-00			2	.					LABEL,INFORMATION:WARNING	80009	334-2037-00
-45	260-1222-00			1	.					SWITCH,PUSH-PUL:10A,250VAC	91929	2DM301
-46	407-1178-00			1	.					BRACKET,ANGLE:CKT BOARD SUPPORT,LEFT (ATTACHING PARTS)	80009	407-1178-00
-47	210-0570-00			2	.					NUT,CAPTIVE:	46384	CL632-1CC
-48	211-0510-00			2	.					SCREW,MACHINE:6-32 X 0.375 INCH,PNH STL	83385	OBD
-49	210-0458-00			1	.					NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
-50	212-0008-00			1	.					SCREW,MACHINE:8-32 X 0.500 INCH PNH STL	83385	OBD
-51	407-1062-00			1	.					BRACKET,ANGLE:CKT BOARD SUPPORT,RIGHT (ATTACHING PARTS)	80009	407-1062-00
-52	210-0570-00			2	.					NUT,CAPTIVE:	46384	CL632-1CC
-53	211-0510-00			2	.					SCREW,MACHINE:6-32 X 0.375 INCH,PNH STL	83385	OBD
-54	210-0458-00			1	.					NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
-55	212-0008-00			1	.					WASHER,LOCK:INTL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-0541C
-56	120-0793-00			1	.					XFMR,PWR,STPDN:50-400HZ (ATTACHING PARTS)	80009	120-0793-00
-57	220-0410-00			4	.					NUT,EXTENDED WA:10-32 X 0.375 INCH,STL	83385	OBD
-58	210-0206-00			1	.					TERMINAL,LUG:SE #10	78189	2103-10-00-2520N
-59	212-0515-00			4	.					SCREW MACHINE:10-32 X 2.250 HEX.HD STL	83385	OBD
-60	210-0010-00			4	.					WASHER,LOCK:INT:0.20 ID X 0.376 " OD,STL	78189	1201-00-00-0541C
-61	166-0227-00			4	.					INS SLV,ELEC:0.187 ID X 1.50 INCH LONG	80009	166-0227-00
-62	200-0772-02			1	.					COV,TRANSFORMER:HALF SHELL,GRAY	80009	200-0772-02
-63	348-0190-00			4	.					FOOT,CABINET:MOLD POLYURETHANE (ATTACHING PARTS FOR EACH)	80009	348-0190-00
-64	210-0458-00			1	.					NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
-65	212-0022-00			1	.					SCREW,MACHINE:8-32 X 1.500 INCH,PNH STL	87308	OBD
-66	131-0955-00			3	.					CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	24931	28JR200-1
-67	131-1404-00			1	.					CONNECTOR,BODY:104 PIN (ATTACHING PARTS)	00779	204511-1
-68	131-0890-00			2	.					CONNECTOR,LOCK:4-40 X 0.312 " L,HEX HD STL	71785	D20418-2
-69	161-0033-00			1	.					CABLE ASSY,PWR:3 WIRE 92 INCH I (ATTACHING PARTS)	70903	KH5443-290D
-70	358-0161-00			1	.					BSHG,STRAIN RLF:CHASSIS MT FOR 0.50 " HOLE	28520	SR5P4
-71	352-0076-00			1	.					FUSEHOLDER:W/HARDWARE	75915	342012
-72	210-0873-00			1	.					WASHER,NONMETAL:0.5 ID X 0.688 INCH OD	71400	OBD
-73	210-0204-00			2	.					TERMINAL,LUG:0.146 DIA LOCKING HOLE (ATTACHING PARTS)	78189	215-06-01-2520N
-74	210-0586-00			1	.					NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD

Mechanical Parts List—153 Interface

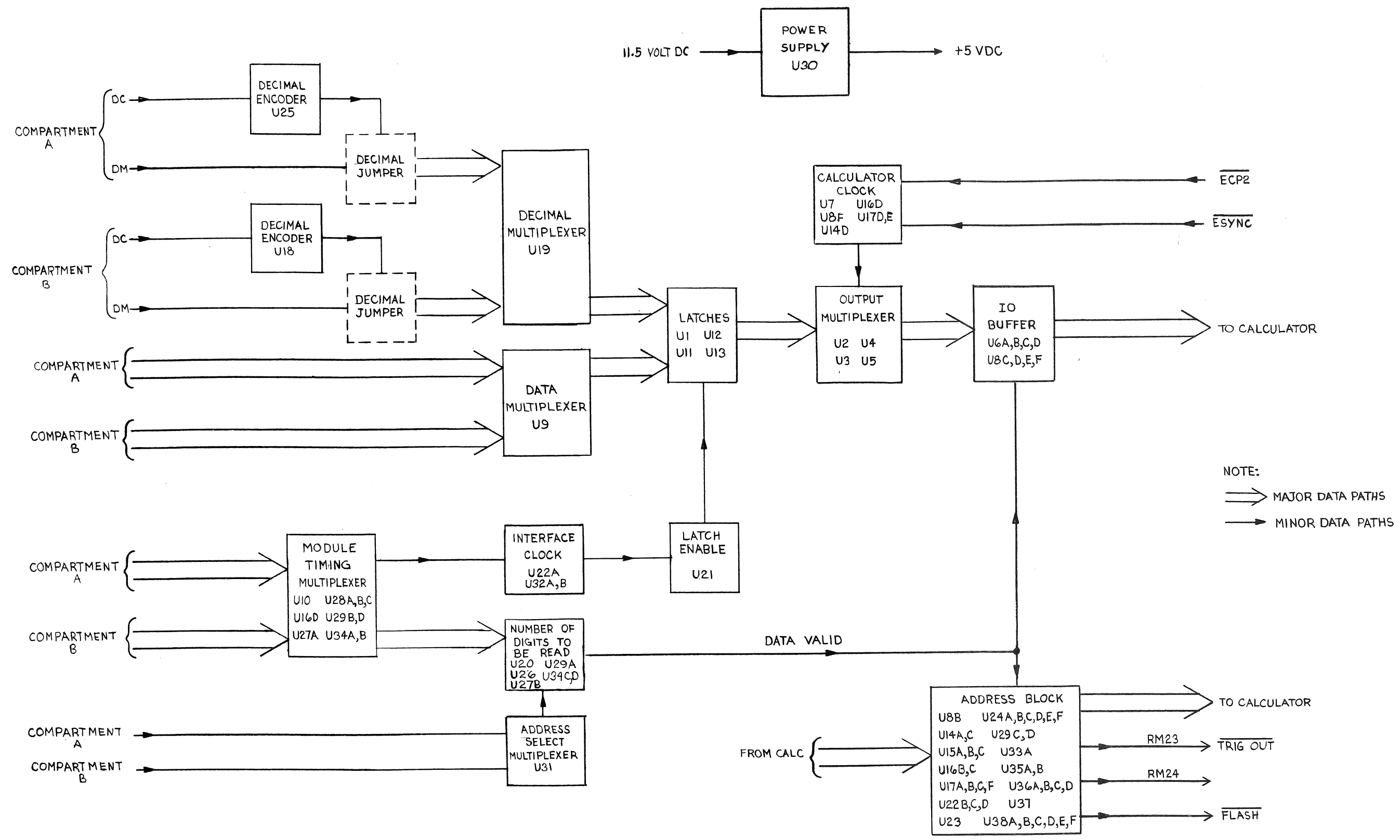
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty						Name & Description	Mfr	
				1	2	3	4	5		Code	Mfr Part Number
1-75	333-1900-00		1	.					PANEL;REAR:	80009	333-1900-00
-76	426-0919-03		1	.					FRAME SECT,CAB:POWER SUPPLY	80009	426-0919-03
	-----		-	.	.	.			FRAME ASSY INCLUDES:		
-77	131-1254-00		3	.	.	.			CONTACT,ELEC:GROUNDING	80009	131-1254-00
									(ATTACHING PARTS)		
-78	210-0617-00		3	.	.	.			EYELET,MET:0.089 OD X 0.125 " L,BRS	57771	81032-001
									-----*-----		
-79	179-2165-00		1	.					WIRING HARNESS:INTERCONNECTING	80009	179-2165-00
	-----		-	.	.	.			WIRING HARNESS INCLUDES:		
-80	131-1406-01		92	.	.	.			CONTACT,ELEC:MALE;CRP-ON 28-22 AWG	00779	204370-2



Mechanical Parts List—153 Interface

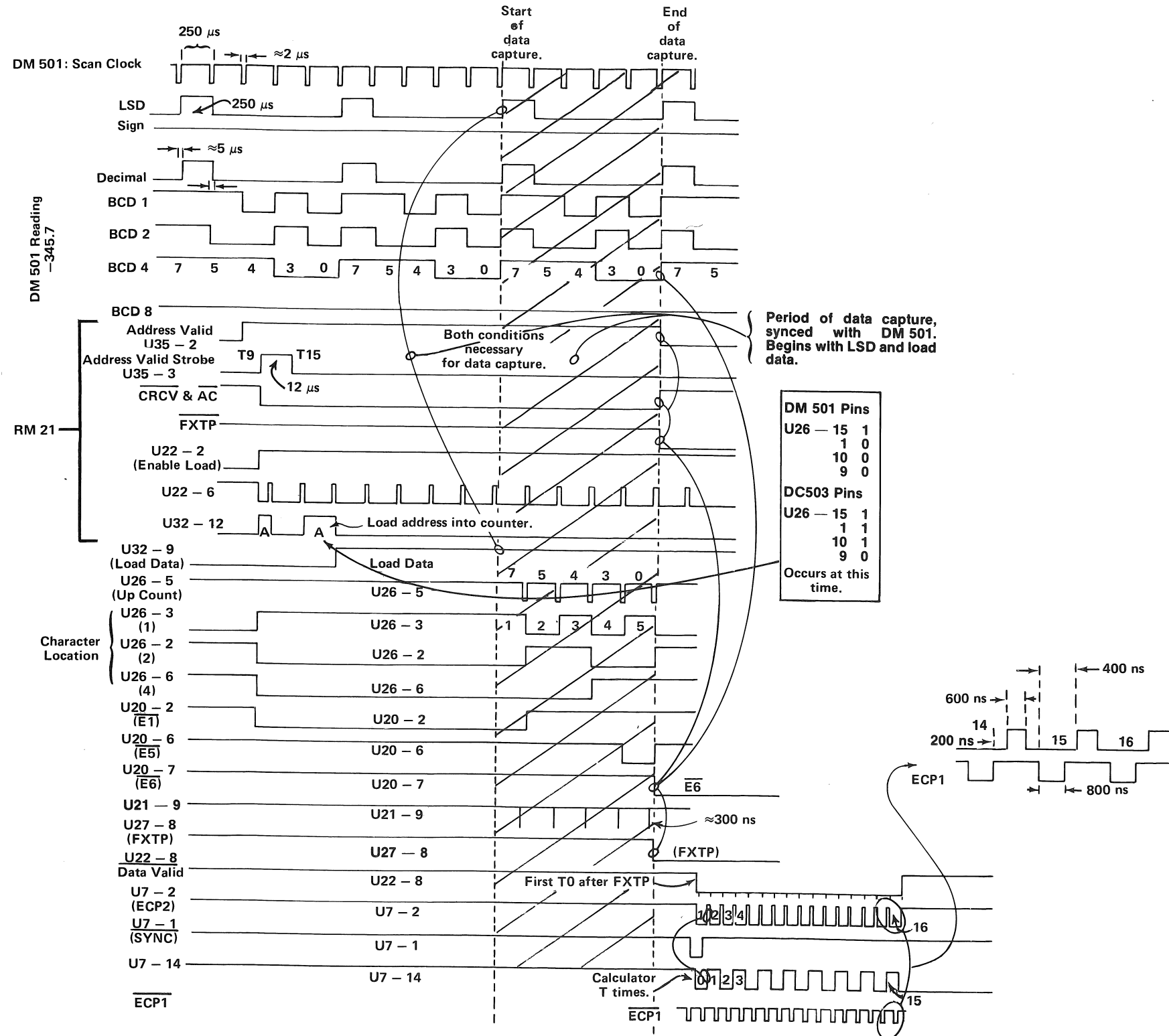
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	Name & Description					Mfr	
				1	2	3	4	5	Code	Mfr Part Number
2-	119-0664-00		1	DIGITAL TRANSLATOR:					80009	119-0664-00
	-----		-	. TRANSLATOR INCLUDES:						
-1	220-0633-00		1	. NUT,PLAIN KNURL:0.25-28 X 0.375 INCH,BRS					80009	220-0633-00
-2	355-0170-00		1	. POST,ELEC-MECH:6-32 X 0.40 INCH L,STD					80009	355-0170-00
-3	136-0140-00		2	. JACK,TIP:BANANA STYLE,CHARCOAL GRAY CAP					80009	136-0140-00
				(ATTACHING PARTS FOR EACH)						
-4	210-0583-00		1	. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS					73743	2X20319-402
-5	210-0046-00		1	. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL					78189	1214-05-00-0541C
-6	210-0269-00		11	. TERMINAL,LUG:NON LOCKING,0.257 MTG HOLE					78584	OBD
-7	210-0895-00		1	. WSHR,SHOULDERED:0.375 OD X 0.105 " THK,NYLON					80009	210-0895-00
				- - - - *						
-8	366-1422-01		1	. KNOB:LATCH					80009	366-1422-01
				(ATTACHING PARTS)						
-9	214-1840-00		1	. PIN,KNOB SECRG:					80009	214-1840-00
				- - - - *						
-10	333-1906-00		1	. PANEL,FRONT:					80009	333-1906-00
-11	-----		-	. LAMP,LED WITH HOLDER:(SEE DS35 EPL)						
-12	214-1513-01		1	. LCH,PLUG-IN RET:					80009	214-1513-01
				(ATTACHING PARTS)						
-13	213-0254-00		1	. SCR,TPG,THD CTG:2-56 X 0.25 100 DEG,FLH STL					45722	OBD
				- - - - *						
-14	386-3086-00		1	. SUBPANEL,FRONT:					80009	386-3086-00
				(ATTACHING PARTS)						
-15	213-0229-00		3	. SCR,TPG,THD FOR:6-20 X 0.375 100 DEG,FLH STL					83385	OBD
				- - - - *						
-16	670-3802-00		1	. CKT BOARD ASSY:PROTECTION(SEE A2 EPL)						
				(ATTACHING PARTS)						
-17	213-0206-00		1	. SCR,TPG,THD FOR:6-32 X 1.25 INCH,PNH STL					80009	213-0206-00
-18	166-0038-00		1	. SPACER,SLEEVE:0.250 OD X 0.750 INCH,L					80009	166-0038-00
				- - - - *						
-19	344-0154-00		2	. . . CKT BOARD ASSY INCLUDES:						
-20	-----		2	. . . CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE					80009	344-0154-00
-21	-----		1	. TRANSISTOR:(SEE Q32 EPL)						
-21	-----		1	. CKT BOARD ASSY:MAIN(SEE A3 EPL)						
				(ATTACHING PARTS)						
-22	213-0146-00		5	. SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL					83385	OBD
				- - - - *						
-23	131-0608-00		87	. . . CKT BOARD ASSY INCLUDES:						
	136-0269-00		1	. . . CONTACT,ELEC:0.365 INCH,LONG					22526	47357
-24	388-3773-00		1	. . . SOCKET,PLUG-IN:14 PIN DUAL INLINE					71785	133-59-02-073
			1	. . . CIRCUIT BOARD:LOGIC					80009	388-3773-00
				(ATTACHING PARTS)						
-25	211-0097-00		5	. . . SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL					83385	OBD
				- - - - *						
-26	131-1487-00		2	. . . CONNECTOR,RCPT:					06928	406-025
				(ATTACHING PARTS FOR EACH)						
-27	211-0097-00		2	. . . SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL					83385	OBD
				- - - - *						
-28	129-0502-00		1	. . . INSULATOR,STDF:4-40 X 0.25 OD X 0.90",L					80009	129-0502-00
				(ATTACHING PARTS)						
-29	211-0097-00		1	. . . SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL					83385	OBD
				- - - - *						
-30	214-1061-00		1	. SPRING,GROUND:FLAT					80009	214-1061-00
-31	426-1153-00		1	. FR SECT,PLUG-IN:TOP					80009	426-1153-00
-32	426-1154-00		1	. FR SECT,PLUG-IN:BOTTOM					80009	426-1154-00
-33	131-0707-00		46	. CONTACT,ELEC:0.48"L,22-26 AWG WIRE					22526	47439
-34	352-0166-00		2	. HOLDER,TERM.CON:8 WIRE BLACK					80009	352-0166-00
-35	352-0200-00		1	. HOLDER,TERM.CON:4 WIRE BLACK					80009	352-0200-00
-36	352-0198-00		11	. HOLDER,TERM CON:2 WIRE BLACK					80009	352-0298-00
-37	352-0171-00		4	. HOLDER,TERM.CON:1 WIRE BLACK					80009	352-0171-00





INTERFACE PLUG-IN BLOCK DIAGRAM

TIMING DIAGRAM DM 501-Interface-Calculator



TIMING DIAGRAM DM 501-
INTERFACE-CALCULATOR

FRONT PANEL CONNECTOR ASSIGNMENTS FOR INTERFACE PLUG-IN

FRONT VIEW TOP

SIGNAL NAME	MNEMONIC		MNEMONIC		SIGNAL NAME
	NAME	SIDE A	SIDE B	NAME	
GROUND	<u>GND</u>	1*	1*	<u>GND</u>	GROUND
STOP	<u>STOP</u>	2	2*	<u>DI04</u>	DATA INPUT OUTPUT BIT 4
SYSTEM BUSY	<u>BUSY</u>	3	3*	<u>DI08</u>	DATA INPUT OUTPUT BIT 8
DISPLAY	<u>DISP</u>	4	4*	<u>DI02</u>	DATA INPUT OUTPUT BIT 2
EXTERNAL SYNC	<u>ESYNC</u>	5*	5*	<u>DI01</u>	DATA INPUT OUTPUT BIT 1
EXTERNAL CLOCK PHASE 2	<u>ECP 2</u>	6*	6	<u>EXT16</u>	EXTERNAL BUS BIT 16
EXTERNAL CLOCK PHASE 1	<u>ECP 1</u>	7	7	<u>INHOUT</u>	INHIBIT OUT
EXTERNAL BUS BIT 32	<u>EXT32</u>	8	8	<u>STBE</u>	STROBE
CALL	<u>CALL</u>	9	9	<u>EXT8</u>	EXTERNAL BUS BIT 8
DC LOW	<u>DCLOW</u>	10	10	<u>EXT4</u>	EXTERNAL BUS BIT 4
ERROR SET	<u>ERST</u>	11*	11	<u>EXT64</u>	EXTERNAL BUS BIT 64
ERROR FLASH	<u>EROT</u>	12	12*	<u>CRCV</u>	CALCULATOR RECEIVE
TERMINATING VOLTAGE	+5 VOLTS	13*	13*	+5 VOLTS	TERMINATING VOLTAGE
POWER RESET	<u>PRRT</u>	14	14	<u>EXT1</u>	EXTERNAL BUS BIT 1
EXTERNAL BUS BIT 128	<u>EXT128</u>	15	15	<u>EXT2</u>	EXTERNAL BUS BIT 2
ADDRESS VALID STROBE	<u>AVS</u>	16*	16	<u>EXTPTR</u>	EXTERNAL PRINTER PRESENT
DIRECT MEMORY ACCESS WRITE TO CALCULATOR	<u>DMAWR</u>	17	17	<u>FLTP</u>	FLOATING POINT DATA
DIRECT MEMORY ACCESS READ FROM CALCULATOR	<u>DMARD</u>	18	18*	<u>AC</u>	ADDRESS COMPARE
FIXED POINT DATA	<u>FXTTP</u>	19*	19	<u>IHIN</u>	INHIBIT IN
UNITS DIGIT ADDRESS BIT 1	<u>UD1</u>	20*	20	<u>DMARY</u>	DIRECT MEMORY ACCESS READY
TENS DIGIT ADDRESS BIT 1	<u>TD1</u>	21*	21*	<u>UD2</u>	UNITS DIGIT BIT 2
DATA WORD	<u>DW</u>	22*	22*	<u>TD2</u>	TENS DIGIT BIT 2
TENS DIGIT ADDRESS BIT 4	<u>TD4</u>	23*	23*	<u>UD8</u>	UNITS DIGIT BIT 8
TENS DIGIT ADDRESS BIT 8	<u>TD8</u>	24*	24*	<u>UD4</u>	UNITS DIGIT BIT 4
GROUND	<u>GND</u>	25*	25*	<u>GND</u>	GROUND

Both connectors are duplicates. Only those connections marked with an asterisk (*) are used in the Interface Plug-In. See the Calculator Interfacing Information Manual for more information.

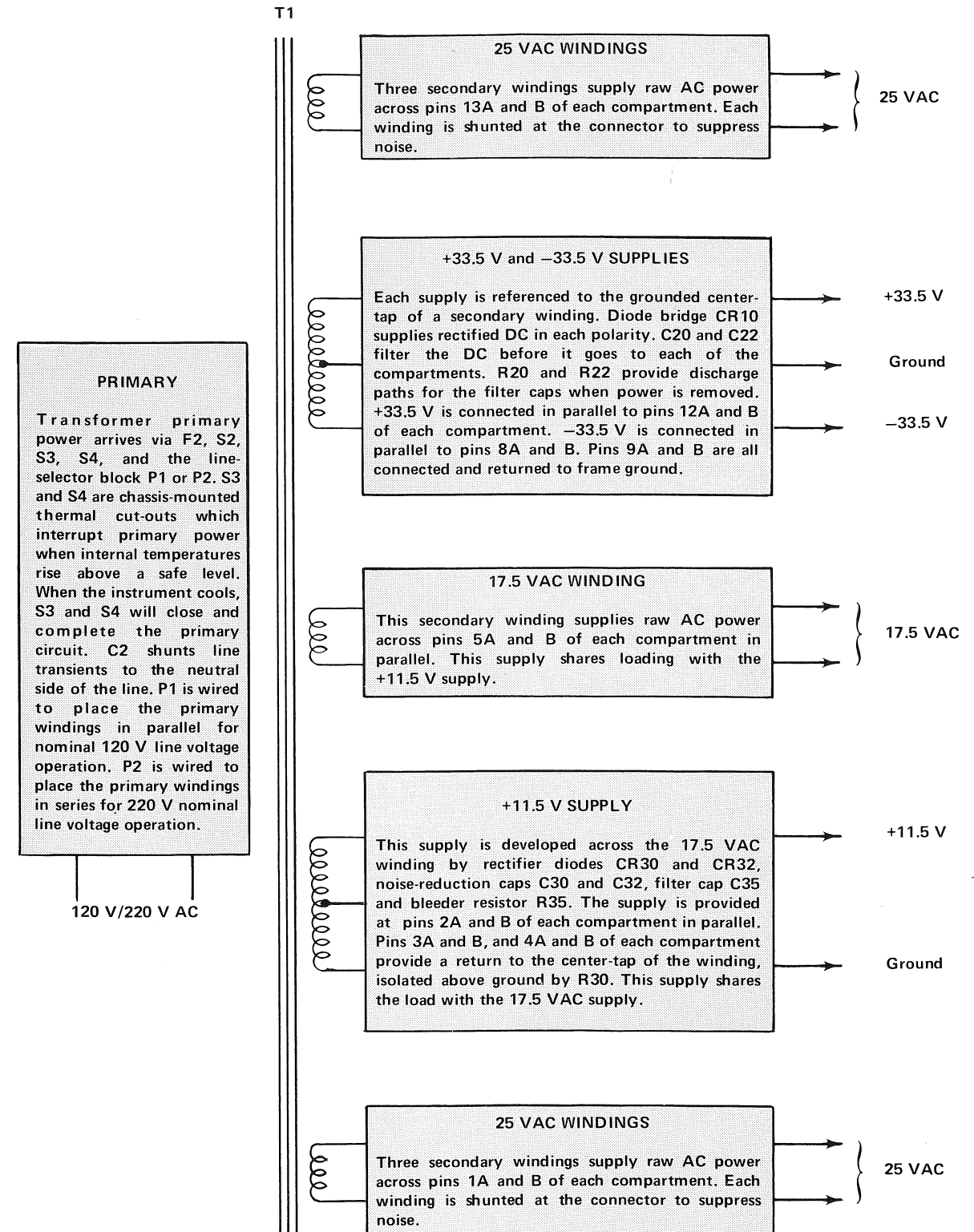
INPUT-OUTPUT ASSIGNMENTS FOR INTERFACE PLUG-IN REAR CONNECTOR

	B		A	
ENABLE DECIMAL	28		28	TRIGGER (Rear Panel)
ERST	27		27	DATA IN 4B
DATA IN 8A	26		26	DATA IN 4A
DATA IN 8B	25		25	DATA IN 2B
ENABLE DECIMAL	24		24	DATA IN 2A
Polarity B	23		23	DATA IN 1B
Polarity A	22		22	DATA IN 1A
LSD or TSO B	21		21	DC DECIMAL 6B
LSD or TSO A	20		20	DC DECIMAL 5B
CLOCK B	19		19	DC DECIMAL 4B
CLOCK A	18		18	DC DECIMAL 6A
DC DECIMAL 1B	17		17	DC DECIMAL 5A
DC DECIMAL 2B	16		16	DC DECIMAL 4A
DC DECIMAL 3B	15		15	DC DECIMAL 3A
DC DECIMAL 1A	14		14	DC DECIMAL 2A
25 Vac winding	13		13	25 Vac winding
+33.5 V filtered dc	12		12	+33.5 V filtered dc
Collector lead of PNP Series-Pass	*11		11*	Base lead of PNP Series-Pass
Transformer shield lead	10		10*	Emitter lead of PNP Series-Pass
±33.5 V common return	9		9	±33.5 V common return
-33.5 V filtered dc	8		8	-33.5 V filtered dc
DATA GOOD or DATA TRANSFER from B to C otherwise collector lead of NPN Series-Pass	*7	Power Module Barrier	7	Emitter lead of NPN Series-Pass
DATA GOOD or DATA TRANSFER from A to C otherwise no connection	*6	Slot	6	Base lead of NPN Series-Pass
17.5 Vac winding	5		5	17.5 Vac winding
+11.5 V common return	4		4	+11.5 V common return
+11.5 V common return	*3		3*	+11.5 V common return
+11.5 V filtered dc	*2		2*	+11.5 V filtered dc
25 Vac winding	1		1	25 Vac winding

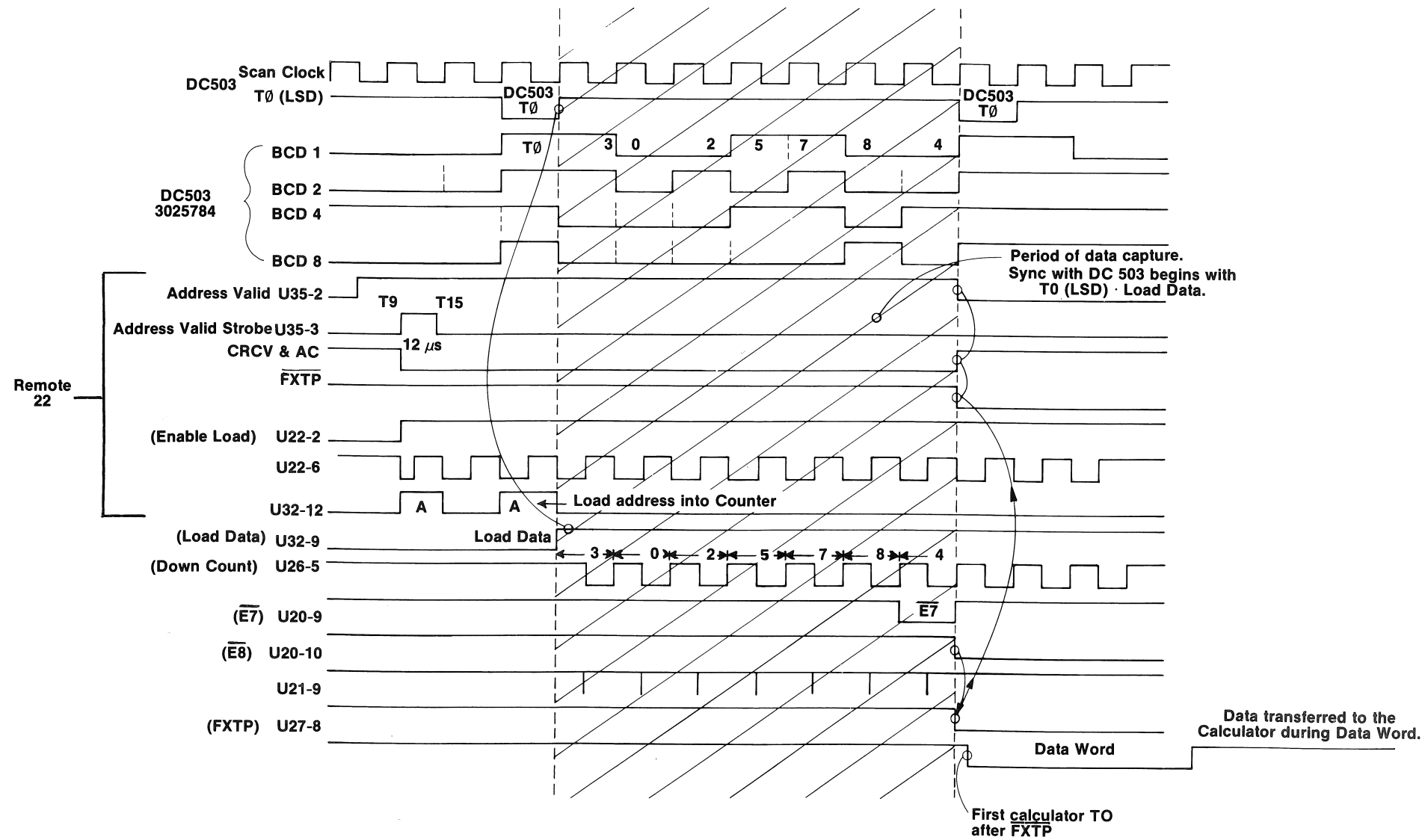
Rear-view of plug-in

Assignments listed for connections 1A-13A and 1B-13B are available in all compartments of the Power Module except as noted; however only those connections marked with an asterisk (*) are used by the Interface Plug-In. The letter A refers to the Power Module left compartment, B to the middle compartment and C to the right compartment when facing the front of the Power Module. All pins from 14 through 28 are inputs to the Interface Plug-In except 28A, 27B, 7B (data function only) and 6B which are outputs.

DETAILED BLOCK DIAGRAM



TIMING DIAGRAM DC 503-Interface-Calculator



TIMING DIAGRAM DC 503-
INTERFACE-CALCULATOR

STANDARD SYSTEM				
DM/DC				
Type # 1 Patch Connector Installed				
PN 013-0153-00				
Power Module Compartment A (J-10)		Power Module Compartment B (J-20)		Power Module Compartment C (J-30)
Patch Connector Pin No.	Digital Multimeter DM 501	Digital Counter Option 4 DC 501, DC 502, DC 503	Interface Plug-In PN 119-0664-00	Patch Connector Pin No.
59	26A SCAN CLOCK		18B $\overline{\text{CLOCK}}$ A	47
63	25A LSD		20B LSD or TSO (A)	45
20	14B POLARITY		22B POLARITY A	24
62	27B DECIMAL POINT		24B <u>ENABLE DECIMAL A</u>	26
21	19B DATA TRANSFER		6B <u>DATA TRANSFER INHIBIT</u>	88
84	19A BCD (1)		22A DATA IN 1A	2
42	21B BCD (2)		24A DATA IN 2A	4
83	20A BCD (4)		26A DATA IN 4A	6
41	20B BCD (8)		26B <u>DATA IN 8A</u>	28
50		24B SCAN CLOCK	19B <u>CLOCK B</u>	46
13		25A TIME SLOT ZERO(TS0)	21B LSD or TSO (B)	23
25		GND (Chassis Lug)	23B POLARITY (B)	101
9		19B DATA GOOD	7B <u>DATA GOOD INHIBIT</u>	89
29		19A BCD (1)	23A DATA IN 1B	3
11		21B BCD (2)	25A DATA IN 2B	5
14		20A BCD (4)	27A DATA IN 4B	7
10		20B BCD (8)	25B DATA IN 8B	27
92		15A DP 1	17B DC <u>DECIMAL 1B</u>	48
8		14B DP 2	16B DC <u>DECIMAL 2B</u>	49
30		15B DP 3	15B DC <u>DECIMAL 3B</u>	64
33		18B DP 4	19A DC <u>DECIMAL 4B</u>	85
12		27B DP 5	20A DC <u>DECIMAL 5B</u>	86
53		28B DP 6	21A DC <u>DECIMAL 6B</u>	1

Note 1: Read across: When Type # 1 Patch Connector (PN 013-0153-00) is installed, pin 26A of Compartment A (J-10) is connected to pin 18B of Compartment C (J-30) through a jumper connection in the Patch Connector from pin number 59 to pin 47.

Note 2: DP 1, DP 2 and DP 6 not available from Digital Counters DC 501 or DC 502.

OPTION 30 SYSTEM				
DM/DM				
Type # 2 Patch Connector Installed				
PN 013-0153-01				
Power Module Compartment A (J-10)		Power Module Compartment B (J-20)	Power Module Compartment C (J-30)	Patch Connector Pin No.
Patch Connector Pin no.	Digital Multimeter DM 501	Digital Multimeter DM 501	Interface Plug-In PN 119-0664-00	Patch Connector Pin No.
59	26A SCAN CLOCK		18B CLOCK A	47
63	25A LSD		20B LSD or TSO (A)	45
20	14B POLARITY		22B POLARITY A	24
62	27B DECIMAL POINT		24B ENABLE DECIMAL A	26
21	19B DATA TRANSFER		6B DATA TRANSFER INHIBIT	88
84	19A BCD (1)		22A DATA IN 1A	2
42	21B BCD (2)		24A DATA IN 2A	4
83	20A BCD (4)		26B DATA IN 4A	6
41	29B BCD (8)		26B DATA IN 8A	28
56		26A SCAN CLOCK	19B CLOCK B	46
13		25A LSD	21B LSD or TSO (B)	23
8		14B POLARITY	23B POLARITY B	25
12		27B DECIMAL POINT	28B ENABLE DECIMAL B	44
9		19B DATA TRANSFER	7B DATA TRANSFER INHIBIT	89
29		19A BCD (1)	23A DATA IN 1B	3
11		21B BCD (2)	25A DATA IN 2B	5
14		20A BCD (4)	27A DATA IN 4B	7
10		20B BCD (8)	25B DATA IN 8B	27

Note 1: Read across: When Type # 2 Patch Connector (PN 013-0153-01) is installed, pin 26A of Compartment A (J-10) is connected to pin 18B of Compartment C (J-30) through a jumper connection in the Patch Connector from pin number 59 to pin number 47.

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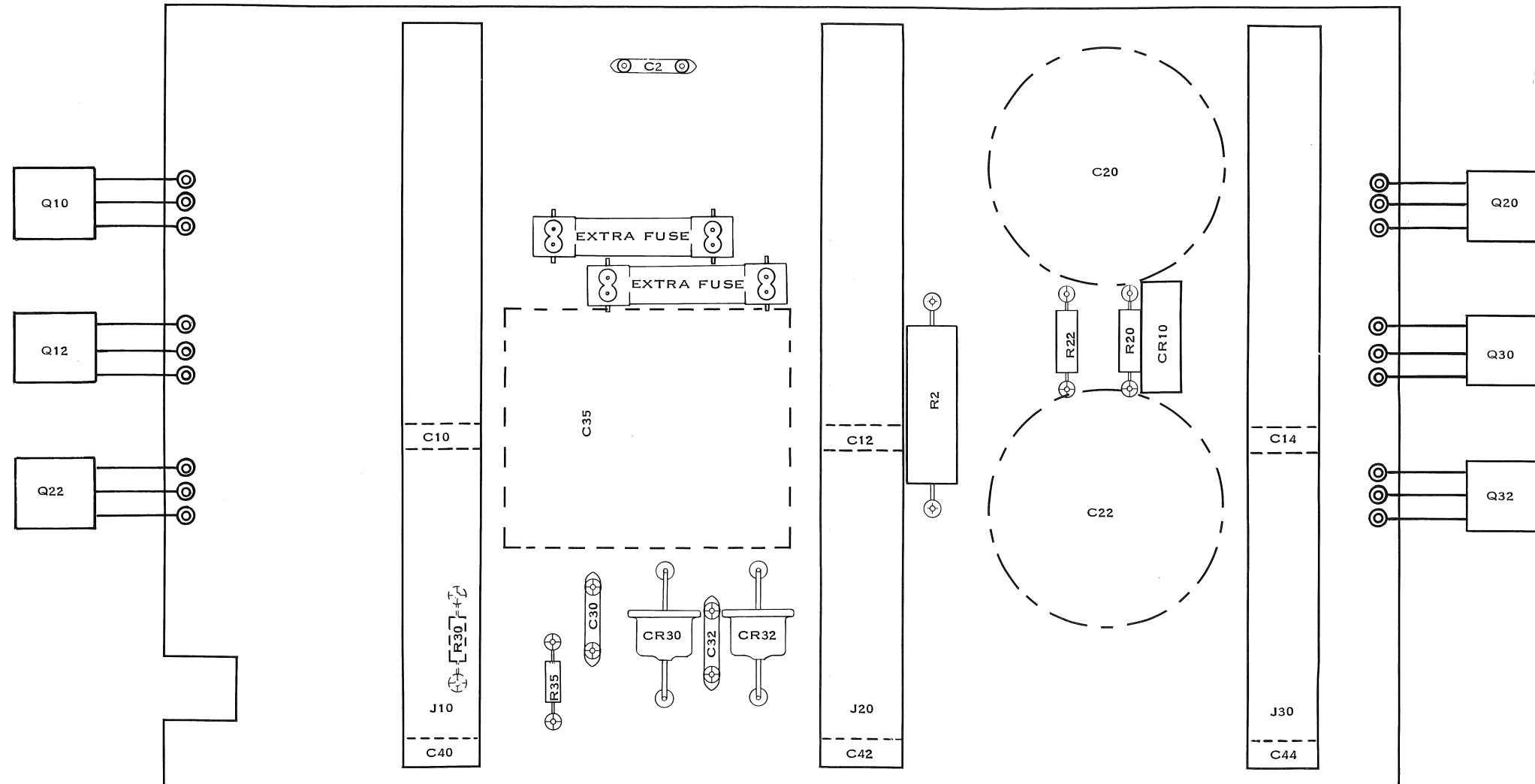
OPTION 31 SYSTEM				
DC/DC				
Type # 3 Patch Connector Installed				
PN 013-0153-02				
Power Module Compartment A (J-10)		Power Module Compartment B (J-20)	Power Module Compartment C (J-30)	Patch Connector Pin No.
Patch Connector Pin No.	Digital Counter Option 4 DC 501, DC 502, DC 503	Digital Counter Option 4 DC 501, DC 502, DC 503	Interface Plug-In PN 119-0664-00	Patch Connector Pin No.
37	24B SCAN CLOCK		18B CLOCK A	47
63	25A TIME SLOT ZERO		20B LSD or TSO (A)	45
101	GND (Chassis Lug)		22B POLARITY A	24
21	19B DATA GOOD		6B DATA GOOD INHIBIT	88
84	19A BCD (1)		22A DATA IN 1A	2
42	21B BCD (2)		24A DATA IN 2A	4
83	20A BCD (4)		26A DATA IN 4A	6
41	20B BCD (8)		26B DATA IN 8A	28
99	15A DP 1		14B DC DECIMAL 1A	65
20	14B DP 2		14A DC DECIMAL 2A	66
15	15B DP 3		15A DC DECIMAL 3A	67
18	18B DP 4		16A DC DECIMAL 4A	68
39	27B DP 5		17A DC DECIMAL 5A	69
62	28B DP 6		18A DC DECIMAL 6A	70
50		24B SCAN CLOCK	19B CLOCK B	46
13		25A TIME SLOT ZERO	21B LSD or TSO (B)	23
102		GND (Chassis Lug)	23B POLARITY B	25
9		19B DATA GOOD	7B DATA GOOD INHIBIT	89
29		19A BCD (1)	23A DATA IN 1B	3
11		21B BCD (2)	25A DATA IN 2B	5
14		20A BCD (4)	27A DATA IN 4B	7
10		20B BCD (8)	25B DATA IN 8B	27
92		15A DP 1	17B DC DECIMAL 1B	48
8		14B DP 2	16B DC DECIMAL 2B	49
30		15B DP 3	15B DC DECIMAL 3B	64
33		18B DP 4	19A DC DECIMAL 4B	85
12		27B DP 5	20A DC DECIMAL 5B	86
53		28B DP 6	21A DC DECIMAL 6B	1

Note 1: Read across: When Type # 3 Patch Connector (PN 013-0153-02) is installed, pin 24B of Compartment A (J-10) is connected to pin 18B of Compartment C (J-30) through a jumper connection in the Patch Connector from pin number 37 to pin number 47.

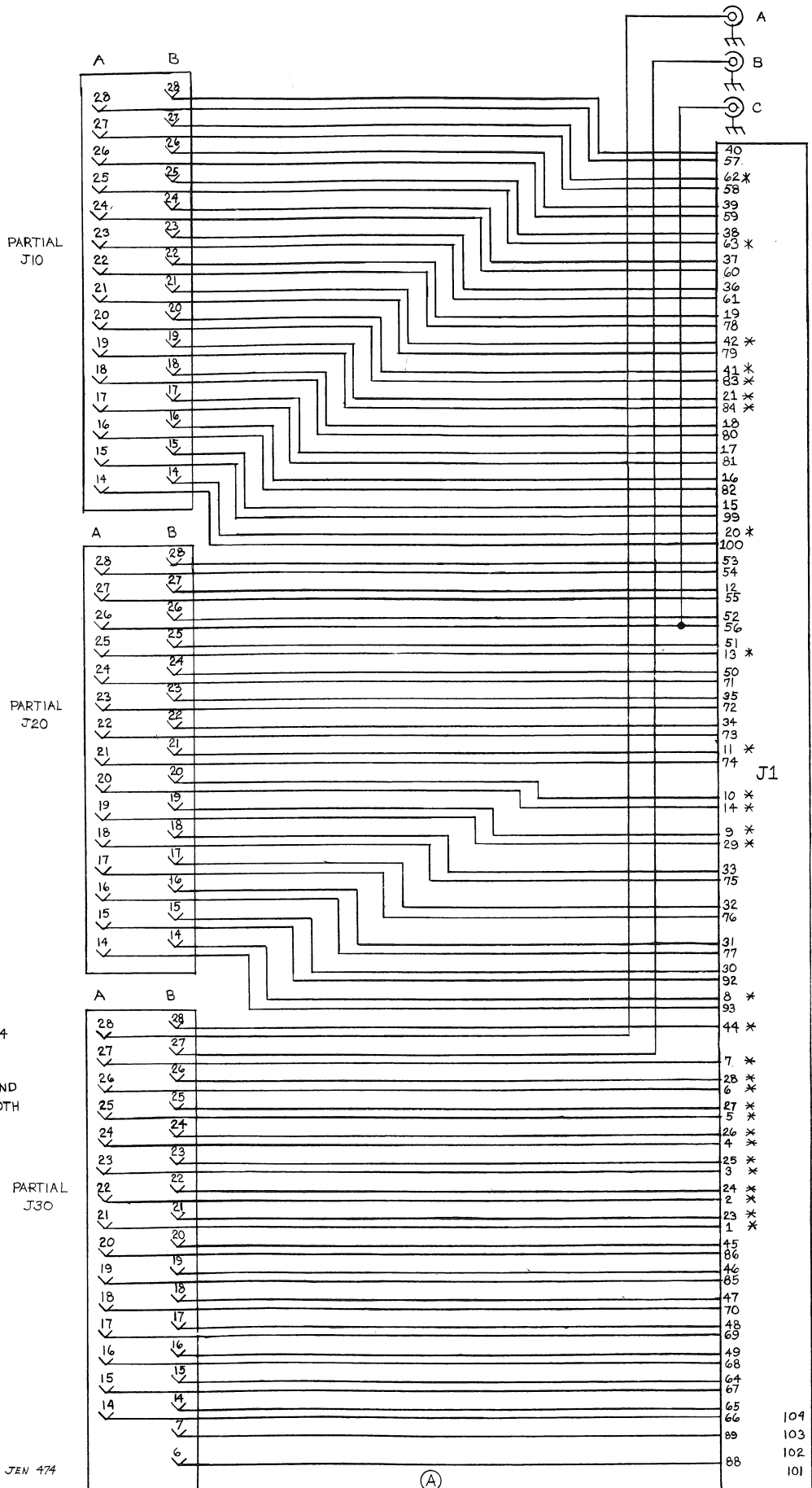
Ⓐ

Note 2: DP 1, DP 2, and DP 6 not available from Digital Counters DC 501 or DC 502.

POWER MODULE PARTS LOCATION GRID



NOTE: COMPONENTS SHOWN WITH DASHED LINES ARE LOCATED ON BACK SIDE OF BOARD.

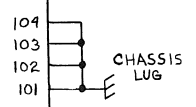


NOTES:
 PINS NOT WIRED ON J1
 ARE: 22, 43, 87, 90, 91, 94
 95, 96, 97, 98

* TWISTED PAIRS. SECOND
 WIRE GROUNDED AT BOTH
 ENDS.

J1 IS LOCATED ON THE
 REAR PANEL.

J1



PI 110V JUMPER

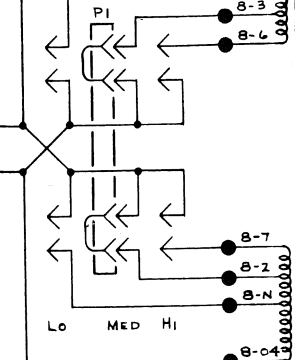
153 INTERFACE
10-4-60

PWR

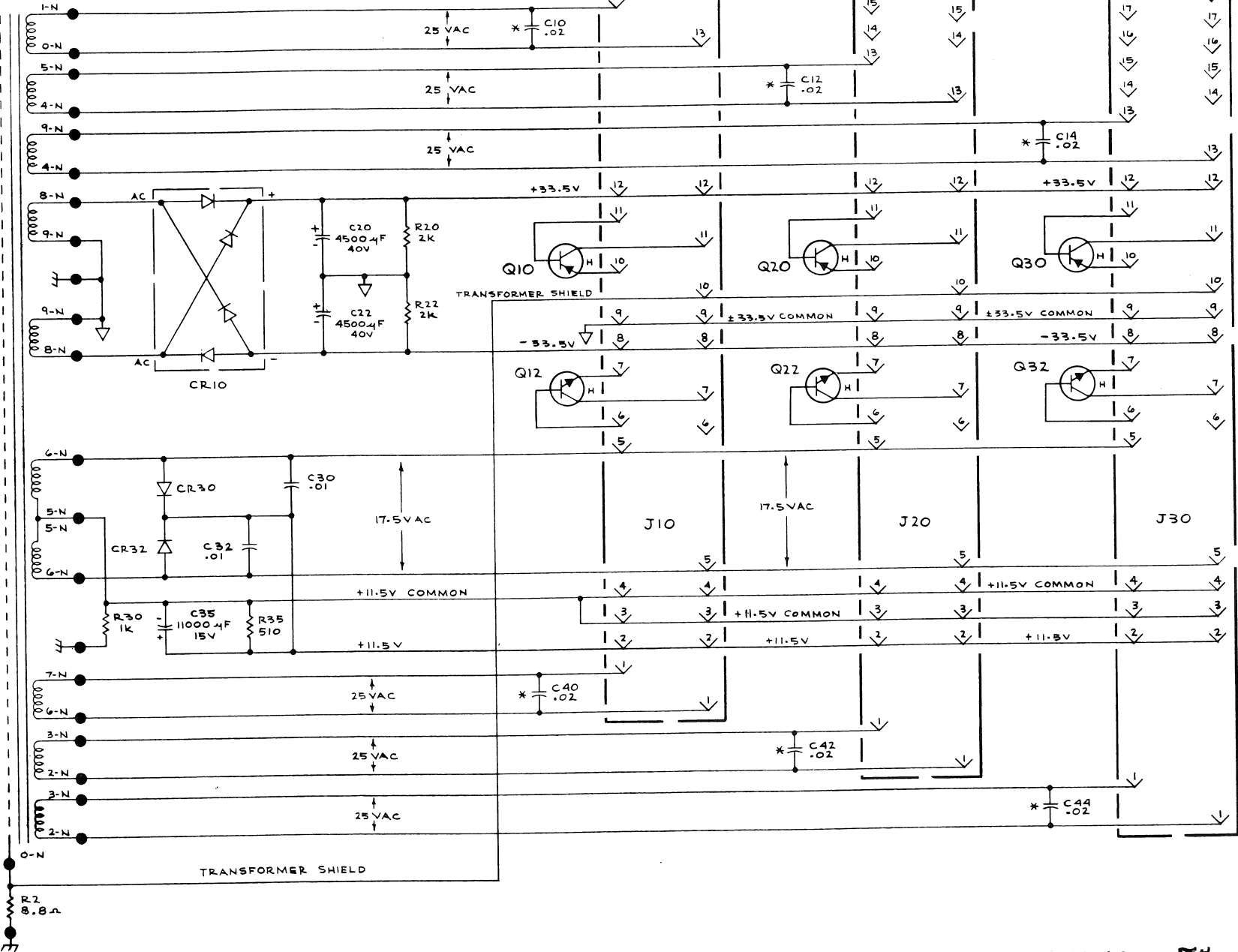
F2
1.6A

P5
110 VAC

110/220V PRIMARY



T1

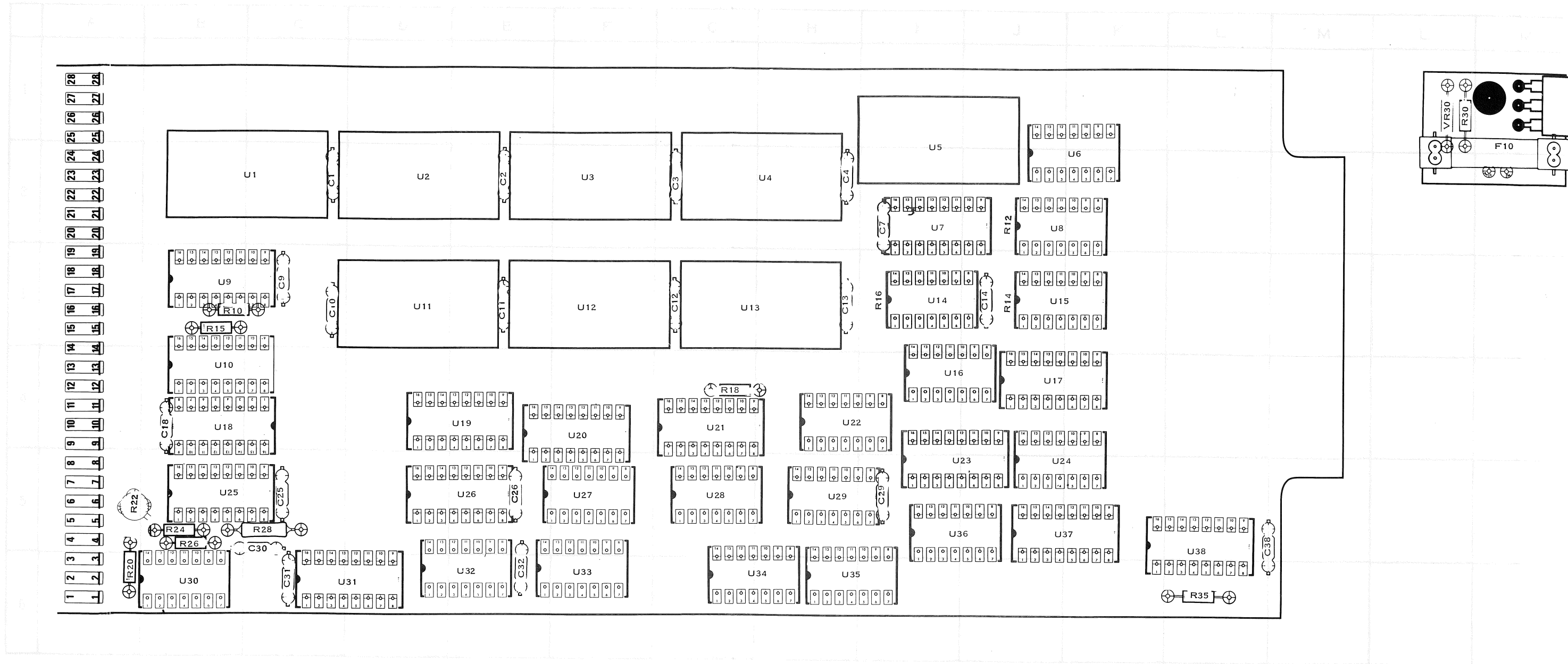


(A)

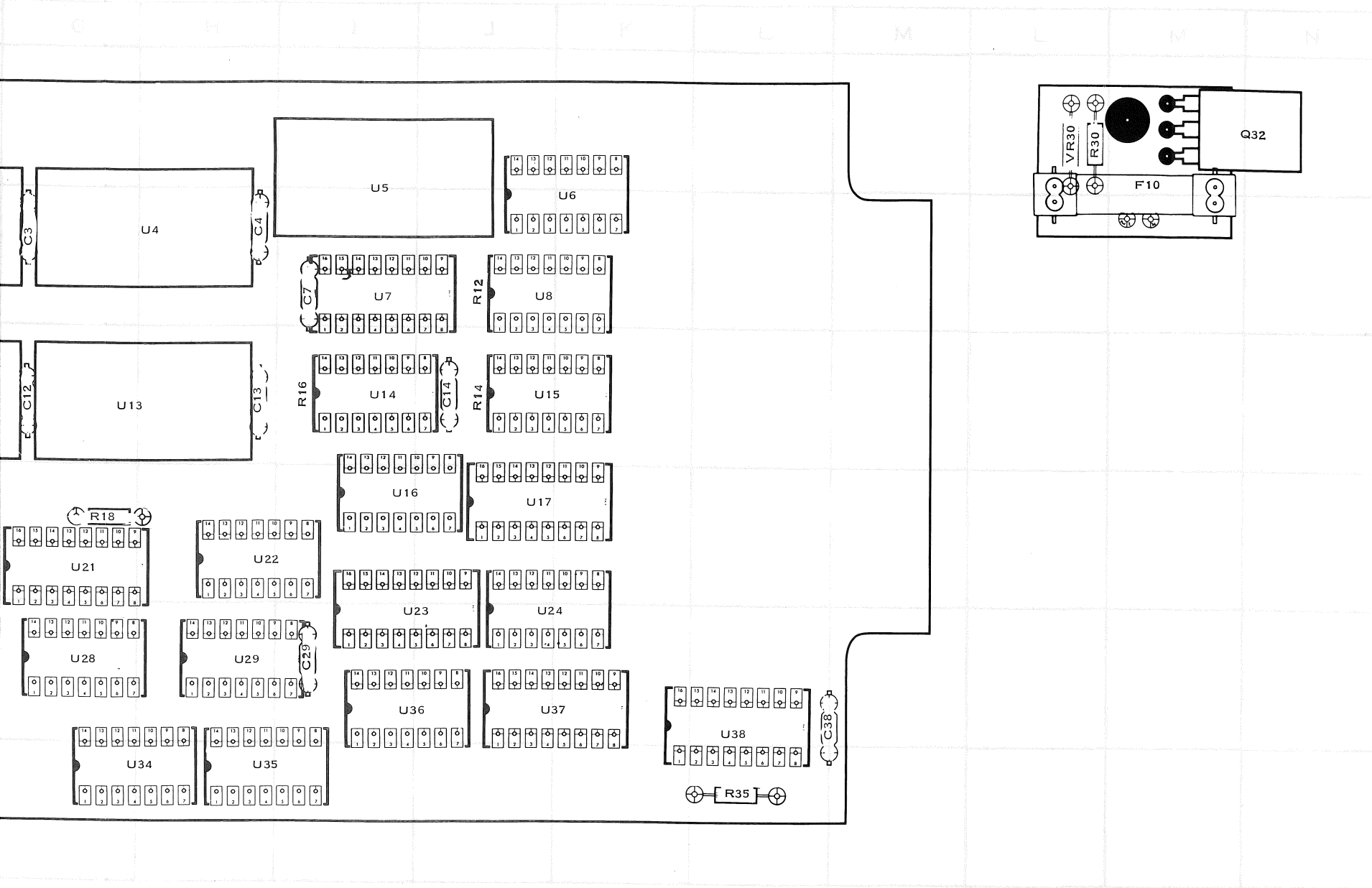
POWER MODULE 620-0242-00

715

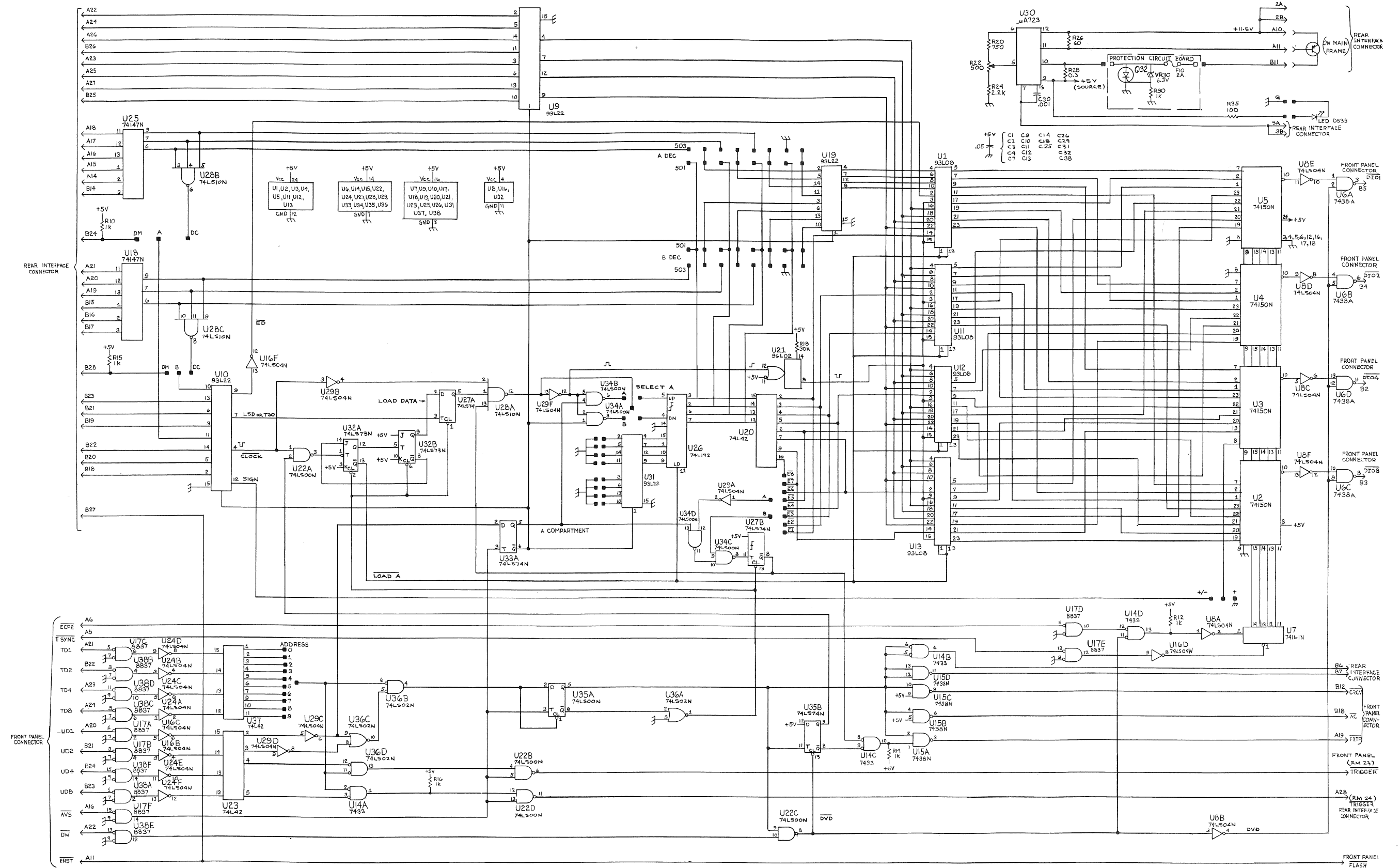
INTERFACE PLUG-IN PARTS LOCATION GRID



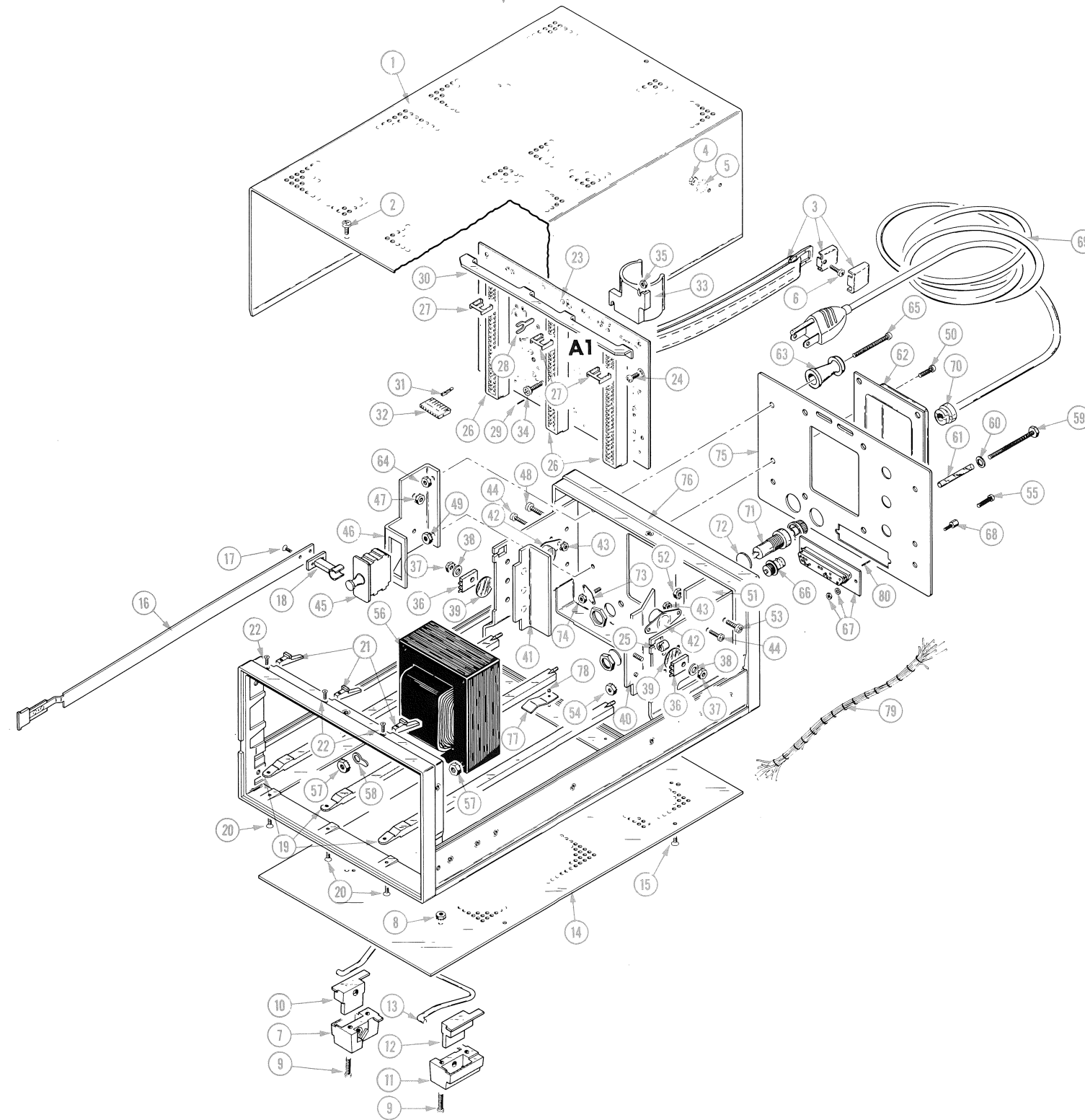
INTERFACE PLUG-IN PARTS LOCATION GRID



CKT NO	GRID LOC	CKT NO	GRID LOC
C1	C2	U4	H2
C2	E2	U5	I1
C3	G2	U6	K2
C4	H2	U7	I2
C7	I2	U8	J2
C9	C3	U9	B3
C10	C3	U10	B4
C11	E3	U11	D3
C12	G3	U12	F3
C13	H3	U13	H3
C14	J3	U14	I3
C18	B4	U15	J3
C25	C5	U16	I4
C26	E5	U17	J4
C29	I5	U18	B4
C30	C5	U19	E4
C31	C6	U20	F4
C32	E6	U21	G4
C38	L5	U22	H4
		U23	I5
F10	M1	U24	J5
		U25	B5
Q32	N1	U26	E5
		U27	F5
R12	J2	U28	G5
R14	J3	U29	H5
R16	I3	U30	B6
R20	A6	U31	D6
R22	A5	U32	E6
R24	B5	U33	F6
R26	B5	U34	H6
R28	C5	U35	H6
R30	L1	U36	I5
R35	L6	U37	K5
		U38	L5
U1	C2		
U2	D2		
U3	F2	VR30	L1



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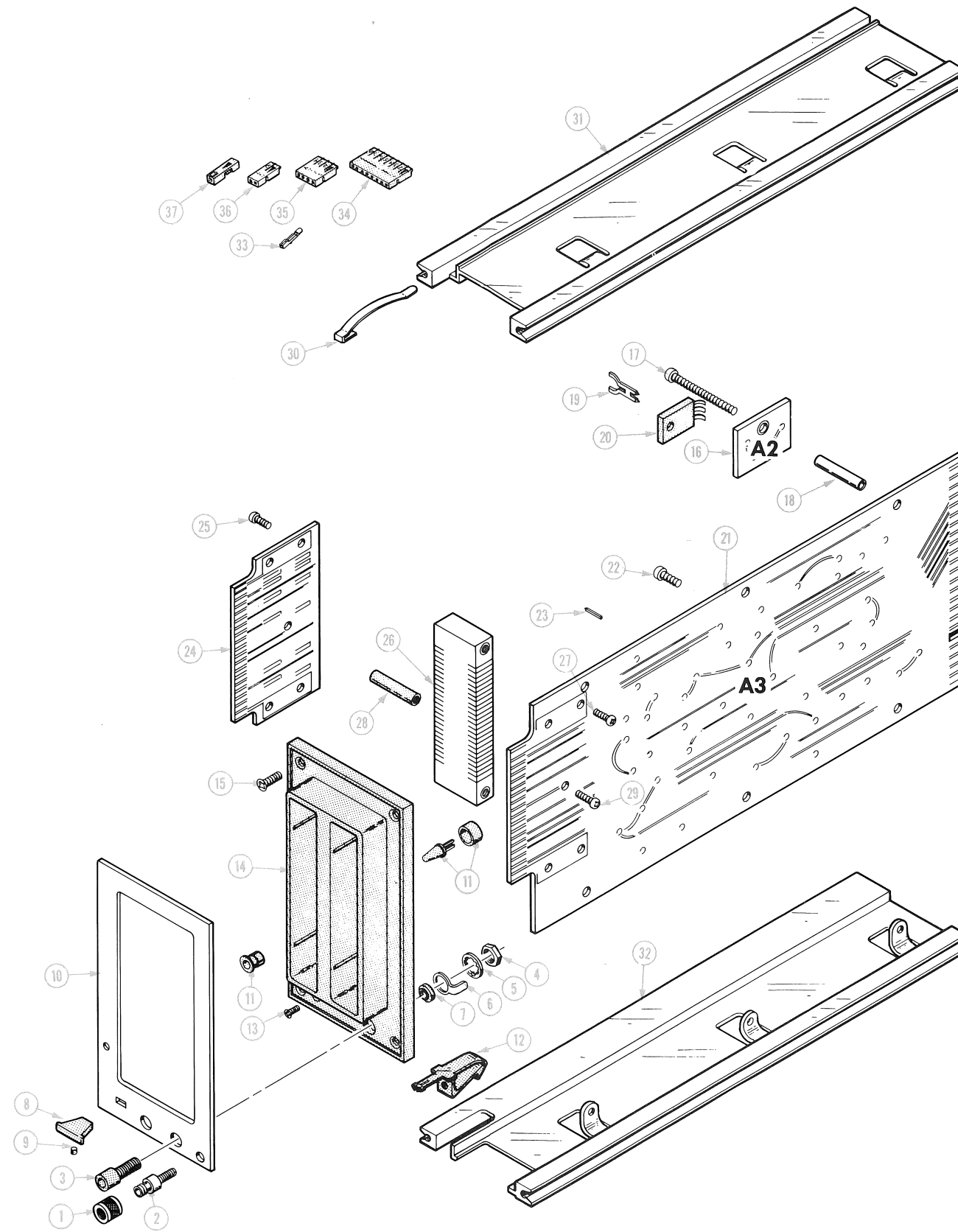


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153 CALCULATOR INSTRUMENTATION INTERFACE

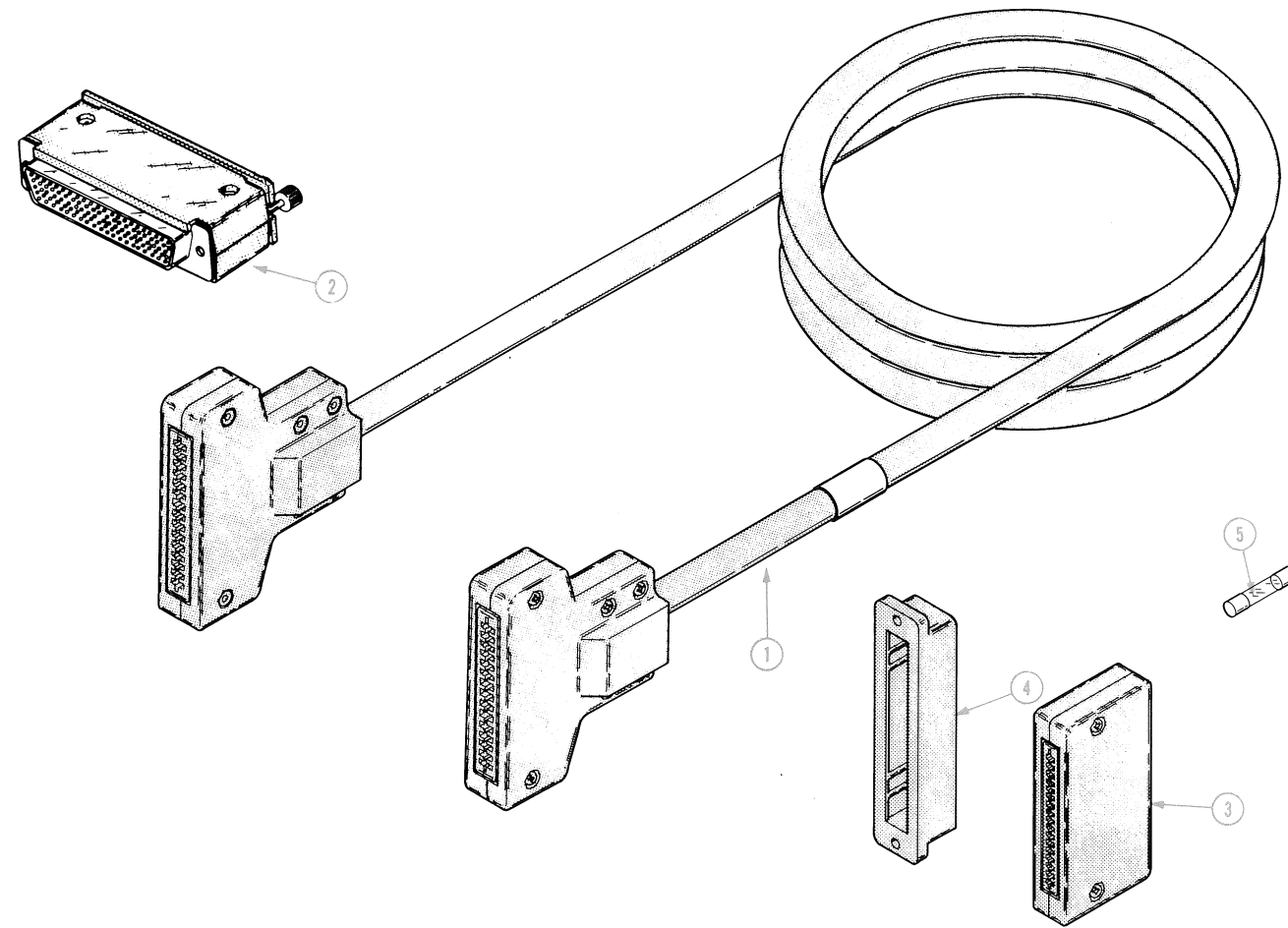
FIG. 2 INTERFACE PLUG-IN

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153 CALCULATOR INSTRUMENTATION INTERFACE

ACCESSORIES



REPACKAGING

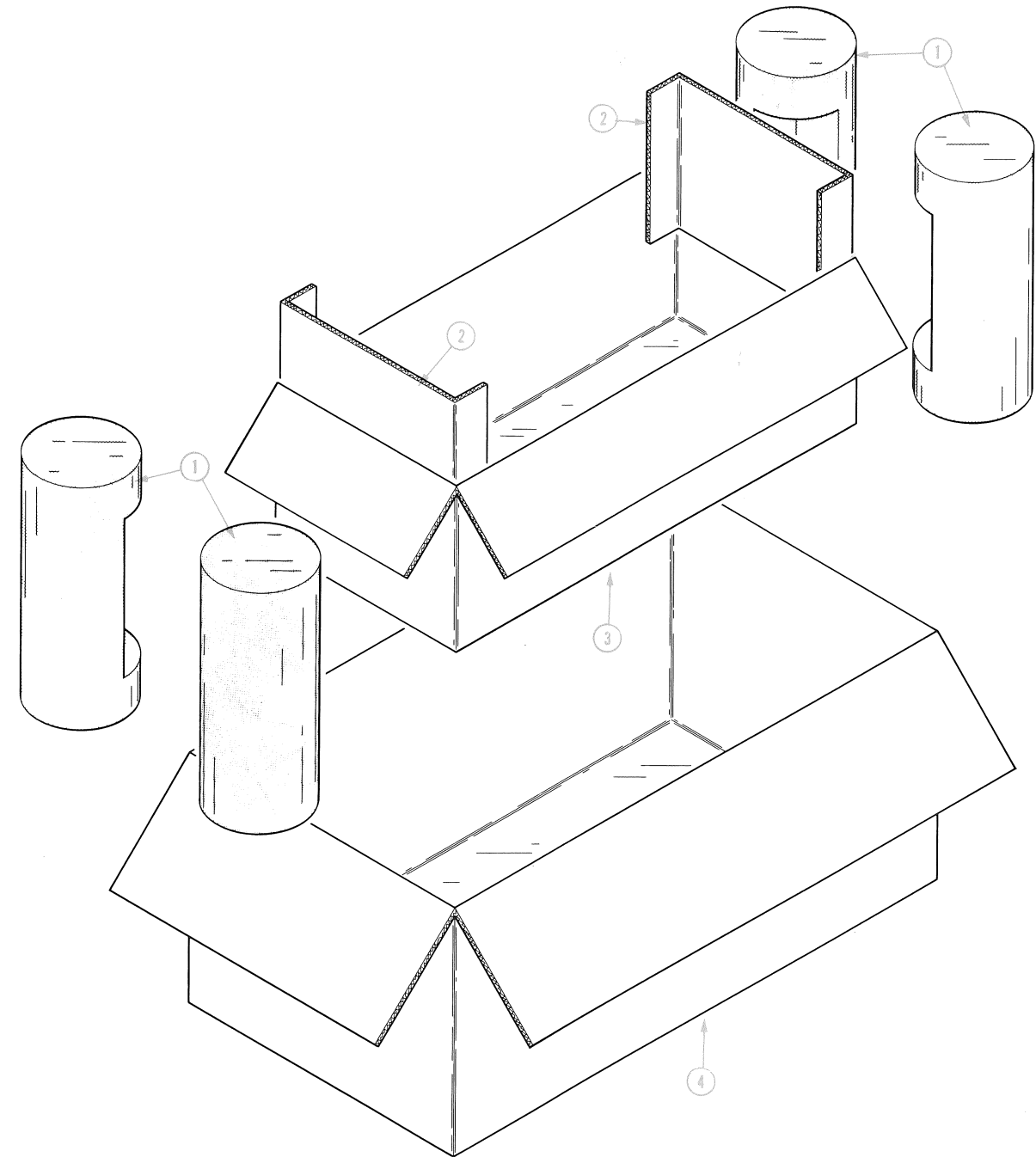


FIG. 3&4 ACCESSORIES & REPACKAGING

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Qty	Dscnt	1 2 3 4 5	Name & Description	Mfr	
							Code	Mfr Part Number
3-	-----	-----	-			STANDARD ACCESSORIES		
-1	012-0499-01		1			CABLE, INTERCONN:TYPE C, 7 FEET LONG	80009	012-0499-01
-2	013-0153-00		1			ADAPTER, CONN:PROGRAMMER, DC/DM	80009	013-0153-00
	013-0153-01 ¹		1			ADAPTER, CONN:PROGRAMMER, DM/DM	80009	013-0153-01
	013-0153-02 ²		1			ADAPTER, CONN:PROGRAMMER, DC/DC	80009	013-0153-02
-3	016-0567-00		1			TERMINATION:CALCULATOR	80009	016-0567-00
-4	016-0579-00		1			GUIDE, CONNECTOR:	80009	016-0579-00
-5	159-0003-00		1			FUSE, CARTRIDGE:1.6A, 250V, SLOW-BLOW	80009	159-0003-00
	159-0018-00		1			FUSE, CARTRIDGE:4A, 250V, FAST-BLOW	80009	159-0018-00
-6	070-1699-00		1			MANUAL TECH:INSTRUCTION(NOT SHOWN)	80009	070-1699-00

¹Option 30 only.
²Option 31 only.

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Qty	Dscnt	1 2 3 4 5	Name & Description	Mfr	
							Code	Mfr Part Number
4-	065-0178-00		1			CARTON ASSEMBLY	80009	065-0178-00
	-----		1			CARTON ASSEMBLY INCLUDES:		
-1	004-0299-00		4			CAP END	80009	004-0299-00
-2	004-1144-00		2			PAD SET	80009	004-1144-00
-3	004-0835-00		1			CARTON:INNER	80009	004-0835-00
-4	004-0834-00		1			CARTON:OUTER	80009	004-0834-00