TEK Instruction Manual

Part No. 070-6506-00
Product Group 20

DP-100
DIGITAL VIDEO PROBE

First Pinting JAN 1988

Tektronix®
COMMITTED TO EXCELLENCE

For further information, contact: Tektronix, Inc., Corporate Offices, P.O. Box 500, Beaverton, OR 97077. Phone: (503) 627–7111; TLX: 151754; TWX: (910) 467–8708; Cable: TEKWSGT.

Subsidiaries and distributors worldwide.

TABLE OF CONTENTS

Table of Contents i-1
List of Tables i-3
List of Illustrations i-3
Safety Summary i-4

SECTION 1 OPERATING INSTRUCTIONS 1-1
Product Description 1-1
Configuring the DP–100 1-4
Installation and Removal Instructions 1-5
Attaching the Data and Clock Probes 1-6

SECTION 2 SPECIFICATION and PERFORMANCE CHECK 2-1
Performance Conditions 2-1
Electrical Specification 2-2
Mechanical Specification 2-4
Performance Check 2-5
Digital Signal Sources for the DP–100 2-8
Short Form Performance Check Procedure 2-9
Long Form Performance Check Procedure 2-10

SECTION 3 ADJUSTMENT PROCEDURE 3-1
Introduction 3-1
Short Form Adjustment Procedure 3-4
Long Form Adjustment Procedure 3-5

SECTION 4 THEORY OF OPERATION 4-1
Introduction 4-1
Block Diagrm Description 4-1
Detailed Circuit Description 4-3
Data Input and DAC 1 4-3
DAC Output and Clock Control 2 4-4
Sync Control 3 4-5
Power Supply and DAC Control 4 4-7

SECTION 5 MAINTENANCE 5-1
Introduction 5-1
Preventive Maintenance 5-1
Cleaning 5-1
Static-Sensitive Components 5-1
Troubleshooting Aids 5-2
Foldout Pages 5-2
Diagrams 5-2
Circuit Board Illustrations 5-3
Assembly and Circuit Numbering 5-3
Corrective Maintenance 5-3
Obtaining Replacement Parts 5-3
Torque Specifications 5-4

Replacing Circuit Assemblies 5-4
DAC Board (A2) Removal 5-4
CONTROLLER Board (A1) Removal 5-5

SECTION 6 OPTIONS 6-1

SECTION 7 REPLACEABLE ELECTRICAL PARTS 7-1

SECTION 8 DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS 8-1

SECTION 9 REPLACEABLE MECHANICAL PARTS 9-1

LIST OF TABLES

Table 1-1	DP–100 Front Panel Control and Connector Description	1-2
Table 2-1	Video Output Characteristics	2-2
Table 2-2	Sync Characteristics	2-2
Table 2-3	Data Input Connector Characteristics	2-3
Table 2-4	Clock Probe Characteristics	2-3
Table 2-5	Physical Characteristics	2-4
Table 2-6	Environmental Characteristics	2-4
Table 2-7	Recommended Test Equipment (Including Accessories)	2-6
Table 2-8	Digital Signal Source Output Data Points for the DP–100	2-8
Table 2-9	Data Threshold Control Levels	2-9
Table 3-1	Recommended Test Equipment (Including Accessories)	3-2
Table 3-2	Data Threshold Control Levels	3-4
Table 5-1	Torque Specifications for the DP–100	5-4

LIST OF ILLUSTRATIONS

Fig. 1-1	DP–100 Front Panel Controls and Connector	1-2
Fig. 1-2	Data Input Connector Detail	1-4
Fig. 1-3	DP–100 rear card-edge connector details	1-5
Fig. 1-4	DP–100 Installation and Removal	1-6
Fig. 1-5	Attaching the DATA and CLOCK probes to the DP–100	1-7
Fig. 2-1	Equipment setup to check Output Gain	2-10
Fig. 2-2	Equipment setup to check Frequency Response	2-12
Fig. 2-3	Typical DP–100 Frequency Response	2-13
Fig. 2-4	Equipment setup for checking Diff Phase and Diff Gain	2-13
Fig. 2-5	Equipment setup for checking Sync Range	2-14
Fig. 2-6	Equipment setup for checking Return Loss	2-15
Fig. 3-1	DP–100 Adjustment Locations	3-5
Fig. 3-2	Equipment setup to adjust Output Gain	3-6
Fig. 3-3	Equipment setup to adjust Frequency Response	3-8
Fig. 3-4	Typical DP–100 Frequency Response	3-8
Fig. 3-5	Equipment setup for checking Differential Phase and Gain	3-9
Fig. 3-6	Equipment setup for checking Sync Range	3-10
Fig. 3-7	Equipment setup to check Return Loss	3-11
Fig. 4-1	Phase Lock Loop Sample and Hold Amplifier Operation	4-6
Fig. 4-2	Flyback Converter Operation	4-8
Fig. 5-1	Using the foldout pages	5-2
Fig. 5-2	DP–100 open for calibration or troubleshooting	5-3

SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

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

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

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property, including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

In This Manual

This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment

DANGER — High voltage.

Protective ground (earth) terminal.

ATTENTION — refer to manual.

Power Source

This product is intended to operate from a power module connected to a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Ground the Product

This product is grounded through the grounding conductor of the power module power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power module power cord is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

Use the Proper Fuse

To avoid fire hazard, use only the fuse of correct type, voltage rating, and current rating as specified in the parts list for your product.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

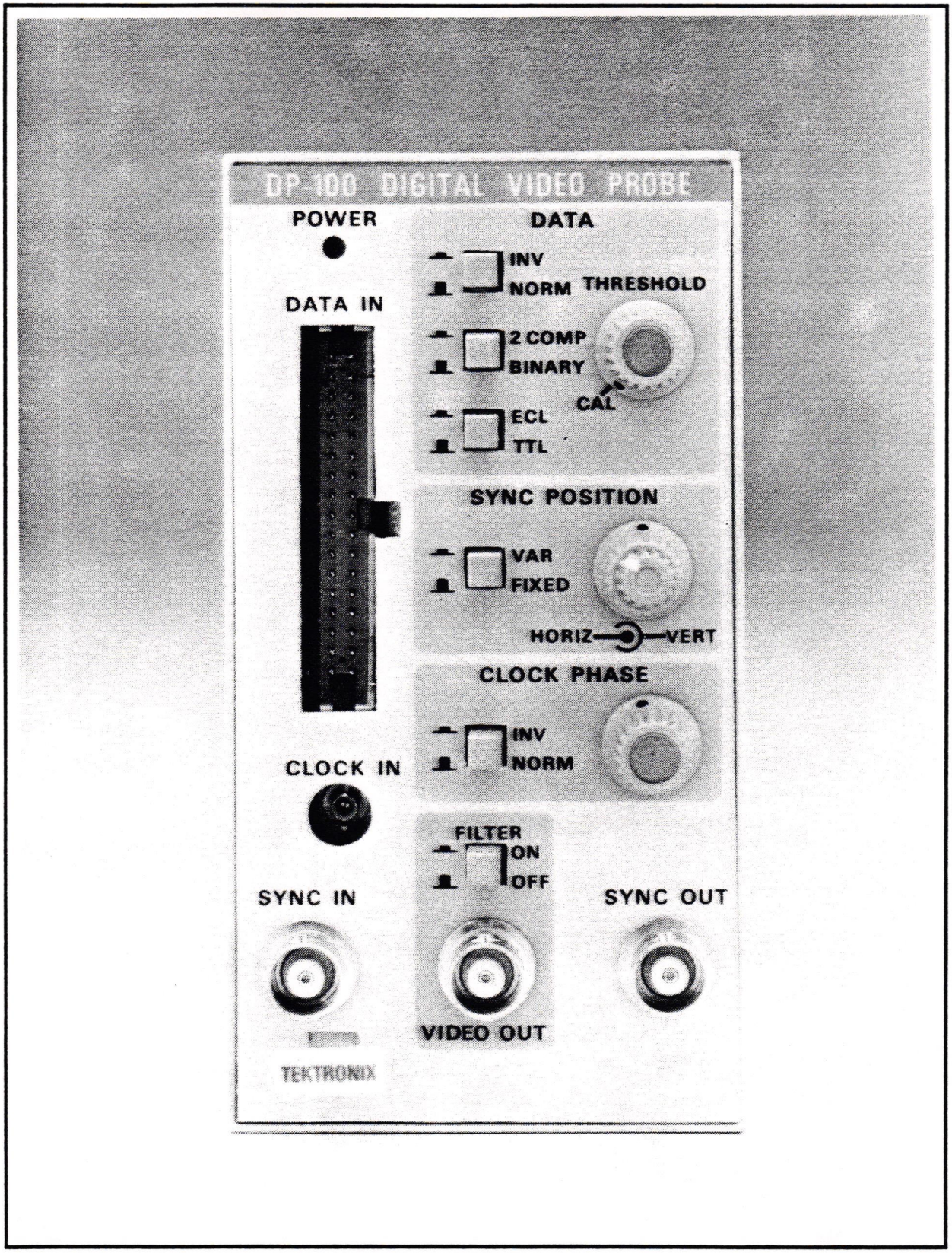
To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Operate Without Covers

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.



DP-100 Digital Video Probe

SECTION 1
OPERATING INSTRUCTIONS

PRODUCT DESCRIPTION

The DP–100 Digital Video Probe provides an easy way to observe up to 10 digital data lines simultaneously, at ECL or TTL data levels, and at data rates up to 50 MHz. Using Digital to Analog conversion, the output may be displayed on a picture monitor, waveform monitor, vectorscope, or an oscilloscope. The six foot data probe provides operator freedom for fault diagnosis in digital video equipment, and in engineering design development.

A separate clock probe provides flexibility, by operating independently of the data probe at clock rates from 1 MHz to 100 MHz, at ECL or TTL levels. The CLOCK PHASE and INVERT controls allow the operator to alter the clock duty cycle by 50% or more of the clock period, by varying the timing of the rising and falling edges of the clock signal. This ensures accurate data latching, for glitch free video output.

The sync portion will provide sync for 525/60 or 625/50 systems, derived from either comp sync or comp video (such as black burst) applied to the SYNC IN connector. The SYNC OUTPUT provides synchronization of test equipment while probing data without sync information. In the VARIABLE mode, HORIZONTAL and VERTICAL positioning allows viewing data on a picture monitor that would otherwise be off screen. Comp sync or video must be applied for the VARIABLE mode to operate.

The Digital Probe information is switched to approximately 0 V for 4 μs after the trailing edge of Variable Sync, for monitor clamping.

The DP–100 is designed as a single-width module to fit into any compartment of a TM500 or TM5000 series mainframe.

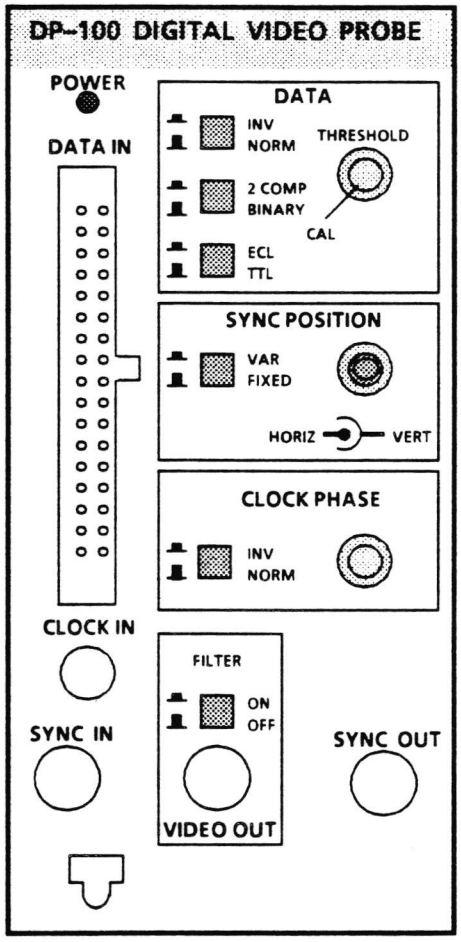


Fig. 1-1. DP–100 Front Panel Controls and Connectors.

Table 1-1. DP–100 Front Panel Control and Connector Description

Control/Connector Name	Description
DATA IN	34 pin connector for 10 bit data probe.
CLOCK IN	SMA type connector for Clock Probe.
SYNC IN	BNC input for comp sync or video. Must be applied for VARIABLE mode to work.
SYNC OUT	BNC output for sync. Sync is reconstructed from sync or video applied to the SYNC IN connector, if the SYNC POSITION push button is in the Fixed position. It is constructed from internal data if the SYNC POSITION push button is in the VARIABLE position.

Table 1-1. DP–100 Front Panel Control and Connector Description (Cont.)

Control/Connector Name	Description
DATA	
INV/NORM	When in the INVERT position (in), all data bits are inverted. In the NORM position (out), they are not.
2 COMP / BINARY	When in the 2s COMPLEMENT position (in), the MSB of the data input to the DP–100 is inverted. In the BINARY position (out), it is not.
ECL/TTL	This push button selects between ECL (in) and TTL (out) data threshold levels for valid input. Whether the ECL position of this push button is set for positive or negative ECL data is determined by a jumper (J200) located at the rear of the instrument.
THRESHOLD	Adjusts threshold voltage level within the data probe, for recognition of valid logic data.
SYNC POSITION	
VARIABLE / FIXED	VARIABLE (in) enables the HORIZ and VERT position controls located to the right of the push button, allowing adjustment of the output signal on the picture monitor. In this position, sync is generated from internal data, and is slightly different from normal sync: the sync and serrations are 4 μs, and the equalizing pulses are 2 μs. Comp sync or video must be applied to the SYNC IN connector in order for the VARIABLE function to operate correctly. FIXED (out) position disables the HORIZ and VERT positioning controls. In this position sync is reconstructed from the comp sync or video applied to the SYNC IN connector. The input signal should be locked to video that the digital data is derived from.
HORIZ	HORIZONTAL control allows horizontal positioning of the output signal when the SYNC push button is depressed (VARIABLE).
VERT	VERTICAL control allows vertical positioning of the output signal when the SYNC push button is depressed (VARIABLE).
CLOCK PHASE	Variable control which adjusts the timing of the clock signal rising and falling edges, by varying the duty cycle of the clock pulse. This allows operator control of the clock timing for accurate data acquisition.
INVERT	Inverts the clock signal. Variable control still controls clock pulse edge placement.
VIDEO OUT	BNC connector for Video output to the display device (picture monitor, waveform monitor, etc.).
FILTER	5 MHz low pass filter with group delay correction, switched in-line when the push button is depressed.

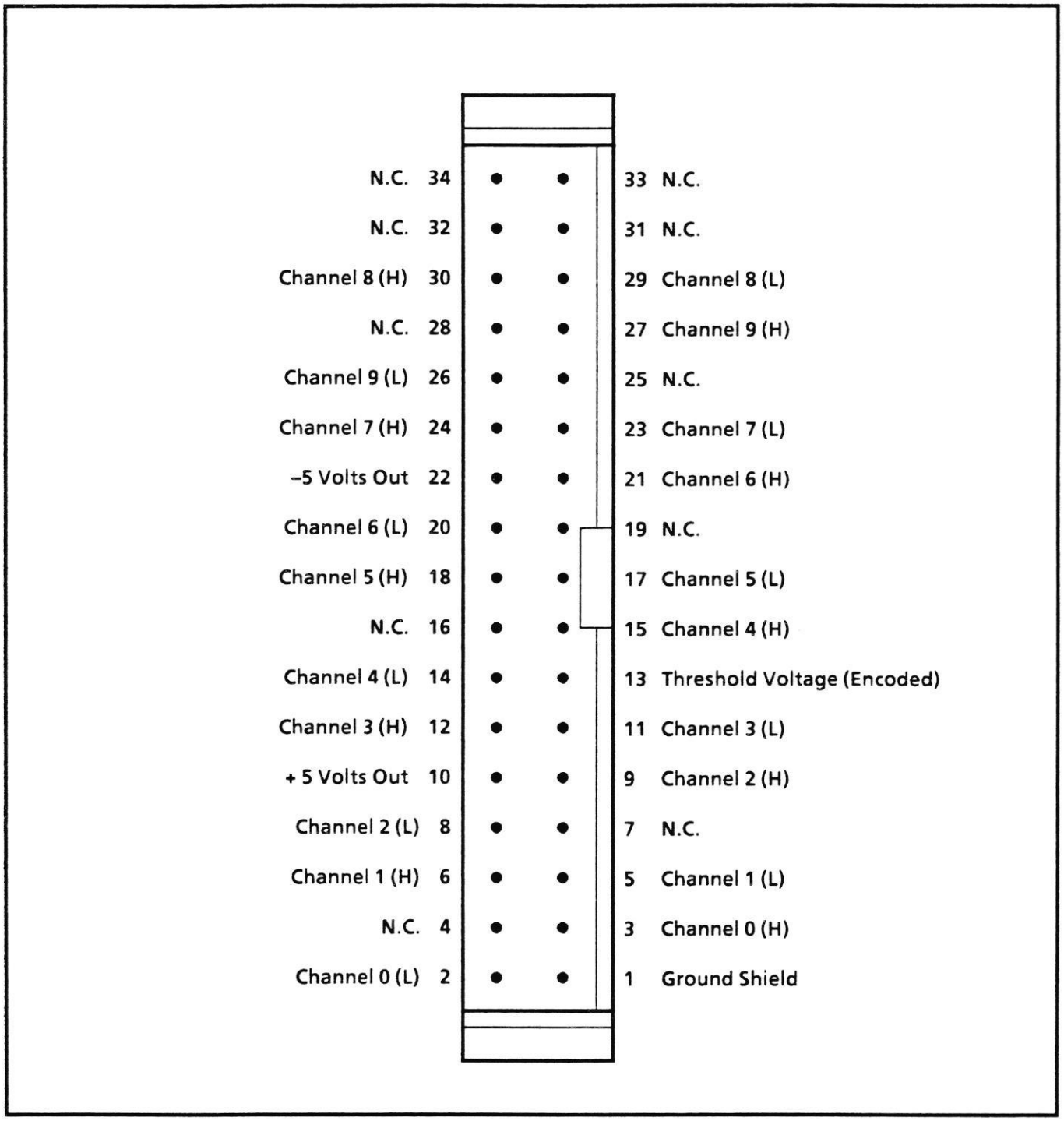


Fig. 1-2. Data Input Connector Detail.

CONFIGURING THE DP–100

As shipped from Tektronix, the DP–100 is set to accept –ECL input, when the ECL/TTL push button is depressed. J200, located at the back of the instrument, next to the fuses, is used to select between positive and negative ECL levels (pins 1&2 = –ECL, pins 2&3 = +ECL). Be sure to turn the power off before removing the DP–100 from the mainframe to change this jumper setting.

Installation and Removal Instructions

The DP–100 Digital Video Probe is designed to operate in a TM500 or TM5000 power module. Power and some signal connections are made through a card-edge connector, P502, etched on the A1 Controller board (see Fig. 1-3). Refer to the power module instruction manual for line-voltage requirements and power module operation.

CAUTION

Turn the power module off before inserting or removing the DP–100; otherwise arcing may occur at the rear interface connectors. Arcing reduces the useful life of the connectors and damage may be done to the plug-in circuitry.

Check for plastic barriers on the interconnecting jacks of the power module in the selected compartments. If the barriers do not match the cutouts in the DP–100 circuit board edge connector, they may indicate special rear interface connections for another type of instrument. Do not insert the plug-in until this has been verified by qualified service personnel.

The power module MUST have a barrier installed between pins 6 and 7 at the standard barrier location to insure proper connector alignment. The power module may also have a barrier between pins 23 and 24 to indicate that the compartment is reserved for plug-ins in the Signal Source family. A barrier in any other location will preclude insertion of the DP–100, because that barrier would indicate that the compartment has been reserved for plug-ins other than those in the Signal Source family.

When the units are properly matched, align the DP–100 with the upper and lower guides (see Fig. 1-4) of the selected compartments. Insert the

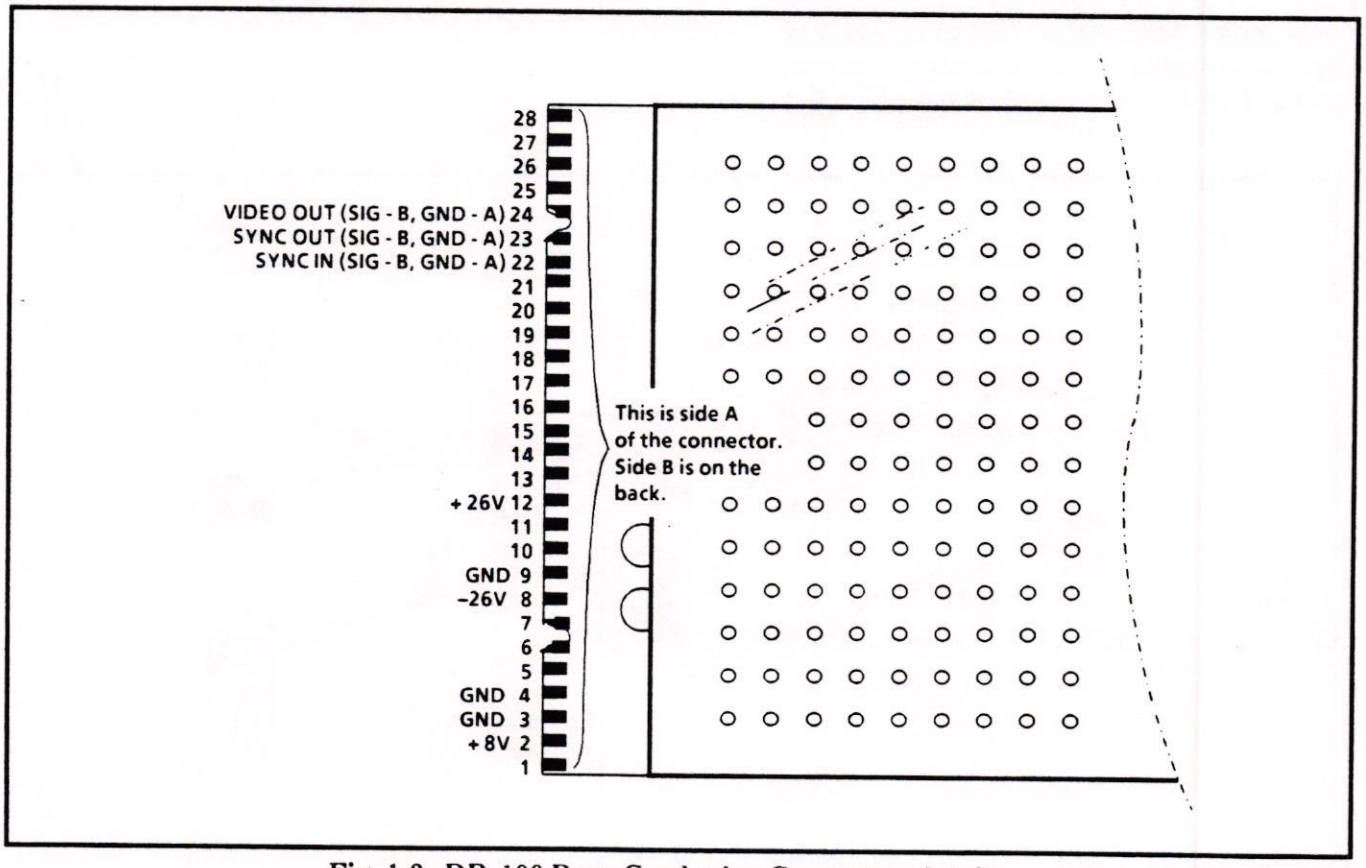


Fig. 1-3. DP–100 Rear Card-edge Connector details.

DP-100 into the compartment and press firmly to seat the circuit board in the interconnecting jacks.

To remove the DP-100, turn the power module off and pull the release latch, located on the lower left corner of the DP-100, until the connector disconnects from the power module. The DP-100 will now slide out of the power module.

Attaching the Data and Clock Probes

After the DP-100 is installed in the TM500 or TM5000 mainframe, plug the P6460 data acquisition probe into the DP-100 DATA IN connector, and plug the P6454 clock probe into the CLOCK IN connector (see Fig. 1-5). If not already connected, attach the ten wire lead set (012-0747-00) and one of the users grounds to the data acquisition probe, as well as the two leads and probe tips to the clock probe.

The ten wire lead set has color coded wires, 0 through 9. This matches up to the data bits that each wire should connect to, with the black wire (0) going to the LSB and the white wire (9) to the MSB.

Each of these ten leads may be connected to a probe tip (206-0222-00, included), plugged onto a 0.025" square pin, or may be attached to a test clip adapter to make connection to an IC easier.

In the Adjustment and Performance Check procedures, the data and clock probes are connected to digital output connectors on the 1910 and the Digital Sweep Generator. The easiest way to do this is to attach the probes to a 25 pin, male, D-subminiature-type connector, and plug it into the digital output connector.

Next, the 5 inch users ground lead should be attached to the probe head, on the side opposite where the data leads plug in. When used at data rates of 25 MHz to 50 MHz, use a 5 inch data lead set (available separately, P/N 012-0987-00), and both of the users grounds.

Finally, two probe tip leads should be plugged into the clock probe head. One of these is the reference input, which goes to ground, the other lead is the clock input. They are marked REF and IN, respectively, on the clock probe head.

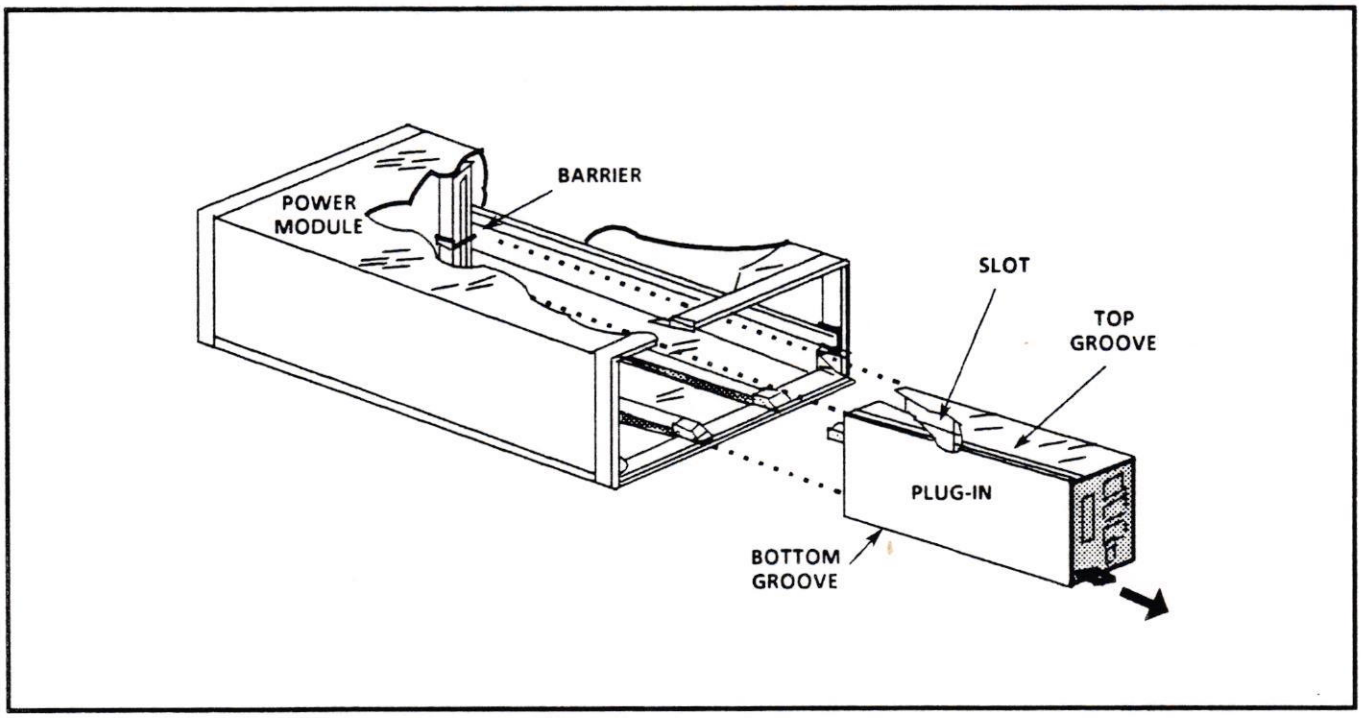


Fig. 1-4. DP-100 Installation and Removal.

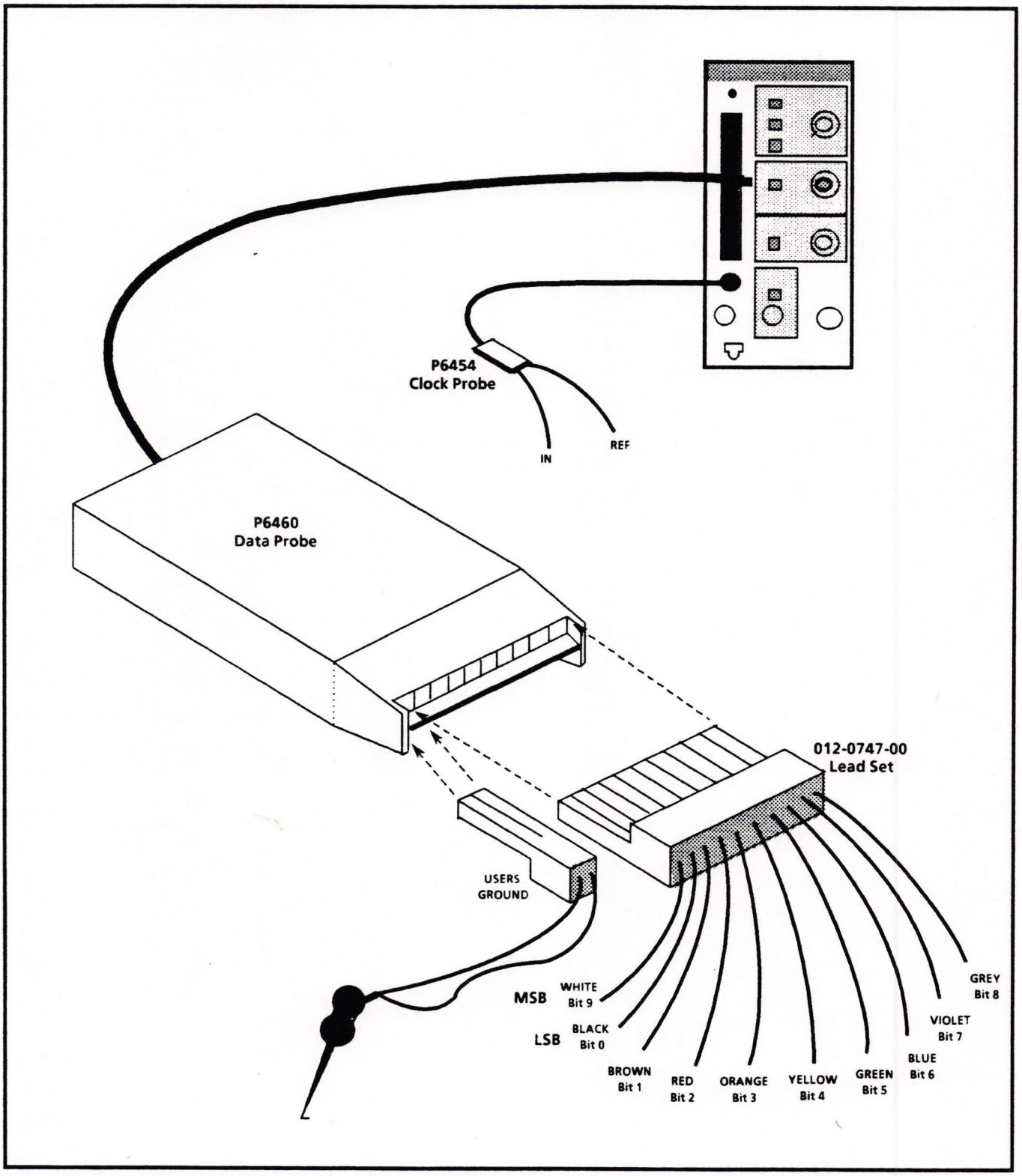


Fig. 1-5. Attaching the Data and Clock probes to the DP–100.

SECTION 2
SPECIFICATION AND PERFORMANCE CHECK

PERFORMANCE CONDITIONS

Electrical Characteristics: The Performance Requirements listed in the Electrical Specification apply over an ambient temperature range of 0°C to +50°C. The rated accuracies are valid when the instrument is calibrated at an ambient temperature range of +20°C to +30°C, after a warm-up time of 20 minutes. Test equipment used to verify Performance Requirements must be calibrated and working within the limits specified under the Equipment Required list.

ELECTRICAL SPECIFICATION

Table 2-1. Video Output Characteristics

Characteristic	Specification	Supplemental Information
Output Dynamic Range	1.3 V p-p ±1%	0 Hz. Terminated in 75Ω. All bits 0 to all bits 1.
D.C. Level	-300 mV ±50 mV	All bits 0.
Frequency Response Filter Off Filter On	 ±5%, D.C. to 50 MHz ±1%, D.C. to 5 MHz	 Referenced to 1 MHz. Referenced to 500 kHz. 7.159 MHz Sweep, 14.31818 MHz Data Rate.
Return Loss 0-5 MHz 5-10 MHz	 -40 dB -30 dB	
Random (Spurious) Noise	≤3 mV	Video Out: to 50 MHz.
Output Impedance	75Ω	
Pulse Response	<2% p-p ringing	2T Pulse, with Filter On.
Linearity Error	< ±1/2 LSB	10 bit digital mod ramp.
Diff Gain	0.6% Max	10 bit digital mod ramp.
Diff Phase	0.3° Max	10 bit digital mod ramp.

Table 2-2. Sync Characteristics

Characteristic	Specification	Supplemental Information
Input Voltage 525 / 60 System 625 / 50 System	 Composite Video or Composite Sync 200 mV to 4 V p-p	 15 kΩ input impedance.
Output Voltage 525 / 60 System 625 / 50 System	-2 V to 0 V ±0.25 V	Utility sync. 75Ω output impedance.
Horiz Position Start Range	 <4 μs ≥56 μs	 From leading edge of incoming sync to leading edge of output sync.
Vert Position Start Range	 <12 Lines ≥250 Lines	 From input line 1 to output line 1.
Jitter		≤50 ns, SYNC IN to SYNC OUT.

Table 2-3. Data Input Connector Characteristics

Characteristic	Specification	Supplemental Information
Differential ECL	0 to 50 MHz	
Input Impedance		50 Ω.
Power Supplies		Output at DATA IN Connector +5 V 600 mA Min 800 mA Max –5.2 V 200 mA Min 250 mA Max
Threshold Reference Range		–ECL –1.1 V to –1.3 V. TTL –1.9 V to –2.4 V. +ECL –2.4 V to –2.6 V.
Threshold Drive (Z_o)		25 KΩ.

Table 2-4. Clock Probe Characteristics

Characteristic	Specification	Supplemental Information
Input Frequency	<1 MHz to >100 MHz	–ECL / +ECL / TTL.
Phase Adjustment Range		≥50% at 1 MHz.
Input Impedance	50 Ω	

MECHANICAL SPECIFICATION

Table 2-5. PHYSICAL CHARACTERISTICS

Characteristic	Supplemental Information
Height	12.7 cm (5 in).
Width	7 cm (2.65 in).
Length	31 cm (12.2 in).
Weight Net Shipping	6.6 kg (3 lbs).

Table 2-6 ENVIRONMENTAL CHARACTERISTICS

Characteristic	Supplemental Information
Nominal Operating Temperature	+15°C to +35°C
Maximum Operating Temperature	0°C to +50°C
Storage Temperature	–40°C to +65°C
Operating Altitude	to 4,572 m (15,000 feet)
Storage Altitude	to 15,240 m (50,000 feet)

PERFORMANCE CHECK

This section gives the procedures for checking your DP–100. There are both short and long form procedures here. The short form procedure provides a quick reference for experienced technicians. The long form procedure gives more detailed steps.

Table 2-7 lists the equipment you will need. If you use alternate equipment, make sure it meets the specifications given in this table.

Table 2–7.
Recommended Test Equipment (Including Accessories)

Test Equipment	Minimum Specifications	Equipment Examples
Test Oscilloscope Mainframe	At least 50 MHz bandwidth with dual-trace plug-in and 10X probe.	TEKTRONIX 7603.
Test Oscilloscope Differential Comparator Plug-In	Minimum deflection factor 10 mV/div with 10X probe.	TEKTRONIX 7A13; plugs into 7603 mainframe.
Test Oscilloscope Dual-Trace Amplifier Plug-In	Minimum deflection factor 50 mV/div with 10X probe.	TEKTRONIX 7A26; plugs into 7603 mainframe.
Test Oscilloscope Dual Time Base Plug-In	Sweep rate 5 ns/div to 5 μs/div.	TEKTRONIX 7B53A; plugs into 7603 mainframe.
Spectrum Analyzer	Capable of measuring to at least 50 MHz.	TEKTRONIX 7L12; plugs into TEKTRONIX 7603 mainframe.
Test Signal Generator	Provides the following test signals: flat field, staircase, pulse & bar, mod ramp and color bars. 10 bit digital data.	TEKTRONIX 1910 (NTSC) or TEKTRONIX TSG–271* (PAL)
Waveform Monitor	For displaying and measuring field-rate and line-rate waveforms.	TEKTRONIX 1485 Mod W5F.
Vectorscope	For measuring differential phase and gain.	TEKTRONIX 520A (NTSC) or TEKTRONIX 521A (PAL).
Digital Sweep Generator	$<$500 kHz to $>$6 MHz 10 bit digital sweep output (Complementary –ECL), Analog Black Burst output, Internal clock available.	Tektronix Part No. 067-1011-00, used in a TM500/TM5000 Power Module.
DAC Test Sweep Generator	$<$1 MHz to $\geq$50 MHz sweep with $<$2 MHz to $\geq$100 MHz swept clock rate.	Tektronix Part No. 067-1362-00, used in a TM500/TM5000 Power Module.

***The TSG–271 has 12 bit digital data available internally. You must have access to the inside of the TSG–271 to be able to use it for testing the DP–100. Refer to "Digital Signal Sources for the DP–100", in this section.**

Table 2–7 (Cont.)
Recommended Test Equipment (Including Accessories)

Test Equipment	Minimum Specifications	Equipment Examples
P-P Detector Amplifier	Input Signal, 0.25 to 1.0 V p-p; Flatness, ±0.2%; Bandwidth, >5 MHz; Input Impedence, 75Ω.	Tektronix Part No. 015-0408-00, used in a TM500/TM5000 Power Module.
P-P Detector Head	Rectifies and detects the peak amplitude of an applied sine-wave signal. Provided with the P-P Detector Amplifier.	Tektronix Part No. 015-0413-00.
Video Amplitude Calibration Fixture (VAC)	Provides a chopped voltage reference accurate to ±0.05% from 0 to 1 V in 0.1 mV increments. (Used with the TEKTRONIX 1480 MOD W5F Waveform Monitor.)	Tektronix Part No. 067-0916-00, used in a TM500/TM5000 Power Module.
Leveled Sine Wave Generator	250 kHz to 50 MHz.	TEKTRONIX SG 503, used in a TM500/TM5000 Power Module.
Return Loss Bridge	At least 54 dB, dc to 10 MHz; 75Ω inputs.	Tektronix Part No. 015-0149-00.
50Ω to 75Ω Minimum Loss Attenuator	Equipped with BNC connectors.	Tektronix Part No. 011-0057-00.
DC Block	None.	Tektronix Part No. 015-0221-00.
End-Line Termination (Qty 3)	Impedance, 75Ω. Equipped with BNC connectors.	Tektronix Part No. 011-0102-00.
Feed-Through Termination (Qty 2)	Impedance, 75Ω. Equipped with BNC connectors.	Tektronix Part No. 011-0103-02.
RG59/U Coaxial Cables (Qty 5)	Impedance, 75Ω; length, 42 inches. Equipped with BNC connectors.	Tektronix Part No. 012-0074-00.
50Ω Coaxial Cable	Length, 42 inches. Equipped with BNC connectors. For use with the spectrum analyzer.	Tektronix Part No. 012-0057-01.
50Ω Precision Coaxial Cable	50Ω ±1%. Length, 36 inches. Equipped with BNC connectors. For use with SG503.	Tektronix Part No. 012-0482-00.
Digital Voltmeter	Resolution/Range = 10 mV from –15 to +15 Vdc.	TEKTRONIX DM502A, used in a TM500/TM5000 Power Module.
TM500 or TM5000 Series Power Module	Power supply and housing for the DP–100 and other TM500/TM5000 plug-in modules.	TEKTRONIX TM5006.

Digital Signal Sources for the DP-100

In order to check or adjust the DP-100, you need a digital source generator. The performance check and the adjustment procedures are written using a TEKTRONIX 1910 digital generator. This is because the 1910 has a connector on its rear panel with 10 bit complementary -ECL output.

Just about any digital generator may be used, preferably with 10 bit architecture, even though it has no outside connector. You must be able to open the instrument and attach the data probe leads to the data lines themselves.

One good place to find the data lines is at the DAC inputs. Table 2-8 lists the DAC inputs for several of the digital generators manufactured by Tektronix. The ICs listed in the table are located on the Analog board in each of these instruments.

In order to use the TSG-271 to calibrate the DP-100, you must remove the TSG-271 top cover and attach the data and clock probes to U250 and U350, as shown in Table 2-8.

This connects the DP-100 to the 10 most significant bits in the TSG-271, which actually has 12 bit architecture. The two lowest bits of the TSG-271, D1 and D0, are simply ignored.

The DP-100 may be used with fewer than 10 data bits as well, by connecting the White lead to the MSB and working down. On an eight bit system, then, the White lead would be connected to data bit 7 and the rest of the leads would be connected in order, with the red bit 2 lead being connected to data bit 0. The two unused DP-100 leads should then be grounded for proper operation.

Table 2-8.
Digital Signal Source Output Data Points for the DP-100.

DP-100 Connections		TSG-170A	TSG-271	TSG-300		
				Channel 1 (Y)	Channel 2 (B-Y)	Channel 3 (R-Y)
MSB	White	U345-15	U250-15	U390-15	U460-15	U340-15
	Grey	U345-16	U250-16	U390-16	U460-16	U340-16
	Violet	U345-17	U250-17	U390-17	U460-17	U340-17
	Blue	U345-18	U250-18	U390-18	U460-18	U340-18
	Green	U345-19	U250-19	U390-19	U460-19	U340-19
	Yellow	U345-20	U250-20	U390-20	U460-20	U340-20
	Orange	U245-15	U350-15	U290-15	U260-15	U240-15
	Red	U245-16	U350-16	U290-16	U260-16	U240-16
	Brown	U245-17	U350-17	U290-17	U260-17	U240-17
LSB	Black	U245-18	U350-18	U290-18	U260-18	U240-18
	Clock	U245-3 or U345-3	U250-3 or U350-3	U290-3 or U390-3	U460-3 or U360-3	U240-3 or U340-3

SHORT FORM PERFORMANCE CHECK

1. Check DATA THRESHOLD control

   Check the DATA IN connector pins 1 (GND) and 13 (Vthreshold) for the ranges listed in Table 2-9.

Table 2-9.
Data Threshold Control Levels

DATA TYPE	MIN (±20%)	MAX (±20%)	DETENT (±20%)
-ECL	-1.1V	-1.3V	-1.15V
TTL	-1.9V	-2.4V	-1.95V
+ ECL	-2.4V	-2.6V	-2.45V

2. Check Output Dynamic Range

   Check VIDEO OUT for -300 mV ±50 mV D.C., with all data bits grounded. Depress DATA INVERT and check for a D.C. shift of +1.3 V ±13 mV.

3. Check Output Gain

   Check white bar amplitude for 714.3 mV (700 mV, PAL) ±1%.

4. Check Pulse Response

   ≤2% p-p ringing following 2T pulse.

5. Check D.C. Level

   Check Blanking level for 0 V ±50 mV.
   Check Residual Noise for ≤3 mV.

6. Check Frequency Response

   Check for 1% to 5 MHz, filter ON.
   Check for 5% to 50 MHz, filter OFF.

7. Check BINARY/2 COMP control

   Check that the push button corrects a data bit 9 inversion.

8. Check Differential Phase and Gain

   0.3° or less; 0.6% or less.

9. Check Sync Position Control Range (Sync In to Sync Out)

   Vertical Sync: Output follows from <760 μs to >15.8 ms behind input.
   Horizontal Sync: Output follows from <4 μs to >50 μs behind output.

10. Check Return Loss

    VIDEO OUT 500 kHz - 5 MHz: ≥-40 dB
    5 MHz - 10 MHz: ≥-30 dB

LONG FORM PERFORMANCE CHECK

PRELIMINARY SETUP

1. Ensure that all test equipment is adapted to a suitable applied line-voltage source.

2. Set the jumper on J200, at the rear of the DP–100, to the + ECL position.

3. Install the DP–100 in the TM500 or TM5000 series power module.

4. Turn on all equipment and allow at least 20 minutes for the equipment to stabilize.

PERFORMANCE CHECK PROCEDURE

1. **Check DATA THRESHOLD Control**

   a. Set the DP–100 controls by depressing the TTL/ECL push button (ECL); all other push buttons out. Set the DATA THRESHOLD control to its detent position. Connect the DVM negative lead to pin 1 (GND) of the DATA INPUT connector, and the positive lead to pin 13 (Data Threshold Encoded) of the DATA INPUT connector.

   b. **CHECK** – that the DATA THRESHOLD level is at –2.45 V ±20%, and that the voltage moves from –2.3 V ±20% to –2.5 V ±20% as the DATA THRESHOLD control is varied from end to end of its range out of detent.

   c. Release the TTL/ECL push button (TTL).

   d. **CHECK** – that the DATA THRESHOLD level ranges from –2.4 V ±20% to –1.6 V ±20% as the DATA THRESHOLD control is rotated from end to end of its range, and is at –1.95 V ±20% when the control is placed in the detent position.

   e. Turn off the power and remove the DP–100 from the mainframe. Move the jumper on J200 from the + ECL position to the –ECL position.

   f. Re-install the DP–100 in the mainframe and turn on the power. Depress the TTL/ECL push button (ECL).

   g. **CHECK** – that the DATA THRESHOLD level is at –1.15 V ±20% with the DATA THRESHOLD control in the detent position, and varies from –1.1 V ±20% to –1.3 V ±20% as the control is rotated from end to end of its range.

   h. Place the DATA THRESHOLD control back into its detent position.

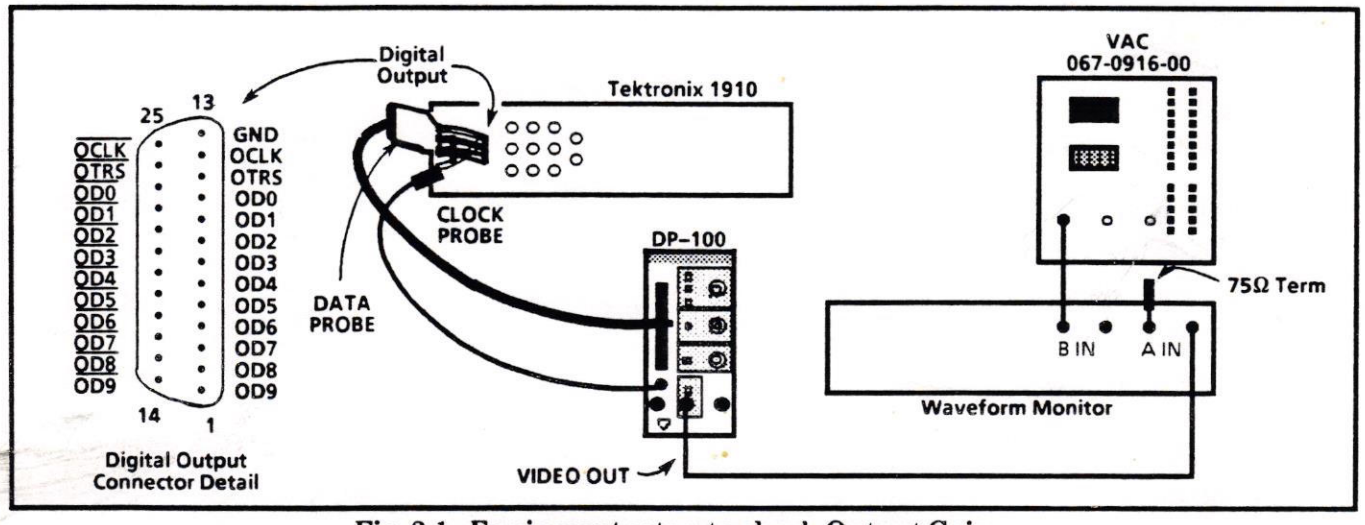


Fig. 2-1. Equipment setup to check Output Gain.

2. Check Output Dynamic Range

a. Connect the data and clock probes to the DP–100 as shown in SECTION 1, OPERATORS INFORMATION. Release the TTL/ECL push button (TTL), and ground all of the data leads.

b. Connect the clock probe Input lead to pin 12 of a 25 pin male D-subminiature plug, and connect the Ref lead to pin 13. Connect the plug to the Digital Output connector of the 1910.

c. Connect the DVM to the DP–100 VIDEO OUTPUT connector, using a 75Ω feedthrough terminator.

d. **CHECK** – that the VIDEO OUTPUT DC level is –300 mV ±50 mV. Note the voltage.

e. Depress the DATA INV/NORM push button (INVERT).

f. **CHECK** – that the VIDEO OUTPUT DC level is +1.3 V ±13 mV from the level noted in part d of this step.

3. Check Output Gain

a. Connect the DP–100, 1910, VAC, and Waveform Monitor as shown in Fig. 2-1. Attach the Data leads to the 25 pin plug that the clock leads are connected to, with the MSB at pin 1 and the LSB at pin 10.

b. Set the following controls:

Waveform Monitor

Input	A–B, DC Coupled	
	Response	FLAT
	Volts Full Scale	0.2
	DC Restorer	OFF
	Oper/Cal	OPER
	Sync	INT, DIRECT
	All Fields	OFF
	Display	10μs/Div
	Magnifier	**X1**

DP–100

Depress the TTL/ECL push button (ECL), and the FILTER push button (Filter On). All other push buttons out, and DATA THRESHOLD in its CAL position.

1910 (TSG–271)

Select the 100 IRE white bar (700 mV Flat Field for PAL).

c. Set the VAC lever switches for 714.3 mV (700.0 mV for PAL), with all push buttons out.

d. **CHECK** – using the VAC that the top of the lower waveform displayed on the Waveform Monitor is within ±14 mV of the blanking level of the upper waveform.

4. Check Pulse Response

a. Leave the equipment connected as in the previous step, and set the Waveform Monitor to 1 μs/Div.

b. Select the multipulse 100 IRE waveform on the 1910 (700 mV for PAL), and adjust the Waveform Monitor controls to place the bottom of the 2T pulse on screen.

c. **CHECK** – using the VAC that there is ≤14 mV P-P of ringing following the 2T pulse.

5. Check D.C. Level

a. Disconnect the VAC and Waveform Monitor from the setup of the previous step, and connect the DP–100 VIDEO OUT to the Test Oscilloscope vertical input, using a 75Ω feed through terminator.

b. Set the Test Oscilloscope to display the white bar at a vertical rate (10 μs /Div).

c. **CHECK** – that the blanking level of the waveform is at 0V DC ±50 mV.

d. Set the Test Oscilloscope vertical amplifier to 2 mV/Div, AC coupled, and set the position controls to display the blanking level of the waveform.

e. **CHECK** – that there is ≤3 mV of Spurious Noise on the waveform.

6. Check Frequency Response

a. Connect the DP-100 and the test equipment as shown in Fig. 2-2.

b. Set the following controls:

Digital Sweep Generator

Frequency	Sweep (knob in)
Clock	Internal
Sine Wave H Reset	Out

DP-100

Depress the TTL/ECL push button (ECL), and the FILTER push button (Filter On). All other push buttons out, and DATA THRESHOLD in its CAL position.

P-P Detector Amp

+ Input	Enabled (In)
– Input	Disabled (Out)

Set the + Level control so that the green light is on and both red lights are off.

Test Oscilloscope

Vertical Mode	Chop
Trigger Source	Left

7A13

Volts/Div	2 mV
+ Input Coupling	DC
– Input Coupling	Gnd
BW	Full

7A18

Display Mode	Ch 1
Ch 1 Volts/Div	500 mV

7B53A

Mode	Auto
Coupling	AC
Source	Ext
Time/Div	2 ms

c. **CHECK** – that the response curve displayed on the oscilloscope is similar to Fig. 2-3. The amplitude excursions should be within ±7 mV of the amplitude at 500 kHz, and the amplitude at 5.5 MHz should be ≤–14 mV of the 500 KHz amplitude.

d. Remove the P-P Detector Amp and Head from the test setup, and connect the VIDEO OUT to the 7A13 + input with a 75Ω coax and feed through terminator. Move the data and clock probes to the DAC Test Sweeper (067-1362-00). The connector pinout is the same as on the Digital Sweep Generator.

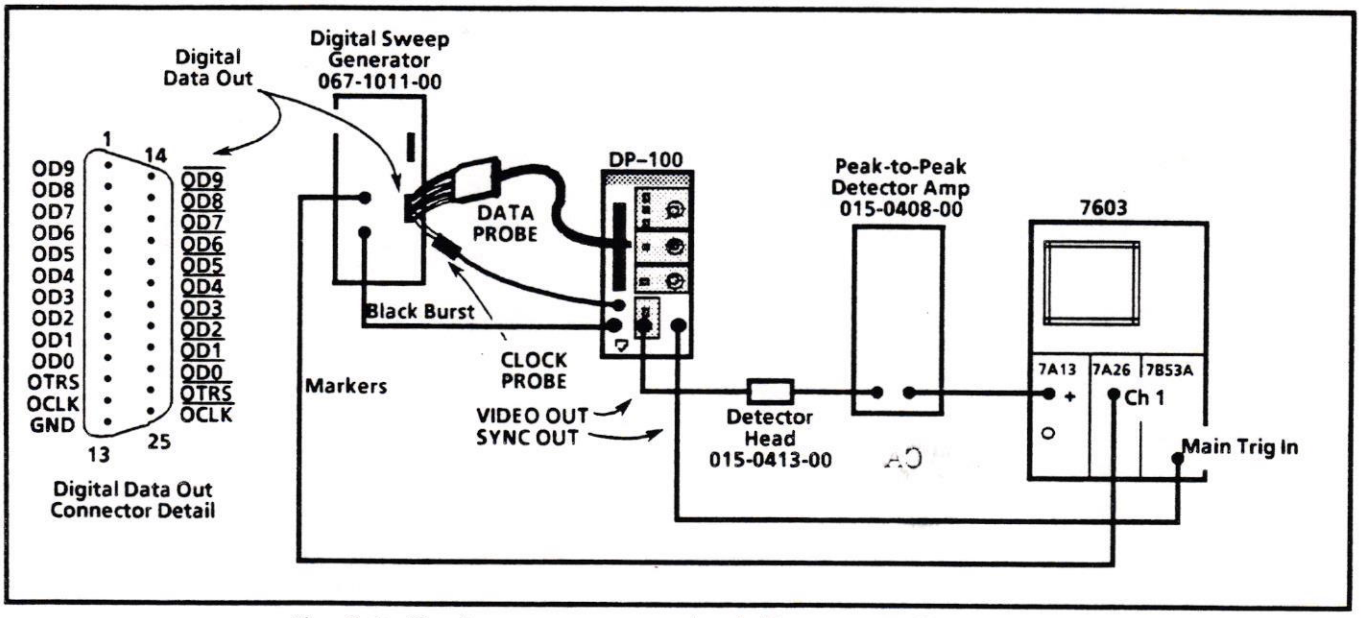


Fig. 2-2. Equipment setup to check Frequency Response.

e. Release the DP–100 FILTER push button (Filter Off). Readjust the CLOCK PHASE and DATA THRESHOLD controls, if necessary, for a stable sweep display.

f. **CHECK** – that the swept frequency amplitude is 714 mV ±35 mV from end to end of the display.

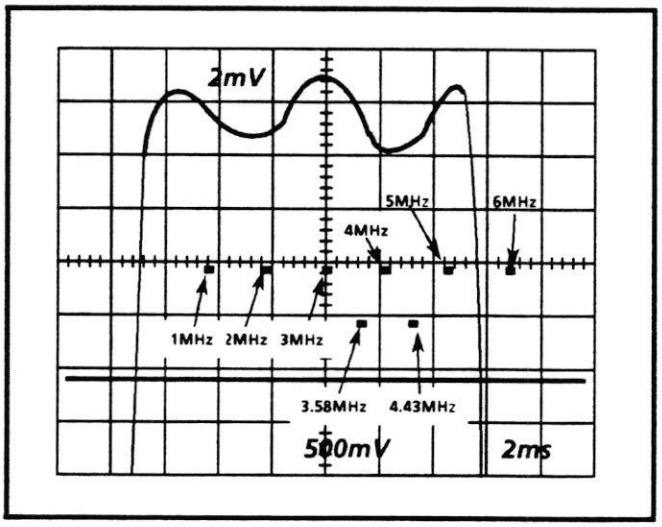


Fig. 2-3. Typical DP–100 Frequency Response.

7. Check BINARY/2 COMP Operation

a. Leave the equipment set up as in Fig. 2-2.

b. Move the MSB lead (white) of the P6460 data probe from the OD9 pin (pin 1) to the $\overline{\text{OD9}}$ pin (pin 14) of the digital data out connector.

c. **CHECK** – that the Frequency Response display appears to split in half on the oscilloscope.

d. Depress the BINARY/2 COMP push button (2s Complement).

e. **CHECK** – that the Frequency Response waveform rejoins and looks the same as before.

f. Return the MSB lead (white) of the P6460 data probe to the OD9 pin (pin 1), and release the BINARY/2 COMP push button (BINARY).

8. Check Differential Phase and Gain

a. Connect the DP–100 and test equipment as shown in Fig. 2-4.

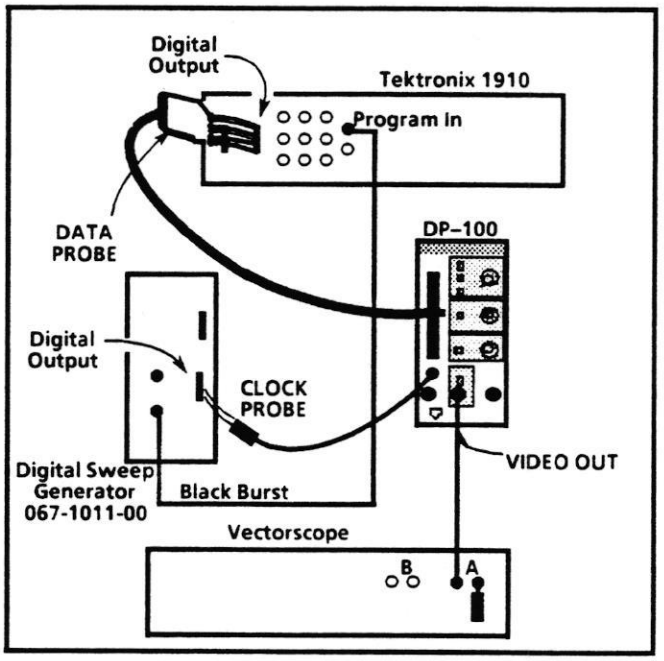


Fig. 2-4. Equipment setup for checking Diff Phase and Diff Gain.

b. Set the following controls:

DP–100

Depress the TTL/ECL push button (ECL) and the FILTER push button (Filter On). All other push buttons out, and DATA THRESHOLD in its CAL position.

1910 (TSG–271)

Select the mod ramp 100 IRE (700 mV for PAL) signal.

Vectorscope

Depress the Ch. A, AØ, Full Field, and Vector buttons. Check that the Calibrated Phase control is set at 0°.

Digital Sweep Generator

Clock	Internal
Sinewave H Reset	Out

c. Set the Vectorscope Channel A gain switch to Max Gain, and adjust the Channel A Gain control to place the vector tip to the compass rose (outer ring of the graticule).

d. Depress the Vectorscope Diff Phase push button, and adjust the Vectorscope Channel A Phase control for a null at the left side of the waveform.

e. **CHECK** – that the DP-100 Diff Phase is within 0.3°, using the Vectorscope Calibrated Phase control.

f. Return the Vectorscope Calibrated Phase control to 0°.

g. Depress the Vectorscope Diff Gain push button and use the Vert position control to place the left side of the trace on the 0 graticule line.

h. **CHECK** – that the DP-100 diff gain is within 0.6%.

9. Check SYNC POSITION Control Range

a. Connect the test equipment as shown in Fig. 2-5. The data and clock probes are not necessary for this step, but may be left connected as in the previous step.

b. Set the following controls:

DP-100

Depress the TTL/ECL push button (ECL) and the FILTER push button (Filter On), all other push buttons out. Set the DATA THRESHOLD control in its CAL position, the VERT SYNC POSITION control fully counter clockwise, and the HORIZ SYNC POSITION control fully clockwise.

Test Oscilloscope

Vertical Mode	Chop
Trigger Source	Left

7A18

Volts/Div	
Ch 1	1 V
Ch 2	1 V
Input Coupling	DC

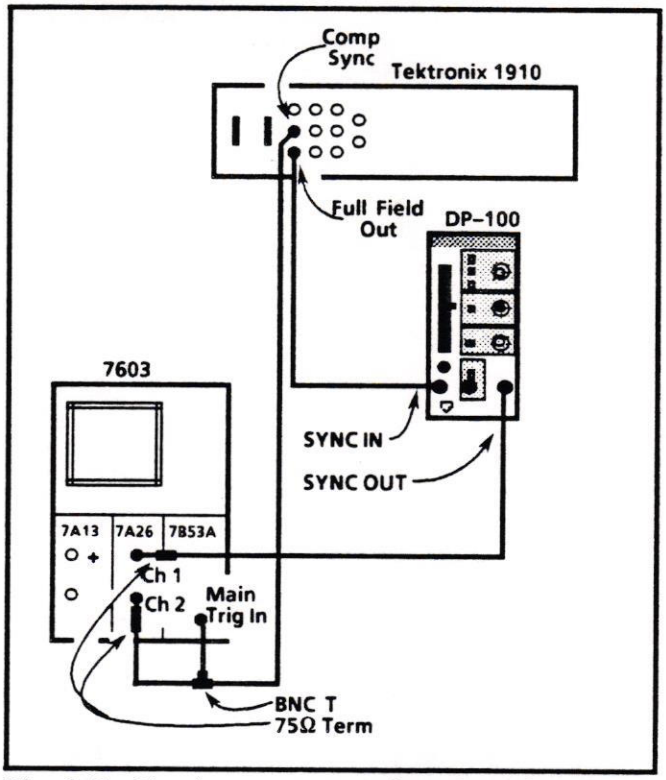


Fig. 2-5. Equipment setup for checking Sync Range.

Display Mode	Alt

7B53A

Mode	Auto
Coupling	AC
Source	Ext
Time/Div	5 ms
Delay	100 μs

1910

Select the color bar signal.

c. Depress the DP-100 FIXED/VAR SYNC POSITION push button (VARIABLE).

d. **CHECK** – that the trailing edge of the DP-100 Vertical Sync follows the trailing edge of the 1910 vertical sync within 760 μs.

e. Change the oscilloscope delayed sweep to 2 ms/Div.

f. **CHECK** – that the DP–100 vertical sync moves to at least 15.8 ms behind the 1910 vertical sync as the VERTICAL SYNC POSITION control is rotated fully clockwise.

g. Change the oscilloscope sweep to 20 μs/Div, delayed sweep to 10 μs/Div.

h. **CHECK** – that the DP–100 horizontal sync pulse leading edge is <4 μs behind the 1910 horizontal sync pulse leading edge.

i. **CHECK** – that the DP–100 Horizontal Sync pulse leading edge moves to at least 50 μs behind the 1910 horizontal pulse leading edge as the HORIZONTAL SYNC control is rotated fully counterclockwise.

10. Check Return Loss

a. Connect the equipment as shown in Fig. 2-6.

b. Set the following controls:

Test Oscilloscope	
Vert Mode	Right
Trig Source	Left
7A13	
+ Input	DC
– Input	DC
Volts/Div	50 mV
BW	Full
SG503	
Amplitude	500 mV
7L12	
Freq	0 MHz
Time/Div	5 ms
Ref Level	–20 dB
Display Mode	10 dB/Div
Gain Selector	CCW
Freq Span/Div	1 MHz
Resolution	300 kHz

c. Set the SG503 to 50 MHz.

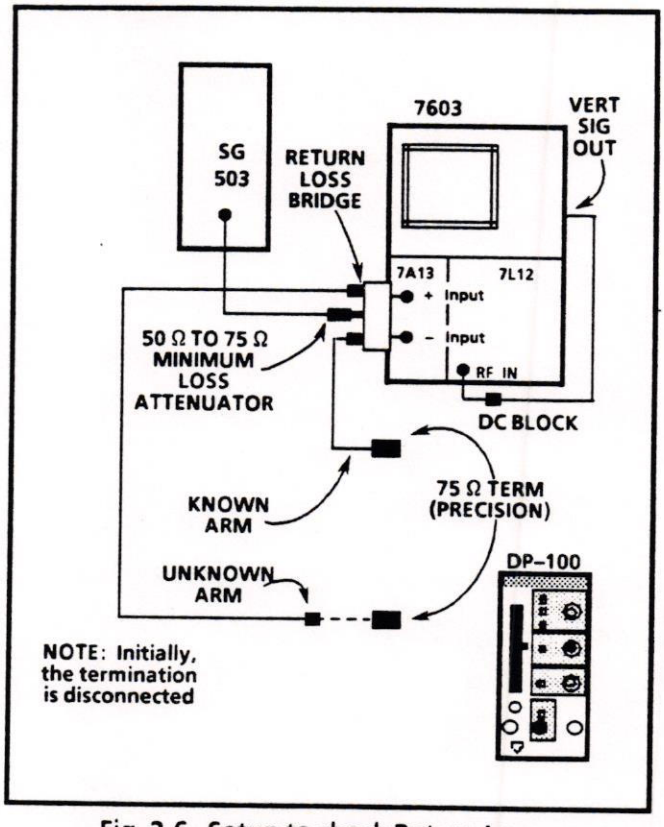


Fig. 2-6. Setup to check Return Loss.

d. With both precision terminators connected, adjust the Return Loss Bridge Balance adjustment to null the 50 MHz response displayed on the Spectrum Analyzer.

e. Remove the precision 75Ω terminator from the Unknown Arm and use the Spectrum Analyzer vertical position control to place the peak of the 50 MHz response at the top line of the graticule.

f. Connect the Unknown cable to the DP–100 VIDEO OUT connector.

g. **CHECK** – that the return loss is >30 dB (3 major divisions) as you vary the SG503 frequency between 50 MHz and 5 MHz.

h. **CHECK** – that the return loss is >40 dB (4 major divisions) as you vary the SG503 frequency between 5 MHz and 500 kHz.

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

SECTION 3

ADJUSTMENT PROCEDURE

This section gives the procedures for adjusting your DP-100. There are both short and long form procedures here. The short form procedure provides a quick reference for experienced technicians. The long form procedure gives more detailed steps.

Table 3-1 lists the equipment you will need. If you use alternate equipment, make sure it meets the specifications given in this table.

Table 3–1. Recommended Test Equipment (Including Accessories)

Test Equipment	Minimum Specifications	Equipment Examples
Test Oscilloscope Mainframe	At least 50 MHz bandwidth with dual-trace plug-in and 10X probe.	TEKTRONIX 7603.
Test Oscilloscope Differential Comparator Plug-In	Minimum deflection factor 10 mV/div with 10X probe.	TEKTRONIX 7A13; plugs into 7603 mainframe.
Test Oscilloscope Dual-Trace Amplifier Plug-In	Minimum deflection factor 50 mV/div with 10X probe.	TEKTRONIX 7A26; plugs into 7603 mainframe.
Test Oscilloscope Dual Time Base Plug-In	Sweep rate 5 ns/div to 5 μs/div.	TEKTRONIX 7B53A; plugs into 7603 mainframe.
Spectrum Analyzer	Capable of measuring to at least 5 MHz.	TEKTRONIX 7L12; plugs into TEKTRONIX 7603 mainframe.
Test Signal Generator	Provides the following test signals: flat field, staircase, pulse & bar, mod ramp and color bars. 10 bit digital data.	TEKTRONIX 1910 (NTSC) or TEKTRONIX TSG–271* (PAL).
Waveform Monitor	For displaying and measuring field-rate and line-rate waveforms.	TEKTRONIX 1485 Mod W5F.
Vectorscope	For measuring differential phase and gain.	TEKTRONIX 520A (NTSC) or TEKTRONIX 521A (PAL).
Digital Sweep Generator	$<$500 kHz to $>$6 MHz 10 bit digital sweep output (Complementary –ECL), Analog Black Burst output, Internal clock available.	Tektronix Part No. 067-1011-00, used in a TM500/TM5000 Power Module.
DAC Test Sweep Generator	$<$1 MHz to $\geq$50 MHz sweep with $<$2 MHz to $\geq$100 MHz swept clock rate.	Tektronix Part No. 067-1362-00, used in a TM500/TM5000 Power Module.

*The TSG–271 has 12 bit digital data available internally. You must have access to the inside of the TSG–271 to be able to use it for calibrating the DP–100. Refer to "Digital Signal Sources for the DP–100", in Section 2.

Table 3–1 (Cont.)
Recommended Test Equipment (Including Accessories)

Test Equipment	Minimum Specifications	Equipment Examples
P-P Detector Amplifier	Input Signal, 0.25 to 1.0 V p-p; Flatness, ± 0.2%; Bandwidth, >5 MHz; Input Impedence, 75Ω.	Tektronix Part No. 015-0408-00, used in a TM500/TM5000 Power Module.
P-P Detector Head	Rectifies and detects the peak amplitude of an applied sine-wave signal. Provided with the P-P Detector Amplifier.	Tektronix Part No. 015-0413-00.
Video Amplitude Calibration Fixture (VAC)	Provides a chopped voltage reference accurate to ± 0.05% from 0 to 1 V in 0.1 mV increments. (Used with the TEKTRONIX 1480 MOD W5F Waveform Monitor.)	Tektronix Part No. 067-0916-00, used in a TM500/TM5000 Power Mainframe.
Leveled Sine Wave Generator	250 kHz to 10 MHz.	TEKTRONIX SG 503, used in a TM500/TM5000 Power Module.
Return Loss Bridge	At least 54 dB, dc to 10 MHz; 75Ω inputs.	Tektronix Part No. 015-0149-00.
50Ω to 75Ω Minimum Loss Attenuator	Equipped with BNC connectors.	Tektronix Part No. 011-0057-00.
DC Block	None.	Tektronix Part No. 015-0221-00.
End-Line Termination (Qty 3)	Impedance, 75Ω. Equipped with BNC connectors.	Tektronix Part No. 011-0102-00.
Feed-Through Termination (Qty 2)	Impedance, 75Ω. Equipped with BNC connectors.	Tektronix Part No. 011-0103-02.
RG59/U Coaxial Cables (Qty 5)	Impedance, 75Ω; length, 42 inches. Equipped with BNC connectors.	Tektronix Part No. 012-0074-00.
50Ω Coaxial Cable	Length, 42 inches. Equipped with BNC connectors. For use with the spectrum analyzer.	Tektronix Part No. 012-0057-01.
50Ω Precision Coaxial Cable	50Ω ± 1%. Length, 36 inches. Equipped with BNC connectors. For use with SG503.	Tektronix Part No. 012-0482-00.
Digital Voltmeter	Resolution/Range = 10 mV from –15 to +15 Vdc.	TEKTRONIX DM502A, used in a TM500/TM5000 Power Module.
TM500 or TM5000 Series Power Module	Power supply and housing for the DP–100 and other TM500/TM5000 plug-in modules.	TEKTRONIX TM5006
Power Module Extender Cable	Allows the DP–100 to be operated outside of the power module for calibration.	Tektronix Part No. 067-0645-02

SHORT FORM ADJUSTMENT PROCEDURE

1. Adjust Power Supply

   Set R525 for -5.1 V ±50 mV. Check other supplies for rated voltage ±6%.

2. Check DATA THRESHOLD control

   Check the DATA IN connector pins 1 (ground) and 13 (Vthreshold) for the ranges listed in Table 3-2.

Table 3-2.
Data Threshold Control Levels

DATA TYPE	MIN (±20%)	MAX (±20%)	DETENT (±20%)
-ECL	-1.1V	-1.3V	-1.15V
TTL	-1.9V	-2.4V	-1.95V
+ ECL	-2.4V	-2.6V	-2.45V

3. Check Output Dynamic Range

   Check VIDEO OUT for -300 mV ±50 mV DC, with all data bits grounded. Depress DATA INVERT and check for a DC shift of +1.3 V ±13 mV.

4. Adjust Output Gain

   Check white bar amplitude for 714.3 mV (700 mV, PAL) ±2%.

5. Check Pulse Response

   ≤2% p-p ringing following 2T pulse.

6. Adjust DC Level

   Adjust R240 for Blanking level of 0 V ±50 mV.

   Check Residual Noise for ≤3 mV.

7. Adjust Frequency Response (Filter ON)

   Adjust C512, L326, L330, L230, L130, and L126 for 1% to 5 MHz, Filter ON.
   Check for 5% to 50 MHz, Filter OFF.

8. Check BINARY/2 COMP control

   Check that the push button corrects a data bit 9 inversion.

9. Check Differential Phase and Gain

   0.3° or less; ≤0.6% or less.

10. Check Sync Position Control Range (Sync In to Sync Out)

    Vertical Sync: Output follows from <760 μs to >15.8 ms behind input.

    Horizontal Sync: O utput follows from <4 μs to >50 μs behind input.

11. Check Return Loss

    VIDEO OUT
    500 kHz - 5 MHz: ≥40 dB
    5 MHz - 50 MHz: ≥30 dB

LONG FORM ADJUSTMENT PROCEDURE

PRELIMINARY SETUP

1. Ensure that all test equipment is adapted to a suitable applied line-voltage source.

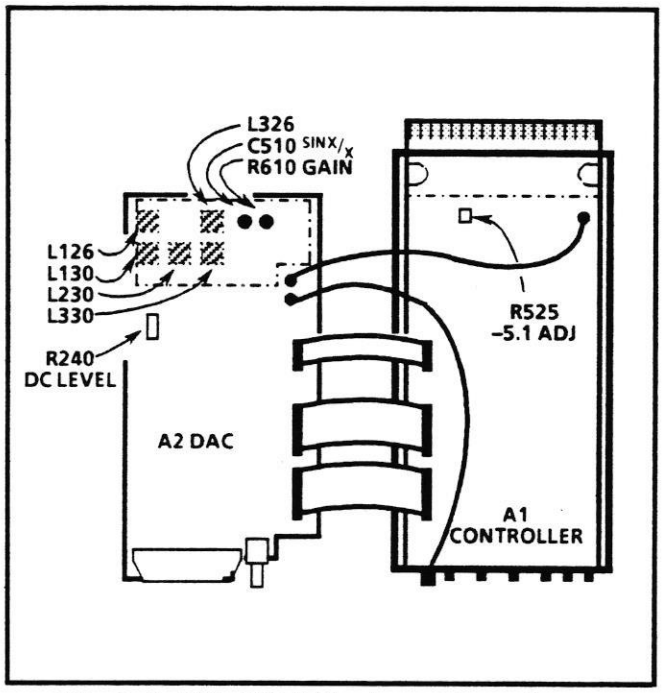


Fig. 3–1. DP–100 Adjustment Locations.

2. Set the jumper on J200, at the rear of the DP–100, to the +ECL position.

3. Remove the top and side covers. Remove the DAC board from its frame, and lay it out in the servicing position as detailed in SECTION 5, MAINTENANCE. Adjustment locations are shown in Fig. 3-1.

4. Connect the DP–100 through the extender cable to any compartment of a TM500 or TM5000 series power module.

5. Turn on all equipment and allow at least 20 minutes for the equipment to stabilize.

ADJUSTMENT PROCEDURE

1. Adjust Power Supply Voltages

a. **ADJUST** – R525 on the Controller board (A1) to set the –5 V TP to –5.1 V, ±50 mV, using the DVM.

b. **CHECK** – that the +15V, +5 V, and –15 V test points are at their stated voltages, ±6%.

2. Check DATA THRESHOLD Control

a. Set the DP–100 controls by depressing the TTL/ECL push button (ECL), all other push buttons out. Set the DATA THRESHOLD control to its detent position. Connect the DVM negative lead to pin 1 (GND) of the DATA INPUT connector, and the positive lead to pin 13 (Data Threshold Encoded) of the DATA INPUT connector.

b. **CHECK** – that the DATA THRESHOLD level is at –2.45 V ±20%, and that the voltage moves from –2 V ±20% to –2.5 V ±20% as the DATA THRESHOLD control is varied from end to end of its range out of detent.

c. Release the TTL/ECL push button (TTL).

d. **CHECK** – that the DATA THRESHOLD level ranges from –2.4 V ±20% to –1.6 V ±20% as the DATA THRESHOLD control is rotated from end to end of its range, and is at –1.95 V ±20% when the control is placed in the detent position.

e. Move the jumper on J200 from the +ECL position to the –ECL position.

f. Depress the TTL/ECL push button (ECL).

g. **CHECK** – that the DATA THRESHOLD level is at –1.15V ±20% with the DATA THRESHOLD control in the detent position, and varies from –1.1V ±20% to –1.3V ±20% as the control is rotated from end to end of its range.

h. Place the DATA THRESHOLD control back into the detent position.

3. Check Output Dynamic Range

a. Connect the data and clock probes to the DP–100 as shown in SECTION 1 OPERSASTORS INFORMATION. Release the TTL/ECL push button (TTL), and ground all of the data leads.

b. Connect the clock probe Input lead to pin 12 of a 25 pin male D-subminiature plug , and connect the Ref lead to pin 13. Connect the plug to the Digital Output connector of the 1910.

c. Connect the DVM to the DP–100 VIDEO OUTPUT connector, using a 75Ω feedthrough terminator.

d. **CHECK** – that the VIDEO OUTPUT DC level is –300 mV ±50 mV. Note the voltage.

e. Depress the DATA INV/NORM push button (INVERT).

f. **CHECK** – that the VIDEO OUTPUT DC level is +1.3 V ±13 mV from the level noted in part d of this step.

4. Adjust Output Gain

a. Connect the DP–100, 1910, VAC, and Waveform Monitor as shown in Fig. 3-2. Attach the data leads to the 25 pin plug that the clock leads are connected to, with the MSB at pin 1 and the LSB at pin 10.

b. Set the following controls:

Waveform Monitor

Input	A–B, DC Coupled
Response	FLAT
Volts Full Scale	0.2
DC Restorer	OFF
Oper/Cal	OPER
Sync	INT, DIRECT
All Fields	OFF
Display	10μs/Div
Magnifier	X1

DP–100

Depress the TTL/ECL push button (ECL), and the FILTER push button (Filter On). All other push buttons out, and DATA THRESHOLD in its CAL position.

1910 (TSG–271)

Select the 100 IRE white bar (700 mV Flat Field for PAL).

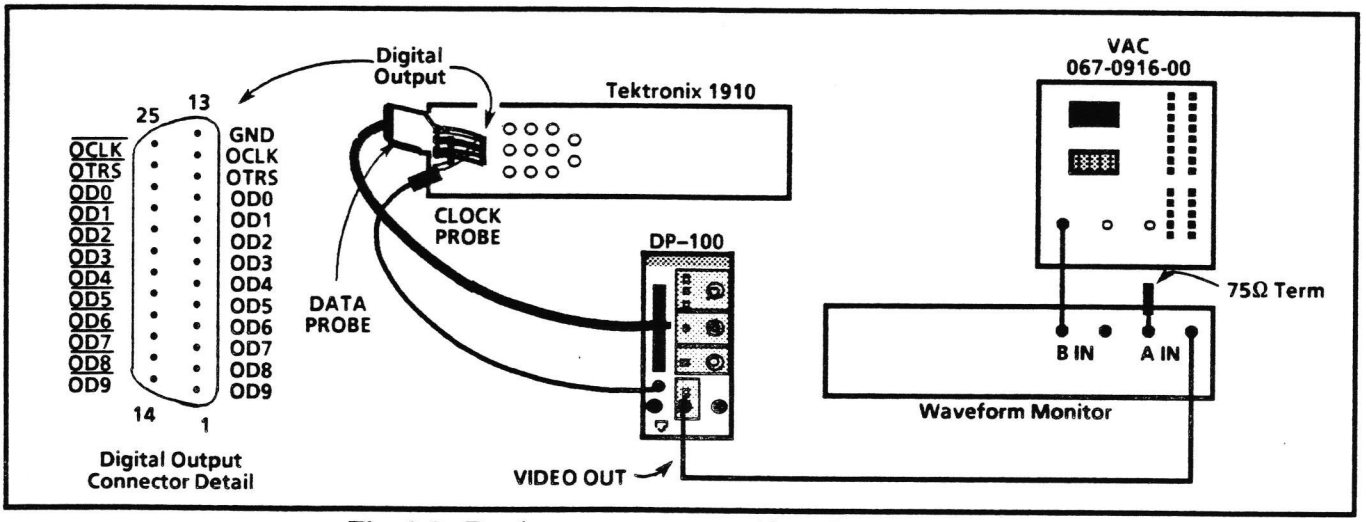


Fig. 3-2. Equipment setup to adjust Output Gain.

c. Set the VAC lever switches for 714.3 mV (700.0 mV for PAL), with all push buttons out.

d. **ADJUST** – R610 on the DAC board (A2) so that the top of the lower waveform displayed on the Waveform Monitor is exactly at the blanking level of the upper waveform.

5. Check Pulse Response

a. Leave the equipment connected as in the previous step, and set the Waveform Monitor to 1 μs/Div.

b. Select the multipulse 100 IRE waveform on the 1910 (700 mV for PAL), and adjust the Waveform Monitor controls to place the bottom of the 2T pulse on screen.

c. **CHECK** – using the VAC that there is ≤14 mV P-P of ringing following the 2T pulse.

6. Adjust DC Level

a. Disconnect the VAC and Waveform Monitor from the setup of the previous step, and connect the DP-100 VIDEO OUT to the Test Oscilloscope vertical input, using a 75Ω feed-through terminator.

b. Set the Test Oscilloscope to display the white bar at a vertical rate (10 μs/Div).

c. **ADJUST** – R240 on the DAC board (A2) to set the blanking level of the waveform to 0 V dc ±50 mV.

d. Set the Test Oscilloscope vertical amplifier to 2 mV/Div, AC coupled, and set the position controls to display the blanking level of the waveform.

e. **CHECK** – that there is ≤3 mV of Spurious Noise on the waveform.

7. Adjust Frequency Response

NOTE

In order to adjust Frequency Response on the DP-100, the shield on the DAC board must be removed to allow access to the coils in the 5.5 MHz filter. These coils have been sealed; the sealer must be removed before the coils can be adjusted. It is recommended that the coils be resealed with a good quality silicon sealer, such as DOW CORNING RTV, following adjustment.

a. Connect the DP-100 and the test equipment as shown in Fig. 3-3.

b. Set the following controls:

Digital Sweep Generator

Frequency	Sweep (knob in)
Clock	Internal
Sine wave H Reset	Out

DP-100

Depress the TTL/ECL push button (ECL), and the FILTER push button (Filter On). All other push buttons out, and DATA THRESHOLD in its CAL position.

P-P Detector Amp

+ Input	Enabled (In)
– Input	Disabled (Out)

Set the + Level control so that the green light is on and both red lights are off.

Test Oscilloscope

Vertical Mode	Chop
Trigger Source	Left

7A13

Volts/Div	2 mV
+ Input Coupling	DC
– Input Coupling	Gnd
BW	Full

7A18

Display Mode	Ch 1
Ch. 1 Volts/Div	500 mV

7B53A

Mode	Auto
Coupling	AC
Source	Ext
Time/Div	2 mS

c. Preset L126 by adjusting the coil core to the bottom of its travel.

d. **ADJUST** – C512 ($SIN\ X/X$) to match the amplitude of the waveform at the 5 MHz marker to the approximate amplitude at 500 kHz.

e. **ADJUST** – L326, L330, L230, and L130 to level the waveform. Readjust L126 if necessary. The response curve displayed on the oscilloscope is not flat, but should have peaks at approximately 500 kHz, 3 MHz, and slightly above 5 MHz. See Fig. 3-4.

f. Repeat parts d and e of this step as necessary, until the response curve is similar to Fig. 3-4.

g. **CHECK** – that the amplitude excursions are within ±7 mV of the amplitude at 500 kHz, and the amplitude at 5.5 MHz is ≤–14 mV of the 500 kHz amplitude.

h. Remove the P-P Detector Amp and Head from the test setup, and connect the VIDEO OUT to the 7A13 + input, with a 75Ω coax and feed-through terminator. Move the data and clock probes to the DAC Test Sweeper (067-1362-00). The connector pinout is the same as on the Digital Sweep Generator.

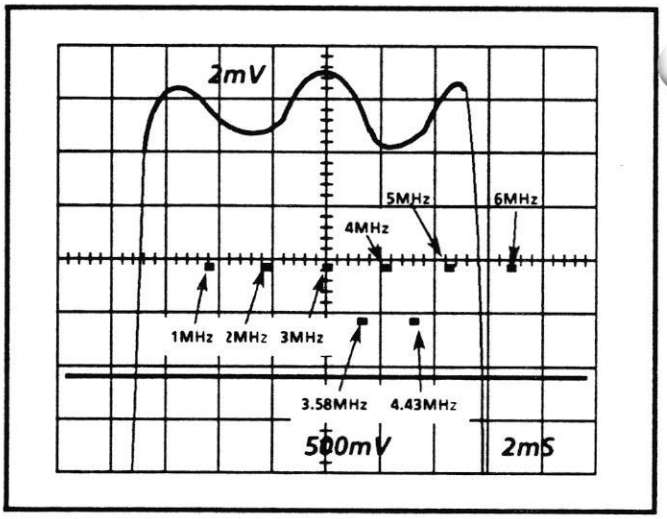


Fig. 3-4. Typical DP–100 Frequency Response.

i. Release the DP–100 FILTER push button (filter off). Readjust the CLOCK PHASE and DATA THRESHOLD controls, if necessary, for a stable sweep display.

j. **CHECK** – that the swept frequency amplitude is 714 mV ±35 mV from end to end of the display.

8. Check BINARY/2 COMP Operation

a. Leave the equipment set up as in Fig. 3-3.

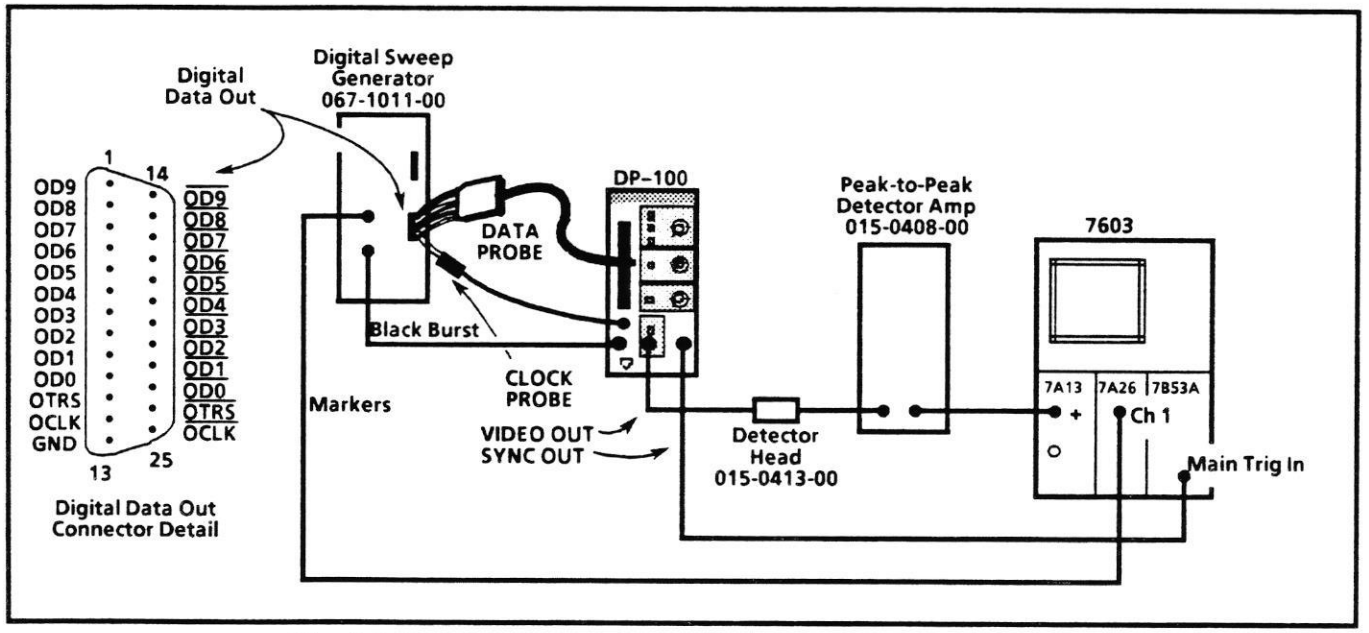


Fig. 3-3. Equipment setup to adjust Frequency Response.

b. Move the MSB lead (white) of the P6460 data probe from the OD9 pin (pin 1) to the OD9 pin (pin 14) of the digital data out connector.

c. **CHECK** – that the Frequency Response display appears to split in half on the oscilloscope.

d. Depress the BINARY/2 COMP push button (2s Complement).

e. **CHECK** – that the Frequency Response waveform rejoins and looks the same as before.

f. Return the MSB lead (white) of the P6460 data probe to the OD9 pin (pin 1), and release the BINARY/2 COMP push button (BINARY).

9. Check Differential Phase and Gain

a. Connect the DP–100 and test equipment as shown in Fig. 3-5.

b. Set the following controls:

DP–100

Depress the TTL/ECL push button (ECL), and the FILTER push button (Filter On). All other push buttons out, and DATA THRESHOLD in its CAL position.

1910 (TSG–271)

Select the mod ramp 100 IRE (700 mV for PAL) signal.

Vectorscope

Depress the Ch. A, AØ, Full Field, and Vector buttons. Check that the Calibrated Phase control is set at 0°.

Digital Sweep Generator

Clock Internal
Sine Wave H Reset Out

c. Set the Vectorscope Channel A gain switch to Max Gain, and adjust the Channel A Gain control to place the vector tip to the compass rose (outer ring of the graticule).

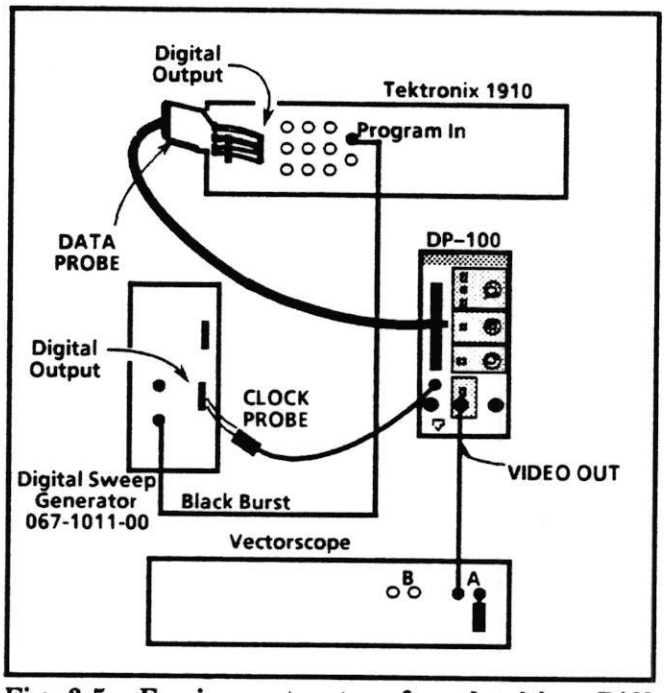


Fig. 3-5. Equipment setup for checking Diff Phase and Diff Gain.

d. Depress the Vectorscope Diff Phase push button, and adjust the Vectorscope Channel A Phase control for a null at the left side of the waveform.

e. **CHECK** – that the DP–100 Diff Phase is within 0.3°, using the Vectorscope Calibrated Phase control.

f. Return the Vectorscope Calibrated Phase control to 0°.

g. Depress the Vectorscope Diff Gain push button and use the Vert position control to place the left side of the trace on the 0 graticule line.

h. **CHECK** – that the DP–100 diff gain is within 0.6%.

10. Check SYNC POSITION Control Range

a. Connect the test equipment as shown in Fig. 3-6. The data and clock probes are not necessary for this step, but may be left connected as in the previous step.

b. Set the following controls:

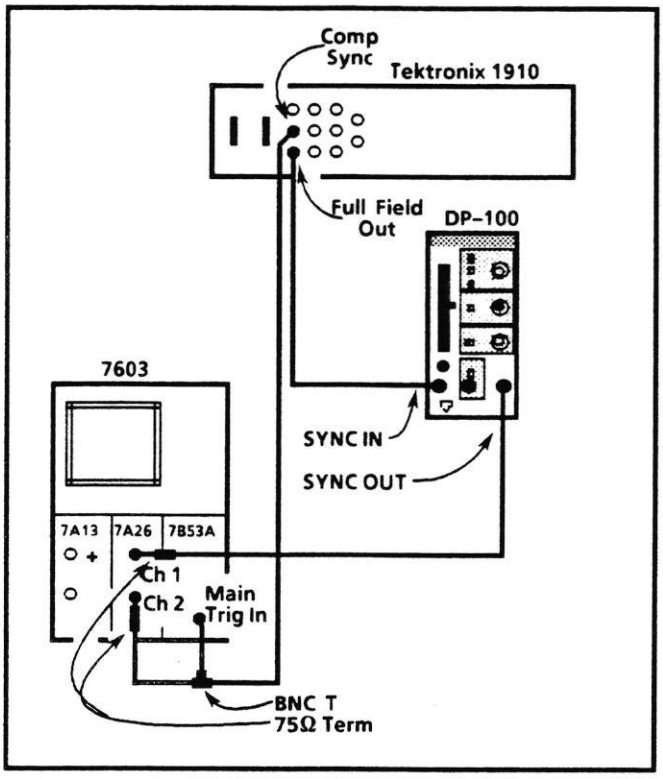


Fig. 3-6. Equipment setup for checking Sync Range.

DP–100

Depress the TTL/ECL push button (ECL), and the FILTER push button (Filter On), all other push buttons out. Set the DATA THRESHOLD control in its CAL position, the VERT SYNC POSITION control fully counterclockwise, and the HORIZ SYNC POSITION control fully clockwise.

Test Oscilloscope

Vertical Mode	Chop
Trigger Source	Left

7A18

Volts/Div	
Ch 1	1 V
Ch 2	1 V
Input Coupling	DC
Display Mode	Alt

7B53A

Mode	Auto
Coupling	AC
Source	Ext
Time/Div	5 ms
Delay	100 μs

1910

Select the color bar signal.

c. Depress the DP–100 FIXED/VAR SYNC POSITION push button (VARIABLE).

d. **CHECK** – that the trailing edge of the DP–100 Vertical Sync follows the trailing edge of the 1910 vertical sync within 760 μS.

e. Change the oscilloscope delayed sweep to 2 ms/Div.

f. **CHECK** – that the DP–100 vertical sync moves to at least 15.8 ms behind the 1910 vertical sync as the VERTICAL SYNC POSTION control is rotated fully clockwise.

g. Change the oscilloscope sweep to 20 μs/Div, delayed sweep to 10 μs/Div.

h. **CHECK** – that the DP–100 horizontal sync pulse leading edge is <4 μs behind the 1910 horizontal sync pulse leading edge.

i. **CHECK** – that the DP–100 Horizontal Sync pulse leading edge moves to at least 50 μs behind the 1910 horizontal pulse leading edge as the HORIZONTAL SYNC control is rotated fully counter clockwise.

11. Check Return Loss

a. Connect the equipment as shown in Fig. 3-7.

b. Set the following controls:

Test Oscilloscope

Vert Mode	Right
Trig Source	Left

7A13

+ Input	DC
– Input	DC
Volts/Div	50 mV
BW	Full

SG503

Amplitude	500 mV

7L12

Freq	0 MHz
Time/Div	5 ms
Ref Level	–20 dB
Display Mode	10 dB/Div
Gain Selector	CCW
Freq Span/Div	1 MHz
Resolution	300 kHz

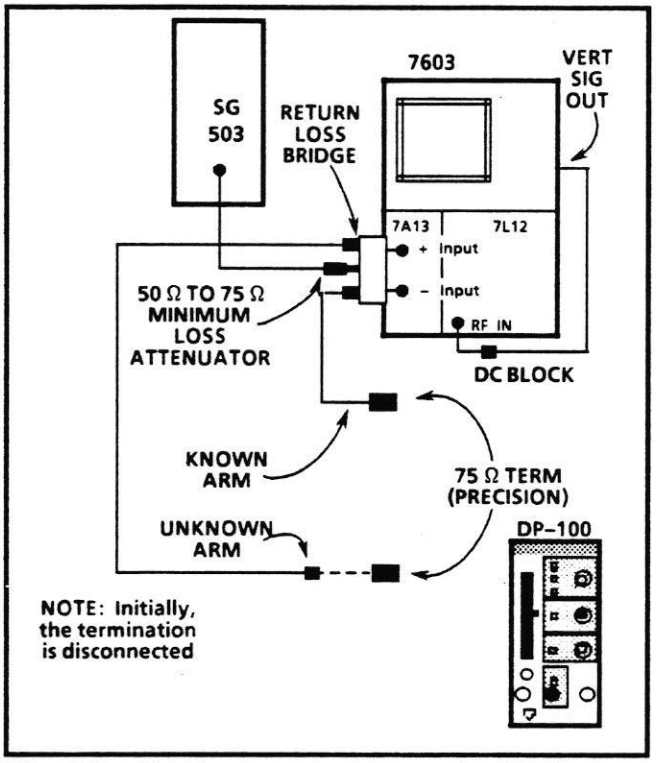


Fig. 3-7. Equipment setup to check Return Loss.

c. Set the SG503 to 50 MHz.

d. With both precision terminators connected, adjust the Return Loss Bridge Balance adjustment to null the 50 MHz response displayed on the Spectrum Analyzer.

e. Remove the precision 75Ω terminator from the Unknown Arm and use the Spectrum Analyzer vertical position control to place the peak of the 50 MHz response at the top line of the graticule.

f. Connect the Unknown cable to the DP–100 VIDEO OUT connector.

g. **CHECK** – that the return loss is >30 dB (3 major divisions) as you vary the SG503 frequency between 50 MHz and 5 MHz.

h. **CHECK** – that the return loss is >40 dB (4 major divisions) as you vary the SG503 frequency between 5 MHz and 500 kHz .

SECTION 4

THEORY OF OPERATION

INTRODUCTION

This section of the manual describes the operation of the DP–100, beginning with a functional block diagram description. This is followed by a more detailed description of each circuit block. The detailed description is arranged to follow the same order that the circuit blocks appear in the schematic diagrams. While using this Theory of Operation, refer to the Block Diagram and the Schematic Diagrams located in the foldout pages at the rear of the manual.

BLOCK DIAGRAM DESCRIPTION

The DP–100 is constructed on two circuit boards, the DAC board (A2), and the Controller board (A1). The DAC board contains the digital processing and analog output circuitry, while the Controller board contains all the front panel controls, the Sync and DAC Control circuitry, and the Power Supply.

The digital data is acquired through the P6460 Data Probe, and applied to the Line Receiver block.

Line Receivers

The data from the P6460 Data Probe is presented to the Line Receivers as differential +ECL. The Line Receivers convert this to single-ended +ECL, and then level shift it to –ECL.

Inverters

The Inverters are controlled by the front panel BINARY/2 COMP and the NORM/INVERT push buttons. The BINARY/2 COMP push button inverts the MSB only, while the NORM/INVERT push button inverts all the data bits.

Clock Generator

The Clock Generator receives a signal from the P6454 Clock Probe, and outputs variable duty cycle clock pulses controlled by the CLOCK PHASE and CLOCK NORM/INV controls. CLK1 latches the data through the MUX Latches, while CLK2 and $\overline{\text{CLK2}}$ are used to clock the data through the DACs.

MUX Latches

These multiplexers latch the data through to the DACs. If Variable Sync is in use, the Clamp pulse from the Sync Output Logic holds all the data lines, except bit six, low for approximately 4 μs following the trailing edge of sync.

DACs

The DACs receive the data from the MUX Latches and convert it to an analog signal. If Variable Sync is in use, the digital word presented during the Clamp pulse holds the output at approximately 0V dc.

5.5 MHz Filter

The 5.5 MHz filter, a low-pass filter with a very sharp cutoff characteristic, is used for smoothing of the analog signal. It may be switched in or out of the signal path by a front panel push button.

Output Amplifier

The Output Amplifier receives the analog signal, either directly from the DACs or through the 5.5 MHz Filter, and outputs a 1 volt analog signal to the front panel bnc and to the rear card-edge connector.

Sync Stripper

The Sync Stripper accepts either a comp video signal or a comp sync signal, through either the front panel bnc or the rear card-edge connector. It outputs, in turn: an H Drive pulse, which is applied to the H Delay circuitry; a burst Gate pulse, which is applied to the V Delay circuitry; and Comp Sync, which is applied to both the V Delay and the Sync Output Logic circuitry.

H Delay

The H Delay circuit is triggered by the H Drive pulse from the Sync Stripper, and produces a delayed horizontal sync pulse. The amount of delay is determined by the front panel HORIZ SYNC POSITION control. This pulse (HDEL) is applied to the Sync Output Logic, and is inverted for use by the V Delay circuitry and the Phase Locked Loop.

Phase Locked Loop

The Phase Locked Loop uses the $\overline{\text{HDEL}}$ pulse to hold a VCO to a frequency of approximately 64H. This clocks a counter which provides a clock to the Sync Output Logic, and part of the address for a PROM in the Sync Output Logic circuitry. The highest output bit that is used from the counter is an H rate square wave. This is inverted, for use as a clock for the V Delay circuitry, then inverted again to be the sampled pulse for the Phase Locked Loop.

V Delay

The V Delay circuitry detects the vertical sync portion of the Sync Stripper comp sync output, and reads the VERT SYNC POSITION control digitized output at that time. This is compared to the output of a counter, clocked by an H rate square wave and reset during each vertical interval, to provide a count of lines per field. When the counter output reaches the line selected by the VERTICAL POSITION control, the comparator produces an output to trigger the start time of the variable vertical sync window.

Var V Window

The pulse from the V Delay comparator is applied to a counter, which then produces a 10H pulse (Variable Vertical Window), which denotes the vertical blanking interval. This pulse causes the PROM in the Sync Output Logic circuit to output the vertical blanking interval information.

System ID

The V Delay line counter also drives two flip flops which are used to determine whether the current field is odd or even, and whether this signal is part of a 525 line system or a 625 line system. These flip flops address the PROM in the Sync Output Logic, to determine which vertical interval to produce.

Sync Output Logic

The Sync Output Logic accepts fixed sync from the Sync Stripper, delayed horizontal sync from H Delay, and variable vertical timing from V Delay. It then produces the delayed vertical interval and combines it with the delayed horizontal sync. The front panel FIXED/VARIABLE SYNC push button then selects whether the variable sync or the fixed sync is gated through to the output buffer. When VARIABLE SYNC is selected, this block also produces the clamp pulse used by the MUX Latches.

Output Buffer

The Output Buffer receives the TTL level sync information from the Sync Output Logic, and provides negative-going sync to the front panel SYNC OUT bnc and to the rear card-edge connector. The output at either or both of these connectors will be –2 volts into a 75Ω load.

Power Supply

The Power Supply connects to the mainframe power supplies at pins 2, 8, and 12 of the rear card-edge connector, and develops regulated +15 V, +5 V, –5.1 V, and –15 V supplies for use throughout the DP-100.

DETAILED CIRCUIT DESCRIPTION

DATA INPUT & DAC ◇1

Line Receivers

U280, U380, and U480 are high speed ECL line receivers. They accept the differential +ECL input from the P6460 Data Probe, through J590, and output single-ended +ECL. Each of the line receivers has a 5V zener diode in line with its output, which shifts the signal from +ECL to -ECL levels. The data is then applied to the Inverters.

Inverters

U462, U460, U162, and U160C are high speed ECL Exclusive-OR gates, used as switchable inverters under the control of the front panel NORM/INV and BIN/2 COMP push buttons (shown on schematic 4). Each of the Line Receivers drives one of the Exclusive-OR gate inputs, while the other input for each gate is controlled by the front panel push buttons. The NORM/INV push button controls all but U162A (bit 9), which is controlled by the BIN/2 COMP push button. The two push buttons are interconnected, so that the function of the BIN/2 COMP push button changes according to the position of the NORM/INV push button.

Normally, with both the NORM/INV and the BIN/2 COMP push buttons released (NORMAL, BINARY), all of the control lines to the inverters are pulled low, to -5.1V, so the Exclusive-OR gates pass the signal with no inversion. If the BIN/2 COMP push button alone is depressed (2s COMPLEMENT), then only the control line to U162A-4 is grounded and only bit 9 is inverted.

If the NORM/INV push button alone is depressed (INVERT), then both control line are grounded, and the inverters all invert their data bits. If both of the push buttons are depressed (INVERT, 2s COMPLEMENT), then the control line that connects to all the inverters except U162A is grounded, and the control line to U162A-4 is held at -5.1V, resulting in all the data bits except bit 9 being inverted.

Multiplex Latches

U350, U450, and U550 are 4 bit multiplex latches. The digital data is applied to their A inputs (pins 6, 4, 13, and 11), while a hard-wired digital word is applied to their B inputs (pins 5, 3, 12, and 10). While CLK1 is low, they pass the data applied to their A inputs or that applied to their B inputs (depending on the state of the $A/\overline{B}$ control, pin 9). When CLK1 returns high, they latch the outputs until the next clock pulse.

In FIXED SYNC operation, the $A/\overline{B}$ control input is held high, so only the digital data from the Inverters is passed through. VARIABLE SYNC operation is the same, except the clamp pulse, developed in the SYNC OUTPUT LOGIC on schematic 3, switches the $A/\overline{B}$ control inputs low for approximately 4 μs immediately following the delayed H sync pulses. The latches pass the hard-wired digital word applied to their B inputs during this time, which the DACs convert to a zero volt level. This emulates the back porch of the video signal, used by the clamping circuits found in many monitors.

DACs

U240 and U540 are the devices which convert the digital data from the Multiplex Latches to an analog signal. U240 converts the six most significant bits, and U540 converts the four least significant bits. The two DAC outputs are combined at pin 8 of the MSB DAC, U240.

Each DAC draws a constant current. Current drawn through pin 8 is proportional to the input data, while the current drawn through pin 7 is the difference between the constant current and that drawn through pin 8. The current source is a reference of approximately +1.1V, supplied by U256. R240 alters the supplied constant current slightly, to adjust the dc level of the DAC output.

The current drawn through pin 8 of U240 generates the MSB portion of the signal voltage across a 75Ω parallel resistor network comprised of R340, R434, R435, and R445. Pin 8 of U540 draws the same amount of current, but R434, R435, and R445 divide its voltage contribution to the total DAC output by 64.

DAC Output & Clock Control ◇2◇

5 MHz Low-pass Filter

The analog signal from the DACs is applied to a relay, K420, which is controlled by the front panel FILTER push button. When the push button is in its FILTER OFF position (released), the relay is not energized and the analog signal is applied directly to the Output Amplifier. When the push button is in its FILTER ON position (depressed) however, the analog signal goes through a low-pass (5.5 MHz) reconstruction filter before being applied to the Output Amplifier.

Output Amplifier

The analog signal, either filtered or direct, is applied to the Output Amplifier, U526 (a high frequency op-amp). The relay that is used to switch the reconstruction filter in or out of the signal path is also used to alter the feedback loop of this op-amp. When the relay is de-energized (FILTER OFF), the feedback loop consists of R610, R612, and R614. R610 is used to adjust the gain of the Output Amplifier.

When the relay is energized (FILTER ON), C510, C512, and C513 are added to the feedback loop to decrease the negative feedback at the high end of the video band ($\text{SIN } X/X$ correction). This compensates for the high frequency roll-off introduced by the reconstruction filter. The amount of compensation is adjusted by C510.

The amplified and compensated signal is applied to the front panel VIDEO OUT connector, and to pin 24B of the card edge-connector, through 75Ω resistors.

Clock Control

NOTE

The shield portion of the CLOCK IN connector is NOT *at ground potential. It is connected to +12V to provide power for the clock probe.*

The P6454 clock probe attaches to the front panel CLOCK IN connector. The clock signal is applied to the input amplifier, U680, which, in turn, drives a FET, Q674. This FET is used as a variable resistor to control the charge rate of varactor diode CR774, which charges during the positive portion of the clock signal and discharges during the negative portion. This creates a triangular waveform of the same frequency as the clock input.

This triangular waveform is applied to a comparator, U667, and to a peak detector comprised of CR672, CR674, C686, and R676. The peak detector output is applied to a feedback amplifier, U770A, the output of which is used to change the slope of the triangular waveform by changing the resistance of the FET and the capacitance of CR774. This serves to keep the output amplitude of the triangular waveform at a constant amplitude.

The comparator, U667, has the triangular waveform applied to its positive input, while its negative input is connected to the front panel CLOCK PHASE control (shown on schematic 4). The CLOCK PHASE control varies the voltage to pin 3 of U667, between +0.2 V and –0.3 V. This has the effect of changing the duty cycle of the comparator output; from a stream of positive-going pulses, when the clock phase voltage is towards the positive peak of the triangular waveform, to a stream of negative-going pulses when the clock phase voltage is towards the negative peak of the triangular waveform. And, of course, when the clock phase voltage is the same as the center voltage of the triangular waveform, the output will be a square wave.

The output of this comparator is applied to pin 15 of an Exclusive-OR gate, U462C, which is used as a switchable inverter. The other input of this gate, pin 14, is controlled by the front-panel CLOCK NORM/INV push button. When the push button is released (NORM) the voltage at pin 14 is pulled low by R778, and the clock signal is passed without inversion; when the push button is depressed (INV) the pin 14 voltage is held at ground, and the signal is inverted. This gate output is the CLK1 signal, and is used by the multiples latches on Schematic 1.

This CLK1 signal is also applied to another Exclusive-OR gate, U462A-4, after being differentiated by C568. Only the portion of the differentiated waveform that corresponds to the rising edge of the CLK1 signal is passed through this gate, which produces complementary outputs CLK2 and $\overline{\text{CLK2}}$. These are used to clock the DACs, U240 and U540, on Schematic 1.

SYNC CONTROL ◇3

Sync Stripper

Composite Sync or Video is applied to the Sync Stripper (U685) through the front panel SYNC IN connector, or through the rear card edge connector. U685 then provides a stream of H-rate pulses (S-I-S Output), used to drive the H Delay circuitry; Comp Sync, used for FIXED SYNC and to drive the V Delay circuitry; Back Porch Gate, also used in the V Delay circuitry; and an AGC voltage. Note that the Back Porch Gate is not produced for 4H around the Vertical Interval, and is slightly different from field to field. In field one, the last pulse before the vertical interval occurs just after the fifth equalizing pulse; in field two it occurs just after the sixth, $\frac{1}{2}$H later.

H Delay

The S-I-S Output of the Sync Stripper consists of a stream of negative going H-rate pulses. These are used to trigger a multivibrator, U375, which produces H-rate pulses of adjustable width, from approximately 470 ns to approximately 57 μs. The pulse width is controlled by the front panel HORIZ SYNC POSITION control.

The falling edge of this pulse is used to trigger another multivibrator, U365, which produces a pulse that is approximately 3.5 μs wide, for use as reconstructed H sync, delayed by the width of the pulse produced by U375.

The positive output of this multivibrator is used as delayed H sync by the Sync Output Logic circuitry when VARIABLE SYNC is selected. The negative output is used by the V Delay and the Phase Locked Loop circuitry.

Phase Locked Loop

The Phase Locked Loop is essentially comprised of a sample and hold amplifier, U150; a voltage controlled oscillator, U130A; and a counter, U435. The voltage controlled oscillator, U130A, is set to run at about 1 MHz, under the control of the sample and hold amplifier, U150. The VCO output clocks the counter, U435.

Only the first six output bits of the counter are used, but they perform several functions. The LSB output is used as a clock for some of the Sync Output Logic circuitry, while the other five output bits form part of the address for the PROM, also in the Sync Output Logic circuitry. In addition, the Q5 output of U435, an H-rate square wave, is also used as a clock in the Sync Output Logic circuitry and in the V Delay circuitry, as well as being fed back to the sample and hold amplifier.

The sample and hold amplifier, U150, samples the H rate square wave from the counter during the delayed H pulse from U365. During the sample time, while U150–14 is low, the sampled waveform causes the capacitor at U150–11 to either charge, when the waveform is high, or discharge, when the waveform is low.

Normally, the falling edge of the square wave occurs approximately half way through the delayed H pulse (see Fig. 4-1a.), so the cap charges and discharges for the same length of time, resulting in the same dc level as at the start of the sample. If the square wave falling edge occurs closer to the beginning of sample time (see Fig. 4-1b.), then the capacitor does not charge for as long a time as it discharges, and the dc level at the end of sample time is lower than at the start. This causes the VCO to run a little slower, moving the falling edge back towards the center of the sample. Conversely, if the falling edge is closer to the end of sample time (see Fig. 4-1c.), the capacitor charges for a longer time than it discharges. This results in an increased dc level, increasing the VCO frequency and moving the falling edge forward towards the center of sample time.

V Delay

U450A, a 4-bit binary counter, is used to identify the vertical interval. This is accomplished by clocking the counter with Comp Sync and clearing it with the Back Porch Gate, both from the Sync Stripper. The output is taken from the third bit of the counter. As the Back Porch Gate clears the counter after each Sync pulse, the third bit of the counter has no output until the vertical interval, during the time that the Back Porch Gate is not produced.

When the Back Porch Gate stops, the counter increments on each falling edge of Sync, so 2H later the third bit of the counter will go high. The counter

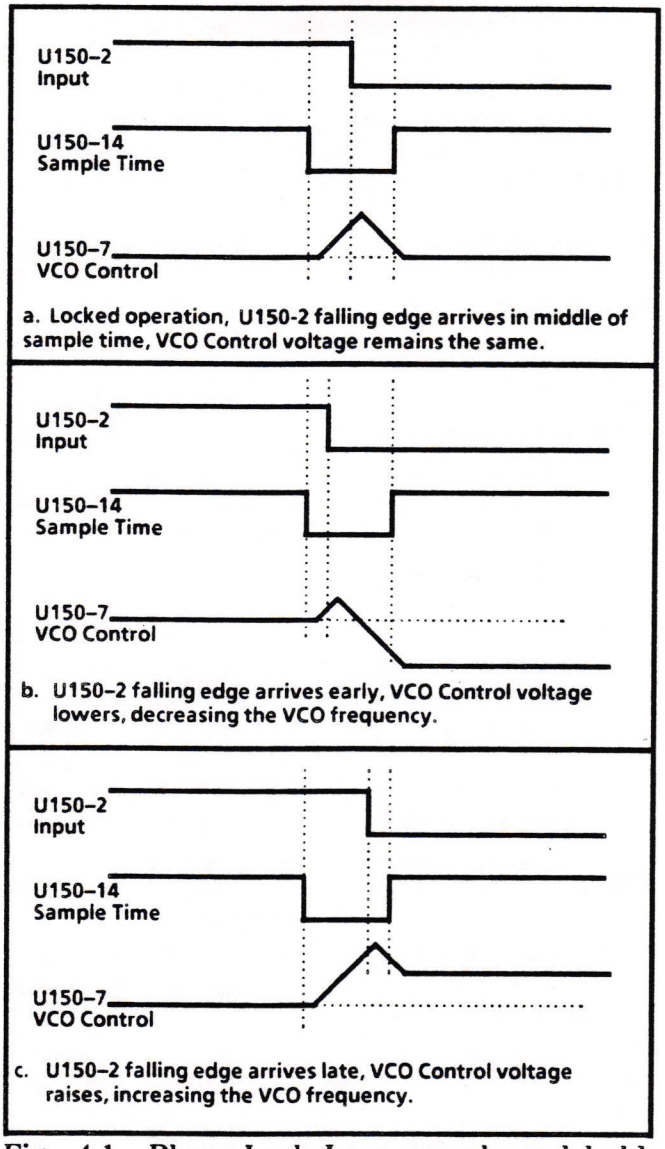


Fig. 4-1. Phase Lock Loop sample and hold amplifier operation.

continues to increment, and the third bit returns low just before the Back Porch Gate starts back up. The result of this is a 2H pulse which starts at the falling edge of the second vertical serration in the odd fields, and at the falling edge of the third vertical serration in the even fields.

This vertical interval recognition pulse is inverted by U440A and then used to enable U450B and to allow U270, an ADC, to digitize the setting of the VERTICAL POSITION control. The ADCs LSB output is ignored, and the other seven bits are applied to one side of an eight bit comparator, U250. The MSB input of this side of the comparator is tied to ground.

U450B is clocked by the inverted H Delay output during the vertical interval recognition pulse, which results in an H-width Vertical Reset pulse (VRST). This pulse is used to set U350, a counter; and to clock U235A and B, which are used for system identification.

U350, then, is set during the vertical interval, pulling all its outputs high. At the end of the one line pulse U350 starts counting the H rate square wave from the Phase Locked Loop. All of the counters outputs, except the LSB and the MSB, are applied to the same 8-bit comparator as the ADC, U250.

U250 compares the counter output to the digital word presented by the ADC and, when they are equal, outputs a two line wide pulse which indicates that the selected vertical position has been reached. This two line pulse is used in the Sync Output Logic to load a starting number (1010) into counter U335.

System ID

U235A and B perform system identification functions, by checking whether bit 0 and bit 5 of the output of counter U350 are at a high or a low state when the Vertical Interval Preset pulse occurs.

Bit 0 of the counter (H/2) is applied to U235A, to determine whether the field is odd or even. This is accomplished by setting U350's outputs high with the Vertical Preset pulse, and then watching the H/2 rate square wave. As there are an odd number of lines between the field one and the field two VRST pulses, and an even number of lines between the field two and field one VRSTs, U235A will have a low at its input when its clock pulse occurs if it is in an odd field, and it will have a high at its input if its in an even field.

U235B works in a similar manner, except that it monitors U350's output bit 5 (H/64). Starting with U350 being preset, this output presents a low level to U235B's D input at 262 and 263 H (NTSC rate), and a high level to the D input at 312 and 313 H (PAL rate), when the next VRST pulse clocks the flip-flop.

Variable Vertical Interval Timing

In normal operation, U335 will be disabled when the two line wide pulse from the comparator reaches it; the RCO will be high, pulling U335-7 low. When U335-9 is pulled low and the number applied to the parallel inputs is loaded, the RCO goes low and the counter is allowed to run. U335 is clocked at an H/2 rate by the LSB of U350, so it takes 10 H to count from 1010 to 1111. At that time the RCO returns high, and is inverted to pull U335-7 low, stopping the counter. The 10 lines during which the RCO is low represent the VARIABLE vertical interval (VAR V WINDOW).

This Var V Window is used in several areas of the Sync Output Logic: it disables U575C, so that it will not pass the Delayed H pulses during the vertical interval; addresses the PROM, so it can produce the vertical interval information; and enables a 4 bit counter, U545B, which counts the H rate square wave for timing the vertical information out of the PROM.

Sync Output Logic

U575C and U555A combine the Delayed H and the Delayed V information, to produce the Variable Sync. U575C receives the delayed H pulses at pin 8, and passes them through U555A except during the 10 Line Window. During that time, U555A is passing the Vertical Interval information from the PROM.

The combined Delayed Sync is applied to U565A, a flip-flop, which is clocked at about 500 kHz. The flip-flop output, in turn, is applied to a NAND gate, U575D, while the fixed sync from the Sync Stripper is applied to U575A-2. Both of these gates are controlled by the FXD/VAR SYNC push button.

If the push button is in the FXD position, U575D is disabled and U575A is enabled. U575A then passes the Comp Sync directly from the Sync Stripper. If the push button is in the VAR position, U575D is allowed to pass the Delayed Sync, and U575A is disabled, so it cannot pass Comp Sync. The outputs of these two NAND gates are applied to U575B, which passes the selected Sync to the Output Buffer, U750.

The variable sync will also be disabled if there is no input to the SYNC IN connector, by U760. With no input, the AGC voltage from the Sync Stripper goes to about 2V, below the reference voltage of 2.5V at the negative input of U760, so U760-6 goes negative. This pulls U575D-12 and U565B-10 low as effectively as the push button being placed in the FXD position, but does not enable U575A to pass Comp Sync, therefore no Sync will be output to the SYNC OUT connector.

The PROM also provides a stream of H-rate pulses which occur slightly after the H sync pulses. This output of the PROM is applied to the D input of U565B, which is being clocked at about 500 kHz. U565B is only allowed to operate when Variable Sync is selected, to produce the Clamp pulse used by the Multiplex Latches on schematic 1.

Output Buffer

The sync output by U575B is at TTL levels, 0 to +5V. VR750 is used to shift this down to 0 to -5V. U750, a video buffer, then provides 0 to -2V utility sync (terminated in 75Ω) to the front panel bnc and to pin 23B of the card-edge connector.

POWER SUPPLY and DAC CONTROL ◇4

Power Supply

The Power Supply for the DP–100 accepts three supplies from the mainframe, through the rear edge-connector, and develops +15 V, +5 V, -5.1 V, and -15 V supplies for use throughout the instrument. The +15 V and -15 V supplies use standard IC regulators, each of which are fused on the input side for protection, while the +5 V and -5.1 V supplies are developed by a switching power supply called a flyback converter (see Fig. 4-2).

A pulse width modulator (PWM), U620, provides and controls the switching pulses used to drive the FET, Q715. An oscillator within the PWM applies the pulses at approximately 110 kHz (set by the resistor and capacitor at U620-6 and U620-7) to the FET, through emitter follower Q815, and then uses feedback from the +5 V output to control the duty cycle of the pulses.

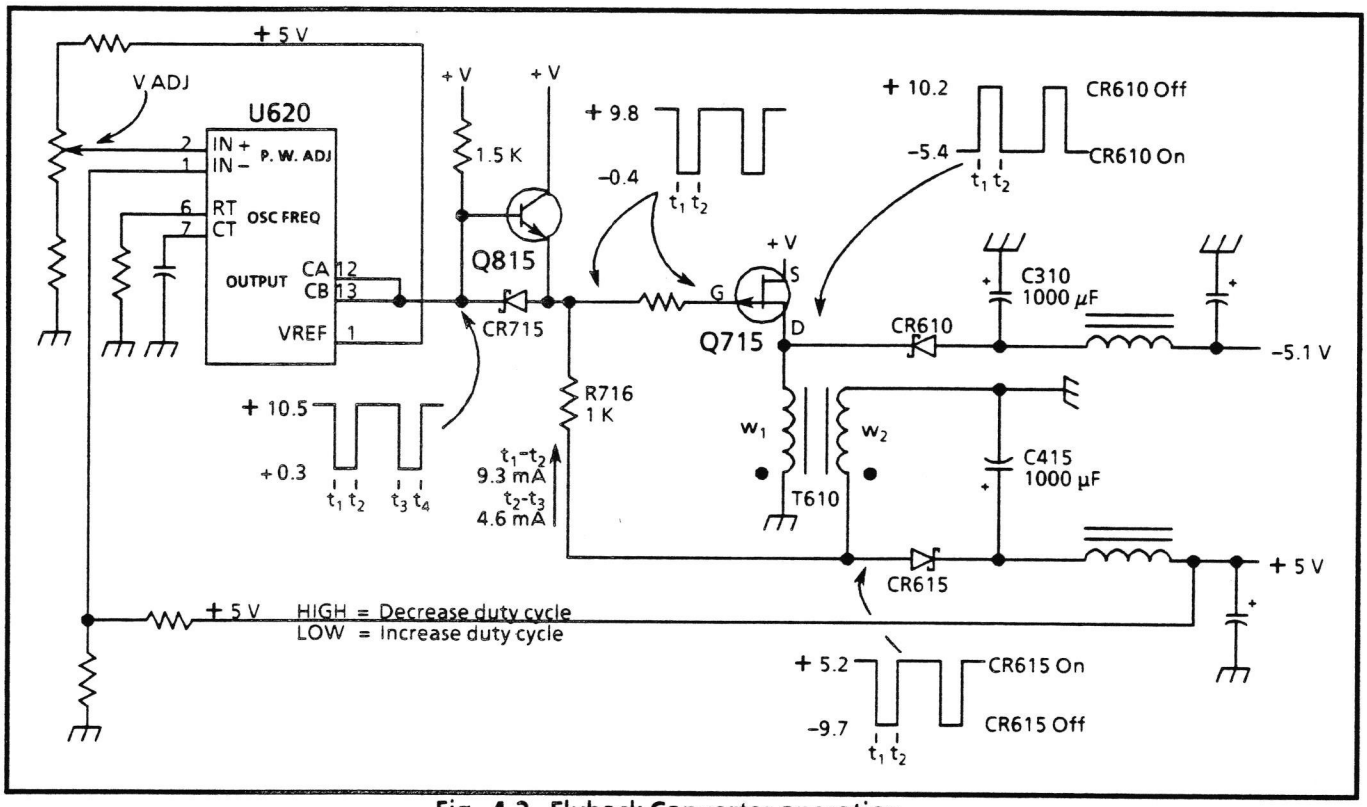


Fig. 4-2. Flyback Converter operation.

When the PWM output goes low, the FET is turned on and its drain is pulled up to approximately the source voltage. This positive transition is developed across w_1 of the transformer, which acts as the primary and couples it across to w_2, where it appears as a negative voltage at the anode of CR615. This pulls down on Q715s gate, through R716, to turn the FET on harder. Both CR610 and CR615 are turned off at this time, so the transformer w_2 coil stores the energy.

The PWM output then goes high, turning the FET off. At this time the voltage across w_1 and w_2 reverses, causing CR610 and CR615 to both turn on. Since the output voltages are at –5.1 V and +5 V, the voltages across w_1 and w_2 are clamped to a diode drop away from each of these; –5.7 V and +5.6 V respectively. The stored energy in T610 is then dumped into the output capacitors at those voltages.

When first turned on, the +5 V supply is at zero. This is applied, through a divider, to U620-1, where it is compared to a voltage derived from an internal +5 V regulator and fed back to U620-2. This is used to control the duty cycle of the pulse output; since the +5 V supply is low, it increases the duty cycle, increasing the on time of the FET and, therefore, the energy applied to w_2. This results in increased energy to the filters when CR610 and CR615 are on. When the +5 V supply starts to get too high the PWM decreases the duty cycle, decreasing the FET on time and, therefore, the energy stored in w_2.

WARNING

If the pulse width modulator, U620, shuts down for any reason, the switching FET, Q715, may be turned full on. This condition can cause the FET to burn out within a matter of seconds. In order to troubleshoot the circuit without damaging the FET, remove P700 (located at the rear of the DP–100) until the problem is corrected.

DAC Control

The DAC Control segment of this schematic consists of the front panel controls which control the various functions on the DAC board (A2).

The CLOCK PHASE control is a variable resistor which develops a dc control voltage in the range of +0.2 V to –0.3 V, used by the Clock Control circuitry on schematic 2.

The FILTER control is a push button which, when depressed (FILTER ON) switches the 5.5 MHz Low-pass reconstruction filter into the signal path between the DACs on schematic 1 and the Output Amplifier on schematic 2. When released (FILTER OFF), the signal from the DACs is applied directly to the Output Amplifier.

The DATA THRESHOLD and ECL/TTL controls are used to provide control of the P6460 data probe, to ensure accurate latching of various data types. The ECL/TTL push button provides preset threshold levels for ECL (depressed) or TTL (released). The ECL position of this push button is set for positive or negative ECL by the placement of P200, located at the rear of the DP–100. The DATA THRESHOLD control allows the operator to alter the preset levels slightly, when it is out of its CAL (detent) position.

The INVERT/NORM and 2 COMP/BINARY push buttons are used to control the Inverters, on schematic 2, to alter the manner that the data is presented to the DACs. When both push buttons are released (NORM, BINARY) the data is presented to the DACs in just the same manner as it's received. If the 2 COMP/BINARY push button is depressed, then bit 9 (MSB) is inverted. If the INV/NORM push button is depressed (INV) then all the data bits are inverted. And if both push buttons are depressed (INV, 2 COMP) then all data bits except bit 9 are inverted.

The CLOCK push button is used by the Clock Control circuitry, on schematic 2, to extend the effective range of the CLOCK PHASE control by inverting the variable duty cycle CLK1 signal.

SECTION 5
MAINTENANCE

INTRODUCTION

This section has three main parts: preventive maintenance, troubleshooting aids, and corrective maintenance.

PREVENTIVE MAINTENANCE

Preventive maintenance steps performed on a regular basis will improve the reliability of the DP–100. However, checking semiconductor devices in the absence of a malfunction is *NOT* recommended.

Under average environmental conditions, preventive maintenance should be done about every 2000 hours. This includes cleaning, visual inspection, and a performance check. See Section 2 for performance check procedures.

Cleaning

Clean the instrument often enough to prevent dust or dirt from accumulating in or on it. Dirt prevents efficient heat dissipation. It also provides high-resistance electrical leakage paths between conductors or components in a humid environment.

CAUTION

The front panel is plastic. Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with organic cleaning solvents, such as benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.

CAUTION

Static discharge can damage any semiconductor component in this instrument.

Static-Sensitive Components

This instrument contains electrical components that are susceptible to damage from static discharge. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only special antistatic, suction-type or wick-type desoldering tools.

TROUBLESHOOTING AIDS

The following is miscellaneous information about schematics, circuit board illustrations, component numbering, and assembly numbering.

NOTE

No repair should be attempted during the warranty period.

Foldout Pages

The foldout pages at the back of the manual give block and schematic diagrams and circuit board illustrations. See Fig. 5-1.

Diagrams

The circuit number and electrical value of each component is shown on the diagrams. The first page in the Diagrams section explains the schematic symbols. The Replaceable Electrical Parts list gives a complete description of each component. Those portions of the circuit that are mounted on circuit boards or assemblies are enclosed in a gray border, with the name and assembly number shown on the border.

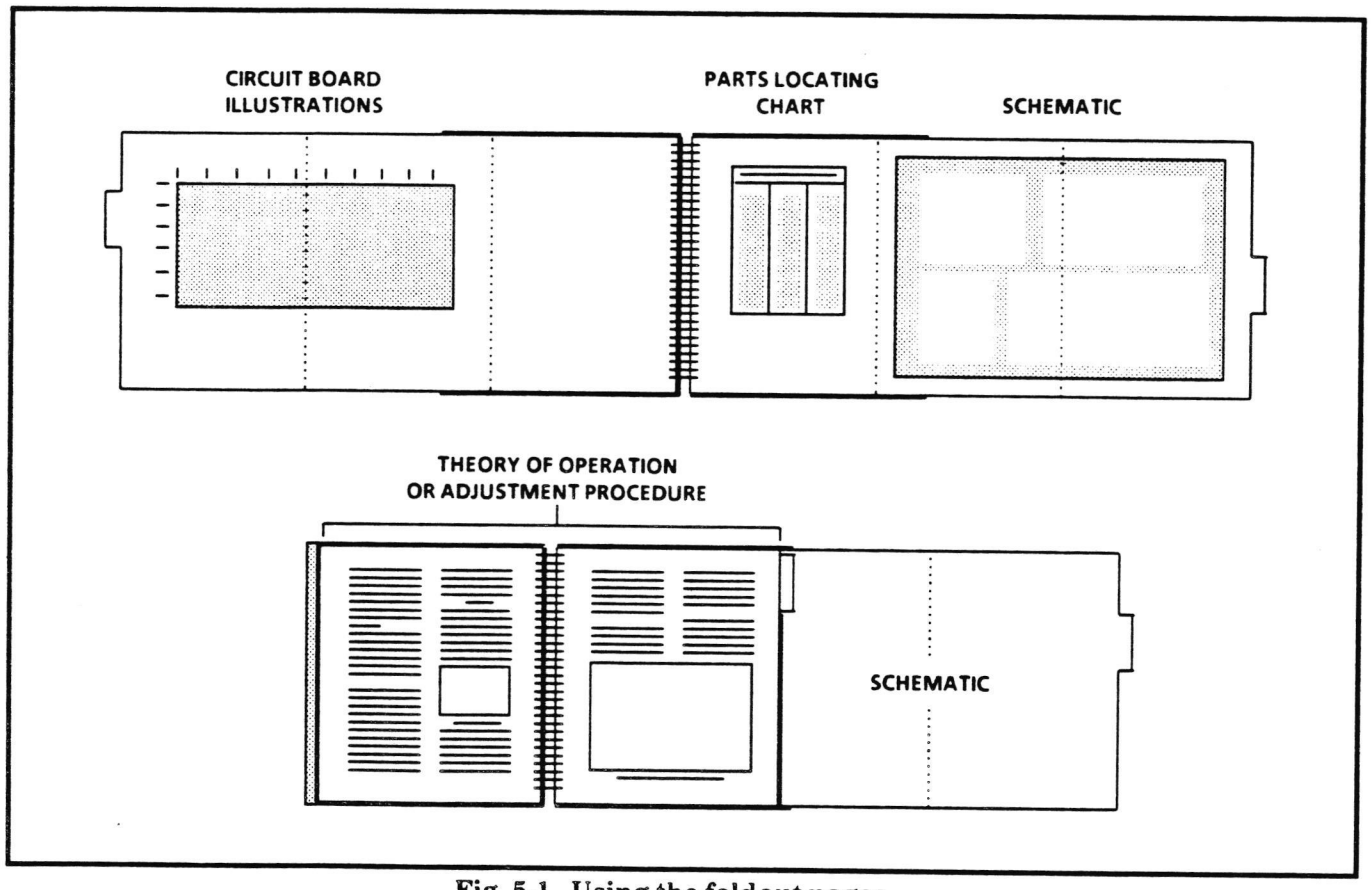


Fig. 5-1. Using the foldout pages.

NOTE

Check the Change Information section at the rear of the manual for inserts describing corrections and modifications to the instrument and manual.

Circuit Board Illustrations

Electrical components, connectors, and test points are identified on circuit board illustrations located on the inside fold of the corresponding circuit diagram or the back of the preceding diagram.

Assembly and Circuit Numbering

The circuit board assemblies are assigned assembly numbers starting with A1. Fig. 5-2 shows the two circuit boards which comprise the instrument. This illustration also shows how the DP–100 is opened for calibration, allowing easy access to the interior of the instrument.

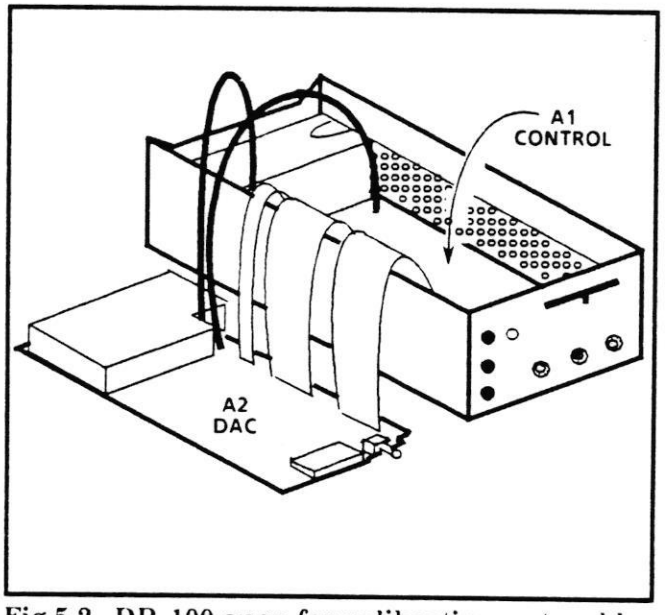


Fig 5-2. DP–100 open for calibration or troubleshooting.

Circuit boards have been assigned an assembly number so that they may be ordered from Tektronix, Inc. They are as follows:

A1 Control Board Assembly
A2 DAC Board Assembly

The part numbers for ordering these boards are given on the first page of the REPLACEABLE ELECTRICAL PARTS list in SECTION 6.

Each component is assigned a circuit number according to its location within an assembly. Component circuit numbers increase in units from left to right, and in hundreds from top to bottom on the circuit board.

The Replaceable Electrical Parts list is arranged in assembly-by-assembly order, as designated by ANSI Standard Y32.16-1975. The circuit number in the parts list is made up by combining the assembly number and the circuit number.

EXAMPLE: R123 on A2 would be listed in the Replaceable Parts list as A2R123.

In the Replaceable Electrical Parts list, assemblies are listed first, followed by circuit board-mounted parts in alphanumeric order.

NOTE

The parts list number should be used when ordering replacement parts.

CORRECTIVE MAINTENANCE

Corrective maintenance deals with obtaining replacement parts, torque specifications, and component replacement.

Obtaining Replacement Parts

All electrical and mechanical replacement parts are available from or through the local Tektronix field office or representative. Many of the standard electronic components may be obtained locally, but check value, tolerance, rating, and description carefully before purchasing or ordering replacement parts.

Some of the parts in this instrument have been manufactured or specially selected by Tektronix to our specifications.

When ordering parts be sure to **include the following information** in your order:

1. Instrument type (and option numbers, if any).
2. Instrument serial number.
3. .Description of the part, as it appears in the Replaceable Electrical or Mechanical Parts listS. Include the circuit number, for electrical parts.
4. The 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 Products catalog and supplements.

If a part that has been ordered is replaced with a new or improved part, the local Tektronix field office or representative will contact you concerning any change in the part number.

Torque Specifications

Only #4, #6, and #8 screws are used in the DP–100. Table 5-1 shows the torque ranges for these.

Correct torque is critical on the screws holding the devices to the Power Supply heat sink.

Table 5-1.
Torque Specifications for the DP–100

Screw #	Torque Range (in inch pounds)
4	$3\frac{1}{2}$–5
6	7–9
8	14–18

REPLACING CIRCUIT ASSEMBLIES

WARNING

Ensure there is no power applied to the instrument before replacing components.

Use the following procedures to remove circuit board assemblies. Reverse the order of the removal procedures to reinstall or replace an assembly.

NOTE

Tag or note the locatiosn of all leads and plugs for reassembly reference. For easier access to the interior of the DP–100, the DAC board (A2) may be removed and laid flat beside the instrument (refer to Fig. 5-2). This also makes removal of most components possible without having to completely remove the Control board (A1).

DAC Board (A2) Removal

To remove the DAC board, A2 (left side of the instrument), completely, or for troubleshooting purposes to the position described above, follow these steps.

REMOVE:

1. The two side covers; grasp the cover at the rear of the DP–100 and pull away from the chassis.
2. The DAC board; four screws hold the DAC board to extension posts which extend from the Control board. Removal of the screws allows the DAC board to be lifted out of the chassis and placed as shown in Fig. 5-2.

Controller Board (A1) Removal

To remove the Control board A1, continue with the following steps.
REMOVE:

1. The back panel; two screws and two locating posts hold the back panel.

2. The DATA THRESHOLD, VARIABLE SYNC POSITION, and CLOCK PHASE knobs; each knob is secured to its control shaft by a set screw.

3. All cables connected to the board.

4. The Control board; four screws hold the CONTROL board to the chassis (the two at the rear of the board are accessible through the holes in the shield). Once the screws are removed, slide the circuit board towards the rear of the instrument until the control shafts clear the front panel. The board may then be lifted out.

SECTION 6
OPTIONS

OPTION 1

This is the only option available for the DP-100 at the time of this printing. Option 1 consists of the DP-100 without the P6460 data acquisition probe and the P6454 clock probe.

REPLACEABLE ELECTRICAL PARTS

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.

LIST OF ASSEMBLIES

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

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

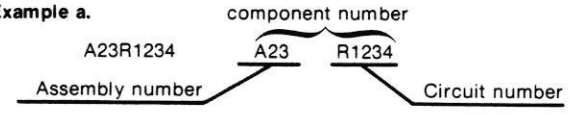
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

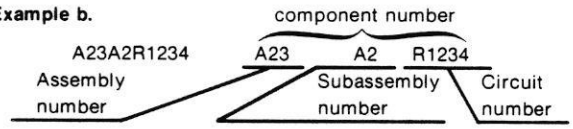
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

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.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00213	NYTRONICS COMPONENTS GROUP INC SUBSIDIARY OF NYTRONICS INC	ORANGE ST	DARLINGTON SC 29532
00779	AMP INC	2800 FULLING MILL PO BOX 3608	HARRISBURG PA 17105
00853	SANGAMO WESTON INC COMPONENTS DIV	SANGAMO RD PO BOX 128	PICKENS SC 29671-9716
01121	ALLEN-BRADLEY CO	1201 SOUTH 2ND ST	MILWAUKEE WI 53204-2410
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXP PO BOX 655012	DALLAS TX 75265
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS SECTOR	5005 E MCDOWELL RD	PHOENIX AZ 85008-4229
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
06665	PRECISION MONOLITHICS INC SUB OF BOURNS INC	1500 SPACE PARK DR	SANTA CLARA CA 95050
07716	TRW INC TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
12697	CLAROSTAT MFG CO INC	LOWER WASHINGTON ST	DOVER NH 03820
14552	MICROSEMI CROP	2830 S FAIRVIEW ST	SANTA ANA CA 92704-5948
15513	DATA DISPLAY PRODUCTS	301 CORAL CIR	EL SEGUNDO CA 90245-4620
16179	M/A-COM OMNI SPECTRA INC SUB OF M/A-COM INC MICROWAVE CONNECTOR DIV	21 CONTINENTAL BLVD	MERRIMACK NH 03054-4303
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054-1516
18324	SIGNETICS CORP MILITARY PRODUCTS DIV	4130 S MARKET COURT	SACRAMENTO CA 95834-1222
19701	MEPCO/CENTRALAB A NORTH AMERICAN PHILIPS CO	P O BOX 760	MINERAL WELLS TX 76067-0760
20999	MINNESOTA MINING AND MFG CO INDUSTRIAL ELECTRICAL PRODUCTS DIV	3M CENTER	ST PAUL MN 55101-1428
21847	FEI MICROWAVE INC	825 STEWART DR	SUNNYVALE CA 94086-4514
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS DIV MILITARY PRODUCTS GROUP	515 FISHING CREEK RD	NEW CUMBERLAND PA 17070-3007
24355	ANALOG DEVICES INC	RT 1 INDUSTRIAL PK PO BOX 9106	NORWOOD MA 02062
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701-3737
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051-0606
32159	WEST-CAP ARIZONA	2201 E ELVIRA ROAD	TUCSON AZ 85706-7026
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507-2114
34333	SILICON GENERAL INC	11651 MONARCH ST	GARDEN GROVE CA 92641-1816
34371	HARRIS CORP HARRIS SEMICONDUCTOR PRODUCTS GROUP	200 PALM BAY BLVD PO BOX 883	MELBOURNE FL 32919
50364	MONOLITHIC MEMORIES INC	2175 MISSION COLLEGE BLVD	SANTA CLARA CA 95050
50434	HEWLETT-PACKARD CO OPTOELECTRONICS DIV	370 W TRIMBLE RD	SAN JOSE CA 95131
51642	CENTRE ENGINEERING INC	2820 E COLLEGE AVE	STATE COLLEGE PA 16801-7515
52262	MICROPLEX INC	2126 S LYON ST	SANTA ANA CA 92705-5304
52763	STETTNER ELECTRONICS INC	6135 AIRWAYS BLVD PO BOX 21947	CHATTANOOGA TN 37421-2970
53510	MINNESOTA MINING AND MFG CO TECHNICAL CERAMIC PRODUCTS DIV	3M CENTER	ST PAUL MN 55101
54583	TDK ELECTRONICS CORP	12 HARBOR PARK DR	PORT WASHINGTON NY 11550
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195-4526
57668	R-OHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
61529	AROMAT CORP	250 SHEFFIELD ST	MOUNTAINSIDE NJ 07092-2303
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
73138	BECKMAN INDUSTRIAL CORP BECKMAN ELECTRONIC TECHNOLOGIES SUB OF EMERSON ELECTRIC	4141 PALM ST	FULLERTON CA 92635

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
75915	LITTELFUSE TRACTOR INC SUB TRACTOR INC	800 E NORTHWEST HWY	DES PLAINES IL 60016-3049
80009	TEKTRONIX INC	14150 SW KARL BRAUM DR PO BOX 500 MS 53-111	BEAVERTON OR 97077
91637	DALE ELECTRONICS INC	2064 12TH AVE PO BOX 609	COLUMBUS NE 68601-3632
TK0946	SAN-O INDUSTRIAL CORP	170 WILBUR PL	BAHEMIA, LONG ISLAND NY 11716
TK1345	ZMAN AND ASSOCIATES	7633 S 180TH	KENT WA 98032
TK1424	MARCON AMERICA CORP	700 LANDWEHR RD	NORTHBROOK IL 60062
TK1450	TOKYO COSMOS ELECTRIC CO LTD	2-268 SOBUDAI ZAWA	KANAGAWA 228 JAPAN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	671-0253-01			CIRCUIT BD ASSY:CONTROLLER	80009	671-0253-01
A2	671-0252-02			CIRCUIT BD ASSY:CONVERTER	80009	671-0252-02
A1	671-0253-01			CIRCUIT BD ASSY:CONTROLLER	80009	671-0253-01
A1C110	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C112	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A1C120	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A1C122	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C124	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C130	283-0651-00			CAP,FXD,MICA DI:430PF,1%,500V	00853	D155F431F0
A1C144	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C146	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C148	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C150	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C160	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C165	290-1069-00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	TK1424	CEUFM0J102
A1C169	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C171	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A1C175	283-0644-00			CAP,FXD,MICA DI:150PF,1%,500V	00853	D155F151F0
A1C180	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A1C185	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C210	290-1069-00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	TK1424	CEUFM0J102
A1C215	290-1069-00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	TK1424	CEUFM0J102
A1C220	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A1C222	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C224	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C230	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C245	285-0808-00			CAP,FXD,PLASTIC:0.1UF,10%,50V	80009	285-0808-00
A1C250	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C260	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C292	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C310	290-1069-00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	TK1424	CEUFM0J102
A1C320	290-0950-00			CAP,FXD,ELCTLT:100UF,+50-20%,50WVDC	55680	ULB1H101TJAANA
A1C340	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A1C360	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C370	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C382	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C415	290-1069-00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	TK1424	CEUFM0J102
A1C424	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C441	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C454	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C460	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C466	283-0711-00			CAP,FXD,MICA DI:2700PF,2%,500V	00853	D195F272G0
A1C475	283-0626-00			CAP,FXD,MICA DI:1800PF,5%,500V	00853	D195F182J0
A1C480	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A1C481	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C488	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C550	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C569	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C580	283-0423-00			CAP,FXD,CER DI:0.22UF,+80-20%,50V	04222	MD015E224ZAA
A1C582	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A1C650	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C670	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C671	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C688	283-0256-00			CAP,FXD,CER DI:130PF,5%,100V	51642	200100N1500131J
A1C710	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C722	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	00853	D151F102F0

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1C726	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C728	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C740	283-0636-00			CAP,FXD,MICA DI:36PF,1.4%,100V	00853	D155E360G0
A1C754	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C762	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C765	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C768	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A1C770	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C780	283-0598-00			CAP,FXD,MICA DI:253PF,5%,300V	00853	D155F253GJ0
A1C782	283-0616-00			CAP,FXD,MICA DI:75PF,5%,500V	00853	D155E750J0
A1C784	283-0027-00			CAP,FXD,CER DI:0.02UF,20%,50V	04222	SR265C203MAA
A1C785	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A1C810	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C825	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A1C828	290-0950-00			CAP,FXD,ELCTLT:100UF,+50-20%,50WVDC	55680	ULB1H101TJAANA
A1C835	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C845	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A1C848	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA
A1C850	283-0636-00			CAP,FXD,MICA DI:36PF,1.4%,100V	00853	D155E360G0
A1C888	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A1CR610	152-0582-00			SEMICOND DVC,DI:RECT,SI,20V,3A	80009	152-0582-00
A1CR615	152-0582-00			SEMICOND DVC,DI:RECT,SI,20V,3A	80009	152-0582-00
A1CR624	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR715	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR760	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1CR762	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A1F300	159-0124-00			FUSE,WIRE LEAD:3A,125V,0.05SEC	75915	272003
A1F400	159-0116-00			FUSE,CARTRIDGE:1A,125V,0.4SEC	TK0946	SM1-1A
A1F450	159-0153-00			FUSE,WIRE LEAD:1.5A,125V,FAST BLOW	71400	A1 1/2
A1F500	159-0124-00			FUSE,WIRE LEAD:3A,125V,0.05SEC	75915	272003
A1F600	159-0116-00			FUSE,CARTRIDGE:1A,125V,0.4SEC	TK0946	SM1-1A
A1F800	159-0153-00			FUSE,WIRE LEAD:1.5A,125V,FAST BLOW	71400	A1 1/2
A1J120	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J120	136-0252-07			SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
A1J200	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1J700	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1J842	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1J860	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1J875	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1J890	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1L115	108-1263-00			INDUCTOR:10UH	54583	TSL 0707-100K1R9
A1L210	108-1263-00			INDUCTOR:10UH	54583	TSL 0707-100K1R9
A1L215	108-1263-00			INDUCTOR:10UH	54583	TSL 0707-100K1R9
A1L310	108-1263-00			INDUCTOR:10UH	54583	TSL 0707-100K1R9
A1L318	108-1263-00			INDUCTOR:10UH	54583	TSL 0707-100K1R9
A1L788	108-0317-00			COIL,RF:FIXED,15 UH	32159	71501M+10PERCENT
A1L810	108-1263-00			INDUCTOR:10UH	54583	TSL 0707-100K1R9
A1P200	131-0993-00			BUS,CONDUCTOR:SHUNT ASSEMBLY,BLACK	22526	65474-005
A1P700	131-0993-00			BUS,CONDUCTOR:SHUNT ASSEMBLY,BLACK	22526	65474-005
A1Q715	151-1257-00			TRANSISTOR:POWER MOSFET,P CHANNEL	80009	151-1257-00
A1Q815	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A1R140	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A1R142	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A1R148	315-0180-00			RES,FXD,FILM:18 OHM,5%,0.25W	19701	5043CX18R00J
A1R173	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R185	321-0216-00			RES,FXD,FILM:1.74K OHM,1%,0.125W,TC=T0	07716	CEAD17400F
A1R186	321-0195-00			RES,FXD,FILM:1.05K OHM,1%,0.125W,TC=T0	07716	CEAD10500F
A1R187	311-2411-00			RES,VAR,NONWW:CKT BD,5K,10%,0.5W	12697	CM45251

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R235	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R278	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A1R279	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R280	315-0180-00			RES,FXD,FILM:18 OHM,5%,0.25W	19701	5043CX18R00J
A1R282	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A1R284	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A1R285	321-0248-00			RES,FXD,FILM:3.74K OHM,1%,0.125W,TC=T0	19701	5043ED3K740F
A1R286	321-0269-00			RES,FXD,FILM:6.19K OHM,1%,0.125W,TC=T0	07716	CEAD61900F
A1R287	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A1R340	307-0445-00			RES NTWK,FXD,FI:4.7K OHM,20%,(9)RES	32997	4310R-101-472
A1R387	311-2410-00			RES,VAR,NONWW:CKT BD,DUAL,2.5K/50K,10%,0.5W	12697	CM45250
A1R420	321-0239-00			RES,FXD,FILM:3.01K OHM,1%,0.125W,TC=T0	19701	5043ED3K010F
A1R422	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A1R424	321-0239-00			RES,FXD,FILM:3.01K OHM,1%,0.125W,TC=T0	19701	5043ED3K010F
A1R480	321-0447-00			RES,FXD,FILM:442K OHM,1%,0.125W,TC=T0	24546	NA55D4423F
A1R481	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A1R488	321-0242-00			RES,FXD,FILM:3.24K OHM,1%,0.125W,TC=T0	19701	5043ED3K240F
A1R525	311-2230-00			RES,VAR,NONWW:TRMR,500 OHM,20%,0.50 LINEAR	TK1450	GF06UT 500
A1R579	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R580	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A1R581	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R582	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A1R589	311-2409-00			RES,VAR,NONWW:CKT BD,500 OHM,10%,0.5W	80009	311-2409-00
A1R625	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A1R665	307-0445-00			RES NTWK,FXD,FI:4.7K OHM,20%,(9)RES	32997	4310R-101-472
A1R675	315-0180-00			RES,FXD,FILM:18 OHM,5%,0.25W	19701	5043CX18R00J
A1R676	321-0339-00			RES,FXD,FILM:33.2K OHM,1%,0.125W,TC=T0	07716	CEAD33201F
A1R680	308-0385-00			RES,FXD,WW:200 OHM,5%,3W	00213	1240S-200-5
A1R686	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A1R688	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A1R689	321-0242-00			RES,FXD,FILM:3.24K OHM,1%,0.125W,TC=T0	19701	5043ED3K240F
A1R715	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A1R716	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A1R720	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A1R722	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A1R725	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A1R740	321-0085-00			RES,FXD,FILM:75 OHM,1%,0.125W,TC=T0	57668	CRB14FXE 75 OHM
A1R742	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A1R744	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A1R745	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A1R754	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A1R760	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A1R766	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A1R768	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A1R778	315-0824-00			RES,FXD,FILM:820K OHM,5%,0.25W	19701	5043CX820K0J
A1R852	321-0085-00			RES,FXD,FILM:75 OHM,1%,0.125W,TC=T0	57668	CRB14FXE 75 OHM
A1S194	260-2395-00			SWITCH,PUSH:3 BIN,2 POLE,ATTENUATOR	80009	260-2395-00
A1S394	260-1713-01			SWITCH,PUSH:1 BTN,2 POLE,CH2 INVERT	80009	260-1713-01
A1S594	260-1713-01			SWITCH,PUSH:1 BTN,2 POLE,CH2 INVERT	80009	260-1713-01
A1S794	260-1713-01			SWITCH,PUSH:1 BTN,2 POLE,CH2 INVERT	80009	260-1713-01
A1T610	120-1669-00			TRANSFORMER,RF:TOROIDAL,65UH,10 AMPS	TK1345	TO BE ASSIGNED
A1TP145	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP150	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP320	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP322	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP324	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP326	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP330	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1TP460	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP465	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP480	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1TP645	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A1U130	156-1584-00			MICROCKT,INTFC:DUAL VCO,SCREENED	01295	SN74S124NP3
A1U150	156-1312-00			MICROCKT,LINEAR:SAMPLE/HOLD AMPLIFIER	06665	SMP11-004Y
A1U215	156-0312-00			MICROCKT,LINEAR:VOLTAGE REGULATOR	04713	MC7815CT
A1U235	156-0388-03			MICROCKT,DGTL:DUAL D FLIP-FLOP,SCRN	01295	SN74LS74ANP3
A1U260	156-2168-00			MICROCKT,DGTL:8 BIT MAGNITUDE COMPARATOR	01295	SN74LS682N3
A1U270	156-1533-00			MICROCKT,LINEAR:CMOS,8 BIT ADC,SCREENED	27014	ADC0801LCD
A1U335	156-0844-02			MICROCKT,DGTL:SYN 4 BIT CNTR,SCRN	01295	SN74LS161A(NP3)
A1U350	156-2042-00			MICROCKT,DGTL:10 BIT COUNTER,SCREENED	50364	SN74LS491NS/JS
A1U365	156-0072-02			MICROCKT,DGTL:MONOSTABLE MV,SCRN	18324	N74121(NB OR FB)
A1U375	156-0072-02			MICROCKT,DGTL:MONOSTABLE MV,SCRN	18324	N74121(NB OR FB)
A1U435	156-2042-00			MICROCKT,DGTL:10 BIT COUNTER,SCREENED	50364	SN74LS491NS/JS
A1U440	156-0724-02			MICROCKT,DGTL:HEX INV W/OC OUT,SCRN,	01295	SN74LS05NP3
A1U450	156-1172-01			MICROCKT,DGTL:DUAL 4 BIT BIN CNTR,SCRN	01295	SN74LS393NP3
A1U535	160-4867-00			MICROCKT,DGTL:NMOS,4096 X 8 EPROM,PRGM	80009	160-4867-00
A1U545	156-1172-01			MICROCKT,DGTL:DUAL 4 BIT BIN CNTR,SCRN	01295	SN74LS393NP3
A1U555	156-0480-02			MICROCKT,DGTL:QUAD 2-INP & GATE,SCRN,	01295	SN74LS08NP3
A1U565	156-0388-03			MICROCKT,DGTL:DUAL D FLIP-FLOP,SCRN	01295	SN74LS74ANP3
A1U575	156-2332-00			MICROCKT,DGTL:ALSTTL,QUAD 2 IN POS NAND GAT E OC	01295	SN74ALS01N3
A1U620	156-0933-02			MICROCKT,LINEAR:RGLTR PULSE WIDTH MOD SCRN	34333	SG3524BN
A1U685	155-0144-00			MICROCKT,LINEAR:SYN STRIPPER	80009	155-0144-00
A1U750	156-1984-00			MICROCKT,LINEAR:VIDEO BUFFER	34371	HA-5033
A1U760	156-0067-00			MICROCKT,LINEAR:OPNL AMPL,SEL	04713	MC1741CP1
A1U830	156-0930-00			MICROCKT,LINEAR:NEGATIVE VOLTAGE REGULATOR	04713	SC75012P
A1VR488	152-0772-00			SEMICOND DVC,DI:ZENER,SI,5.6V,5%,1.0W	04713	1N4734A
A1VR750	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A1VR755	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.5W,DO-7	14552	TD3810976
A1XF300	136-0261-00			SOCKET,PIN TERM:U/W 0.022 TO 0.025 PIN	00779	1-331677-6
A1XF400	136-0261-00			SOCKET,PIN TERM:U/W 0.022 TO 0.025 PIN	00779	1-331677-6
A1XF450	136-0261-00			SOCKET,PIN TERM:U/W 0.022 TO 0.025 PIN	00779	1-331677-6
A1XF500	136-0261-00			SOCKET,PIN TERM:U/W 0.022 TO 0.025 PIN	00779	1-331677-6
A1XF600	136-0261-00			SOCKET,PIN TERM:U/W 0.022 TO 0.025 PIN	00779	1-331677-6
A1XF800	136-0261-00			SOCKET,PIN TERM:U/W 0.022 TO 0.025 PIN	00779	1-331677-6
A1XJ120	136-0252-01			SOCKET,PIN TERM:U/W 0.0.19 DIA PINS	00779	1-332095-2
A2	671-0252-02			CIRCUIT BD ASSY:CONVERTER	80009	671-0252-02
A2C120	283-0631-00			CAP,FXD,MICA DI:95PF,1%,500V	00853	D155F950F0
A2C122	283-0784-00			CAP,FXD,MICA DI:40PF,2%,500V	00853	D155E400G0
A2C140	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C141	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C142	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C150	285-0627-00			CAP,FXD,PLASTIC:0.0033UF,5%,100V	07716	TEK44-33251
A2C160	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C162	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C163	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A2C170	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C180	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C184	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C210	283-0788-00			CAP,FXD,MICA DI:267PF,1%,500V	00853	D155F267OF0
A2C220	283-0625-00			CAP,FXD,MICA DI:220PF,1%,500V	00853	D105F221F0
A2C222	283-0688-00			CAP,FXD,MICA DI:464PF,1%,300V	00853	D155F4640F0
A2C224	283-0638-00			CAP,FXD,MICA DI:130PF,1%,100V	00853	D155F131F0
A2C232	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C234	283-0596-00			CAP,FXD,MICA DI:528PF,1%,300V	00853	D153F5280F0
A2C240	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2C242	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A2C250	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C252	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C270	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C290	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C320	283-0775-00			CAP,FXD,MICA DI:1764 PF,1%,500V	00853	D195F17640F0
A2C322	283-0780-00			CAP,FXD,MICA DI:125PF,1%,500V	00853	D155F1250F0
A2C330	283-0644-00			CAP,FXD,MICA DI:150PF,1%,500V	00853	D155F151F0
A2C352	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C354	283-0178-00			CAP,FXD,CER DI:0.1UF,20%,100V	05397	C330C104Z1U1CA
A2C437	283-0781-00			CAP,FXD,MICA DI:27PF,5%,500V	00853	D155E270J0
A2C440	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C452	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C460	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C462	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C512	283-0770-00			CAP,FXD,MICA DI:300 PF,1%,500V	00853	D155F301F0
A2C513	281-0604-00			CAP,FXD,CER DI:2.2PF,+/-0.25PF,500V	52763	2RDPLZ007 2P20CC
A2C524	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C525	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C526	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C534	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C540	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A2C542	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C552	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C560	283-0600-00			CAP,FXD,MICA DI:43PF,5%,500V	00853	D105E430J0
A2C570	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C572	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C580	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C586	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C634	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C642	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C656	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C662	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C664	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	00853	D151F102F0
A2C665	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C666	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	00853	D151F102F0
A2C670	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C684	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C686	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C694	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C696	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C740	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C754	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C764	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C766	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C768	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C772	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C782	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C784	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C830	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C832	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-20%,10V	55680	ULB1A221TPAANA
A2C834	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C851	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C852	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C882	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2C884	283-0421-00			CAP,FXD,CER DI:0.1UF,+80-20%,50V	04222	MD015C104MAA
A2CR356	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR448	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,DO-35	50434	5082-2672

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2CR548	152-0322-00			SEMICOND DVC,DI:SCHOTTKY,SI,15V,DO-35	50434	5082-2672
A2CR560	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR561	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2CR672	152-0723-00			SEMICOND DVC,DI:SCHOTTKY,SI,6V,0.45PF,DO-35	21847	A2X1518
A2CR674	152-0723-00			SEMICOND DVC,DI:SCHOTTKY,SI,6V,0.45PF,DO-35	21847	A2X1518
A2CR774	152-0595-00			SEMICOND DVC,DI:VVC,SI,12V,120PF,DO-14	04713	MV1404
A2DS190	150-1111-00			LT EMITTING DIO:GREEN,D565NM,35MA	15513	PCL200-MG
A2J590	131-1465-00			CONN,RCPT,ELEC:CKT BD MT,34 CONTACT	20999	3431-1002
A2J690	131-1931-00			CONN,RCPT,ELEC:SNAP CPLG,R ANGLE,CKT BD MT	16179	5164-5006-09
A2J730	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A2J730	136-0252-07			SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
A2J732	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A2J732	136-0252-07			SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
A2J850	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2J864	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2J874	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2K520	148-0163-00			RELAY,ARMATURE:4 FORM C,2A,30V,COIL 5VDC,50 M OHM	61529	DS4E-M-DC5V
A2L126	114-0366-00			COIL,RF:VARIABLE,2.30-2.80UH	80009	114-0366-00
A2L130	114-0366-00			COIL,RF:VARIABLE,2.30-2.80UH	80009	114-0366-00
A2L230	114-0364-00			COIL,RF:VARIABLE,1.42-1.68UH	80009	114-0364-00
A2L326	114-0411-00			COIL,RF:VARIABLE,0.9UH-1.0UH	80009	114-0411-00
A2L330	120-1180-00			TRANSFORMER,RF:VARIABLE	80009	120-1180-00
A2Q674	151-1103-00			TRANSISTOR:FET,N CHANNEL,SI,TO-72	17856	DM1001
A2R150	321-0649-00			RES,FXD,FILM:2.19K OHM,0.25%,0.125W,TC=T2	07716	CEAC21900C
A2R152	321-0234-00			RES,FXD,FILM:2.67K OHM,1%,0.125W,TC=T0	19701	5033ED2K67F
A2R160	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R162	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R182	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A2R190	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A2R192	307-0719-00			RES NTWK,FXD,FI:9,1.5K OHM,1%,0.15W EACH	32997	4310R101152F
A2R193	315-0361-00			RES,FXD,FILM:360 OHM,5%,0.25W	19701	5043CX360R0J
A2R240	311-1879-00			RES,VAR,NONWW:TRMR,20K OHM,0.5W	32997	3299W-R27-203
A2R242	321-0454-00			RES,FXD,FILM:523K OHM,1%,0.125W,TC=T0	01121	CC5233FY
A2R243	321-0221-00			RES,FXD,FILM:1.96K OHM,1%,0.125W,TC=T0	19701	5043ED1K960F
A2R244	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A2R245	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R0OJ
A2R246	315-0820-00			RES,FXD,FILM:82 OHM,5%,0.25W	57668	NTR25J-E82E0
A2R266	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R270	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R278	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R340	321-0086-00			RES,FXD,FILM:76.8 OHM,1%,0.125W,TC=T0	91637	CMF55116G76R80F
A2R342	321-0085-07			RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	57668	CRB14 BZE 75 OHM
A2R346	321-0086-00			RES,FXD,FILM:76.8 OHM,1%,0.125W,TC=T0	91637	CMF55116G76R80F
A2R348	321-0830-03			RES,FXD,FILM:2.41K OHM,0.25%,0.125W,TC=T2	07716	CEAC24100C
A2R358	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R374	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R378	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R434	321-0392-00			RES,FXD,FILM:118K OHM,1%,0.125W,TC=T0	07716	CEAD11802F
A2R435	321-0085-07			RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	57668	CRB14 BZE 75 OHM
A2R436	321-0830-03			RES,FXD,FILM:2.41K OHM,0.25%,0.125W,TC=T2	07716	CEAC24100C
A2R437	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A2R438	321-0085-07			RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	57668	CRB14 BZE 75 OHM
A2R440	307-1318-00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%, 0.125W	32997	4604X-4W1-000
A2R442	321-0793-03			RES,FXD,FILM:37.5 OHM,0.25%,0.125W,TC=T2	91637	CMF55116D37R50C
A2R444	321-0001-00			RES,FXD,FILM:10 OHM,1%,0.125W,TC=T0	19701	5033RD10R00FMS
A2R446	321-0793-03			RES,FXD,FILM:37.5 OHM,0.25%,0.125W,TC=T2	91637	CMF55116D37R50C

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2R448	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A2R454	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R464	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R490	307-0486-00			RES NTWK,FXD,FI:100 OHM,20%,1.125W	80009	307-0486-00
A2R492	307-0719-00			RES NTWK,FXD,FI:9,1.5K OHM,1%,0.15W EACH	32997	4310R101152F
A2R494	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A2R544	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A2R546	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A2R554	307-0637-00			RES NTWK,FXD,FI:5,2K OHM,2%,0.125W	01121	206A202
A2R556	307-0511-00			RES,FXD,FILM:43 OHM,1%,0.075W	52262	MCRA430FY
A2R562	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A2R564	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R565	315-0561-00			RES,FXD,FILM:560 OHM,5%,0.25W	19701	5043CX560R0J
A2R566	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R582	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A2R584	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A2R610	311-1175-00			RES,VAR,NONWW:TRMR,100 OHM,0.5W	73138	68WR100-77A
A2R612	321-0085-07			RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	57668	CRB14 BZE 75 OHM
A2R614	321-0928-07			RES,FXD,FILM:250 OHM,0.1%,0.125W,TC=T9	19701	5033RE250R0B
A2R648	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A2R660	321-0261-00			RES,FXD,FILM:5.11K OHM,1%,0.125W,TC=T0	19701	5033ED5K110F
A2R676	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A2R682	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2R685	315-0622-00			RES,FXD,FILM:6.2K OHM,5%,0.25W	19701	5043CX6K200J
A2R692	321-0771-01			RES,FXD,FILM:50 OHM,0.5%,0.125W,TC=T0	57668	RB14DXE 50E
A2R720	321-0085-07			RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	57668	CRB14 BZE 75 OHM
A2R722	321-0085-07			RES,FXD,FILM:75 OHM,0.1%,0.125W,TC=T9	57668	CRB14 BZE 75 OHM
A2R740	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A2R758	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A2R760	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R762	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A2R774	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A2R776	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A2R778	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R780	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A2R781	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A2R786	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2R788	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A2R862	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A2R870	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A2TP323	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A2TP373	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A2TP456	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A2TP764	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A2TP786	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A2TP860	214-4085-00			TERM,TEST POINT:BRASS,W/NYLON COLLAR,RED	80009	214-4085-00
A2U160	156-1676-00			MICROCKT,DGTL:SCREENED	04713	MC10H107LD
A2U162	156-1676-00			MICROCKT,DGTL:SCREENED	04713	MC10H107LD
A2U240	155-0282-00			MICROCKT,DGTL:DIGITAL TO ANALOG CONVERTER	80009	155-0282-00
A2U254	156-1173-00			MICROCKT,LINEAR:VOLTAGE REFERENCE	04713	MC1403UDS
A2U256	156-0067-00			MICROCKT,LINEAR:OPNL AMPL,SEL	04713	MC1741CP1
A2U280	156-0308-04			MICROCKT,DGTL:QUAD DIFF LINE RCVR,SCREENED	04713	MC10115PD/LD
A2U350	156-2116-00			MICROCKT,DGTL:ECL,QUAD 2-INPUT MUX/LATCH	04713	MC10H173 (P/L)
A2U380	156-0308-04			MICROCKT,DGTL:QUAD DIFF LINE RCVR,SCREENED	04713	MC10115PD/LD
A2U450	156-2116-00			MICROCKT,DGTL:ECL,QUAD 2-INPUT MUX/LATCH	04713	MC10H173 (P/L)
A2U460	156-1676-00			MICROCKT,DGTL:SCREENED	04713	MC10H107LD
A2U462	156-1676-00			MICROCKT,DGTL:SCREENED	04713	MC10H107LD

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2U480	156-0308-04			MICROCKT,DGTL:QUAD DIFF LINE RCVR,SCREENED	04713	MC10115PD/LD
A2U526	156-3432-00			MICROCKT,LINEAR:OPERATIONAL AMP ULTRAWB	80009	156-3432-00
A2U540	155-0282-00			MICROCKT,DGTL:DIGITAL TO ANALOG CONVERTER	80009	155-0282-00
A2U550	156-2116-00			MICROCKT,DGTL:ECL,QUAD 2-INPUT MUX/LATCH	04713	MC10H173 (P/L)
A2U667	156-1344-00			MICROCKT,LINEAR:ECL,COMPARATOR	24355	AD9685BH
A2U680	156-1344-00			MICROCKT,LINEAR:ECL,COMPARATOR	24355	AD9685BH
A2U770	156-1191-01			MICROCKT,LINEAR:DUAL BI-FET OP-AMP,8 DIP	80009	156-1191-01
A2VR272	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR274	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR276	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR370	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR372	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR376	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR470	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR472	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR476	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR478	152-0662-00			SEMICOND DVC,DI:ZEN,SI,5V,1%,400MW,DO-7	04713	SZG195RL
A2VR880	152-0520-00			SEMICOND DVC,DI:ZEN,SI,12V,5%,1W,DO-41	80009	152-0520-00
A2XJ730	136-0252-01			SOCKET,PIN TERM:U/W 0.0.19 DIA PINS	00779	1-332095-2
A2XJ732	136-0252-01			SOCKET,PIN TERM:U/W 0.0.19 DIA PINS	00779	1-332095-2
J1				(PART OF W100)		
J2				(PART OF W200)		
J3				(PART OF W300)		
W100	175-9862-00			CABLE ASSY,RF:75 OHM COAX,3.0 L,9-4 (FROM SYNC IN FRONT PANEL TO A1J890)	80009	175-9862-00
W200	174-1160-00			CABLE ASSY,RF:50 OHM COAX,9.0 L (FROM VIDEO OUT FRONT PANEL TO A2J730)	80009	174-1160-00
W300	175-9859-00			CABLE ASSY,RF:75 OHM COAX,3.0 L,9-1 (FROM SYNC OUT FRONT PANEL TO A1J890)	80009	175-9859-00
W400	174-0741-00			CA ASSY,SP,ELEC:20,28 AWG,4.5 L,RIBBON (FROM A1J875 TO A2J874)	80009	174-0741-00
W500	174-0741-00			CA ASSY,SP,ELEC:20,28 AWG,4.5 L,RIBBON (FROM A1J860 TO A2J864)	80009	174-0741-00
W600	174-1002-00			CA ASSY,SP,ELEC:10,28 AWG,5.0 L,RIBBON (FROM A1J842 TO A2J850)	53510	174-1002-00
W700	174-1119-00			CABLE ASSY,RF:50 OHM COAX,9.0 L (FROM A1J120 TO A2J732)	80009	174-1119-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966	Drafting Practices.
Y14.2, 1973	Line Conventions and Lettering.
Y10.5, 1968	Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

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

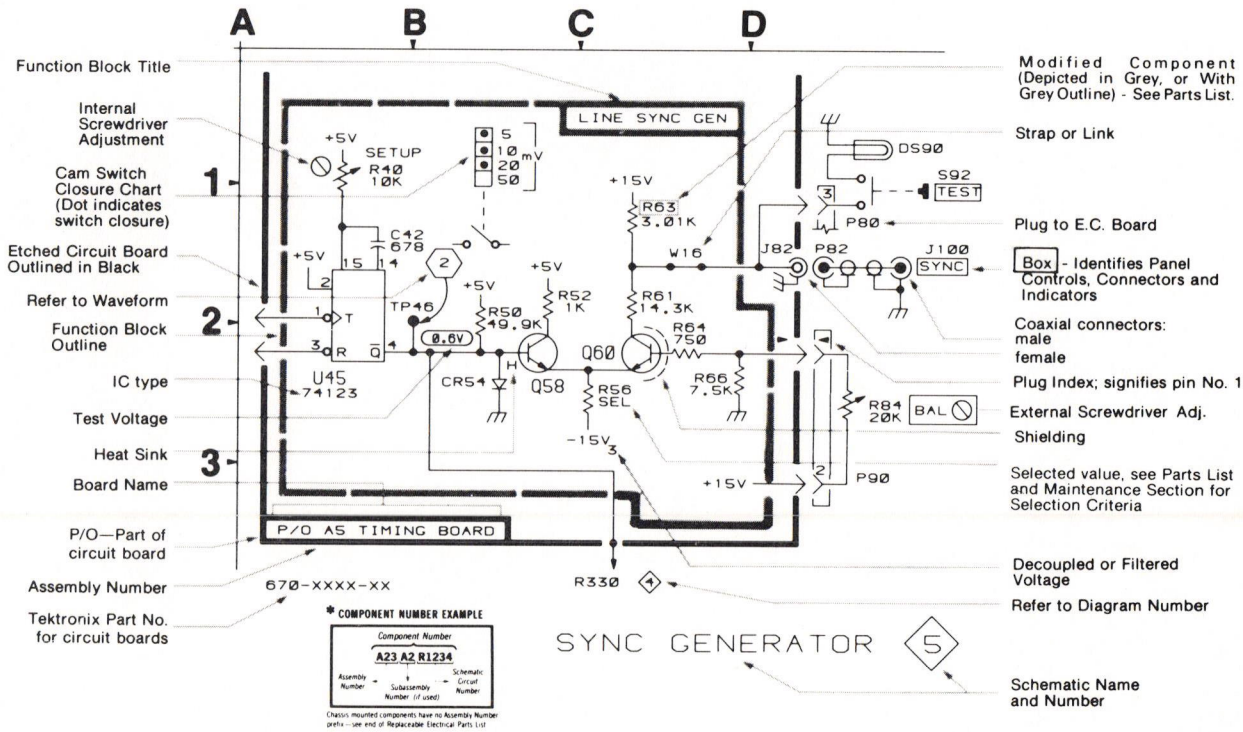
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

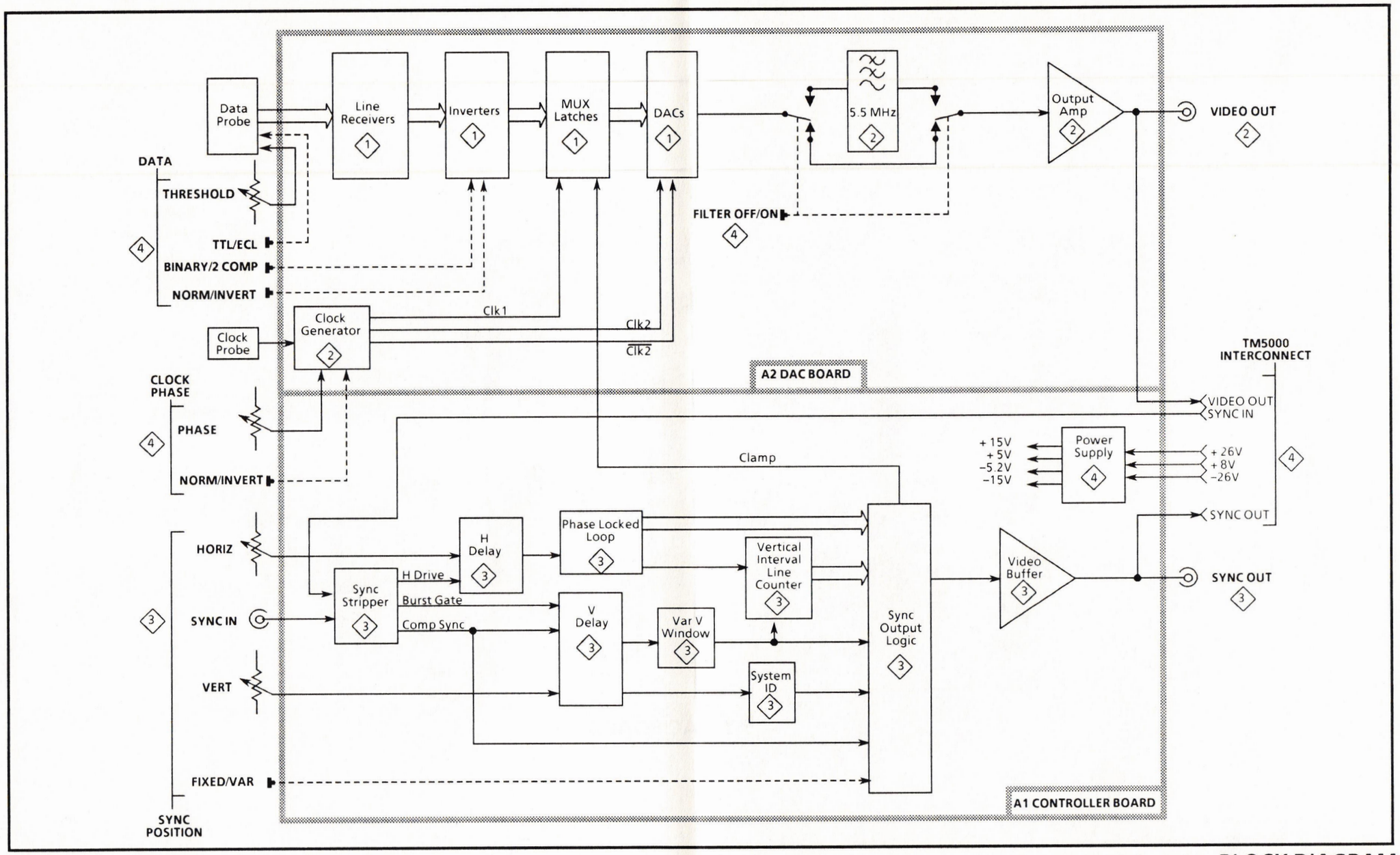
The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

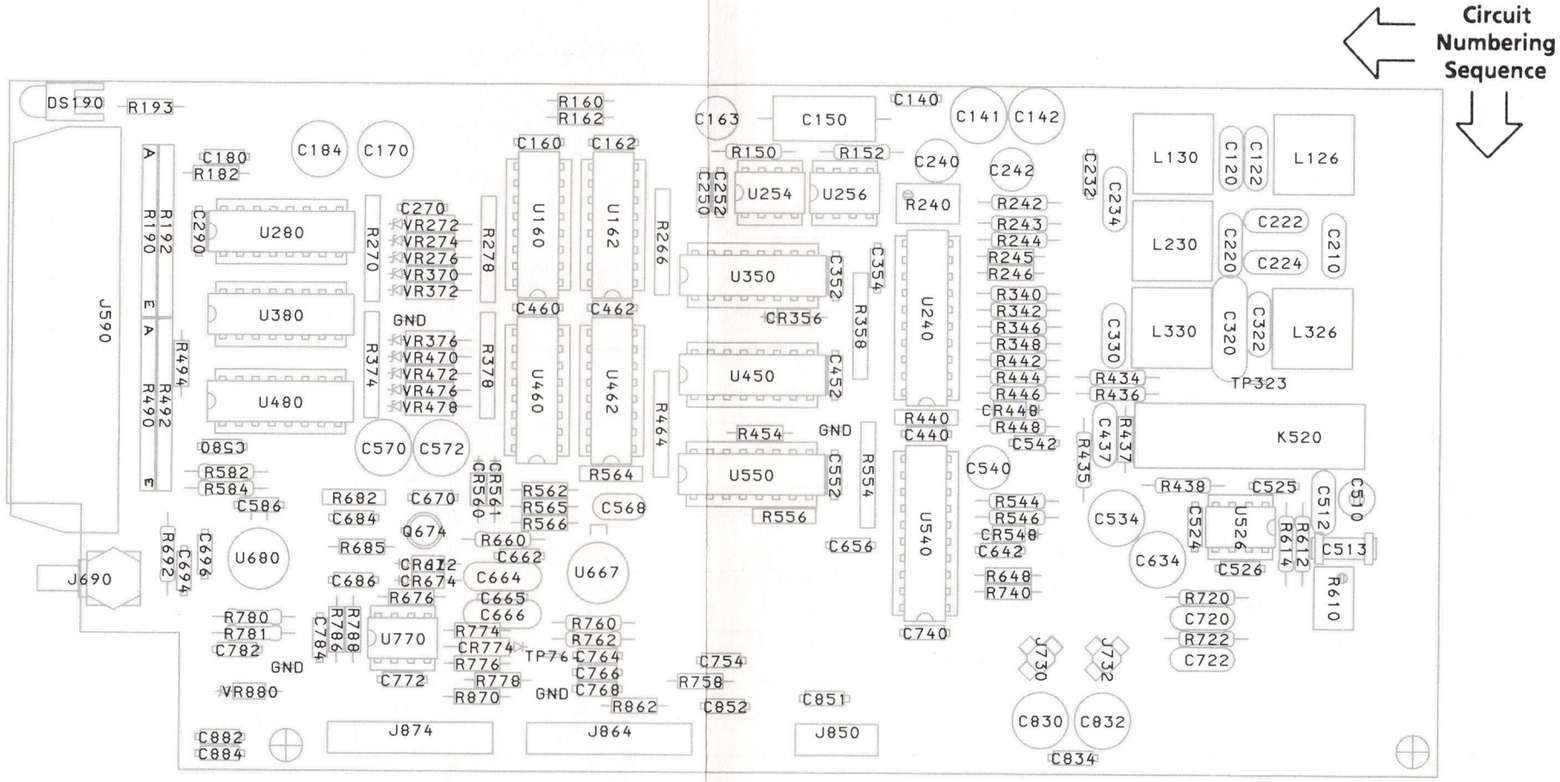
The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.





DP–100

BLOCK DIAGRAM



A2 DAC BOARD

Static Sensitive Devices
See Maintenance Section

DIAGRAM 1

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
A2 Dac Board	
C141	F5
C142	G3
C150	G3
C163	G3
C170	G5
C184	B1
C232	G3
C240	G3
C242	G4
C252	F4
C280	F5
C290	E5
C354	G4
C440	G5
C540	G2
C542	F2
C570	B1
C580	F5
C642	G2
C662	F5
C740	H5
C832	G5
C884	B1
CR356	D4
CR448	F4
CR548	F2
CR560	C1
CR561	C1
DS190	E1
J590	A2
J874	A1
P874	A1
R150	F3
R152	F3
R160	C5
R162	C5
R182	B5
R190A	B5
R190B	B5
R190C	B4
R190D	B4
R190E	B3
R192A	B5
R192B	B5
R192C	B5
R192D	B4
R192E	B4
R192F	B4
R192G	B4
R192H	B4
R192I	B4
R193	E1
R240	F3
R242	F3
R243	G3
R244	G4
R245	G3
R246	G3
R266	D1
R270A	C5
R270B	C5
R270C	C4
R270D	C4
R270E	C4
R278A	C5
R278B	C5
R278C	C4
R278D	C4
R278E	C4
R340	H3
R342	H4
R346	H3
R348	H3
R358	F1
R374A	C3
R374B	C3
R374C	C2
R374D	C2
R374D	C2
R374E	C2
R378A	C3
R378B	C3
R378C	C2
R378D	C2
R378E	C2
R434	H3
R436	H3
R440	E4
R442	H3
R444	G3
R446	H2
R448	F4
R454	D5
R464	D1
R490A	B3
R490B	B3
R490C	B2
R490D	B2
R490E	B1
R492A	B3
R492B	B3
R492C	B3
R492D	B2
R492E	B2
R492F	B2
R492G	B2
R492H	B2
R492I	B2
R494	B3
R544	G2
R546	F2
R554	E1
R556	D4
R648	G1
R740	G1
R758	D5
R862	D5
U160A	D4
U160B	C5
U160C	C3
U162A	C5
U162B	D4
U162C	C3
U240	G4
U254	F2
U256	G3
U280C	B5
U280D	C5
U350	E4
U380A	C3
U380B	B3
U380C	B4
U380D	B4
U450	E3
U460A	D2
U460B	C2
U460C	C3
U462B	C2
U480A	C1
U480B	B2
U480C	B3
U480D	B2
U540	G2
U550	E2
VR478	C2
VR272	C5
VR274	C5
VR276	C4
VR370	C4
VR372	C3
VR376	C3
VR470	C3
VR472	C2
VR476	C2

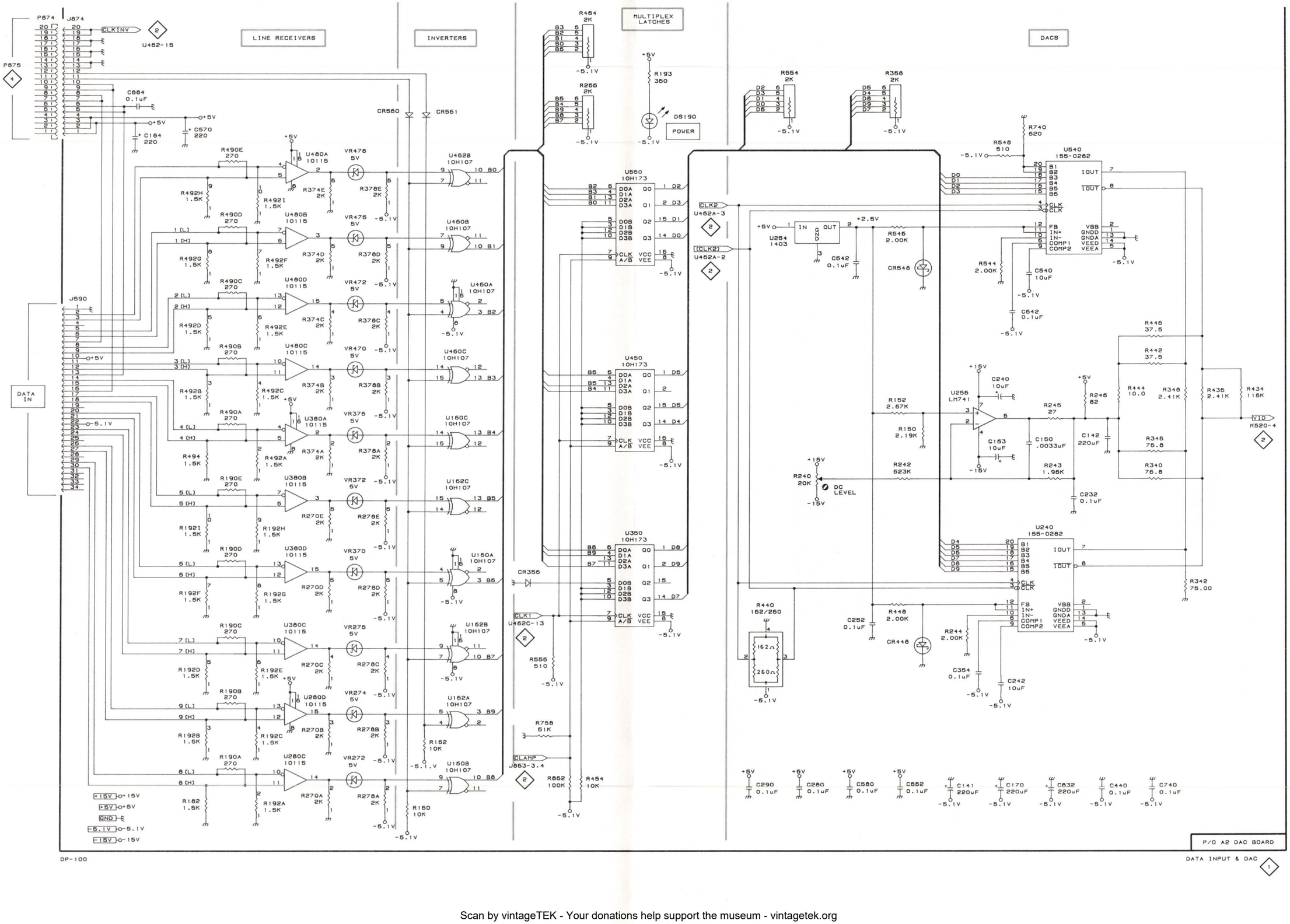


DIAGRAM 2

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
A2 Dac Board	
C120	E1
C122	E1
C140	B4
C160	A5
C162	B5
C180	B5
C210	E1
C220	D1
C222	D1
C224	D1
C234	E1
C250	B5
C320	D1
C322	D1
C330	D1
C352	C5
C422	A5
C437	D2
C460	B5
C462	B5
C510	F3
C512	F3
C513	G2
C524	G1
C525	G1
C526	G1
C534	G1
C552	B5
C568	G3
C572	C5
C586	C4
C634	G1
C664	D3
C665	E5
C666	E4
C670	D4
C684	C3
C686	E5
C694	B3
C696	C3
C754	A4
C764	F4
C766	E4
C768	B4
C772	D5
C784	D4
C830	C5
C834	B4
C851	C4
C852	B1
C882	A3
CR672	E5
CR674	E5
CR774	E4
J2	H1
J690	A3
J730	H1
J732	H2
J850	A2
J864	A1
K420A	C1
K420C	F1
K420D	F2
K420E	C1
L126	E1
L130	E1
L230	D1
L326	D1
L330	D1
P730	H1
P732	H2
P850	A2
P864	A1
Q674	D3
R435	C2
R437	D2
R438	F1
R562	G3
R564	F4
R565	G4
R566	G4
R582	B3
R584	B3
R610	G2
R612	G2
R614	G2
R660	D3
R676	D5
R682	C3
R685	D3
R692	B3
R720	G1
R722	G2
R760	E3
R762	E3
R774	D4
R776	D4
R778	F4
R780	C4
R781	B3
R782	B3
R786	D4
R788	D5
R870	A3
TP343	A4
TP373	B4
TP456	B4
TP764	E3
TP786	B4
TP860	C4
U462A	H3
U462C	G3
U526	G1
U667	F3
U680	C3
U770A	D4
VR880	A3

5MHz LOWPASS FILTER

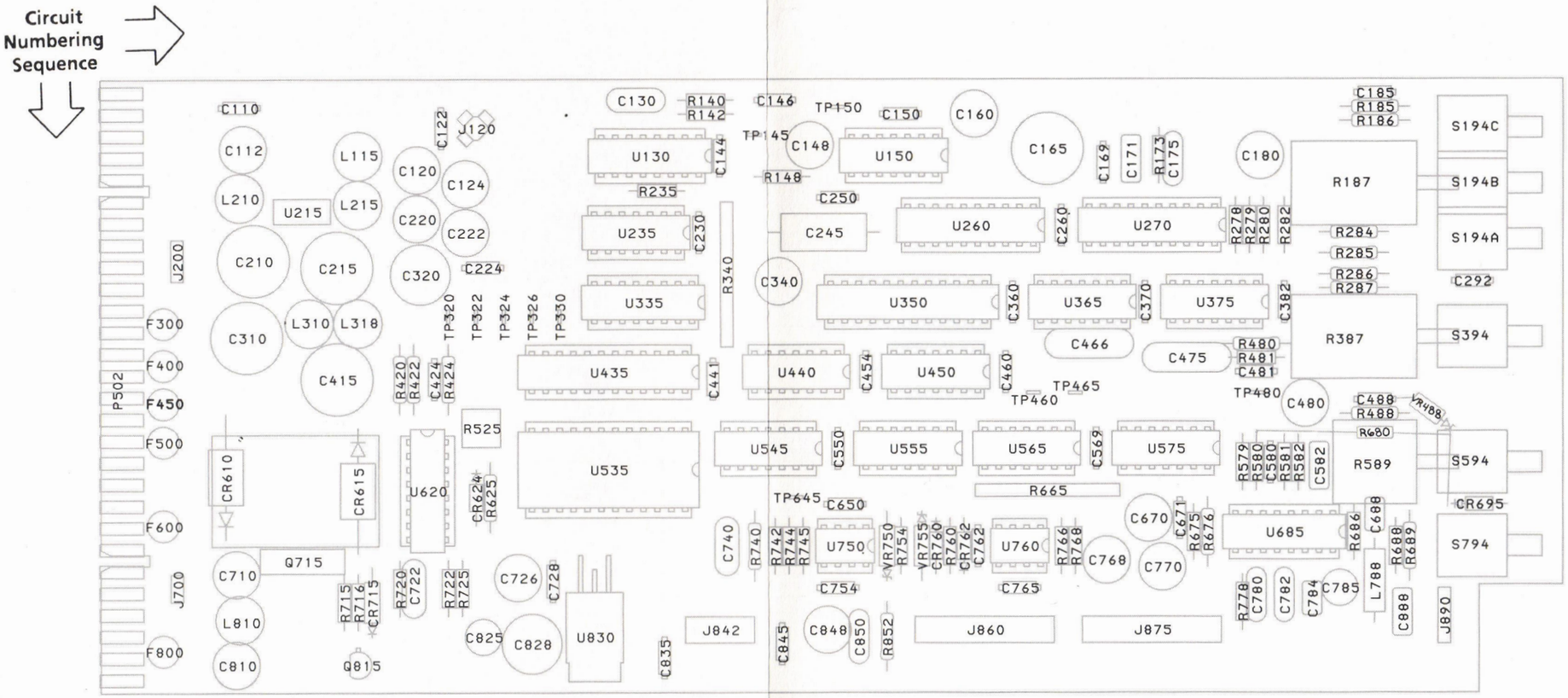
OUTPUT AMPLIFIER

CLOCK CONTROL

P/O A2 DAC BOARD

DP-100

DAC OUTPUT & CLOCK CONTROL 2



A1 CONTROLLER BOARD

Static Sensitive Devices
See Maintenance Section

DIAGRAM 3

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
A1 Controller Board	
C130	D1
C144	D1
C146	D2
C148	C1
C150	C2
C160	C2
C169	C5
C173	C5
C175	C5
C180	C5
C245	C2
C250	C1
C260	F5
C360	E4
C365	B2
C370	B1
C382	A2
C441	E2
C454	C3
C460	D3
C466	B1
C475	B1
C480	A2
C481	B1
C550	E2
C569	F1
C580	C3
C582	E3
C650	G4
C668	B3
C671	A3
C688	B3
C740	H4
C754	G3
C762	E3
C765	E3
C780	B3
C782	B3
C784	B3
C785	B3
C850	H4
C888	A3
CR762	F3
J1	A3
J3	A3
J890	A3
L788	B3
P890	A3
R140	D2
R142	D2
R148	C1
R173	C5
R235	C1
R278	B2
R279	C5
R280	C4
R282	B5
R340A	F3
R340B	F4
R340C	F4
R340D	D1
R340E	C1
R340F	D4
R340G	C4
R340H	C3
R340I	D2
R387A	A1
R387B	B5
R480	A1
R481	A1
R579	A2
R580	C3
R581	D3
R582	C3
R665A	H1
R665B	H2
R665C	G2
R665D	F1
R665E	G2
R665F	G1
R665G	G1
R665H	G1
R665I	H1
R675	B3
R676	B4
R686	B3
R688	B3
R740	H4
R742	G3
R744	G4
R745	G4
R754	H1
R760	F3
R766	E2
R768	E3
R852	H4
S394	G2
TP145	D2
TP460	B2
TP465	D3
TP645	G5
U130A	D2
U130B	D1
U150	C2
U235A	F4
U235B	F3
U260	F4
U270	D5
U335	F4
U350	E4
U375	B2
U435	E1
U440A	D4
U440B	C3
U440C	D2
U440D	E2
U440E	F5
U440F	G1
U450A	D3
U450B	D4
U535	F1
U545B	E2
U555A	G2
U565A	G1
U565B	G1
U575A	H2
U575B	H1
U575C	G2
U575D	H1
U685	B3
U750	G3
U760	E3
VR750	G3
VR755	H1

PHASE LOCKED LOOP

HORIZ POSITION

H DELAY

V DELAY

SYNC STRIPPER

VERTICAL POSITION

VARIABLE VERTICAL INTERVAL TIMING

SYNC OUTPUT LOGIC

OUTPUT BUFFER

SYSTEM ID

SYNC

FIXED

VARIABLE

SYNC IN

SYNC OUT

SYNCIN

SYNCA

SYNCB

CLAMP

H_DEL

(H_DEL)

VAR_V_WINDOW

FIELD

PAL/NTSC

FXD_SYNC

V_RST

H/64

H/2

+15V

+5V

GND

-5.1V

-15V

P/O A1 CONTROLLER BOARD

SYNC CONTROL 3

DP-100

DIAGRAM 4

SCHEMATIC DIAGRAM LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
A1 Controller Board	
C110	G2
C112	G2
C120	G2
C122	G2
C124	C1
C165	B4
C185	F4
C210	F2
C215	G2
C220	G2
C222	C1
C224	B1
C292	E4
C310	F2
C320	B1
C340	A4
C415	F2
C424	E2
C488	A5
C625	C1
C710	B1
C722	D2
C726	C3
C728	C3
C768	B4
C770	B5
C810	B1
C825	D2
C828	B3
C835	G2
C845	B5
C848	B5
CR610	F2
CR615	F2
CR624	D1
CR695	G5
CR715	E2
F500	B1
F600	B3
F800	B1
J120	A4
J200	F4
J700	F1
J842	H3
J860	H3
J875	H4
L115	G2
L210	G2
L215	F2
L310	F2
L318	F2
L810	B1
P120	A4
P200	G4
P502A	A1
P502B	A3
P700	F1
P842	H3
P860	H3
P875	H4
Q715	E2
Q815	E1
R185	F4
R186	F4
R187	D4
R285	F4
R286	E4
R287	E4
R294	E4
R420	D2
R422	C2
R424	D1
R488	F3
R525	C1
R589	F3
R680	G3
R689	F3
R715	E2
R716	E2
R720	E1
R722	D2
R725	D2
S194A	E5
S194B	E5
S194C	E5
S594	G5
S794	G3
T610	F2
TP150	A4
TP320	C1
TP322	C3
TP324	G2
TP326	G2
TP330	B4
TP480	B4
U215	B1
U620	D1
U830	B3
VR488	G3

A B C D E F G H

1 2 3 4 5

P502A TM5000 +8V F800 1.5A L810 10uH C810 100uF C710 100uF TP320 +15V
+25V F500 3A U215 7815 C320 100uF 50V C224 0.1uF C222 100uF C124 100uF
J700 P700 TEST +5V DISABLE
R424 3.01K R525 500 VOLTAGE ADJUST R625 2.0K U520 SG3524 IN+ IN- SENSE+ SENSE- RT CT COMP SHUTDOWN EA EB VIN OSC CA CB VREF GND
CR624 R722 10K C722 .001uF R725 5.6K C625 10uF C424 0.1uF
R720 1.5K Q815 CR715 R715 10 Q715 R716 1K
CR610 C310 1000uF L310 10uH C210 1000uF L210 10uH C635 0.1uF C112 220uF C110 0.1uF TP326 -5.1V
T610 C415 1000uF CR615 L318 10uH L215 10uH L115 10uH TP324 +5V
C215 1000uF C220 220uF C120 220uF C122 0.1uF
R420 3.01K R422 2.0K
POWER SUPPLY

P502B TM5000 -25V F500 1A C628 100uF U630 7915 C726 100uF C726 0.1uF TP322 -15V
SYNCB C740 SYNCIN J880-2
P120 J120 VIDB P732

TP150 TP330 TP480
+5V C340 220uF +5V C768 220uF +5V C155 1000uF
C488 0.1uF -5.1V C645 0.1uF -5.1V +15V C648 100uF +5V C770 220uF
+15V +5V GND -5.1V -15V

+5V R669 3.24K CLOCK PHASE R569 500 R488 3.24K -5.1V
CLAMP VR755 RELAY
+15V R660 200 OFF ON VR488 5.6V S794 FILTER +5V
DAC CONTROL
J860 P860 -5.1V +15V -15V P864 2
J842 P842 -5.1V -5.1V P850 2
J875 P875 +5V P874 1
DATA THRESHOLD R187 5K VARY CAL -5.1V R264 20.0K 1% C292 0.1uF
R286 5.19K R186 1.05K R185 1.74K 1% C185 0.1uF J200 +ECL -5.1V -ECL P200
TTL/ECL S194A TTL ECL R287 10.0K R285 3.74K -5.1V -5.1V
DATA INV/NORM S194C NORM INV
2 COMP/BINARY S194B BINARY 2 COMP
CR695 NORM INV S594 CLOCK
P/O A1 CONTROLLER BOARD

DP-100

POWER SUPPLY & DAC CONTROL 4

REPLACEABLE MECHANICAL PARTS

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.

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.

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
                  **** END ATTACHING PARTS ****
  Detail Part of Assembly and/or Component
  Attaching parts for Detail Part
                  **** END ATTACHING PARTS ****
    Parts of Detail Part
    Attaching parts for Parts of Detail Part
                  **** END ATTACHING PARTS ****
```

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.

ABBREVIATIONS

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

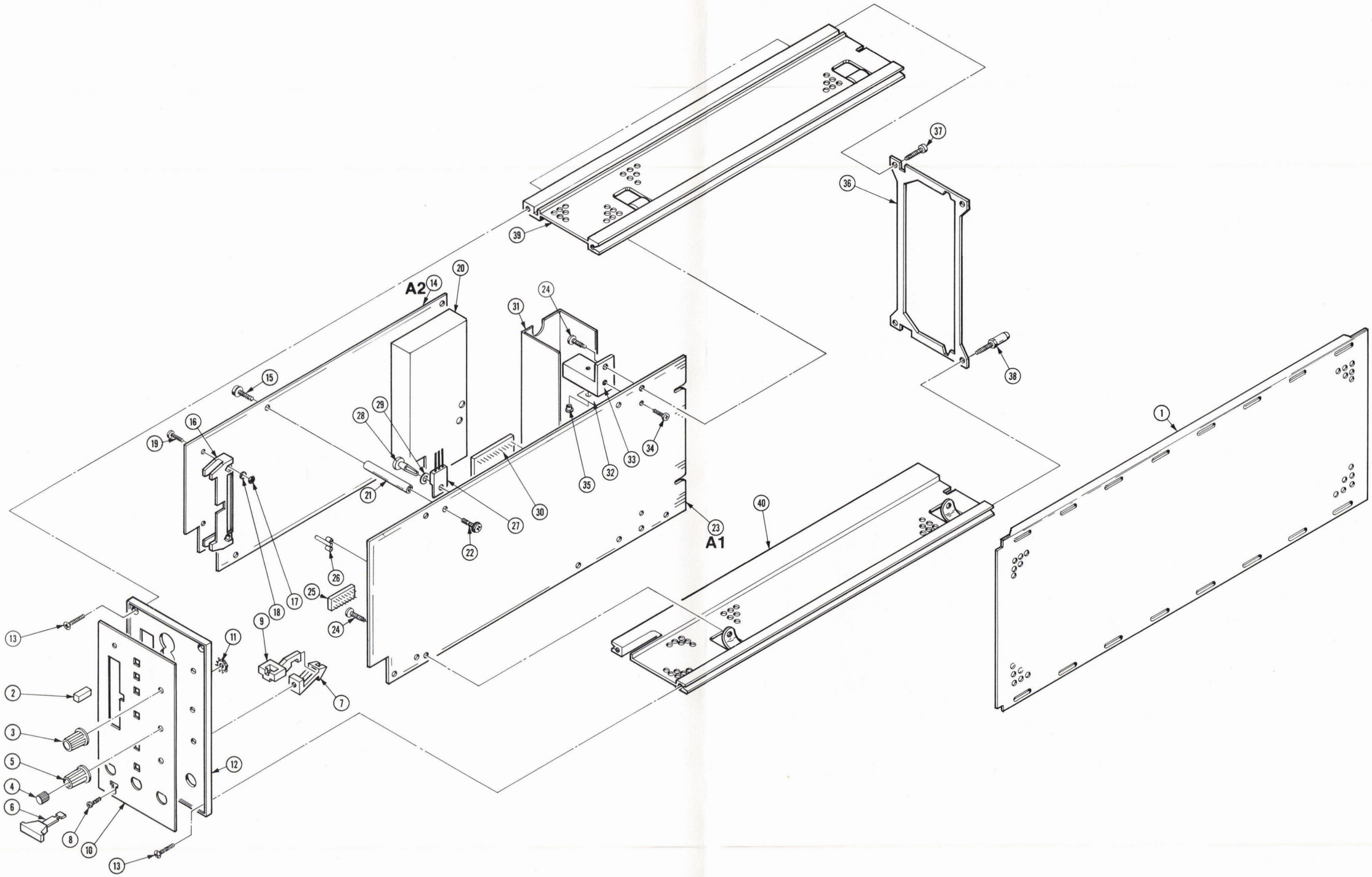
CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
02768	ILLINOIS TOOL WORKS INC FASTEX DIVISION	195 ALGONQUIN ROAD	DES PLAINES IL 60016-6103
09922	BURNDY CORP	RICHARDS AVE	NORWALK CT 06852
13103	THERMALLOY CO INC	2021 W VALLEY VIEW LN PO BOX 810839	DALLAS TX 75381
18565	CHOMERICS INC	77 DRAGON COURT	WOBURN MA 01801-1039
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076-9749
77900	SHAKEPROOF DIV OF ILLINOIS TOOL WORKS	SAINT CHARLES RD	ELGIN IL 60120
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
80009	TEKTRONIX INC	14150 SW KARL BRAUM DR PO BOX 500 MS 53-111	BEAVERTON OR 97077
83385	MICRODOT MFG INC GREER-CENTRAL DIV	3221 W BIG BEAVER RD	TROY MI 48098
87308	FARLEY METALS INC SOUTHERN SCREW DIV	BARKLEY RD P O BOX 1360	STATESVILLE NC 28677-9774
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61101
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609-3320
TK1452	SHELLY-RAGON INC	8219 SW CIRRUS	BEAVERTON OR 97005

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	337-1399-04			1	SHIELD,ELEC:SIDE	80009	337-1399-04
-2	366-1559-01			6	PUSH BUTTON:GRAY,0.18 SQ X 0.43	80009	366-1559-01
-3	366-0494-08			2	KNOB:GY,NEW GEN,0.127ID X 0.530D X 0.5H	80009	366-0494-08
-4	366-1391-00			1	KNOB:GY,0.081 ID X 0.28 OD X 0.32 H	80009	366-1391-00
-5	366-1215-02			1	KNOB:DOVE GY,0.127 ID X 0.5 OD X 0.531 H	80009	366-1215-02
-6	366-1690-00			1	KNOB,LATCH:SIL GY,0.53 X 0.23 X 1.059	80009	366-1690-00
-7	105-0718-01			1	BAR,LATCH RLSE: (ATTACHING PARTS)	80009	105-0718-01
-8	213-0113-00			1	SCREW,TPG,TF:2-32 X 0.312,TYPE B,PNH,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
-9	105-0719-00			1	LATCH,RETAINING:PLUG-IN	80009	105-0719-00
-10	333-1483-15			1	PANEL,FRONT: (ATTACHING PARTS)	80009	333-1483-15
-11	210-0586-00			2	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL (END ATTACHING PARTS)	78189	211-041800-00
-12	386-2402-19			1	SUBPANEL,FRONT:ALUMINUM (ATTACHING PARTS)	80009	386-2402-19
-13	213-0229-00			4	SCREW,TPG,TF:6-20 X 0.375,TYPE B,FLH,100 DEG,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
-14	----- -----			1	CKT BOARD ASSY:CONVERTER(SEE A2 REPL) (ATTACHING PARTS)		
-15	211-0658-00			4	SCR,ASSEM WSHR:6-32 X 0.312,PNH,STL,POZ (END ATTACHING PARTS) CKT BOARD ASSY INCLUDES:	78189	S51-060545-0X
-16	----- -----			1	.CONN,RCPT,ELEC:(SEE A2J590 REPL) .(ATTACHING PARTS)		
-17	210-0405-00			2	.NUT,PLAIN,HEX:2-56 X 0.188,BRS CD PL	73743	12157-50
-18	210-0001-00			2	.WASHER,LOCK:#2 INTL,0.013 THK,STL	77900	1202-00-00-0541C
-19	211-0185-00			2	.SCREW,MACHINE:2-56 X 0.438,PNH,STL .(END ATTACHING PARTS)	TK0435	ORDER BY DESCR
-20	337-3476-00			1	.SHIELD,ELEC:BRASS	80009	337-3476-00
-21	385-0024-00			4	SPACER,POST:1.375 L W/6-32 THD EA END,AL (ATTACHING PARTS)	80009	385-0024-00
-22	211-0658-00			4	SCR,ASSEM WSHR:6-32 X 0.312,PNH,STL,POZ (END ATTACHING PARTS)	78189	S51-060545-0X
-23	----- -----			1	CKT BOARD ASSY:CONTROLLER(SEE A1 REPL) (ATTACHING PARTS)		
-24	213-0146-00			4	SCREW,TPG,TF:6-20 X 0.312,TYPE B,PNH,STL (END ATTACHING PARTS) CKT BOARD ASSY INCLUDES:	83385	ORDER BY DESCR
-25	136-0729-00			1	.SKT,PL-IN ELEK:MICROCKT,16 CONTACT	09922	DILB16P-108T
-26	361-0383-00			10	.SPACER,PB SW:0.33 L,CHARCOAL,POLYCARBONATE	80009	361-0383-00
-27	----- -----			1	.MICROCIRCUIT,LI:(SEE A1U830 REPL) .(ATTACHING PARTS)		
-28	214-3012-00			1	.FSTNR,SNAP-IN:0.437 L X 0.3 DIA,ROUND HD	02768	254-090601-01
-29	210-3057-00			1	.WASHER,FLAT:0.17 ID X 0.35 OD X 0.03,NYL .(END ATTACHING PARTS)	TK1452	ORDER BY DESCR
-30	136-0751-00			1	.SKT,PL-IN ELEK:MICROCKT,24 PIN	09922	DILB24P108
-31	337-3477-00			1	.SHIELD,ELEC:BRASS	80009	337-3477-00
-32	342-0563-00			2	.INSULATOR,PLATE:TRANSISTOR	18565	69-11-8805-1674
-33	214-4103-00			2	.HEAT SINK:ALUMINUM .(ATTACHING PARTS)	80009	214-4103-00
-34	211-0008-00			4	.SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESCR
-35	210-1178-00			2	.WASHER,SHLDR: .(END ATTACHING PARTS)	13103	7721-7PPS
-36	386-4278-00			1	SUPPORT,FRAME:REAR,AL (ATTACHING PARTS)	80009	386-4278-00
-37	213-0192-00			2	SCREW,TPG,TF:6-32 X 0.5,SPCL TYPE,FILH,STL	87308	ORDER BY DESCR
-38	386-3657-01			2	SUPPORT,PLUG-IN: (END ATTACHING PARTS)	93907	ORDER BY DESCR
	334-7209-00			1	MARKER,IDENT:	80009	334-7209-00
-39	426-0725-05			1	FR SECT,PLUG-IN:TOP	80009	426-0725-05
-40	426-0724-04			1	FR SECT,PLUG-IN:BOTTOM	80009	426-0724-04
					STANDARD ACCESSORIES		
	----- -----			1	P6460		

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345	Name & Description	Mfr. Code	Mfr. Part No.
1-	----- -----			1		P6464		
	070-6506-00			1		MANUAL,TECH:INSTR,DP100	80009	070-6506-00
						OPTIONAL ACCESSORIES		
	067-0645-02			1		FIXTURE,CAL:FLEX PLUG IN EXTENDER	80009	067-0645-02

FIG.1 EXPLODED



DP100

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.