

TEKTRONIX®

TYPE
286/287/R288
SAMPLING HEAD
MULTIPLEXER SYSTEM

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
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070-1007-00

Serial Number _____

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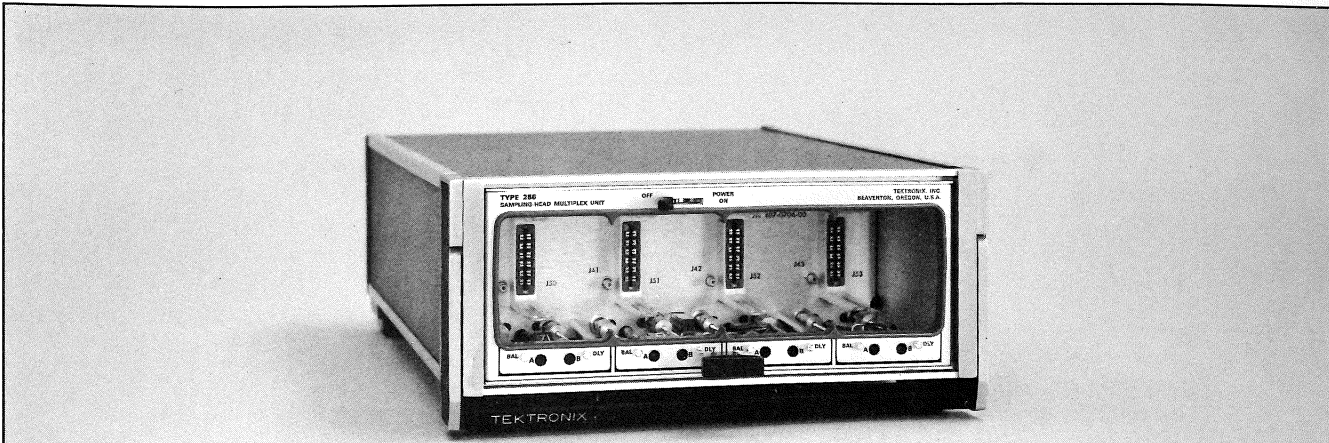
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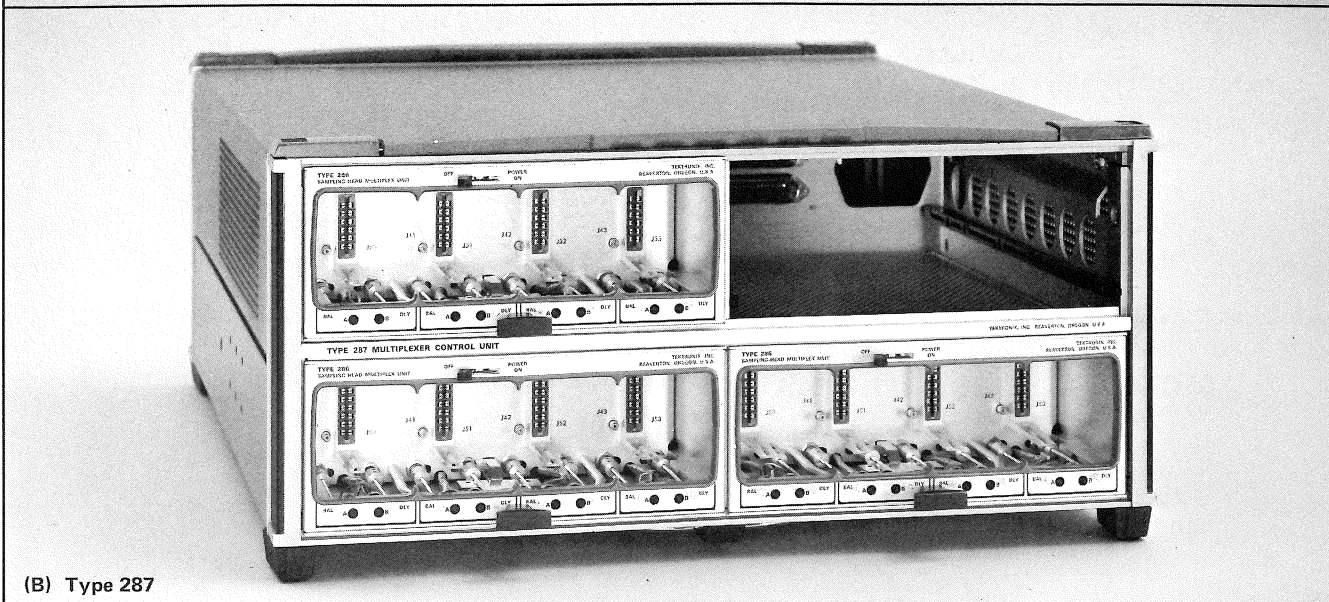
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SECTION 1 SPECIFICATION

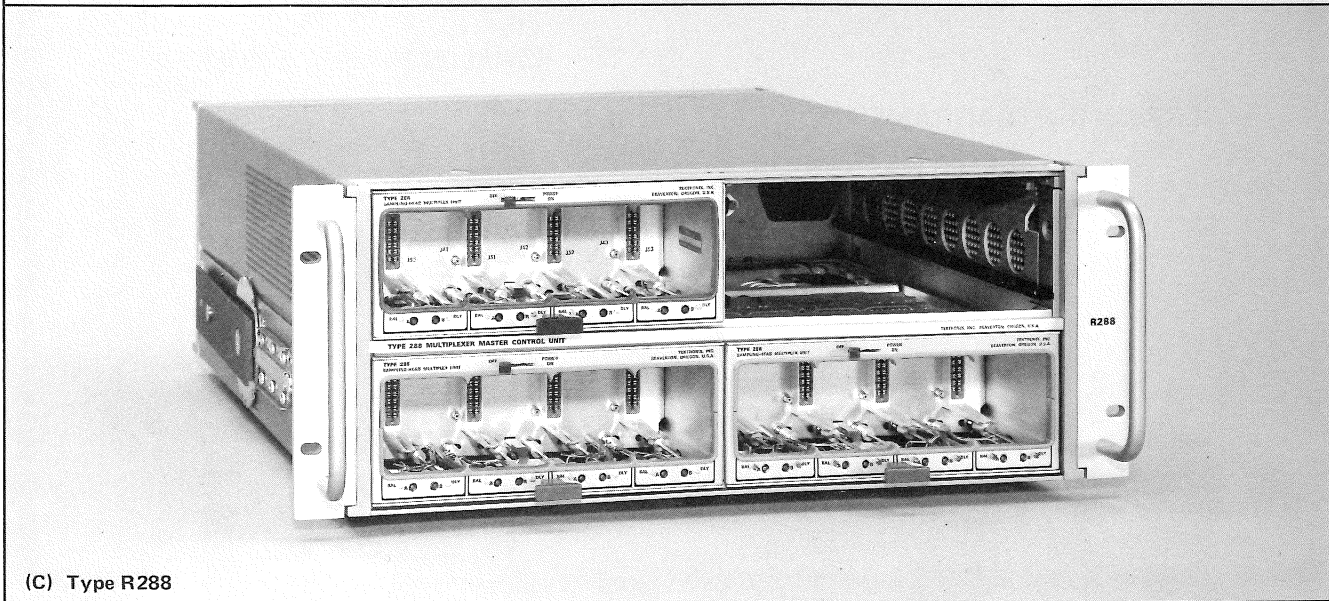
Change information, if any, affecting this section will be found at the rear of the manual.



(A) Type 286



(B) Type 287



(C) Type R288

Fig. 1-1. (A) Type 286; (B) Type 287 with three Type 286's installed; (C) Type R288 with three Type 286's installed.

Introduction

The Type 286, Type 287 and Type R288 are the main components of the Tektronix sampling-head multiplexer system. Sampling-head multiplexing allows the signals from many test points to be measured by a two-input sampling system. These measurements are made by connecting a test probe from a sampling head to each test point. The signals sensed by these probes are then electronically switched (multiplexed) into the sampling system, two at a time. A sampling-head multiplexer system is controlled by an external programmer.

The Type 286 Sampling-Head Multiplexer Unit is the basic unit of a multiplexer system. The Type 286 can multiplex four sampling heads which are installed in compartments in the Type 286. The Type 287 Multiplexer Control Unit controls up to four Type 286's. These Type 286's are installed in compartments in the Type 287. The Type R288 Master Multiplexer Control Unit controls Type 287's. The Type R288 contains Type R288 circuitry along with the circuitry of one Type 287, and four Type 286 compartments. The Type R288, therefore, controls one internal Type 287 and up to three external Type 287's.

These three sampling-head multiplexer system components allow multiplexer systems of various sizes to be assembled. If one Type 286 is used, up to 4 sampling heads can be multiplexed. If a Type 287 (and three more Type 286's) is added to the multiplexer system, up to 16 sampling heads can be multiplexed. If a Type R288 (two more Type 287's and 12 more Type 286's) is added to the multiplexer system, up to 64 sampling heads can be multiplexed.

A sampling-head multiplexer system can be connected to any Tektronix sampling unit which uses sampling heads: a Type 3S6, Type 3S5, Type 3S2 or 7S11. Three Tektronix programmers can be used to program a multiplexer system: a Type 241, Type 240/R240 or Type R250. Of these programmers, the Type 241 and Type 240/R240 can program up to 16 sampling heads and the Type R250 can program up to 64 sampling heads.

The Type R288, Type 287 and/or Type 286 will meet the following electrical characteristics provided they are connected to a sampling unit which has been calibrated as specified in Section 6. The performance check procedure in Section 6 provides a method of checking the performance of these instruments if the sampling unit has been properly calibrated.

TABLE 1-1
ELECTRICAL CHARACTERISTICS

Signal Transmission	
Characteristic	Performance
Type 286 BAL (Balance) Control Range	At least 200 mV
Type 286 DLY (Delay) Control Range	At least 20 ns
Loop Gain (With 6 ft. Signal Cable to Type 568) Using:	
Type 286	Within 10% of unity
Type 286/Type 287	Within 10% of unity
Type 286/Type 287/Type R288	Within 10% of unity
Deflection Factor Accuracy (In addition to Accuracies Specified for Sampling Head and Sampling System) Using:	
Type 286	Within 1%
Type 286/Type 287	Within 1%
Type 286/Type 287/Type R288	Within 1%

TABLE 1-1 (cont)

Characteristic	Performance
Displayed Noise (Measured Tangentially) Due to:	
Type 286	Less than 1.2X specified sampling head noise
Type 286/Type 287/Type R288	Less than 1.2X specified sampling head noise
Type 286/Type 287/Type R288	Less than 1.2X specified sampling head noise
Displayed Jitter Due to:	
Type 286	Less than 20 ps additional
Type 286/Type 287	Less than 20 ps additional
Type 286/Type 287/Type R288	Less than 20 ps additional

Head Selection and Vertical Scale Data Input Requirements

Logic Type	Positive Logic conforming to MIL STANDARD 806B
Logic Levels	
Low (L) Input	0 V (ground), sourcing ¹ 0.5 mA, to +2 V, sourcing 0.25 mA or less.
High (H) Input	+5 V to +15 V (input diode disconnects at +5 V).

Programming Inputs to Type 286 Through Connector J1

Sampling Head Selection	Channel A			Channel B			
	Pin Number	2	3	4	6	7	8
Bit Title (in Binary Code)	$\overline{4}$	$\overline{2}$	$\overline{1}$	$\overline{4}$	$\overline{2}$	$\overline{1}$	

¹Sourcing (output) terminal supplies current into an external circuit.

TABLE 1-1 (cont)

Characteristic	Performance					
Logic State for Selection of each Sampling Head						
0	L	H	H	L	H	H
1	L	H	L	L	H	L
2	L	L	H	L	L	H
3	L	L	L	L	L	L

Programming Inputs to Type 287 Through Connector J521

Type 286 Selection	Channel A			Channel B		
Pin Number	14	1	2	16	5	6
Bit Title (in Binary Code)	$\overline{16}$	$\overline{8}$	$\overline{4}$	$\overline{16}$	$\overline{8}$	$\overline{4}$
Logic State for Selection of each Type 286						
0	L	H	H	L	H	H
1	L	H	L	L	H	L
2	L	L	H	L	L	H
3	L	L	L	L	L	L

Logic State for Selection of each Type 286

0	L	H	H	L	H	H
1	L	H	L	L	H	L
2	L	L	H	L	L	H
3	L	L	L	L	L	L

Vertical Scale Selection

Pin Number	11	9	10
Bit Title	$\overline{\text{AMPS}}$	$\overline{\text{X10}}$	$\overline{\text{X0.1}}$
Logic State for Selection of			
Multiplier			
X1.0		H	H
X0.1		H	L
X10		L	H or L

TABLE 1-1 (cont)

Characteristic	Performance			
Units				
Volts	H			
Amperes	L			
Programming Inputs to Type R288 Through Connector J521				
Type 287 Selection	Channel A		Channel B	
Pin Number	13	14	15	16
Bit Title (in Binary Code)	$\overline{32}$	$\overline{16}$	$\overline{32}$	$\overline{16}$
Logic State for Selection of each Type 287				
0 (R288)	H	H	H	H
1	H	L	H	L
2	L	H	L	H
3	L	L	L	L
Vertical Scale Selection				
Pin Number	11	9	10	
Bit Title	$\overline{\text{AMPS}}$	$\overline{\text{X10}}$	$\overline{\text{X0.1}}$	
Logic State for Selection of				
Multiplier				
X1.0		H	H	
X0.1		H	L	
X10		L	H or L	
Units				
Volts	H			
Amperes	L			

TABLE 1-1 (cont)

Characteristic	Performance	
Sampling Head and Vertical Scale Data Output		
Sampling Head Data Logic Type	Positive	
Sampling Head Data Logic Levels		
Low (L) Output	−12 V, sinking ² 10 μA or less (should be diode disconnected from 0 V to −12 V)	
High (H) Output	+15 V, sourcing ³ 1.5 mA or less	
Sampling Head Data Output Through Connector J1 of Type 286	Logic state of pin will be high when associated sampling head is selected for associated sampling unit channel.	
Sampling Head Selected	Channel A	Channel B
0	18	27
1	19	28
2	20	29
3	21	30
A Indicator Light	When on, indicates that associated sampling head has been switched into channel A of the sampling unit.	
B Indicator Light	When on, indicates that associated sampling head has been switched into channel B of the sampling unit.	
Sampling Head Data Output Through Connector J516 of Type 287 or Type R288	Logic state of pin will be high when associated sampling head is selected for associated sampling unit channel.	

²Sinking (output): terminal accepts current from an external load.
³Sourcing (output): terminal supplies current to an external load.

TABLE 1-1 (cont)

Characteristic	Performance	
	Channel A	Channel B
Sampling Head Selected		
0	1	19
1	2	20
2	3	21
3	4	22
4	5	23
5	6	24
6	7	25
7	8	26
8	9	27
9	10	28
10	11	29
11	12	30
12	13	31
13	14	32
14	15	33
15	16	34
Vertical Scale Data Output Through Connector J531 of Type 287 or Type R288		
Pins	23 (Channel A) and 31 (Channel B)	
Output for Selection of Multiplier of:		
X0.1	-12.2 V through 6.2 k Ω	
X1.0	0 V (ground) through 390 Ω	

TABLE 1-1 (cont)

Characteristic	Performance
X10	+15 V through 1.39 k Ω
Pins	25 (Channel A) and 33 (Channel B)
Output for Selection of Units of:	
Volts	0 V (ground) through 390 Ω
Amperes	+15 V through 6.2 k Ω
Power Requirements	
Line Voltage	
Type 286	90 VAC to 136 VAC or 180 VAC to 272 VAC
Type 287 and Type R288	Determined by Type 286
Line Frequency	
Type 286	48 Hz to 440 Hz
Type 287 and Type R288	Determined by Type 286
Power Consumption	
Type 286	25 W
Type 287 and Type R288	25 W per Type 286
Fuses	
Type 286	1 A fast-blowing (115 V) or 0.5 A fast-blowing (230 V)
Type 287 and Type R288	3 A fast-blowing (115 V) or 1.5 A fast-blowing (230 V)

TABLE 1-2

ENVIRONMENTAL CHARACTERISTICS	
Characteristics	Performance
Temperature	
Non-operating Range	-40°C to +65°C
Operating Range	0°C to +50°C
Altitude	
Non-operating Range	To 50,000 feet
Operating Range	To 15,000 feet
Vibration Range of Type 287 or Type R288 with Type 286's Installed	To 15 minutes along each axis at 0.010 inch. Frequency varied from 10 to 50 to 10 cycles/second in 1-minute sweeps. Three minutes at any resonant point or at 55 cycles/second.
Shock Range of Type 287 or Type R288 with Type 286's Installed	To 15 g's 1/2 sine, 11 ms duration, 1 shock per axis. Total of 6 shocks.

TABLE 1-3

PHYSICAL DESCRIPTION		
Characteristic	Description	
Finish of Type 286, Type 287, Type R287 and Type R288	Anodized aluminum front panel	
Dimensions		
Type 286	≈3.13 inches high X 7.78 inches wide X 13.80 inches deep overall.	
Type 287	≈8.00 inches high X 16.81 inches wide X 20.81 inches deep overall.	
Type R287 and Type R288	≈6.99 inches high X 19.00 inches wide X 22.50 inches deep overall	
Weight	Net	Shipping
Type 286	≈6.25 lbs	≈9 lbs
Type 287	≈18.8 lbs	≈30.3 lbs
Type R287	≈18.8 lbs	≈30.3 lbs
Type R288	≈19 lbs	≈30.5 lbs

Sampling Heads. All Tektronix sampling heads may be used in a multiplexer system. The sampling heads available at this time are: the Type S-1, Type S-2, Type S-3, Type S-4 and Type S-5. Also available are the Type S-50 Pulse Generator Head and the Type S-51 Trigger Countdown Head. Descriptions of these sampling heads are located at the end of the section.

In using these sampling heads, they may either be installed directly into the sampling head compartments in the Type 286's or be connected to the Type 286's through sampling head extender cables (Tektronix Part No. 012-0130-00 or 012-0124-00).

Tektronix Programmers. Three Tektronix programmers may be used to program sampling head multiplexer systems: a Type 241 Programmer, a Type 240 Program Control Unit or a Type R250 Auxiliary Control Unit. The programmer provides head selection data which controls the operation of the Type 286's, Type 287's and Type R288. If a Type R250 is chosen to program the multiplexer system, a special Type R250 program assembly is necessary. One assembly which might be ordered is a Type 240 Program Assembly (Tektronix Part No. 067-0204-00). This card must be modified slightly. Another method of obtaining a program assembly is to order separately: a shift register card (Tektronix Part No. 020-0020-00) and two standard program boards (Tektronix Part No. 020-0021-00). These components may be used to construct a program assembly. Instructions for modifying the Type 240 program assembly or for constructing a program assembly from individual components are given at the end of this section under Preparation of Programmer.

TABLE 2-2

Tektronix Programmers Which Can Be Used To Program A Sampling-Head Multiplexer System

Programmer	Number of Heads It Can Program	Type of Memory
Type 241/R241	Up to 16	Program Cards
Type 240/R240	Up to 16	Magnetic Disc, Perforated Tape Computer
Type R250	Up to 64	

Other Programmers. If a programmer made by another company is to be used to program a multiplexer system, some information about its connection to the multiplexer system will be necessary. Table 2-3 shows the information applied to connectors J1 on the Type 286, J521 on the Type 287, and J521 on the Type R288. One of these connectors will receive head selection data from the external programmer, depending on the size of the multiplexer

system being used. Each of these connectors is a 36 pin Amphenol connector. See the Programming and General Operation section for information about multiplexer system programming.

If a programmer is to be constructed, a 36 wire cable (Tektronix Part No. 012-0132-00) will probably be useful. This cable has a 36 pin Amphenol connector on one end and no connector on the other end. The open end of this cable can be connected to the programmer.

Accessories. Besides the previously described components, certain accessories are required to assemble a sampling head multiplexer system. These accessories include interconnection cables, mounting hardware, signal choppers and miscellaneous equipment. Table 2-4 lists these accessories, their Tektronix Part Numbers and a brief description of each. Of the listed accessories, some are standard and are included with the multiplexer units, and others are optional and must be ordered separately.

Tables 2-5 and 2-6 show standard and optional accessories as related to the size of the multiplexer system, method of mounting, and the programmer and sampling unit used.

PLANNING A SAMPLING-HEAD MULTIPLEXER SYSTEM

General

There are three basic multiplexer system sizes: small, medium and large. The three sizes are distinguished by the number of sampling heads each can multiplex.

Small Multiplexer System

A small multiplexer system can multiplex from 2 to 4 sampling heads. A small multiplexer system uses one Type 286. The Type 286 may be connected to any of the programmers and sampling units previously mentioned. The Type 286 can be installed in a Type 287/R287 or in a Type R288. It can also be mounted in a rack adapter or bench-mounted.

Medium Multiplexer System

A medium multiplexer system can multiplex from 5 to 16 sampling heads. A medium multiplexer system uses one Type 287 and up to four Type 286's. The Type 287 can be connected to any of the programmers and sampling units previously mentioned. It may be benchmounted or rack-mounted (Type R287). The Type 286's are installed in the Type 287.

TABLE 2-3

Information Applied to or Received from Type 286, Type 287 and Type R288 Program Connectors

J1 on Type 286				J521 on Type 287				J521 on Type R288			
Pin No.	Data Title	Input/Output	Logic Levels	Pin No.	Data Title	Input/Output	Logic Levels	Pin No.	Data Title	Input/Output	Logic Levels
2	$\overline{A4}$ ENABLE	Input	1	1	$\overline{A8}$	Input	1	1	$\overline{A8}$	Input	1
3	$\overline{A2}$	INPUT	1	2	$\overline{A4}$	Input	1	2	$\overline{A4}$	Input	1
4	$\overline{A1}$	Input	1	3	$\overline{A2}$	Input	1	3	$\overline{A2}$	Input	1
6	$\overline{B4}$ ENABLE	Input	1	4	$\overline{A1}$	Input	1	4	$\overline{A1}$	Input	1
7	$\overline{B2}$	Input	1	5	$\overline{B8}$	Input	1	5	$\overline{B8}$	Input	1
8	$\overline{B1}$	Input	1	6	$\overline{B4}$	Input	1	6	$\overline{B4}$	Input	1
18	A·0	Output	2	7	$\overline{B2}$	Input	1	7	$\overline{B2}$	Input	1
19	A·1	Output	2	8	$\overline{B1}$	Input	1	8	$\overline{B1}$	Input	1
20	A·2	Output	2	9	$\overline{X10}$	Input	1	9	$\overline{A32}$	Input	1
21	A·3	Output	2	10	$\overline{X0.1}$	Input	1	10	$\overline{A16}$	Input	1
27	B·0	Output	2	11	\overline{AMPS}	Input	1	11	$\overline{B32}$	Input	1
28	B·1	Output	2	14	$\overline{A16}$ ENABLE	Input	1	12	$\overline{B16}$	Input	1
29	B·2	Output	2	16	$\overline{B16}$ ENABLE	Input	1	13	$\overline{X10}$	Input	1
30	B·3	Output	2	23	+12 V	Input		14	$\overline{X0.1}$	Input	1
36	Ground			25	-3.5 V	Input		15	\overline{AMPS}	Input	1
				33	A CHOP	Input	3	23	+12 V	Input	
				34	B CHOP	Input	3	25	-3.6 V	Input	
				35	Ground			33	A CHOP	Input	3
				36	Ground			34	B CHOP	Input	3
								35	Ground		
								36	Ground		

¹ Low is 0 V (ground), sourcing 0.5 mA, to +2 V, sourcing 0.25 mA or less; high is +5 V to +15 V (input diode disconnects at +5 V).

² Low is -12 V, sinking 10 μ A or less (should be diode disconnected from 0 V to -12 V); +15 V, sourcing 1.5 mA or less.

³ Low is +1 V or less sourcing 20 mA; high is +12 V through 12 k Ω .

Large Multiplexer System

A large multiplexer system can multiplex from 17 to 64 sampling heads. A large multiplexer system uses one Type R288, up to three Type 287's and up to 16 Type 286's. A Type R250 is suggested for programming a large multiplexer system and a Type 3S6 is the suggested sampling unit. The Type R288 is a rackmount instrument. Instructions are given in this section under Mounting the Type 287/R287 and Type R288 for converting a Type R288 to a benchmount instrument.

Ordering a Sampling-Head Multiplexer System

When ordering a multiplexer system, include the following:

1. Multiplexer components—Order a Type R288, Type 287's and/or Type 286's according to the number of sampling heads to be multiplexed (see Table 2-5).

2. Programmer—Order according to the two sizes of the multiplexer system and the type of digital measurement system being assembled (see Table 2-2).

3. Sampling System—Order according to the type of digital measurement system being assembled (see Table 2-1).

4. Cables and Chopper Quads—Order according to the sizes of the multiplexer system, the programmer chosen and

TABLE 2-4

Sampling-Head Multiplexer System
Accessories Descriptions

Tektronix Part No.	Name	Description
012-0131-00	Cable	Interconnecting cable, 6 ft., 36-pin to 36-pin.
012-0131-02	Cable	Chopper cable. 6 ft., 36-pin to 36-pin. Used only when signal choppers are required. Connects Type 287 ¹ or Type R288 to Type 240.
012-0132-00	Cable	Program cable. 8 ft., 36-pin connector on one end, no connector on other end.
012-0176-00	Cable	Program cable. 6 ft., 36-pin to 36-pin. Interconnects Type 286 or Type 287 ¹ with Type 241 ¹ .
012-0177-00	Cable	Signal cable. 6 ft., 36-pin to 36-pin. Interconnects Type 286, Type 287 ¹ or Type R288 with Type 568 ¹ .
012-0178-00	Cable	Signal cable. 6 ft., 36-pin to two sampling head connectors. Interconnects Type 286, Type 287 ¹ or Type R288 with Type 3S5, Type 3S2 or two 7S11's.
012-0186-00	Cable	Chopper adapter cable. Permits chopper quad to be operated directly from a Type 230 ¹ .
014-0034-00	Drawer	Plug-in drawer unit to fill unused space in Type 287 ¹ or Type R288.

TABLE 2-4 (cont)

Tektronix Part No.	Name	Description
015-0155-01	Chopper Quad	Four signal choppers to provide ground reference for Type S-3 sampling head probes. Single 24-pin connector connects to Type 287 ¹ , Type R288 or Type 230 ¹ (via chopper adapter cable Tektronix Part No. 012-0186-00).
016-0081-00	Blank Panel	Used to cover unused compartment or rack adapter. One half width of rack adapter.
016-0086-01	Rack Adapter	Allows rackmounting of one Type 286 along with a pulse generator such as a Type 106, Type 114, Type 115, Type 184 or Type 191. Type 286 Mounting Kit (Tektronix Part No. 016-0157-00) must be ordered along with rack adapter. Half width blank panel (Tektronix Part No. 016-0081-00) must also be ordered separately.
016-0157-00	Type 286 Mounting Kit	Allows single Type 286 to be mounted in rack adapter (Tektronix Part No. 016-0086-01).
016-0158-00	Type R287 Recess Mounting Kit	Allows recessing of Type R287 front panel 4 in. into rack and covers with blank door panel. Provides space to route sampling-head signal cables to rear of rack.
016-0158-01	Type R288 Recess Mounting Kit	Allows recessing of Type R288 front panel 4 in. into rack and covers with blank door panel. Provides space to route sampling-head signal cables to rear of rack.

¹Refers also to rackmount versions of these instruments.

TABLE 2-4 (cont)

Tektronix Part No.	Name	Description
070-1007-00	Instruction Manual	Operation and Maintenance manual for Type 286, Type 287 ¹ and Type R288.
103-0013-00	Power Plug Adapter	Three-to-two wire adapter.
131-0293-00	Connector	36-pin program connector.
161-0010-03	Power Cord	8 ft., 3-wire power cord with connectors. Only required if single Type 286 is being operated.
334-1526-00	Type 286 Cable Labels	Sheet of pre-gummed labels to identify all cable connectors used with Type 286.
334-1527-00	Type 287 Cable Labels	Sheet of pre-gummed labels to identify all cable connectors used with Type 287 ¹ .
334-1528-00	Type R288 Cable Labels	Sheet of pre-gummed labels to identify all cable connectors used with Type R288.
334-1560-00	Type 287 Sampling Head Labels	Sheet of pre-gummed labels to identify sampling heads in Type 287.
351-0086-00	Slide-out Tracks	Slide-out tracks and mounting hardware for rackmounting Type R287 or Type R288.
437-0110-00	Type 286 Cabinet	Allows bench-mounting of single Type 286.

the type of sampling heads being used (see Table 2-5). Table 2-4 gives descriptions of the cables and chopper quads listed in Table 2-5.

5. Mounting and Miscellaneous Accessories—Order according to the method to be used to mount the multi-

plexer components. Some mounting accessories are standard, and come with the multiplexer components; others are optional and are ordered according to the mounting method chosen (see Table 2-6). Table 2-4 gives descriptions of the accessories listed in Table 2-6.

MOUNTING THE TYPE 286

Installation of a Type 286 in a Type 286/R287 or Type R288

No mounting accessories are required to operate a Type 286 in a Type 287/R287 or a Type R288. Install the Type 286 by sliding it into one of the four compartments provided for it in a Type 287/R287 or a Type R288. The unit should slide easily until the last half inch of the slide. At this point, the Type 286 must be pushed firmly as contact is made between the Type 286 rear panel connectors and matching connectors on the Type 287/R287 or Type R288. When the Type 286 is flush with the Type 287/R287 or Type R288 frame, catches on the Type 286 lock it in place.

To remove a Type 286 installed in a Type 287/R287 or Type R288, place the index finger and middle finger around the catch release handle on the bottom center of the Type 286 (see Fig. 2-1). Place the thumb against the frame of the Type 287/R287 or Type R288. Pull on the handle while pushing against the frame with the thumb. A firm pull will be required until the Type 286 connectors are disconnected from the main frame. Once these connectors are disconnected, the Type 286 should slide out easily.

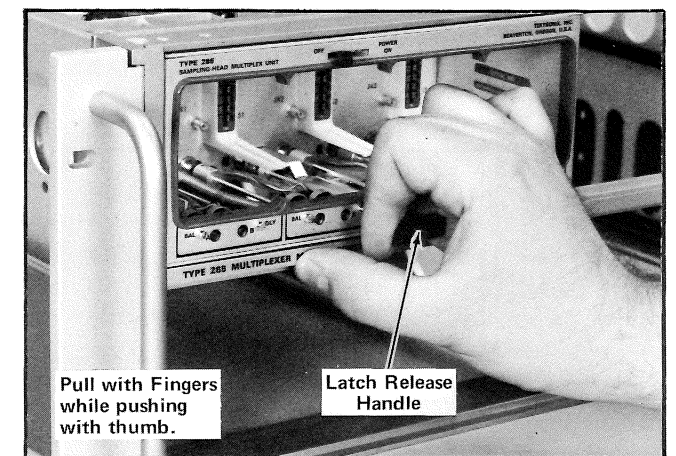


Fig. 2-1. Removing Type 286 from Type 287 or Type R288.

TABLE 2-5
Ordering Multiplexer System Components
and Interconnection Cables¹

No. of Sampling Heads	No. of Type		R288 to 287 Interconn. Cables	Programmer-to-MUX System Cables			Sampling-Unit-to MUX System Cables		Signal Chopper Cables	Chopper Quads
	286's	287's		Type R288	Type 241	Type 240	Type R250	Type 3S5, Type 3S2 or 7S11		
1 to 4	1	None	None	012-0176-00	012-0131-00	012-0131-00	012-0177-00	012-0178-00	012-0186-00	1
5 to 8	2	1	1 each 012-0177-00 012-0131-00	012-0176-00	012-0131-00	012-0131-00	012-0177-00	012-0178-00	012-0186-00 012-0131-02	2
9 to 12	3		1 each 012-0177-00 012-0131-00	012-0176-00	012-0131-00	012-0131-00	012-0177-00	012-0178-00		3
13 to 16	4		2 each 012-0177-00 012-0131-00	012-0176-00	012-0131-00	012-0131-00	012-0177-00	012-0178-00		4
17 to 20	5		3 each 012-0177-00 012-0131-00	012-0176-00	012-0131-00	012-0131-00	012-0177-00	012-0178-00		5
21 to 24	6			Not Applicable	Not Applicable					6
25 to 28	7			Not Applicable	Not Applicable					7
29 to 32	8			Not Applicable	Not Applicable					8
33 to 26	9	2		Not Applicable	Not Applicable					9
37 to 40	10			Not Applicable	Not Applicable					10
41 to 44	11			Not Applicable	Not Applicable					11
45 to 48	12			Not Applicable	Not Applicable					12
49 to 52	13			Not Applicable	Not Applicable					13
53 to 56	14			Not Applicable	Not Applicable					14
57 to 60	15			Not Applicable	Not Applicable					15
61 to 64	16			Not Applicable	Not Applicable					16

¹Cable numbers in table are Tektronix part numbers.

²Number of chopper quads ordered depend on number of Type S-3 Sampling Heads used in the System.

TABLE 2-6

Type 286, Type 287/R287 and Type R288
Mounting and Miscellaneous Accessories

Instrument	Method of Mounting	Standard ¹ Accessories	Optional ¹ Accessories
Type 286	Installed in Type 287, Type R287 or Type R288		
	Installed in Rack Adapter		Rack Adapter (016-0086-01) Type 286 Mounting Kit (016-0157-00) Blank Panel (016-0081-00) Power Cord (161-0010-03) Power Plug Adapter (103-0013-00) Instruction Manual (070-1007-00) Type 286 Cable Labels (334-1526-00)
	Bench-mounted	Power Cord (161-0010-03) Power Plug Adapter (103-0013-00) Instruction Manual (070-1007-00) Type 286 Cable Labels (334-1526-00)	

¹Numbers in parenthesis are Tektronix Part Numbers.

TABLE 2-6 (cont)

Instrument	Method of Mounting	Standard ¹ Accessories	Optional ¹ Accessories
			Type 286 Cabinet (437-0110-00)
Type R287	Rack-mounted	Slide-out Tracks (351-0086-00) Power Plug Adapter (103-0013-00) 2 Instruction Manuals (070-1007-00) Type 287 Cable Labels (334-1527-00)	Drawer (014-0034-00)
	Recess Rack-mounted	Slide-out Tracks (351-0086-00) Power Plug Adapter (103-0013-00) 2 Instruction Manuals (070-1007-00) Type 287 Cable Labels (334-1527-00)	Drawer (014-0034-00) Type R287 Recess Mounting Kit (013-0158-00)
Type 287	Bench-mounted	Power Plug Adapter (103-0013-00) Instruction Manual (070-1007-00) Type 286 Cable Labels (334-1526-00)	Drawer (014-0034-00)

TABLE 2-6 (cont)

Instrument	Method of Mounting	Standard ¹ Accessories	Optional ¹ Accessories
Type R288	Rack-mounted	Slide-out Tracks (351-0086-00)	Drawer (014-0034-00)
		Power Plug Adapter (103-0013-00)	
		Type 288 Cable Labels (334-1528-00)	
	Recess Rack-mounted	Slide-out Tracks (351-0086-00)	Drawer (014-0034-00)
		Power Plug Adapter (103-0013-00)	Type R288 Recess Mounting Kit (016-0158-01)
		Type 288 Cable Labels (334-1528-00)	

Installation in a Rack Adapter

General. A single Type 286 can be mounted in a Tektronix Rack Adapter (Tektronix Part No. 016-0086-01). In order to utilize this rackmounting method, the rack adapter must be modified using a Type 286 Rackmounting Kit (Tektronix Part No. 016-0157-00). Once the rack adapter has been modified, one Type 286 may be installed in one side of the rack adapter and a pulse generator or other testing device may be installed in the other side. If the side of the rack adapter without a Type 286 is not going to be used, a blank panel (Tektronix Part No. 016-0081-00) may be ordered to cover the open space.

Installing the Type 286 Mounting Kit in a Rack Adapter. The following instructions describe how to install the Type 286 Rackmounting Kit in a rack adapter:

1. Remove old center support panel. If there is a center support panel already in the rack adapter, remove it. This partition may be removed by removing four screws from the top and four screws from the bottom of the rack adapter.

2. Install the new center support panel. The new center support panel should be installed in the same positions as

the old center support panel, with the plastic slide rail facing the left compartment of the rack adapter. This center partition is held in place by eight self-tapping screws, which are placed in the same holes from which screws were removed in step 1 (see Fig. 2-2).

3. Remove the guide rail. Remove the square aluminum guide rail from the bottom of the left compartment of the rack adapter. It is held in place by two screws

4. Install the left support panel. The left support panel should be installed on the inside left of the rack adapter, with the plastic slide rail on the inside of the instrument. This panel is held in place by six bolts, two on the top and four on the bottom.

5. Install the upper trim plate. The upper trim plate (the plate without grommets) should be installed on the inside top of the left compartment of the rack adapter. This panel is held in place by two bolts.

6. Install the lower trim plate. The lower trim plate (the trim plate with the grommets) should be connected to the inside bottom of the left compartment of the rack adapter. This panel is held in place by two bolts.

7. Remove the rear cover plate. The rear cover plate is located on the center of the rack adapter rear panel. It is held in place by four bolts.

Mounting the Rack Adapter. The rack adapter is designed for permanent mounting in a standard 19-inch wide rack with at least 5 1/4 inches of vertical space. Front mounting brackets can be adjusted for rear mounting depths from 8 1/2 inches to 26 inches. To mount the rack adapter into a rack, proceed as follows:

1. Attach a rear mounting bracket to each side of the rack adapter (see Fig. 2-3).

2. Fasten the rear mounting extension brackets to the rear rails of the rack at the height at which the rack adapter is to be mounted. Use bar nuts if the holes in the rails are not tapped.

3. Hold the rack adapter in a position such that the rear mounting brackets slide inside the bracket extensions and fasten the rack adapter securely to the front rails of the rack. Use bar nuts if the holes on the rails are not tapped.

4. Connect the rear mounting brackets to the bracket extensions with hexagonal head screws and bar nuts. Each

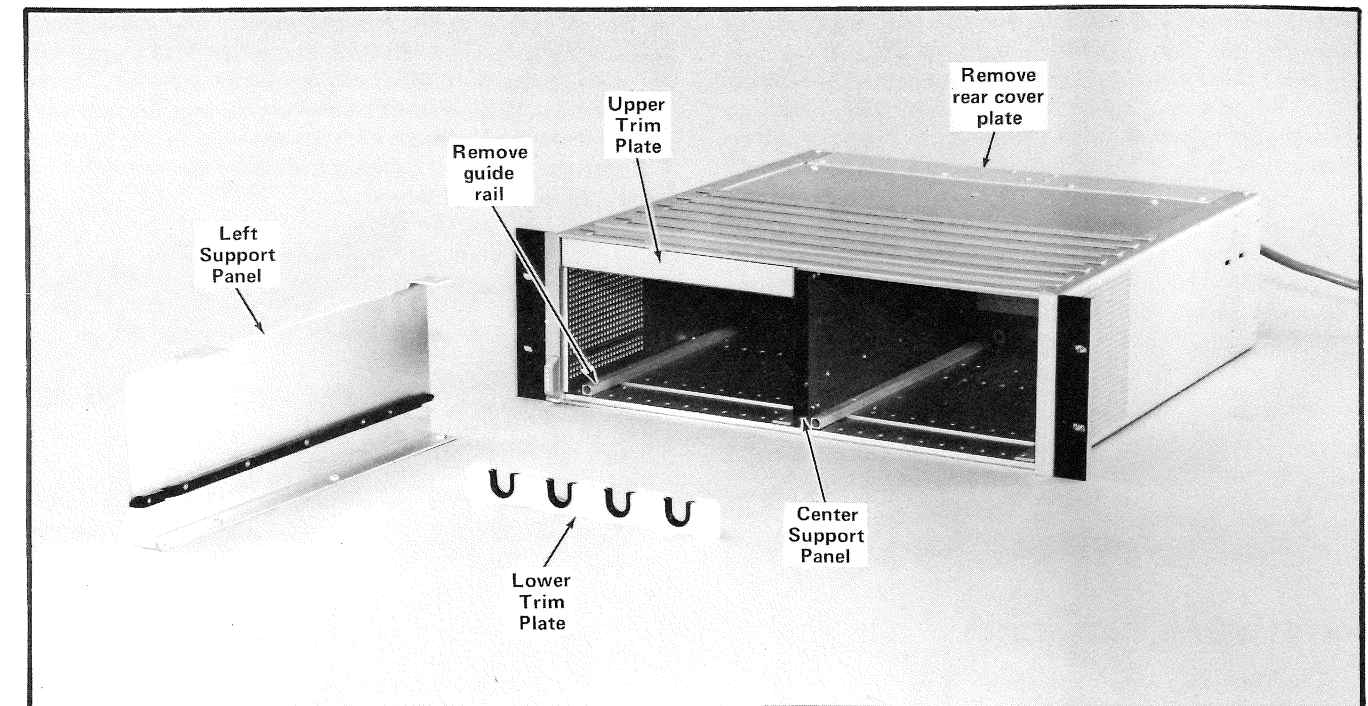


Fig. 2-2. Modified Rack Adapter.

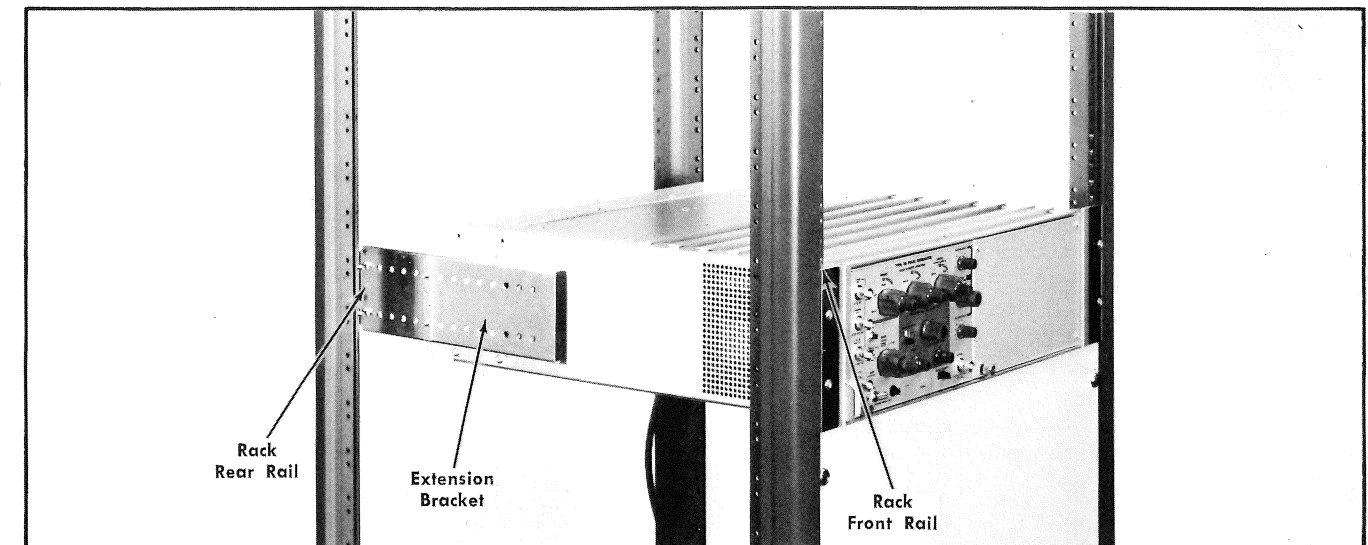


Fig. 2-3. Rack Adapter mounted in a rack.

screw-nut assembly should be arranged so that a screw head and a washer are on the instrument side of the rear mounting bracket.

Installation of Type 286 in Modified Rack Adapter. To install a Type 286 in a modified rack adapter, proceed as follows:

1. Pull the signal cable, programming cable and power cord through the hole in the rear panel of the rack adapter

and out the front of the left compartment. Connect them to the Type 286 (see the the instructions for cable interconnection of a small multiplexer system).

2. Install the sampling heads in the Type 286. Connect any necessary cables to the sampling heads and pull these cables and any probe cables through the left compartment of the rack adapter and out the hole in the rear panel of the rack adapter.

3. Slide the Type 286 into the rack adapter. When the Type 286 is in place, catches on the Type 286 will catch on the guide rails of the rack adapter holding the Type 286 in place. Be sure the cables from the sampling heads go through the grommets in the lower trim plate of the rack adapter.

4. To remove the Type 286 from the rack adapter, pull on the catch release handle on the lower front of the Type 286 front panel. This handle releases the catches which hold the Type 286 in place, and allow it to be pulled out of the rack adapter.

NOTE

The cord from the rack adapter need not be plugged in unless the right compartment is going to be used.

Bench Mounting the Type 286

The Type 286 may be operated as a bench instrument by ordering a Type 286 cabinet (Tektronix Part No. 437-0110-00). Use the following procedure to install a Type 286 in its cabinet:

1. Slide the Type 286 into the cabinet. When the Type 286 is all the way in the cabinet, catches on the Type 286 will catch on the cabinet guide rails securing the instrument in place.

2. Connect the signal cable, programming cable and power cord to the Type 286. (See the instructions for cable interconnection of a small multiplexer system.)

3. To remove the Type 286 from the cabinet, disconnect the two cables and the power cord from the Type 286 rear panel. Pull on the latch release handle on the lower front of the Type 286. This handle releases the Type 286 catches and allows the instrument to be pulled out of its cabinet.

TYPE 287/R287 AND TYPE R288 MOUNTING OPTIONS

The Type 287 is a benchmount instrument which may be operated on any flat surface or stacked with other instruments having the same cabinet design. The Type R287 and Type R288 are rackmount instruments and may be installed in any standard 19-inch wide rack which has Universal, EIA, RETMA or Western Electric hole spacings. Rackmounting instructions follow. The Type R288 is not available in a benchmount version. Both the Type R288 and the Type R287, however, can be converted into benchmount instruments. In addition, the Type 287 can be converted into a rackmount instrument.

Recess mounting kits are available for the Type R287 and the Type R288 as optional accessories. There is one kit for each instrument. Each of these kits recesses a Type R287 or Type R288 front panel 4 inches into the rack and covers the sampling heads with a blank door panel. Space is also provided to route cables and probes from the sampling heads to the rear of the rack.

Rackmounting and Conversion instructions for these options follow.

CONVERTING FROM TYPE R287¹ TO TYPE 287**Removing Parts**

Certain parts must be removed from the Type R287 chassis before it can be converted to a benchmount instrument (Type 287). These parts are shown in Fig. 2-4 and can be removed as follows:

1. Disconnect the Type 287 from the power source and remove the cables from the rear panel. Remove the unit from the rack and set it on its bottom surface.

2. Remove all the Type 286's.

3. Lift the front and rear trim strips from the top of the chassis. Use a thin-bladed device to pry them up at one corner and then peel them off. Removal will bend them, but they can be straightened for later re-use.

4.² Loosen the four screws on the top dust cover and remove the cover.

5.² Remove the six nuts, washers and screws from the mounting arm of the right chassis section assembly.

6.² Remove the nut and washer from the pivot screw while holding the pivot screw and chassis section assembly in place. Remove the pivot screw and chassis section assembly as a unit, holding it together tightly. Replace the washers and nut and hand-tighten the nut to hold the assembly together after removal.

7.² Remove the left chassis section assembly, following the procedure described in parts 5 and 6.

¹The following information also applies to the Type R288.

²For only temporary conversion to a benchmount instrument, this step may be omitted.

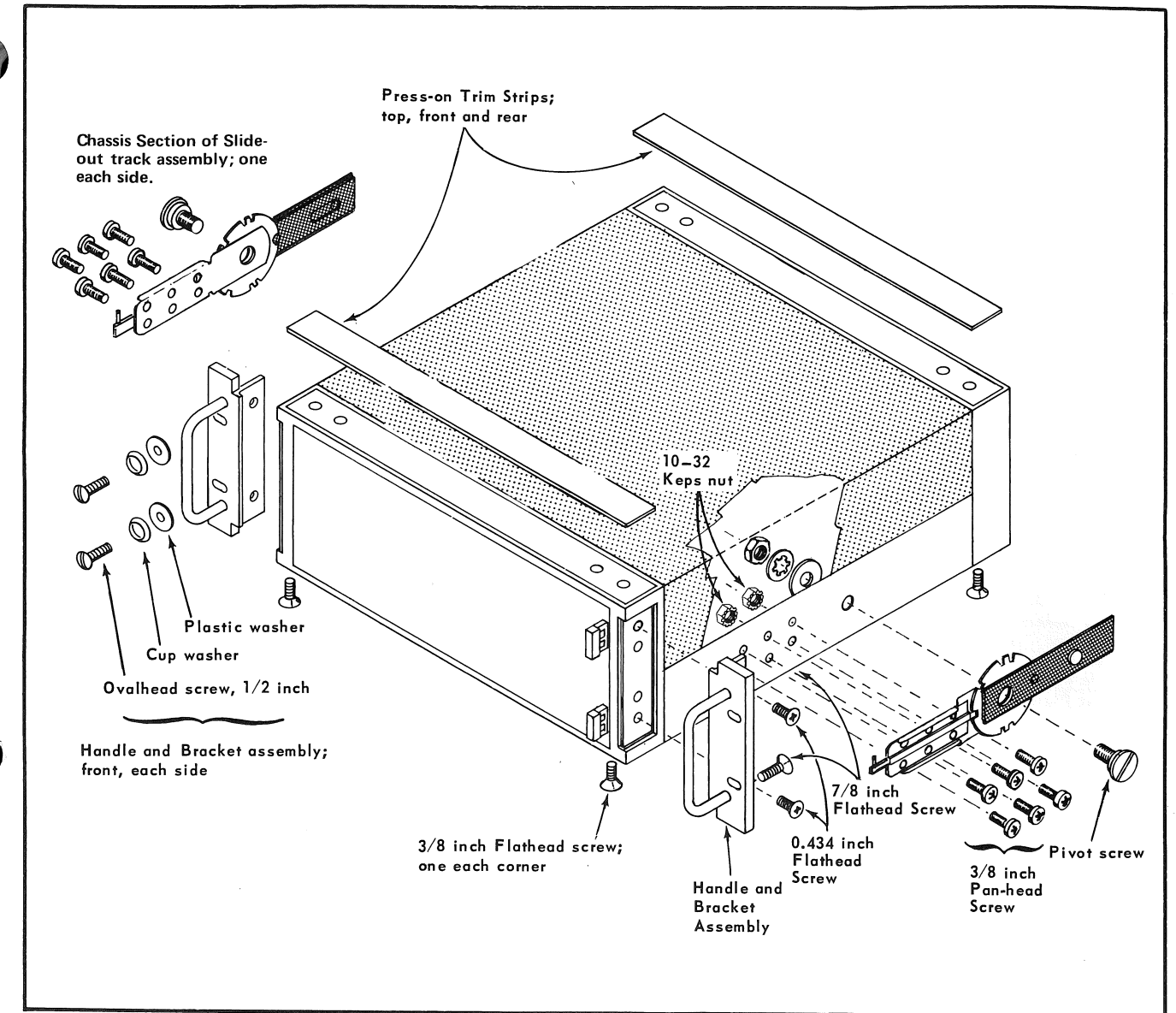


Fig. 2-4. Parts particular to the Type R287 and R288 (rackmount instrument).

8. Remove the outermost screw from each of the four corners on the bottom of the chassis.

9.² Remove the angle brackets from the front corners of the chassis.

Save all parts that have been removed for possible later conversion back to a Type R287.

Parts Required

The parts listed in Table 2-5 must be added to complete the conversion of a Type R287 to a benchmount instrument. Locations are shown in Fig. 2-5.

Installing Parts

Use the following procedure to install parts on the Type 287:

1. Install the four feet, orienting them as shown in Fig. 2-5, then insert the four rubber foot pads. Install the flip stand retainer, then spring the flip stand in place.

2.² Remove the protective strip from the back of a press-on trim strip (black) and install it on one front corner as shown. Attach the front edge first to insure alignment, then press the entire strip firmly in place. Repeat at the other front corner.

3. Install the top dust cover. Place a plastic plate at each corner of the instrument and a handle at each end of the instrument as shown. Center each plastic plate front-to-back in the frame recess (to permit installation of the front cover) and tighten the screws. Snap the plastic end covers in place. This completes the conversion.

4. Insert the Type 286's.

CONVERTING FROM TYPE 287 to TYPE R287

Removing Parts

Certain parts must be removed from the Type 287 before it can be converted to a rackmount instrument (Type

R287). These parts are shown in Fig. 2-5 and can be removed as follows:

1. Disconnect the Type 287 from the power source and remove the cables from the rear panel.

2. Remove all the Type 286's.

3. Place a thin-bladed device under the outer edge of one of the plastic end covers and pull up to remove the cover. Remove the two screws from the end of the handle. Repeat this procedure at each of the other three corners of the instrument. The handles and plastic plates can then be removed.

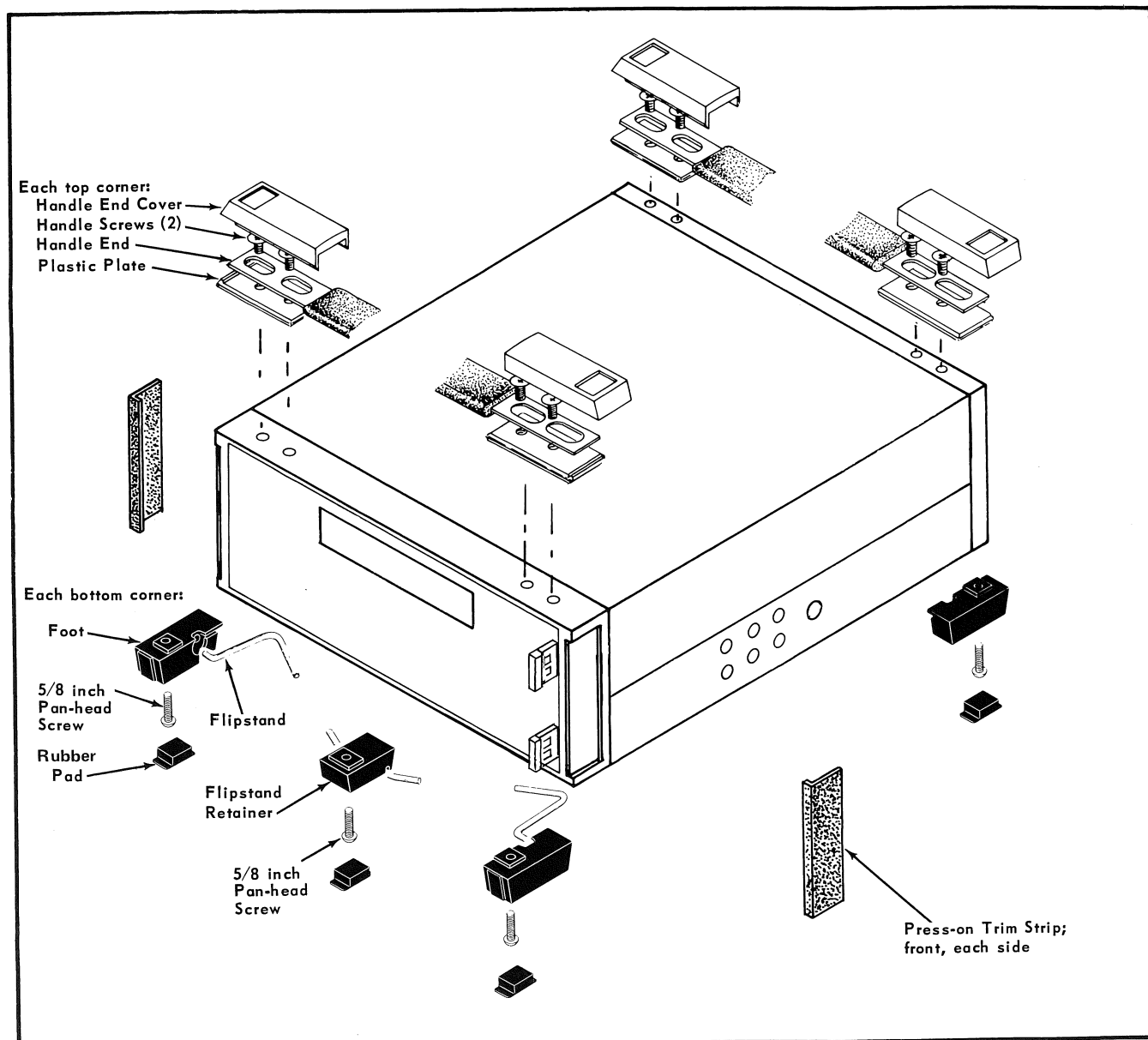


Fig. 2-5. Parts Particular to the Type 287 (benchmount instrument).

TABLE 2-7

Parts Found in the Type 287 Only

Qty.	Item	Tektronix Part No.	Figure Number
2 ea	Handle, carrying	367-0073-00	2-5
4 ea	Plate, plastic	386-1352-00	2-5
8 ea	Screw, 10-32 X 0.40 inch, FHS	213-0155-00	2-5
4 ea	Cover, handle end	200-0728-00	2-5
2 ea	Strip, trim 0.995 X 6.45 inch	124-0189-00	2-5
2 ea	Foot, cabinet, front right and rear left	348-0096-01	2-5
2 ea	Foot, cabinet, front left and rear right	348-0098-01	2-5
5 ea	Screw, 10-32 X 5/8 inch, PHS	212-0509-00	2-5
4 ea	Pad, cabinet foot	348-0097-00	2-5
1 ea	Retainer, Flipstand	214-0846-01	2-5
1 ea	Flipstand, cabinet	348-0095-01	2-5

4. Stand the instrument on its rear feet. Remove the front corner trim strips (black) by prying out on their front edges. They are glued in place and removal will probably bend them. They can be bent back into shape for later re-use.

5. Spring the flip stand out of the two front feet. Bend it only as far as necessary to remove it, to avoid damaging it.

6. Pry the rubber pads from the feet on the bottom corners of the instrument. Remove the screws from the feet and the screw from the flip stand retainer. Remove the feet and the retainer.

Parts Required

The following parts must be added to complete the conversion of a Type 287 to a rackmount instrument. Locations of parts to be attached to the chassis are shown in Fig. 2-4. Identification of the slide-out track assembly parts is contained in Fig. 2-6.

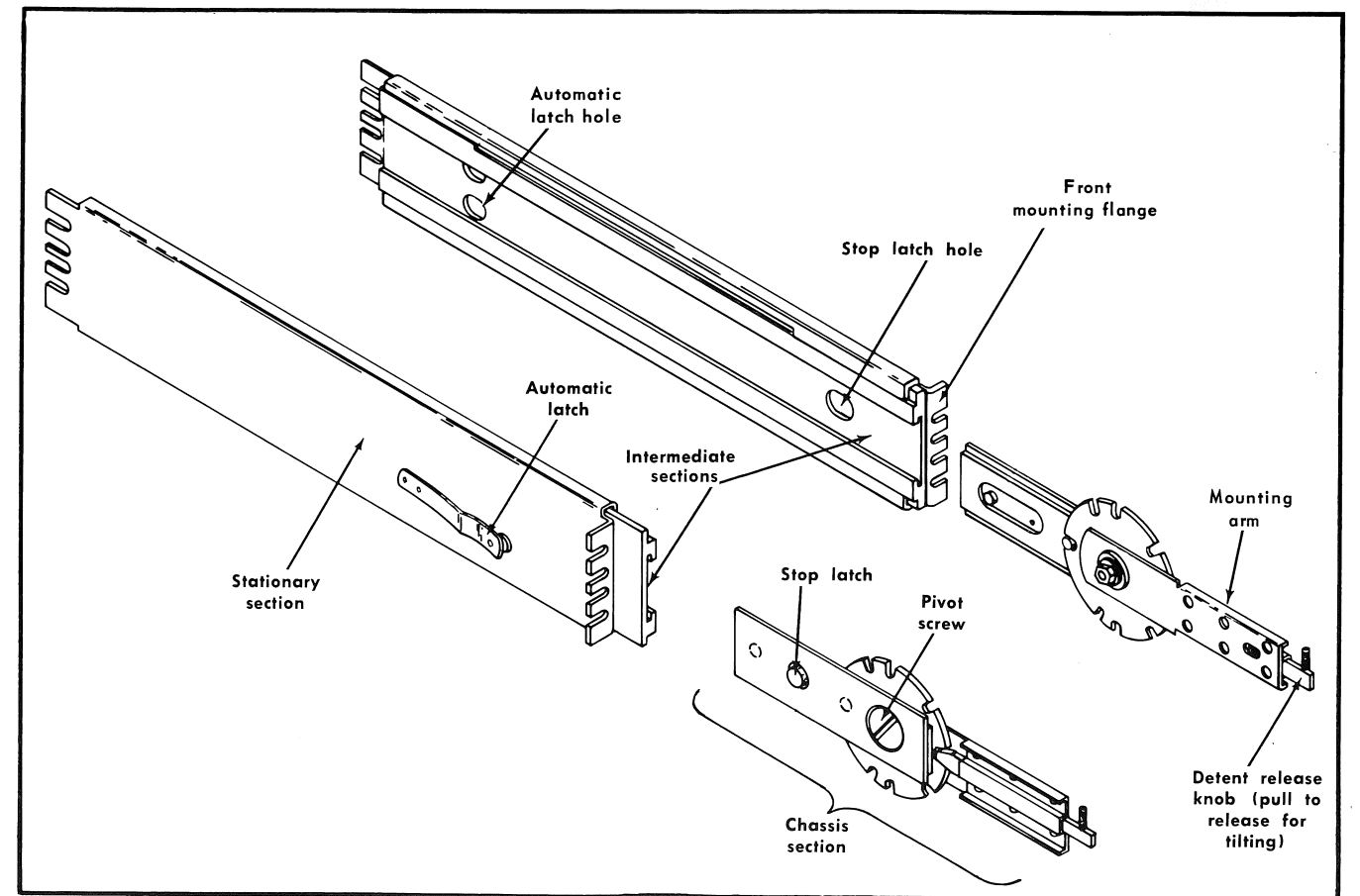


Fig. 2-6. Slide-out track assemblies.

TABLE 2-8

Parts Found in the Type R287 Only

Qty.	Item	Tektronix Part No.	Figure Number
1 ea	Modification Kit Standard-to-Rack-Mount Conversion; contents as follows: 2 ea Bracket ¹ , angle, plain	040-0489-00	2-4
	2 ea Handle	407-0296-00	2-4
	2 ea Washer, cup #10	367-0076-00	2-4
	4 ea Screw, #10-32 X 1/2 OHS	210-0833-00	2-4
	4 ea Screw, #10-32 X 7/8 FHS	212-0512-00	2-4
	4 ea Screw, #10-32 X 0.434 FHS	212-0562-00	2-4
	1 pr Track, slide-out section, Tiltlock (chassis section)	212-0574-00	2-4
	1 pr Track, slide, stationary and intermediate sections, mounting hardware included	351-0082-00	2-4
		351-0086-00	2-6
12 ea	Screw, 10-32 X 3/8 PHS		
		212-0507-00	2-4
12 ea	Nut, keps, 10-32 X 2/8		
		220-0410-00	2-4
4 ea	Washer, plastic, 0.191 inch ID X 5/8 inch OD		
		210-0917-00	2-4
2 ea	Strip, trim, blue 16.3 inches X 0.876 inch		
		124-0188-00	2-4
4 ea	Screw, #10-32 X 3/8 inch, FHS		
		212-0574-00	2-4

¹A bracket bearing the inscription "R287" is listed separately under Part No.

Installing Parts

Use the following procedure for installing parts on the Type 287:

- Loosen the four screws on the top dust cover and lift the cover off.
- Remove the nut and washers from the pivot screw of the right side chassis section (see Fig. 2-6). The right side

TABLE 2-8 (cont)

Parts Found in the Type R287 Only

Qty.	Item	Tektronix Part No.	Figure Number
1 ea	Rackmount Kit, Rear Support; Contents as follows: 2 ea Screw, 1/4-20 X 1/2 inch HHS	016-0097-00	2-2
	2 ea Bushing, instrument securing, 1.05 inches long	213-0001-00	2-12
	2 ea Pin, support 1/2 inch D	358-0310-00	2-12
	2 ea Washer, neoprene, 0.484 inch ID, 0.828 inch OD	214-0502-00	2-12
	2 ea Washer, flat, 0.512 inch ID, 7/8 inch OD	210-0984-00	2-12
	4 ea Washer, flat, 0.264 inch ID 1 1/8 inch OD	210-0985-00	2-12
	2 ea Bar, support 5.0 inches long	210-0866-00	2-12
	8 ea Screw, 10-32 X 1 1/2 inches, RHS	381-0279-00	2-12
	2 ea Spacer, block, 1.625 X 1.0 X 0.50 inch	212-0553-00	2-12
	2 ea Bracket, angle, support	361-0153-00	2-12
	2 ea Lockwasher, internal, 1/4 inch ID, 15/32 inch OD	407-0073-00	2-12
	2 ea Screw, 1/4-20 X 0.750 inch, HHS	210-0011-00	2-12
	4 ea Screw, 10-32 X 1 1/4 inches, HHS	213-0134-00	2-12
	4 ea Washer, flat 0.204 ID X 0.438 inch OD	212-0520-00	2-12
		210-0805-00	2-12

section can be identified by the tilt-lock release knob which will point toward the top of the unit after installation. Hold the assembly together while removing the nut and while installing the assembly on the chassis.

- Place the assembly against the chassis, inserting the pivot screw into the hole indicated in Fig. 2-4. Replace the flat washer, lock washer and nut on the pivot screw and

hand-tighten the nut. Check that the slide, the tilt-lock mechanism, and the chassis side are tight against each other. If not, manipulate the components while working the pivot screw until they do fit together tightly. Again, hand-tighten the nut.

- Fasten the mounting arm to the chassis, using six 10-32 X 3/8 PHS screws and Keps nuts (see Fig. 2-4). Tighten the six nuts.

- Apply light pressure to the top edge of the track section (black) and note the track position with respect to the bottom edge of the cabinet. If it is not parallel to the bottom, keep the pressure applied and rotate the pivot screw with a screwdriver until the screw's cam action causes the track to be parallel with the bottom of the cabinet. Tighten the nut with a wrench without permitting the pivot screw to turn. After tightening, recheck that the track is parallel to the bottom of the cabinet.

- Install the left chassis section assembly, following the procedure described in parts 2 through 5.

- Install and tighten a 10-32 X 3/8 FHS screw to each corner on the bottom of the instrument where the feet were removed.

- Attach a handle to each angle bracket and connect the brackets to the front corners of the instrument. If one of the brackets has R287 (R288) written on it, that bracket should be attached to the right corner. The oval head screw, cup washer and plastic washer, shown as part of the handle assembly, should be installed after the Type R287 is placed in a rack.

- Set the Type R287 on its bottom. Peel the tape from the back of a trim strip. Place the strip in the recess at the top-front of the unit. Attach the rear edge first, then lower the strip into place. Apply a firm pressure along the entire strip to complete the bond. Attach a second strip to the rear of the unit.

- Install the top dust cover on the instrument.

- Install the Type 286's.

The conversion has been completed and the Type R287 can be installed in a rack, provided that a rack has been equipped as explained later in this section.

Installation of Recess Mounting Kit

Use the following procedure to install a recess mounting kit on a Type R287 or a Type R288:

- Remove the angle brackets from the front corner of the chassis.
- Slip the front panel extension onto the front of the instrument so that the sides of the extension are in the same position that the angle brackets were before being removed in part 1. (See Fig. 2-7.)
- Secure the front panel extension with four screws, two on each side.

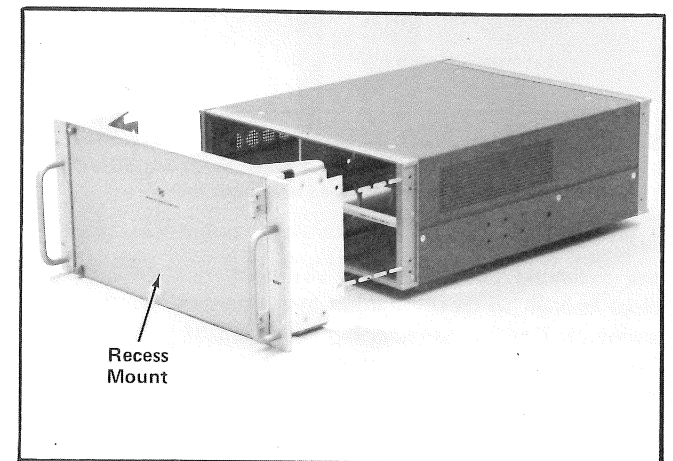


Fig. 2-7. Installation of Recess Mount Kit.

RACKMOUNTING THE TYPE R287 AND TYPE R288

General Information

Slide-out tracks permit the Type R287 or Type R288 to be extended out of the rack for troubleshooting or servicing (see Fig. 2-8). When not extended, the instrument is held into the rack with four securing screws.

The chassis sections of the slide-out tracks are installed on the chassis at the factory or can be installed according to the preceding instructions. The stationary sections are to be attached to the mounting rails of the racks. When installed, the intermediate sections slide freely between the chassis and the stationary sections as the instrument is pulled out or pushed into the rack. The mounting hardware provided with the slide-out tracks is intended to make them adaptable to a variety of racks and installation methods. Not all of the hardware will be needed for any particular installation. In order to operate the Type R287 or Type R288 in

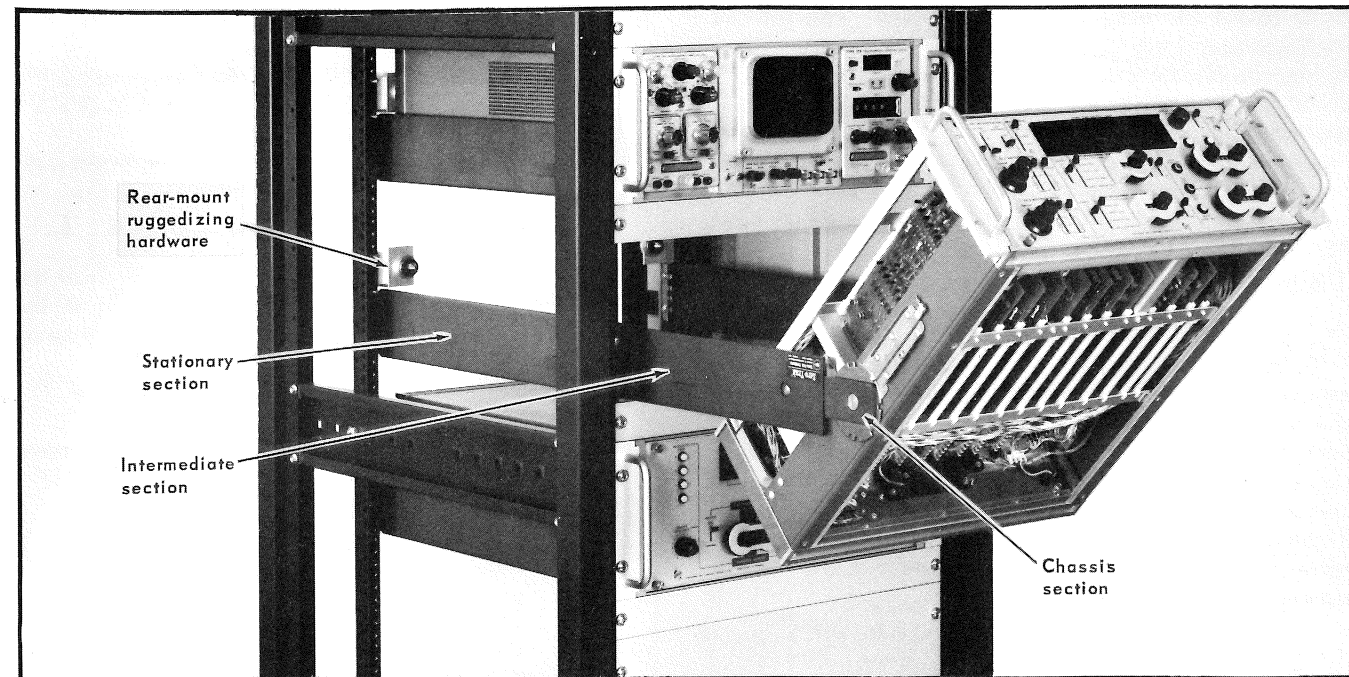


Fig. 2-8. An instrument extended on slide-out tracks; shown with rack sides and instrument panels removed. Mounting the Type R287 and Type R288 is identical to that of the instrument shown.

the extended position, the instrument must be mounted close enough to its companion instruments to permit interconnecting cables to reach between instruments. Also, the input power connection must be located close enough for the power cord to reach.

Mounting Considerations

A wide variety of mounting methods is available for attaching the slide-out tracks to the rack. The following factors should be taken into consideration when choosing the mounting method for a particular installation:

1. Depth of rack.
2. Degree of mechanical stability required.
3. Mounting method used for other instruments in the rack.
4. Type of mounting holes in the supporting rails; that is, whether they are tapped, untapped or countersunk.
5. Whether or not the rear support rails are movable, and if movable, whether they can be positioned at any location or moved only in discrete increments.
6. Relative thickness of the front panels of the various instruments in the rack.

7. General appearance desired for the complete rack assembly.

These factors will usually determine whether the front mounting flanges of the stationary sections are to be mounted in front of the front rails or behind them, whether or not the ruggedizing rear-support hardware is to be used, etc.

Front-End Mounting with Tapped Front Rails. If the mounting holes in the front rails of the rack are tapped for 10-32 screws, the easiest method of attaching the front ends of the stationary sections to the rack is to mount the front flanges in front of the front rails (see Fig. 2-9A). When mounted in this position, 10-32 pan-head screws may be used directly to attach the front flanges to the rails, or 10-32 flat-head screws may be used with countersunk shim material to clamp the front flanges to the rails.

The use of countersunk shim material provides better support for the front flanges and also permits depth adjustment of the front panel. If the various instruments in the rack have different panel thicknesses, different thicknesses of shim material can be used to make the front surfaces of all panels flush with each other. The shim material should be approximately 1/2 inch wide and have a minimum thickness of approximately 1/8 inch to accommodate the countersunk screw heads. Each strip should be at least as long (vertical dimension in the rack) as the width of the front flanges of the stationary sections (3 1/8 inches). Since

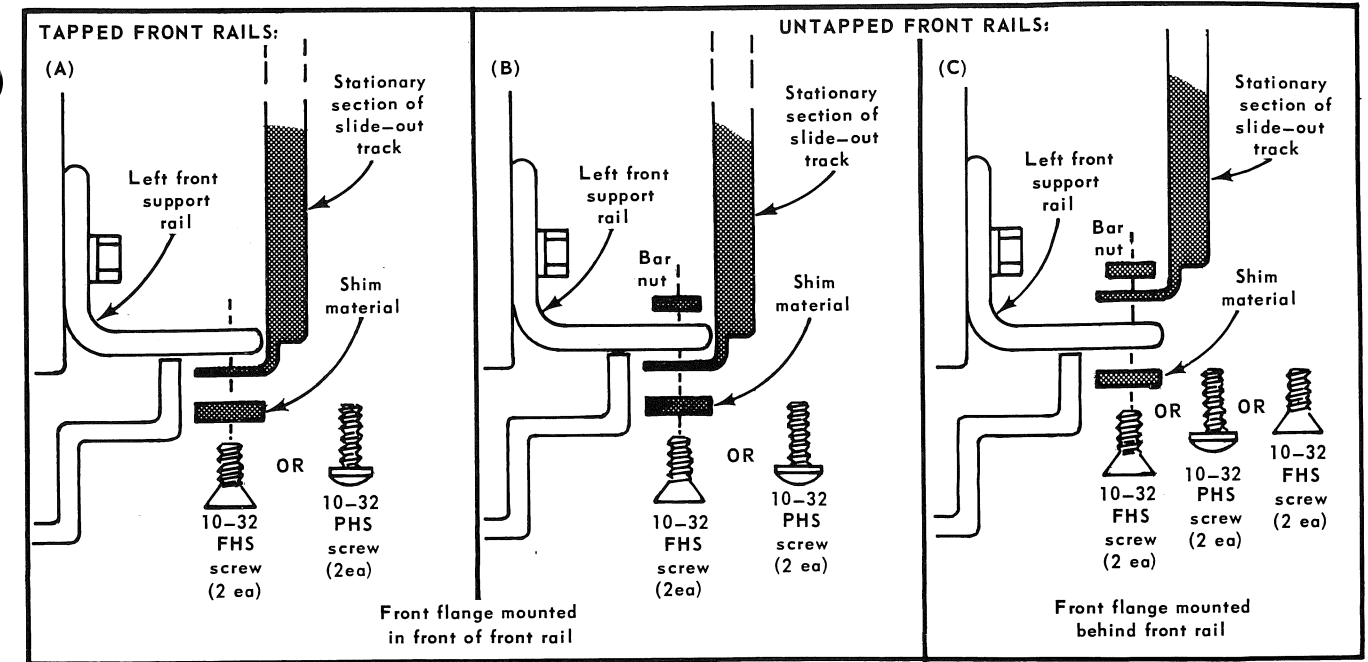


Fig. 2-9. Methods for mounting front end of stationary sections as described in the text. Thickness of optional shim material is selected to compensate for differences in front-panel thickness of various instruments in rack. (Shim material described in the text is not provided.)

the dimensions of the shim material are determined entirely by the dimensions of the rack installation, no shim material is provided with the mounting hardware.

izing rear-mount hardware may be required (see *Standard Rear-End Mounting*).

NOTE

When the flanges are mounted in front of the front rails or when shim material exceeding 1/8 inch in thickness is used, special adjustment of the rugged-

Front-End Mounting with Untapped Front Rails. If the mounting holes in the front rails are not tapped, bar nuts (Fig. 2-10) must be used behind the rails to accommodate the mounting screws. All of the options previously described for tapped front rails also apply to the untapped

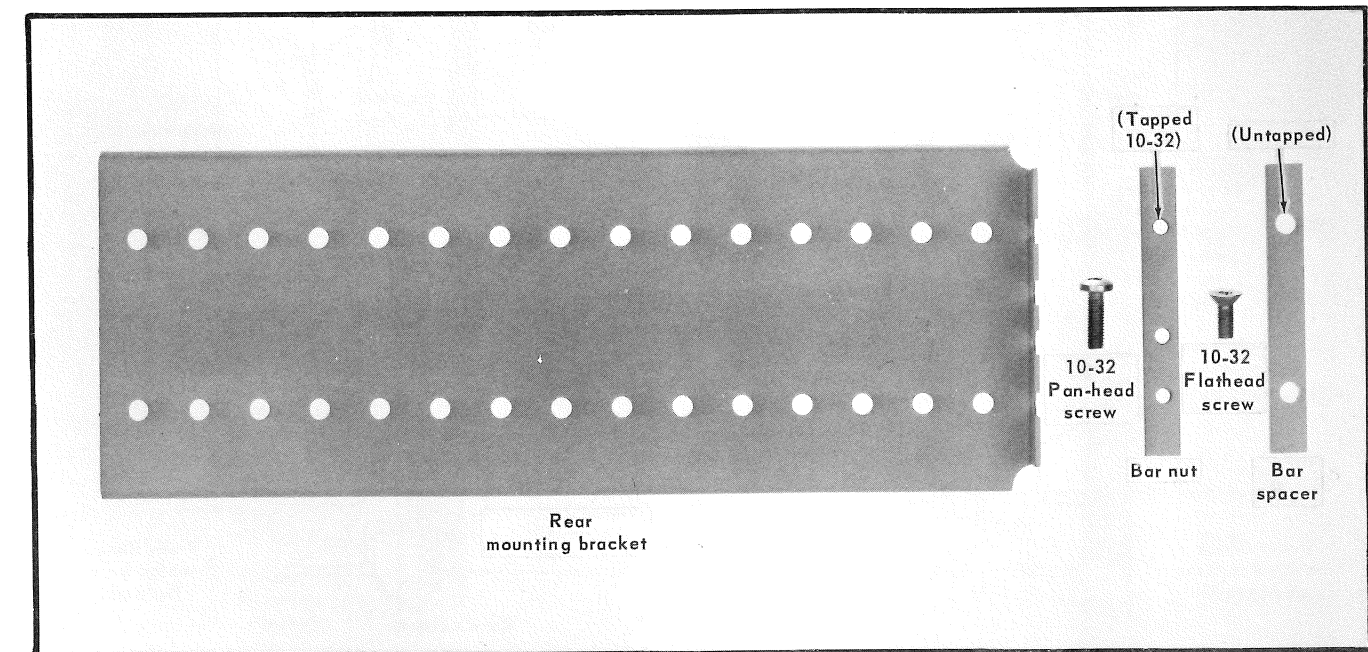


Fig. 2-10. Identification of mounting hardware provided with the stationary/intermediate track sections.

rails when used with bar nuts (see Fig. 2-9B and C). In addition, the untapped front rails (with bar nuts) permit the front mounting flanges to be attached to the rear sides of the front rails, if desired (see Fig. 2-9C). When mounted in this position, the flanges are clamped between the bar nuts and the front rails. Either 10-32 pan-head screws or 10-32 flat-head screws with shim material may be used as described for tapped front rails, or 10-32 flat-head mounting screws may be countersunk into the front rails.

Standard Rear-End Mounting. To provide an adequate shock-mounted installation, the rear end of each stationary section must be mounted firmly to a rear-support rail using the ruggedizing hardware. If the rack does not have a strong supporting member located the correct distance from the front rails (see Fig. 2-11), an additional support must be provided. Use the 10-32 round-head screws provided in the ruggedizing kit (see Fig. 2-12) to mount the rear bar supports to the rear rails, and use 10-32 pan-head screws to attach the stationary sections of the tracks to the bar supports. If the mounting holes in the rear rails are not tapped, bar nuts must also be used for mounting the bar supports.

NOTE

Additional washers and possibly longer support-pins and/or securing bushing screws (see Fig. 2-12) may be

needed to make the ruggedizing support fit securely if any of the following conditions exist:

1. If the front flanges of the stationary sections are mounted in front of the front rails.
2. If more than 1/8 inch of shim thickness is used for mounting the front flanges.
3. If the support rails are located at fixed positions such that the distance from the front surface of the front rail to the rear surface of the rear rail is slightly greater than 21 inches. No more than 1/2 inch of washer thickness can be added to each rear-support mounting without deteriorating the ruggedizing capabilities of the installation.

Non-Ruggedized Rear-End Mounting. If the rear support rails cannot be positioned so that the distance from the front surface of the front rails to the rear surface of the rear rails is approximately 21 inches, the rear-mount ruggedizing hardware cannot be used. Or, if the particular installation does not require a high degree of physical rigidity, the use of ruggedizing hardware may be omitted. In either of these cases, an alternative method is required for supporting the rear ends of the stationary sections. Fig. 2-13 illustrates two alternative mounting methods using the rear mounting brackets instead of the ruggedizing hardware. The depth between the front and rear rails of the rack will determine which of these configurations should be used.

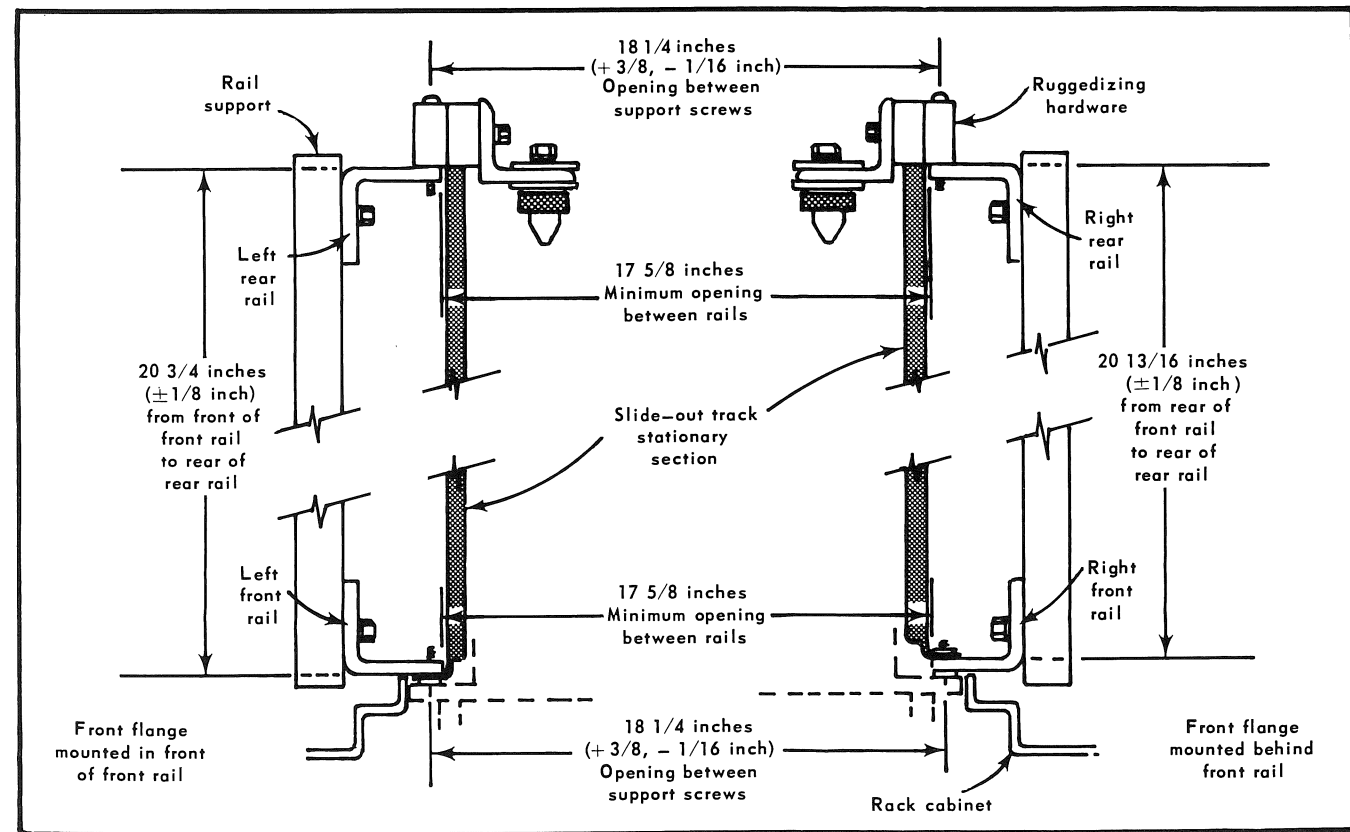


Fig. 2-11. Required spacing of support rails for mounting stationary sections of slide-out tracks.

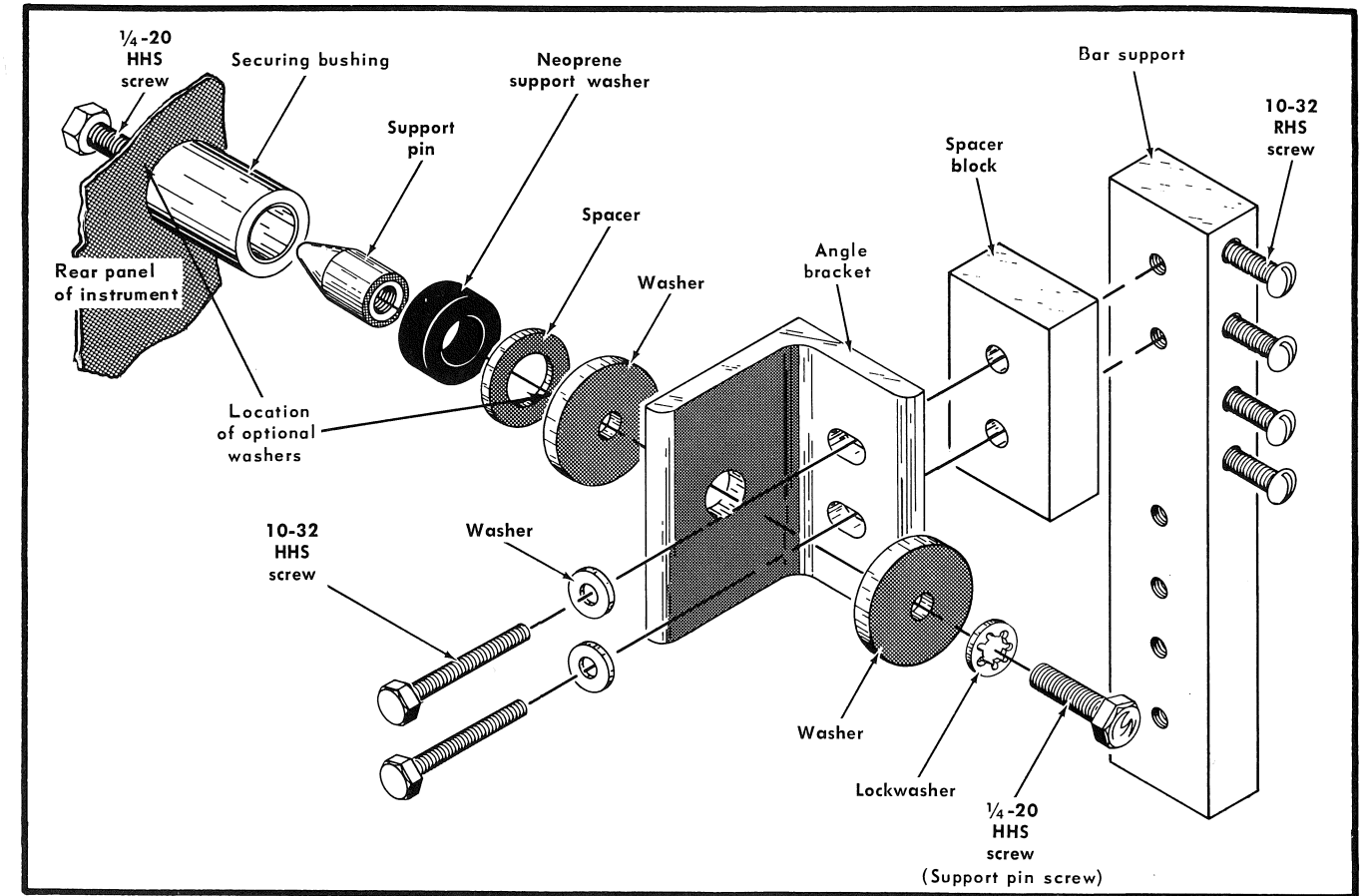


Fig. 2-12. Rear-support ruggedizing hardware. Optional washers (purchased separately under Tektronix Part No. 210-0866-00) may be required for depth adjustment as described in the text.

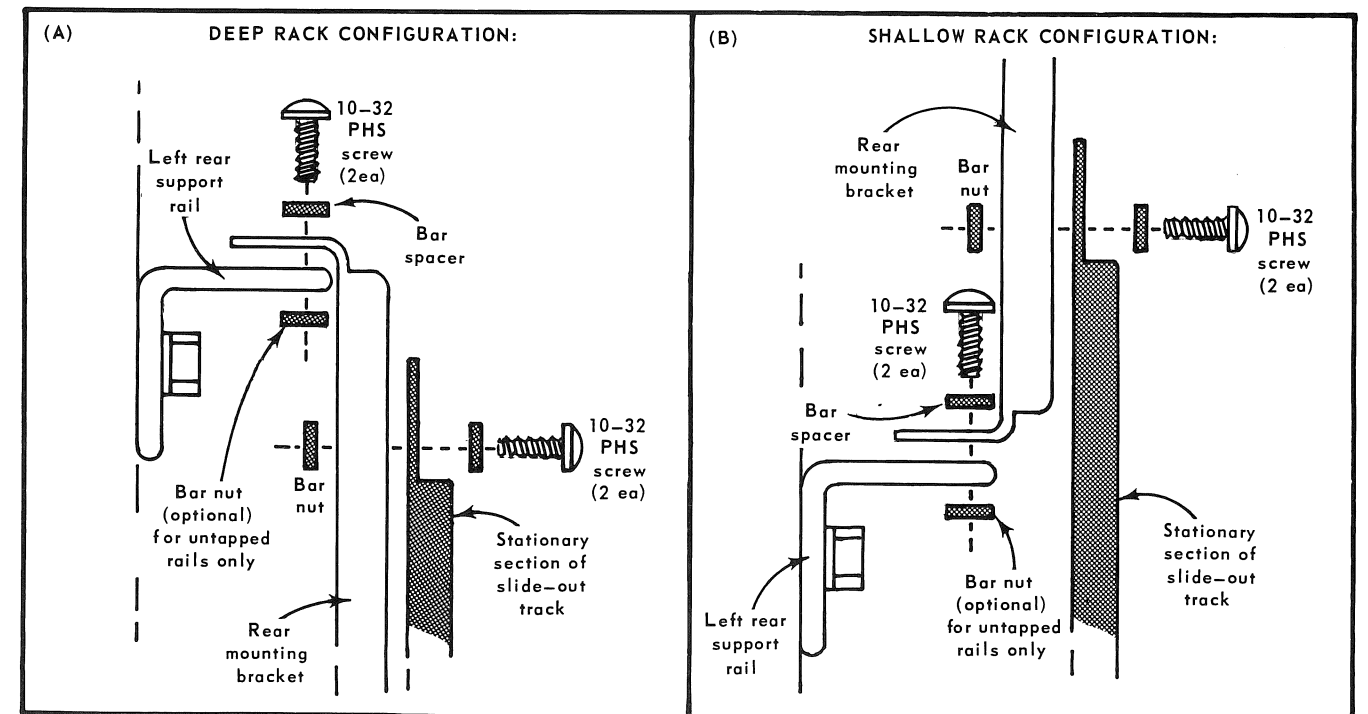


Fig. 2-13. Non-ruggedized mounting: (A) For use with racks deeper than 21 inches from the front rail to the rear of the rear rail; (B) For use with racks shallower than 21 inches.

CAUTION

Although the alternative mounting methods shown in Fig. 2-13 provide adequate support under normal operating conditions, they do not provide the solid rear-mount support required for a ruggedized installation. If mounted without the ruggedizing hardware, the instrument may be damaged if subjected to severe vibration or shock.

Rack Dimensions

Fig. 2-11 shows the maximum and minimum dimensions required between support rails to provide adequate support for the Type R287 or Type R288 and to assure proper operation of the slide-out tracks. Minimum overall depth of the rack from the front surface of the front rails to the rear of the cabinet must be at least 22 1/2 inches to accommodate the rear-mount ruggedizing hardware, power cord and interconnecting cables, and to provide enough space for air circulation.

Standard Mounting and Alignment Procedures

The following mounting and alignment procedures use the rear-support ruggedizing hardware for attaching the rear end of each stationary section to the rear support rail. If the ruggedizing hardware is not to be utilized, refer to the following Non-Ruggedized Mounting and Alignment Procedures.

Mounting. The stationary and intermediate sections of the slide-out tracks are shipped as matched pairs and should not be separated. To distinguish between the right and left stationary/intermediate assemblies, note the position of the automatic latch (see Fig. 2-6) in each assembly. The automatic latch should be located near the bottom of the assembly when it is installed in the rack.

Use the following procedure to install the stationary sections of the slide-out tracks and the Type R287 or Type R288 in the rack:

1. Referring to Fig. 2-14, select the proper front-rail mounting holes for the stationary sections.

2a. If the front flanges of the stationary sections are to be mounted in front of the front rails, mount the front of each stationary section as shown in Fig. 2-9A.

2b. If the front flanges are to be mounted behind the front rails, mount the front end of each stationary section as shown in Fig. 2-9C.

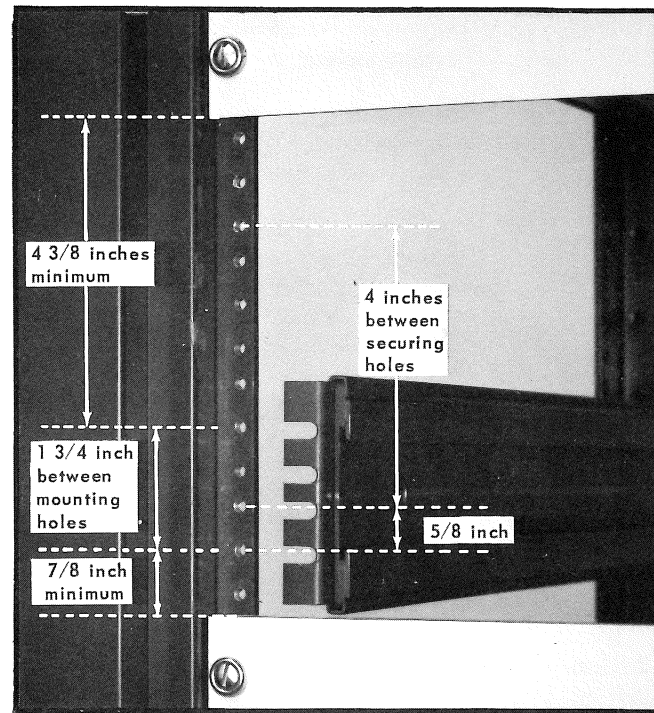


Fig. 2-14. Vertical mounting position for front end of slide-out tracks.

3. Temporarily attach a bar support to the rear end of each stationary section with two 10-32 pan-head screws and a bar spacer. Do not tighten the screws.

4. With the front end of each stationary section attached to the front rail, hold the track in a level position in the rack and locate the proper rear-rail mounting holes (see Fig. 2-15).

5. Attach the bar supports to the rear support rails with 10-32 round-head screws (see Fig. 2-12), using at least two mounting screws for each bar support.

6. Tighten the screws holding the bar supports to the rear rails, then tighten the screws holding the stationary sections to the bar supports.

7. Mount the angle brackets and spacer blocks on the bar supports as shown in Fig. 2-12, but do not tighten the screws.

8. Fasten the support pins and washers to the angle brackets in the order shown in Fig. 2-12, but do not tighten the screws. Be sure the spacers are properly centered.

9. Remove the top dust cover from the type R287 or Type R288 and mount the two securing bushings (see Fig.

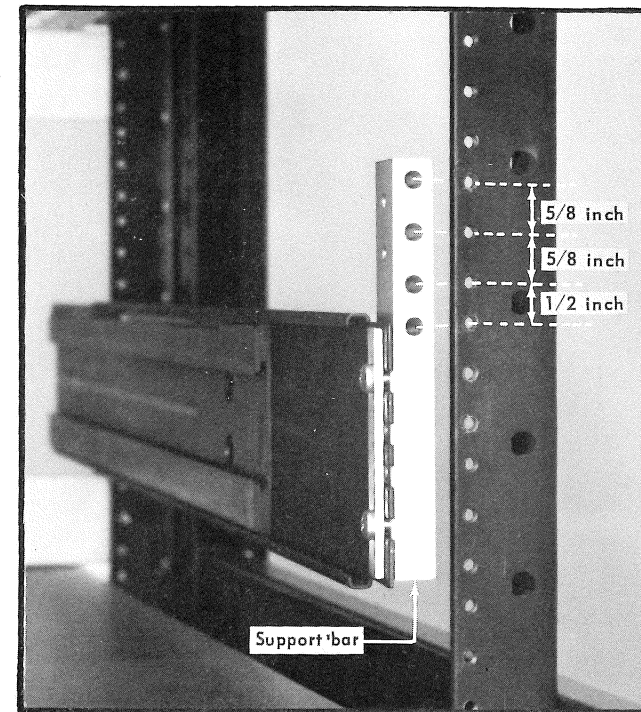


Fig. 2-15. Vertical mounting position for rear end of slide-out tracks. Left stationary section is shown.

2-12) on the rear panel of the instrument with 1/4-20 hexagonal head screws. Tighten the screws and replace the dust cover on the instrument.

10. Referring to Fig. 2-16, insert the instrument into the rack. Do not connect the power cord or interconnecting cables yet, and do not install the securing screws.

Alignment. Use the following procedure to adjust the instrument alignment in the rack:

1. Position the instrument approximately halfway out of the rack so that the point of rotation on each chassis section is adjacent to the front rail of the rack. Loosen the mounting screws holding the front mounting flanges to the front rails.

2. Hold the instrument in the center of its mounting space, and re-tighten the front mounting screws.

3. Push the instrument all the way into the rack and check the vertical and horizontal alignment of the front panel of the instrument. If necessary, readjust the positioning as described in steps 2 and 3.

4. Push the instrument all the way into the rack again and install one securing screw through each handle bracket,

using a finishing washer and a plastic washer with each securing screw as shown in Fig. 2-16. If the front rails are not tapped for the 10-32 securing screws, some other means of securing the instrument to the rack must be provided.

NOTE

If the instrument does not slide easily all the way into the rack, check the fit of the rear-support ruggedizing hardware before installing the securing screws. If necessary, move the inside support-pin washers to the outside of the angle brackets (see Fig. 2-12).

5. Press each securing bushing over the support pin and check the alignment of the ruggedizing hardware.

6a. If the securing bushings and support pins fit tightly together with the neoprene washers seated against the securing bushings, hold each angle bracket firmly in place and tighten the angle-bracket screws and support-pin screw. Fig. 2-17 shows the completed installation of the left rear support.

6b. If the securing bushing and support pin do not fit tightly together, determine what adjustment is necessary; i.e., whether one or more additional washers are required for a tight fit, etc. Remove the securing screws, extend the instrument part way out of the rack and make the necessary changes in the ruggedizing hardware. Repeat steps 4, 5 and 6a.

7. Secure the handle brackets of the Type R287 or Type R288 to the front rails of the rack with the four securing screws (see Fig. 2-16).

NOTE

The securing screws are an important part of the shock-mounted installation.

8. After all adjustments have been made and all hardware has been tightened securely, connect the power cord to a suitable power source and connect the programming and signal cables to the proper connectors on the rear panel of the instrument. (Interconnection instructions can be found at the end of this section).

Non-Ruggedized Mounting and Alignment Procedures

If the ruggedizing hardware is not to be used, refer to Fig. 2-13 for mounting the rear end of each stationary sec-

TO INSERT THE INSTRUMENT:

1. Pull out the intermediate section (A) of each slide-out track to its fully extended position.

2. Insert the chassis sections (B) into the intermediate sections and push the instrument in until the stop latches (C) hit the intermediate sections.

3. Press both stop latches (C) and push the instrument in until the stop latches snap into the stop latch holes (D).

4. Press both stop latches (D) and push the instrument all the way into the rack. The automatic latches will release as the instrument is pushed in.

5. Insert the 4 securing screws (E) (with finishing washers and plastic washers) through the slots in the handle brackets and screw them into the front rails of the rack.

TO REMOVE THE INSTRUMENT:

1. Disconnect the power cord and remove the interconnecting cables from the rear-panel connectors.

2. Remove the securing screws and washers (E).

3. Pull the instrument outward until the stop latches snap into the stop latch holes and the automatic latches snap into the automatic latch holes.

4. Press both stop latches (D) and pull the instrument out of the rack.

5. Press the automatic latch in each intermediate section and push the track into the rack.

6. Connect the proper interconnecting cables to the rear-panel program connectors and connect the power cord to a suitable power source.

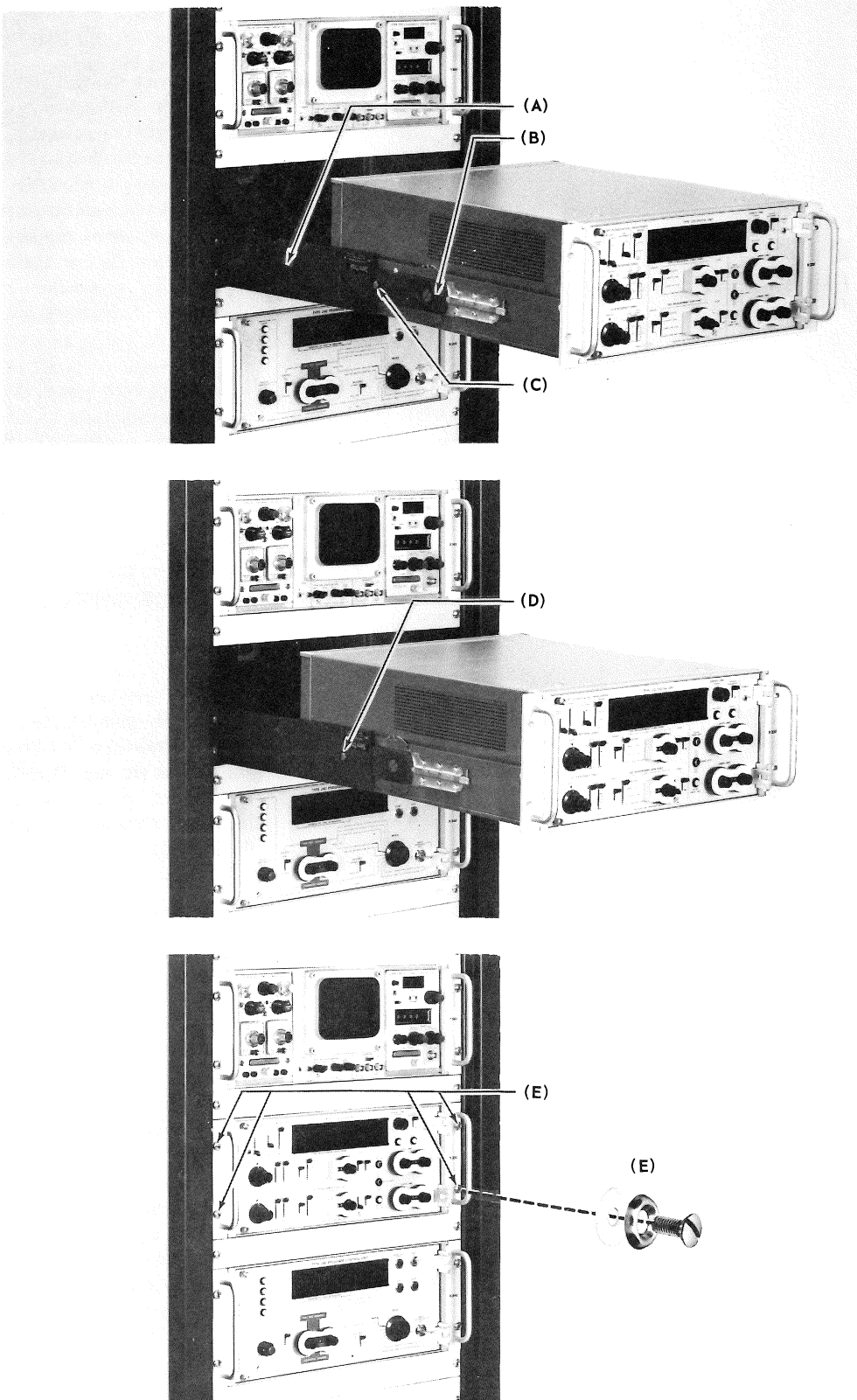


Fig. 2-16. Insertion and removal of rackmount instrument after the slide-out tracks have been installed.

rear mounting bracket screws while holding up on the rear of the instrument so that the weight is removed from the brackets.

3. Omit step 6.

4. Perform steps 7 and 8.

Slide-Out Track Lubrication

The special finish on the sliding surfaces of the slide-out tracks provide permanent lubrication. However, if the tracks do not slide smoothly even after being properly adjusted, a thin coating of paraffin may be rubbed onto the sliding surfaces for additional lubrication. It will be necessary to remove the tracks from the rack to do this.

Removal and Re-insertion

After the initial installation and adjustment of slide-out tracks, the Type R287 or Type R288 may be removed or re-inserted into the rack by following the instructions given in Fig. 2-16. Under normal circumstances, no further adjustments are required.

POWER AND TEMPERATURE REQUIREMENTS

Operating Voltage

The Type 286, 287 and Type R288 may be operated from either a 115 volt or 230 volt nominal line voltage source. The Line Voltage Selector assembly located on the rear panel of the Type 286 converts the instrument from one operating voltage to the other (115 volts or 230 volts). This assembly also allows selection of any of three regulating ranges, and contains the two line fuses. When the instruments are converted from one nominal line voltage source to the other, the assembly connects or disconnects one of the fuses to provide the proper protection for the power transformer. In addition, line fuses are located on the rear panels of the Type 287 and Type R288 which must be changed when the line voltage is changed.

Use the following procedure to convert a Type 286 between line voltages or regulating ranges:

1a. If the Type 286 is being operated alone, disconnect it from the power source.

1b. If the Type 286 is installed in a Type 287 or Type R288, turn off the Type 286 and remove it.

2. Remove the two captive screws which hold the cover of the LINE VOLTAGE SELECTOR assembly to the Type 286 rear panel, and remove the cover.

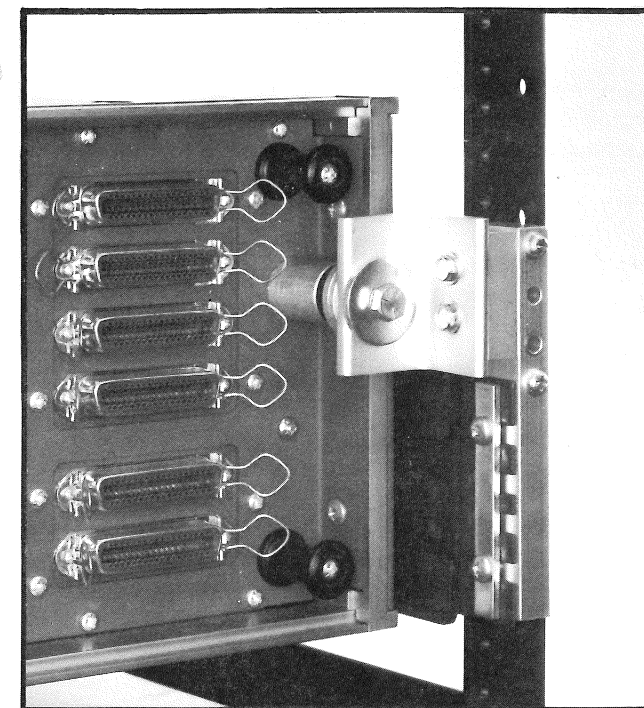


Fig. 2-17. Completed installation of left rear support.

tion and modify the standard mounting and alignment procedures as follows:

Mounting. Modify the standard mounting procedure as follows:

1. Perform steps 1 and 2 of the Standard Mounting Procedure.

2. Omit step 3.

3. Perform step 4.

4. Attach the rear mounting brackets to the rear support rails as shown in Fig. 2-13 and tighten the screws securely.

5. Omit steps 6 through 9.

6. Perform step 10.

Alignment. Modify the standard alignment procedure as follows:

1. Perform steps 1 through 4 of the Standard Alignment Procedure. (Omit the NOTE in step 4.)

2. Loosen the screws that hold the rear mounting brackets to the support rails and allow the rear ends of the stationary sections to seek their normal position. Tighten the

3. To convert to a different line voltage, pull out the Voltage Selector switch bar (see Fig. 2-18), turn it around 180° and plug it into the opposite set of holes. The Voltage Selector switch bar will be in the upper position for 115 volt operation and in the lower position for 230 volt operation.

4. To change regulating ranges, pull out the Range Selector switch bar (see Fig. 2-18), slide it to the desired range and plug it back in. Select a range which is centered about the average line voltage to be applied (see Table 2-9).

5. Re-install the cover of the LINE VOLTAGE SELECTOR assembly with the two captive screws. Be sure the cover fits firmly against the rear panel. This ensures that the line fuses are installed correctly.

6. Before applying power to the instrument, check that the indicating tabs on the switch bars which protrude through the holes in the cover indicate the voltage and regulating ranges chosen.

CAUTION

The Type 286 should not be operated with the Voltage Selector or Range Selector switches in the wrong positions for the line voltage applied. Operation of the instrument with either switch in the wrong position will cause incorrect operation and may damage the instrument.

Use the following procedure to convert a Type 287 or Type R288 between line voltages:

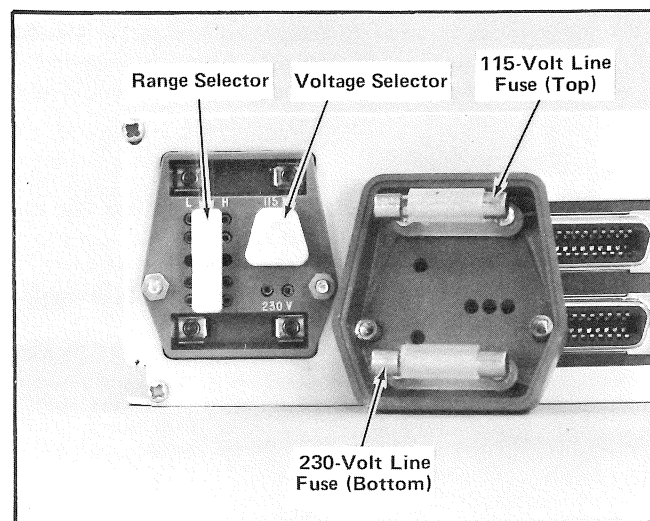


Fig. 2-18. Line Voltage Selector Assembly on rear panel of Type 286.

TABLE 2-9
Regulating Ranges

Range Selector Switch Position	115 Volts Nominal	230 Volts Nominal
LO (switch bar in left holes)	90 to 110 volts	180 to 220 volts
M (switch bar in middle holes)	104 to 126 volts	208 to 252 volts
HI (switch bar in right holes)	112 to 136 volts	224 to 272 volts

1. Disconnect the instrument from the power source.
2. Remove the fuse located above the power cord receptacle on the rear panel of the instrument and exchange it for the proper fuse. A 3 A slow-blow fuse is required for 115-volt operation and a 1.5 A slow-blow fuse is required for 230-volt operation.
3. It may be necessary to use a 115- to 230-volt adapter to match the power plug to the power source receptacle, or the power cord and plug may be changed. Use the following procedure to change the power cord:
 - a. Disconnect the power cord from the power source.
 - b. Unsolder the ground wire (green) from the ground lug on the rear bulkhead (see Fig. 2-19A).
 - c. Remove the clear plastic insulator and unsolder the black wire from the end of the fuse holder.
 - d. Unsolder the white wire from the terminal on the base of K501 on the under side of the instrument (see Fig. 2-19B).
 - e. Compress the strain relief and pull the power cord out through the rear panel.
 - f. Cut and strip the leads of the new power cord to the same length as on the old cord.
 - g. Install the new power cord through the hole in the rear panel and solder the leads to the same terminals from which the previous cord was removed.
 - h. Place the strain relief on the power cord near the rear panel, compress the strain relief, and re-install in the hole in the rear panel.

Operating Temperature

The Type 286, Type 287 and Type R288 will operate within specifications in any environment with an ambient

grounds pins 14 and 16 on connector J521 of the Type 287, thus enabling the head selector circuits in the Type 287.

Small Multiplexer System. The Type 241 also does not require any special preparation to program a small multiplexer system. When programming a single Type 286 with a Type 241, however, the Type 286 head selector circuits must be enabled by one of the following methods:

1. When setting up a Type 241 program card, install diodes between both the A4 and the B3 diode terminals.
2. Connect a ground strap (#24 insulated wire) between pins P and E and pin 35 (ground) on J80 of the Type 286.

Type 240

Medium Multiplexer System. A Type 240 with a serial number above B080220 does not require any special preparation to program a medium multiplexer system. A Type 240 with a serial number below B080220 and having a Model 1 P12 program assembly requires the following modifications:

1. Solder a strap (#24 insulated wire) between 'E2' UPPER and 11 LOWER OUT on the P12 Program Assembly Model 1 (see Fig. 2-20).
2. Solder a strap (#24 insulated wire) across the UPPER 'H' terminals on P12.
3. Remove the strap from between the UPPER ENABLE terminals on P12.
4. Solder straps (#22 solid, bare wire) between pins 12 and 14, and between pins 14 and 16 of J238 on the Type 240 rear panel.

Small Multiplexer System. A Type 240 requires the same modifications to program a small multiplexer system as it does to program a medium one. In addition, one of the following methods must be used to enable the head selector circuits of the Type 286:

1. When writing a Type 240 program, add 4 to the decimal numbers programmed for characters 45 and 46.
2. Solder a strap (#24 insulated wire) from the junction of J14 and F14 to the junction of E1 and D1 on the P12 Program Assembly (see Fig. 2-20). Solder another strap from the J24-F24 junction to the E2-D2 junction.

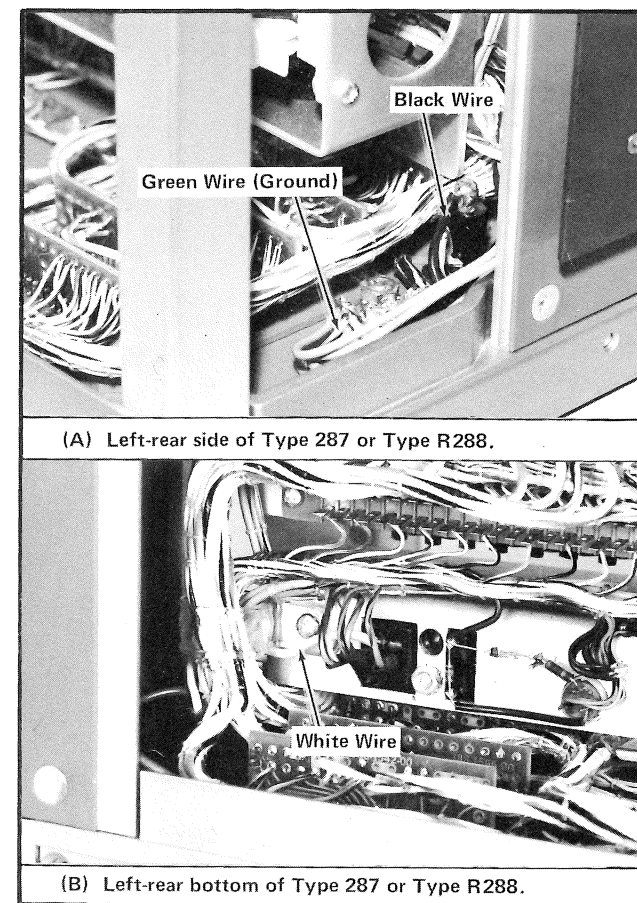


Fig. 2-19. Power cord replacement.

temperature between 0°C and +50°C (+32°F and +122°F). For best operation, a free flow of air should be provided around the outside of the instruments.

PREPARATION OF TEKTRONIX PROGRAMMERS

General

Any of three Tektronix programmers may be used to program a multiplexer system: a Type 241, Type 240 or Type R250. Of these programmers, the Type R250 can program any of the three multiplexer system sizes, and the Type 241 and Type 240 can program only a small or medium multiplexer system. Whichever programmer is chosen, the programmer and/or a multiplexer component will require some preparation before the programmer can be used to program the multiplexer system.

Type 241

Medium Multiplexer System. The Type 241 does not require any special preparation to program a medium multiplexer system. A special interconnection cable (Tektronix Part No. 012-0176-00) is, however, required. This cable

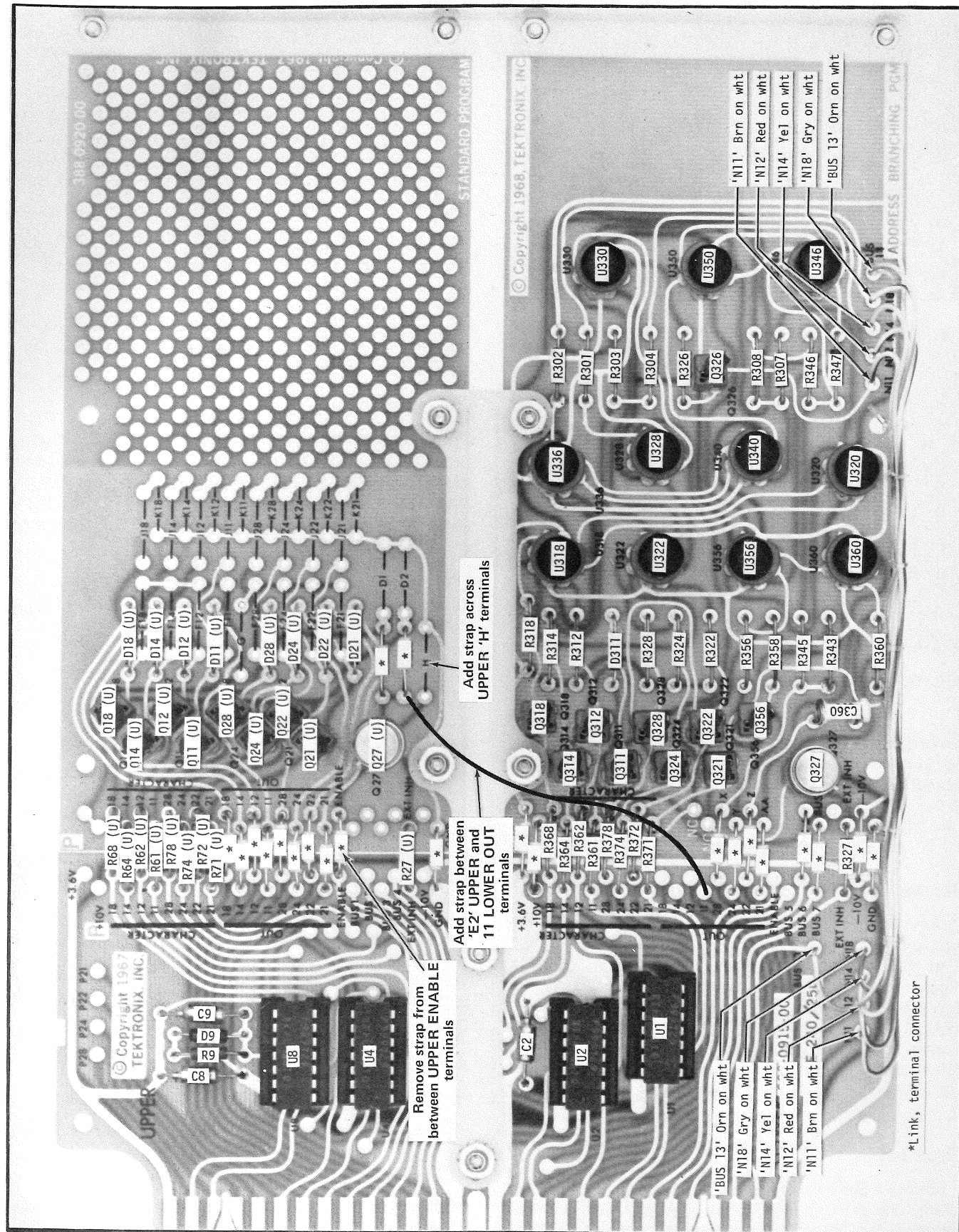


Fig. 2-20. Modification of Type 240 P12 Program Assembly Model 1.

3. Connect a ground strap (#24 insulated wire) between pins P and E and pin 35 (ground) on J80 of the Type 286.

Type R250

Large Multiplexer System. To use a Type R250 to program a large multiplexer system, a special program assembly must be prepared. This program assembly may be prepared using one of the following methods:

1. Use the following procedure to prepare a Type R250 program assembly from a Type 240 program assembly:

a. Order a P4 Program Assembly (Tektronix Part No. 672-0204-00). This assembly is normally used in a Type 240.

b. Solder a strap (#24 insulated wire) between the LOWER 24 OUT terminal on the shift register card and the LOWER 24 OUT terminal on the standard program board (see Fig. 2-21).

c. Relabel the front of the program assembly to coincide with the new location and use of the assembly.

2. Use the following procedure to construct a Type R250 program assembly from a standard shift register card and two standard program boards:

a. Order a Shift Register Card (Tektronix Part No. 020-0020-00) if the Type R250 is not already equipped with them. Order two Standard Program Boards (Tektronix Part No. 020-0021-00).

b. Attach the two plastic center tie strips, included with the shift register kit, to the shift register card (see Fig. 2-21). Use the P4 Program Assembly from the Type 240 as a model. Attach the two standard program boards to the tie strips. Attach the end tie strip to the assembly.

c. Using the P4 Program Assembly as a model, solder resistors and straps (#24 insulated wire) to the new program assembly. The 750 Ω resistors included in the standard program board kits should be substituted where 2.7 kΩ resistors appear on the P4 Program Assembly.

d. Solder a strap (#24 insulated wire) between the LOWER 24 OUT terminal on the shift register card and the LOWER 24 OUT terminal on the standard program board.

e. Label the front of the new Type R250 program assembly to coincide with the location and use of the new program assembly.

The newly constructed Type R250 program assembly can be installed in a variety of locations in the Type R250. Table 2-10 shows which jacks the program assembly may be installed in, the characters associated with these jacks, the rear panel connector at which the program information will be found for each location, and the Type R250 diagram which shows the input and output information for each jack. As bit titles are assigned to characters, mark them on the proper diagram for future reference.

Medium Multiplexer System. The same Type R250 program assembly constructed to program a large multiplexer system can be used to program a medium multiplexer system with the following modifications:

1. Solder a strap (#24 insulated wire) between 'E2' UPPER and 11 LOWER OUT on the program assembly (see Fig. 2-20).

2. Solder a strap (#24 insulated wire) across the UPPER 'H' terminals.

3. Remove the strap from between the UPPER ENABLE terminals.

4. Solder straps (#22 solid, bare wire) between pins 12 and 14, and between pins 14 and 16 of the Type R250 rear panel connector at which the program information is to appear.

Small Multiplexer System. The same Type R250 program assembly used to program a medium multiplexer system can be used to program a small multiplexer system. In addition, one of the following methods must be used to enable the head selector circuits of the Type 286:

1. When writing a Type R250 program, add 4 to the decimal programmed for characters 51 and 52 (or their equivalent, depending on the placement of the program assembly).

TABLE 2-10

Possible Locations of the Type R250 Program Assembly Used to Program a Sampling-Head Multiplexer System

Program Assembly Conn.	Character Numbers	Rear Panel Conn.	Type R250 Diagram Number
J1	49 through 52	J231	1
J4	61 through 64	J233	8
J6	69 through 72	J234	10
J8	77 through 80	J235	12
J10	85 through 88	J236	14
J12	93 through 96	J237	16

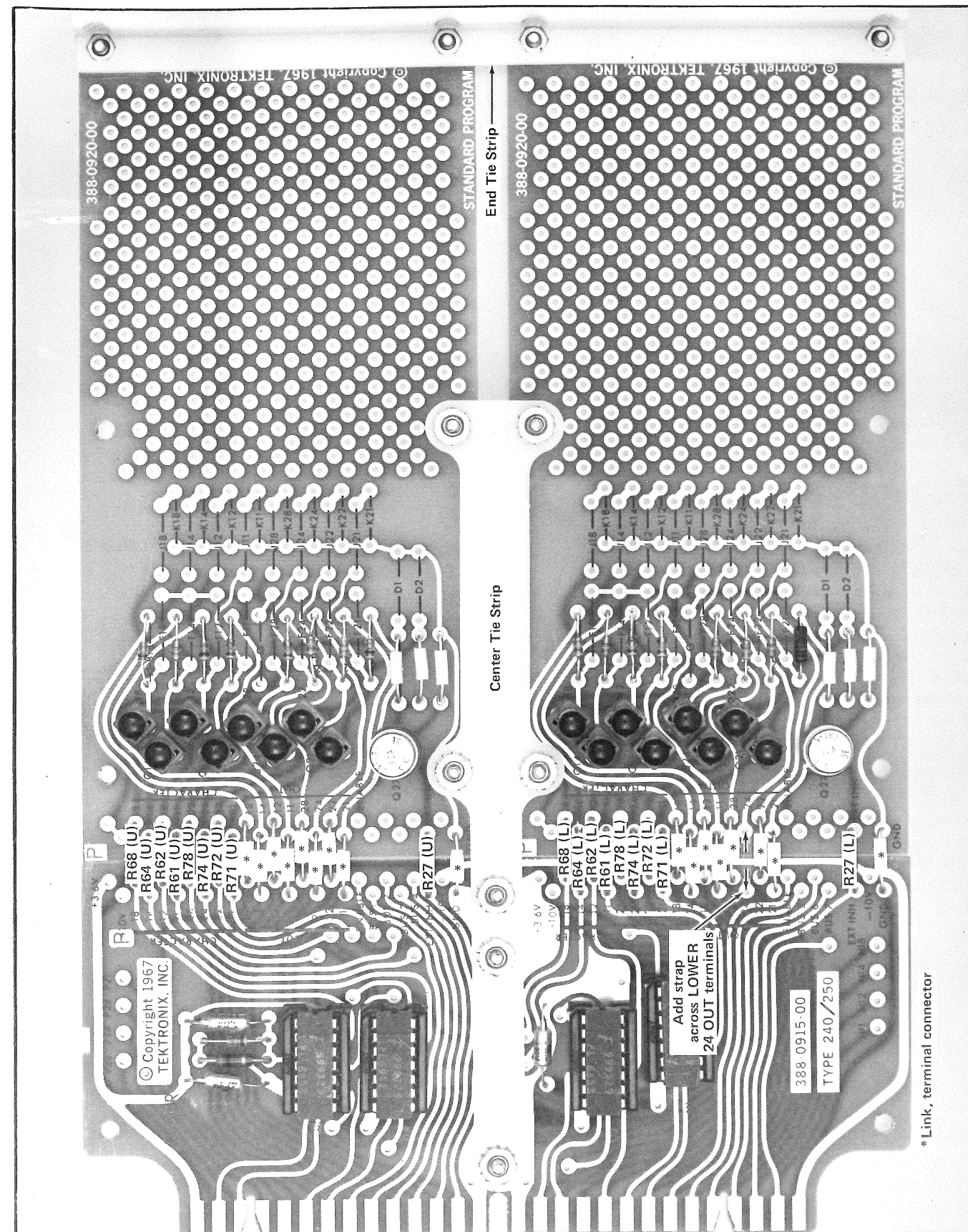


Fig. 2-21. Modification of Type 240 P4 Program Assembly.

TYPE 286 J1 ONLY cable label to the end of this cable connected to J1 of the Type 286.

1b. Type 240. Connect the programming cable (Tektronix Part No. 012-0131-00) between J238 of the Type 240 and J1 of the Type 286. Attach the CONNECT TO TYPE 240 J238 ONLY and the CONNECT TO TYPE 286 J1 ONLY cable labels to the appropriate connectors of this cable.

2. Solder a strap (#24 insulated wire) from the junction of J14 and F14 to the junction of E1 and D1 on the program assembly (see Fig. 2-20). Solder another strap from the J24-F24 junction to the E2-D2 junction.

3. Connect a ground strap (#24 insulated wire) between pins P and E and pin 35 (ground) on J80 of the Type 286.

INTERCONNECTION

General

The cables which carry head selection data, signal data and chopper drive data may be connected to the components of the multiplexer system in a variety of ways depending on the choice of the programmer. The following discussion provides instructions for making interconnections, depending on the choice of multiplexer system components as determined by Table 2-3.

Keying and Cable Labels

The multiplexer system interconnection cables are shell-keyed to avoid connection to the wrong connector. In addition, labels are available from Tektronix which may be attached to the interconnection cable connectors or sampling heads. The cable labels tell which connector on a multiplexer system component, a cable connector is to be connected to. They aid in reconnecting interconnection cables to multiplexer components, if a multiplexer system has been disassembled. The sampling head labels allow the sampling heads in a multiplexer system to be labeled up to 15.

The labels must be ordered separately for each instrument. (Tektronix Part No. 334-1526-00, 334-1527-00 and 334-1528-00 for the Type 286, Type 287 and Type R288 respectively and Tektronix Part No. 334-1560-00 for the sampling head labels.) A label is attached to a connector or sampling head by cutting the label from a sheet of labels, taking the paper from the back of the label and pressing it on the connector on the front of the sampling head. The following cable interconnection instructions tell which labels are to be attached to which connectors.

Small Multiplexer Systems

Use the following procedure to connect interconnection cables in a small multiplexer system using a Type 241, Type 240, Type R250 or non-Tektronix programmer, and a Type 3S6, Type 3S5 or Type 3S2 as the sampling unit (see Fig. 2-22):

1a. Type 241. Connect the programming cable (Tektronix Part No. 012-0176-00) between J303 of the Type 241 and J1 of the Type 286. Attach the CONNECT TO

1c. Type R250. Connect the programming cable (Tektronix Part No. 012-0131-00) between J231 of the Type R250 and J1 of the Type 286. Attach the CONNECT TO TYPE 250 J231 ONLY and the CONNECT TO TYPE 286 J1 ONLY cable labels to the appropriate connectors of this cable.

1d. Non-Tektronix Programmer. Connect the non-Tektronix programmer programming cable to J1 of the Type 286. Attach the CONNECT TO TYPE 286 J1 ONLY cable label to the connector connected to J1 of the Type 286.

2a. Type 3S6. Connect the signal cable (Tektronix Part No. 012-0177-00) between J113 of the Type 568 and J2 of the Type 286. Attach the CONNECT TO TYPE 568 J113 ONLY and the CONNECT TO TYPE 286 J2 ONLY cable labels to the appropriate connectors of this cable.

2b. Type 3S5 or Type 3S2. Connect the signal cable (Tektronix Part No. 012-0178-00) between the sampling unit and the J2 connector of the Type 286. The connection of this cable to the sampling unit consists of installing two sampling heads, one marked Channel A and one marked Channel B in the sampling unit sampling head compartments. Attach the CONNECT TO TYPE 286 J2 ONLY cable label to the connector attached to J2 of the Type 286.

Medium Multiplexer Systems

Use the following procedure to connect interconnection cables in a medium multiplexer system using a Type 241, Type 240, Type R250 or non-Tektronix programmer, and a Type 3S6, Type 3S5 or Type 3S2 sampling unit (see Fig. 2-23):

1a. Type 241. Connect the programming cable (Tektronix Part No. 012-0176-00) between J303 of the Type 241 and J521 of the Type 287. Attach the CONNECT TO TYPE 287 J521 ONLY cable label to the connector connected to J521 of the Type 287.

1b. Type 240. Connect the programming cable (Tektronix Part No. 012-0131-00) between J238 of the Type 240 and J521 of the Type 287. Attach the CONNECT TO TYPE 240 J238 ONLY and the CONNECT TO TYPE 287 J521 ONLY cable labels to the appropriate connectors of this cable.

1c. Type R250. Connect the programming cable (Tektronix Part No. 012-0131-00) between J231 of the Type R250 and J521 of the Type 287. Attach the CONNECT TO TYPE 250 J231 ONLY and the CONNECT TO TYPE 287 J521 ONLY cable labels to the appropriate connectors of this cable.

1d. Non-Tektronix Programmer. Connect the non-Tektronix programmer to J521 of the Type 287. Attach the CONNECT TO TYPE 287 J521 ONLY cable label to the connector connected to J521 of the Type 286.

2a. Type 3S6. Connect the signal cable (Tektronix Part No. 012-0177-00) between J113 of the Type 568 and J531 of the Type 287. Attach the CONNECT TO TYPE 568 J113 ONLY and the CONNECT TO TYPE 287 J531 ONLY cable labels to the appropriate connectors of this cable.

2b. Type 3S5 or Type 3S2. Connect the signal cable (Tektronix Part No. 012-0178-00) between the sampling unit and J531 of the Type 287. The connection of this cable to the sampling unit consists of installing two sampling heads, one marked Channel A and one marked Channel B in the sampling unit sampling heads compartments. Attach the CONNECT TO TYPE 287 J531 ONLY cable label to the connector connected to J531 of the Type 287.

3. Type 286's. Install the Type 286's in the Type 287.

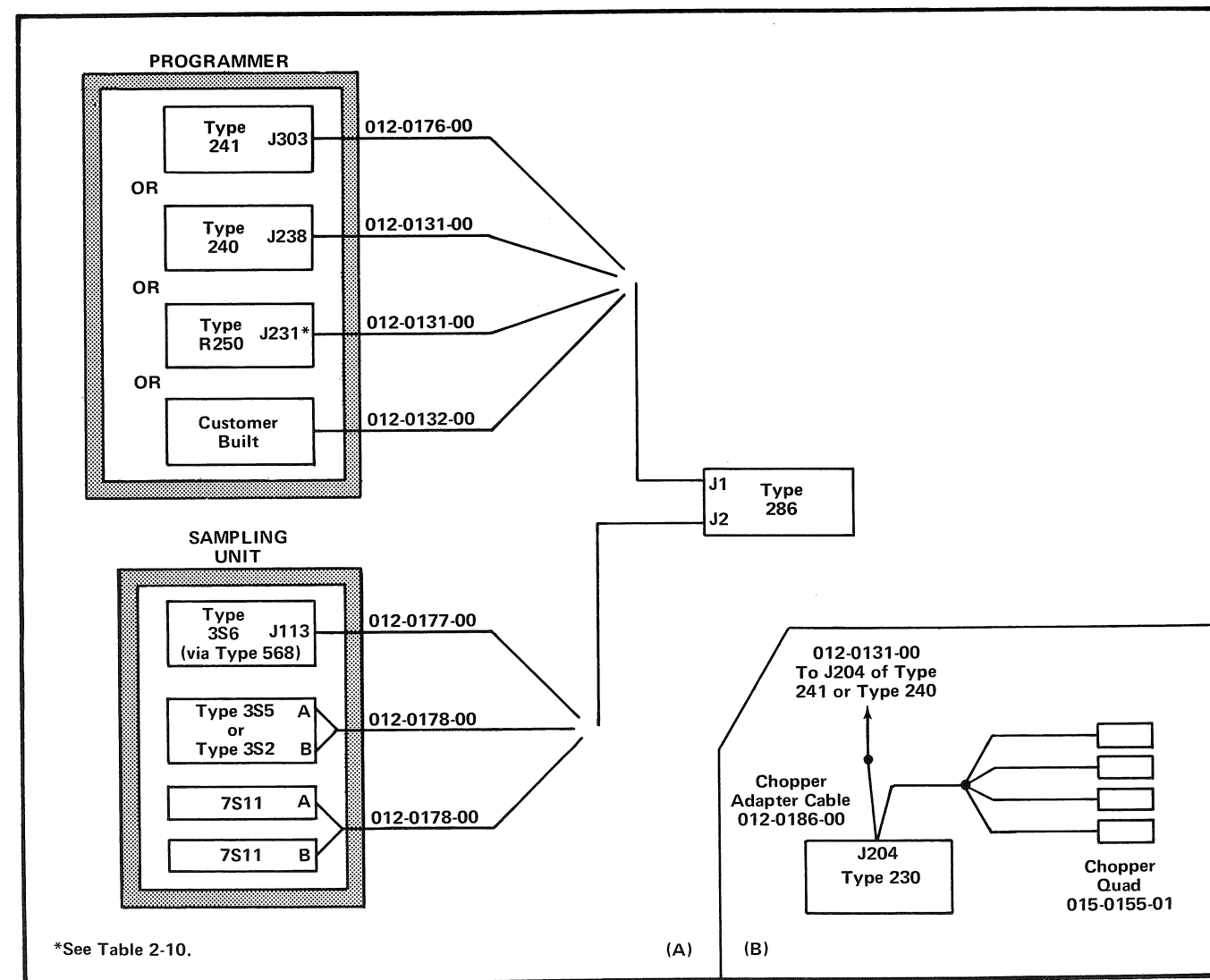


Fig. 2-22. (A) Connection of small multiplexer system to measurement system; (B) Chopper Option. (Cable numbers are Tektronix part numbers.)

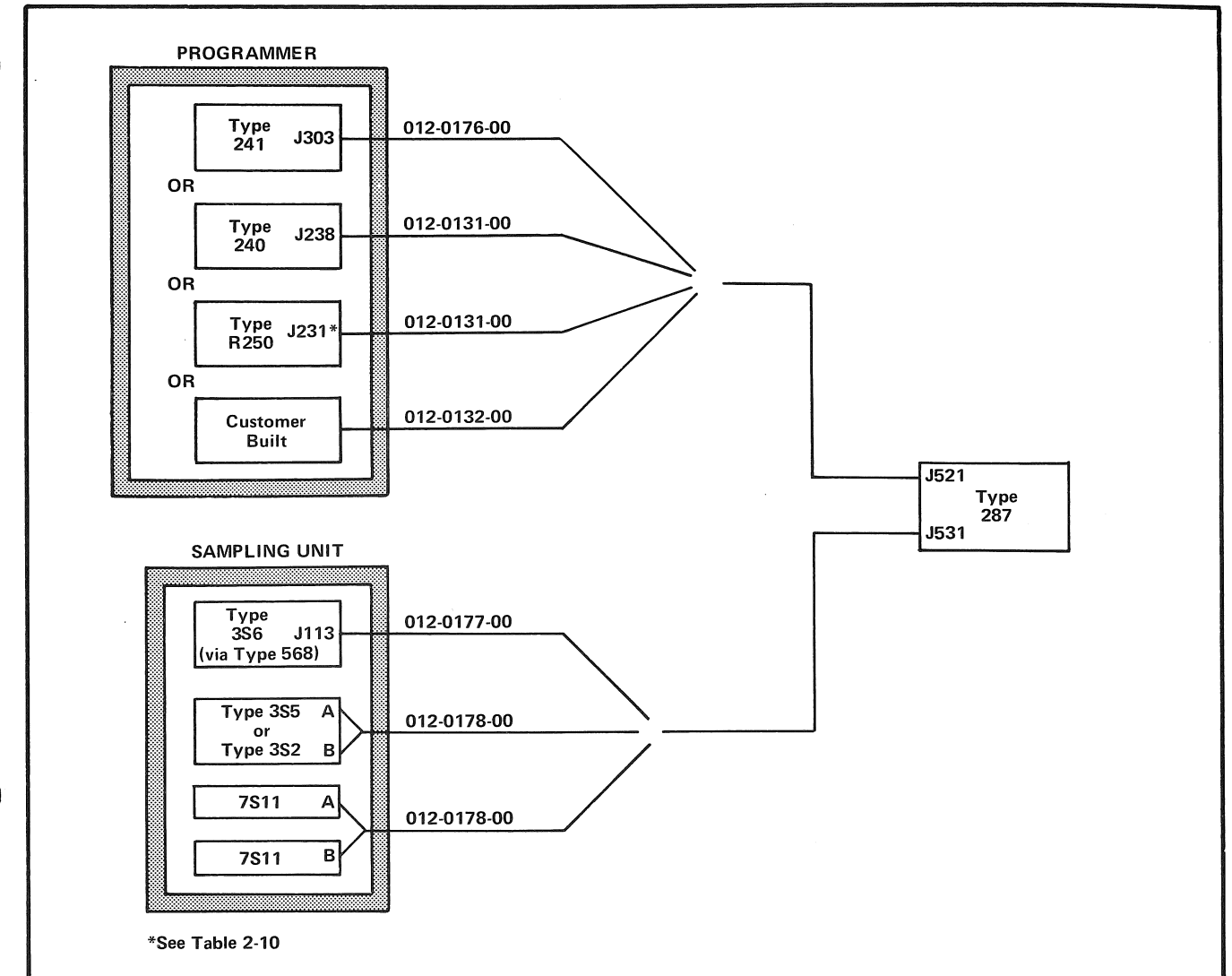


Fig. 2-23. Connection of medium multiplexer system to measurement system. (Cable numbers are Tektronix part numbers.)

Large Multiplexer Systems

Use the following procedure to connect interconnection cables in a large multiplexer system using a Type R250 or non-Tektronix programmer, and a Type 3S6 as the sampling unit (see Fig. 2-24):

1a. Type R250. Connect a programming cable (Tektronix Part No. 012-0131-00) between J231 of the Type R250 and J521 of the Type R288. Attach the CONNECT TO TYPE 250 J231 ONLY and the CONNECT TO TYPE 288 J521 ONLY cable labels to the appropriate connectors of this cable.

1b. Non-Tektronix Programmer. Connect the non-Tektronix programmer to J521 of the Type R288. Attach the CONNECT TO TYPE 288 J521 ONLY cable label to the connector connected to J521 of the Type R288.

2. Connect a signal cable (Tektronix Part No. 012-0177-00) between J113 of the Type 568 and J531 of the Type R288. Attach the CONNECT TO TYPE 568 J113 ONLY and the CONNECT TO TYPE 288 J531 ONLY cable labels to the appropriate connectors of this cable.

3. Connect a programming cable (Tektronix Part No. 012-0131-00) between J522 of the Type R288 and J521 of Type 287 1. Attach the CONNECT TO TYPE 288 J522 ONLY and the CONNECT TO TYPE 287 J521 cable labels to the appropriate connectors of this cable.

4. Connect a signal cable (Tektronix Part No. 012-0177-00) between J532 of the Type R288 and J531 of Type 287 1. Attach the CONNECT TO TYPE 288 J532 ONLY and the CONNECT TO TYPE 287 J531 ONLY cable labels to the appropriate connectors of this cable.

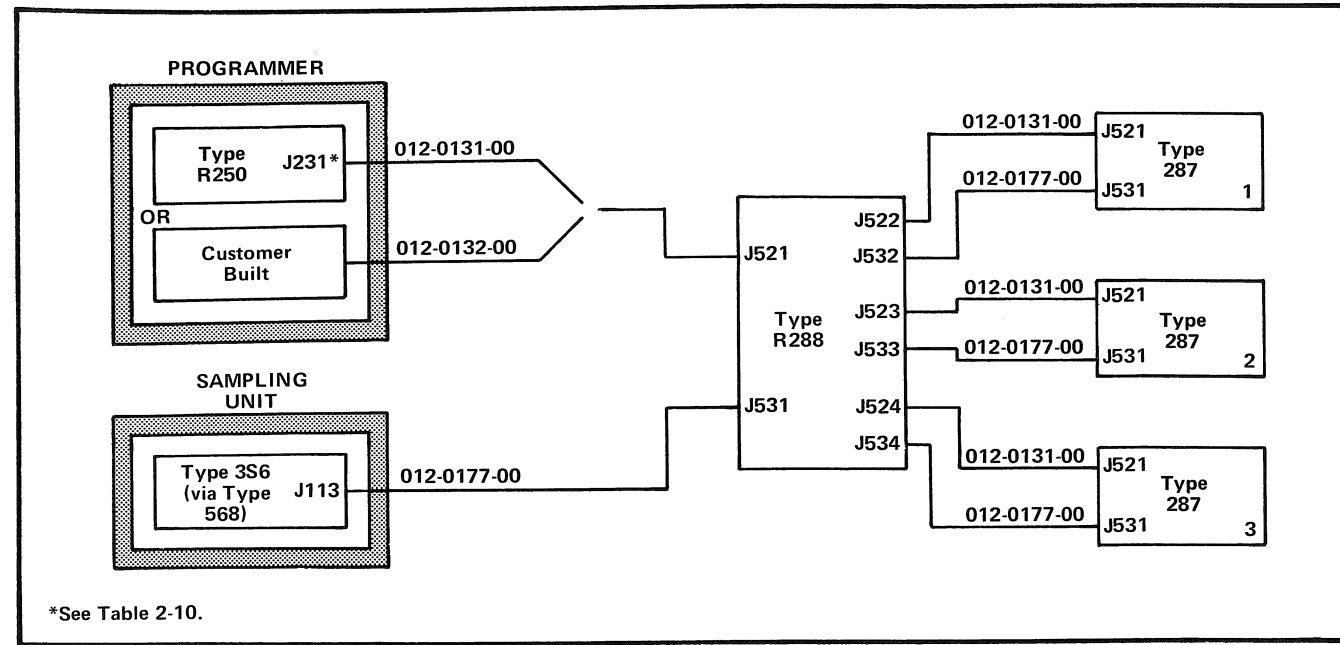


Fig. 2-24. Connection at large multiplexer system to measurement system. (Cable numbers are Tektronix part numbers.)

5. Connect a programming cable (Tektronix Part No. 012-0131-00) between J523 of the Type R288 and J521 of Type 287 2. Attach the CONNECT TO TYPE 288 J523 ONLY and the CONNECT TO TYPE 287 J521 ONLY cable labels to the appropriate connectors of this cable.

6. Connect a signal cable (Tektronix Part No. 012-0177-00) between J533 of the Type R288 and J531 of Type 287 2. Attach the CONNECT TO TYPE 288 J533 ONLY and the CONNECT TO TYPE 287 J531 ONLY cable labels to the appropriate connectors of this cable.

7. Connect a programming cable (Tektronix Part No. 012-0131-00) between J524 of the Type R288 and J521 of Type 287 3. Attach the CONNECT TO TYPE 288 J524 ONLY and the CONNECT TO TYPE 287 J521 ONLY cable labels to the appropriate connectors of this cable.

8. Connect a signal cable (Tektronix Part No. 012-0177-00) between J534 of the Type R288 and J531 of Type 287 3. Attach the CONNECT TO TYPE 288 J534 ONLY and the CONNECT TO TYPE 287 J531 ONLY cable labels to the appropriate connectors of this cable.

9. Type 286's. Install the Type 286's in the Type 287's and the Type R288.

INSTALLATION OF CHOPPER QUADS

General

A chopper quad is four signal choppers connected to one 24-pin Amphenol connector. Each signal chopper of a

chopper quad can be connected to a Type S-3 sampling head probe tip. Chopper quads may be used with all three multiplexer system sizes.

Small Multiplexer System

There is no way to connect a chopper quad to a Type 286. A special chopper adapter cable (Tektronix Part No. 012-0186-00), however, is available which allows the chopper quad to be connected directly to the Type 230. The Type 230 is the source of the chopper drive data. Use the following procedure to install a chopper quad in a small multiplexer system:

1. Turn off the Type 230 and programmer and disconnect the cable from J204 on the Type 230 rear panel (see Fig. 2-22).
2. Connect the chopper adapter cable (the connector which has two cables attached to it) to J204 of the Type 230.
3. Connect the cable removed in step 1 to the open 36-pin connector of the chopper adapter cable.
4. Connect the chopper quad to the open 24-pin connector of the chopper adapter cable.
5. Turn on the Type 230 and programmer.

Medium Multiplexer System

In a medium multiplexer system, chopper drive data can be applied to the Type 287 through connectors J521 or

Connecting Signal Choppers to Type S-3 Probe Tips

Each signal chopper in a chopper quad is numbered (0, 1, 2 or 3) to coincide with the sampling head numbering of a Type 286. Use the following procedure to connect a signal chopper to a probe tip:

1. Connect the Type S-3 probe tip to the signal chopper as shown in Fig. 2-25. Be sure the number on the signal chopper and the number on the Type S-3 coincide.
2. Connect a 10X attenuator (supplied with the chopper quad) to the signal chopper as shown in Fig. 2-25.

TABLE 2-11
Type 286 Associated with Each Chopper Quad Connector for Type 287 or Type R288

Chopper Quad Connector	Type 286
J510	0
J511	1
J512	2
J513	3

J515. If a Type 241 is being used to program the Type 287, the chopper drive data is applied to the Type 287 through connector J521 along with the head selection data. If a Type 240 is being used to program the Type 287, connect a chopper cable (Tektronix Part No. 012-0131-02) between J205 on the Type 240 and J515 on the Type 287.

Up to four chopper quads may be connected to chopper quad connectors on the Type 287 rear panel. Each of these connectors is associated with a particular Type 286 in the Type 287 (see Table 2-11).

Large Multiplexer System

To apply chopper drive data to a large multiplexer system, connect a chopper cable (Tektronix Part No. 012-0131-02) between J205 on the Type 240 and J515 on the Type R288. Chopper quads can be connected to the Type R288 by way of rear panel connectors just like those on the Type 287. Each of these connectors is associated with a particular Type 286 in the Type R288 (see Table 2-11).

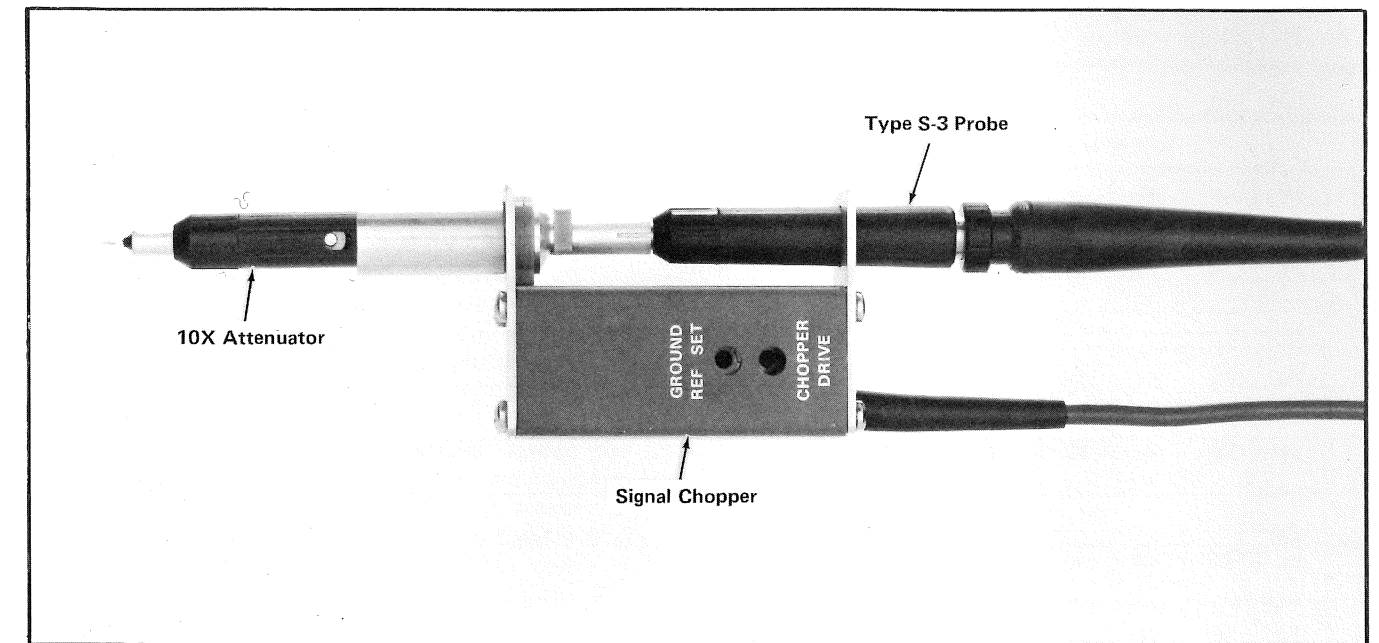


Fig. 2-25. Connection of Type S-3 probe to signal chopper.

NOTES

SECTION 3 PROGRAMMING and GENERAL OPERATION

Change information, if any, affecting this section will be found at the rear of the manual.

PROGRAMMING A MULTIPLEXER SYSTEM

System Data

Three classes of data are transmitted in a Type 286, Type 287 and Type R288 multiplexer system: head selection data, signal data, and chopper drive data. A description of this data is given at the beginning of the Circuit Description section under Overall System Explanation. Familiarity with this data may aid in understanding the programming and operation of the Type 286, Type 287 and Type R288.

General Programming Information

A sampling head multiplexer system is programmed by applying head selection bits and vertical scale bits to the programming connectors on the rear panels of the Type 286, Type 287 or Type R288. Head selection bits determine which sampling heads are going to be switched into the sampling unit, and vertical scale bits determine the vertical scale of the Type 230. Four program lines are required to program a small multiplexer system, 8 lines for a medium multiplexer system and 12 lines for a large multiplexer system.¹ In addition, two enable lines are required to program a small or a medium multiplexer system. Three more program lines are required to program the vertical scale in a medium or a large multiplexer system.

Each sampling head in a multiplexer system has a number. In a small multiplexer system they are numbered 0 through 3, in a medium system 0 through 15, and in a large system 0 through 63². Fig. 3-1 shows a diagram of the numbering of sampling heads in the three multiplexer system sizes. Note that the 0 Type 287 is the Type R288 in the large multiplexer system.

The logic level of a programming bit may be either high (+5 to +15 volts) or low (0 to +2 volts). The combinations of logic levels of the programming bits determines which sampling heads are selected for operation.

¹See the discussion of multiplexer system sizes under Sampling Head Multiplexer Systems at the beginning of Section 2.

²Large multiplexer systems may have 32, 48 or 64 sampling heads, depending on the number of Type 287's used in the multiplexer system.

Each programming bit is given a letter and a number. The letter (A or B) indicates the sampling unit channel. The number is part of a binary code (1, 2, 4, 8, 16, 32). Fig. 3-2 shows diagrams of the three programming connectors in a multiplexer system and indicates which bit is applied to each pin.

To select a sampling head for operation by a particular sampling unit channel,

1. Select programming bits from the group of bits which have the same letter as the channel to which the sampling head is to be connected. The numbers of the bits chosen should add up to the number of the sampling head.
2. Apply lows to the pins of the programming connector which correspond to the chosen programming bits.

Type R288 or Type 287 0															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Type 286 0				Type 286 1				Type 286 2				Type 286 3			
Type 287 1															
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Type 286 4				Type 286 5				Type 286 6				Type 286 7			
Type 287 2															
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Type 286 8				Type 286 9				Type 286 10				Type 286 11			
Type 287 3															
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
Type 286 12				Type 286 13				Type 286 14				Type 286 15			

Fig. 3-1. Sampling head numbering in a sampling head multiplexer system.

TABLE 3-1
Sampling Head Programming

Sampling Head No.	Programming Bit Numbers					
	32	16	8	4	2	1
0	H	H	H	H	H	H
1	H	H	H	H	H	L
2	H	H	H	H	L	H
3	H	H	H	H	L	L
4	H	H	H	L	H	H
5	H	H	H	L	L	H
6	H	H	H	L	L	L
7	H	H	H	L	L	L
8	H	H	L	H	H	H
9	H	H	L	H	H	L
10	H	H	L	H	L	H
11	H	H	L	H	L	L
12	H	H	L	L	H	H
13	H	H	L	L	H	L
14	H	H	L	L	L	H
15	H	H	L	L	L	L
16	H	L	H	H	H	H
17	H	L	H	H	H	L
18	H	L	H	H	L	H
19	H	L	H	H	L	L
20	H	L	H	L	H	H
21	H	L	H	L	H	L
22	H	L	H	L	L	H
23	H	L	H	L	L	L
24	H	L	L	H	H	H
25	H	L	L	H	H	L
26	H	L	L	H	L	H
27	H	L	L	H	L	L
28	H	L	L	L	H	H
29	H	L	L	L	H	L
30	H	L	L	L	L	H
31	H	L	L	L	L	L
32	L	H	H	H	H	H
33	L	H	H	H	H	L
34	L	H	H	H	L	H
35	L	H	H	H	L	L
36	L	H	H	L	H	H
37	L	H	H	L	H	L
38	L	H	H	L	L	H
39	L	H	H	L	L	L
40	L	H	L	H	H	H
41	L	H	L	H	H	L
42	L	H	L	H	L	H
43	L	H	L	H	L	L
44	L	H	L	L	H	H
45	L	H	L	L	H	L
46	L	H	L	L	L	H
47	L	H	L	L	L	L

TABLE 3-1 (cont.)

Sampling Head No.	Programming Bit Numbers					
	32	16	8	4	2	1
48	L	L	H	H	H	H
49	L	L	H	H	H	L
50	L	L	H	H	L	H
51	L	L	H	H	L	L
52	L	L	H	L	H	H
53	L	L	H	L	H	L
54	L	L	H	L	L	H
55	L	L	H	L	L	L
56	L	L	L	H	H	H
57	L	L	L	H	H	L
58	L	L	L	H	L	H
59	L	L	L	H	L	L
60	L	L	L	L	H	H
61	L	L	L	L	H	L
62	L	L	L	L	L	H
63	L	L	L	L	L	L

For example, assume that sampling head 36 of a large multiplexer system is to be connected to channel A of the sampling unit. Since this is a large multiplexer system, programming bits are applied to connector J521 of the Type R288. Pins 1, 2, 3, 4, 13 and 14 of this connector are used to program a sampling head for use by channel A. To program sampling head 36, bits A4 and A32 must be low (A4 + A32 = A36) and the remaining A bits must be high. Pins 2 and 13 of J521 must be low and pins 1, 3, 4 and 14 must be high.

Table 3-1 shows the logic levels of the program bits to program each sampling head from 0 to 63. Note this table pertains to either channel A or B. For a medium multiplexer system, bit 32 and sampling head numbers 16 through 63 in Table 3-1 can be ignored. Bit 16 for a medium multiplexer system becomes an enable bit. For a small multiplexer system, bits 32, 16 and 8, and sampling head numbers 4 through 63 can be ignored. In this case bit 4 becomes an enable bit.

NOTE

In programming a multiplexer system, one sampling head should be selected for channel A and another sampling head for channel B. If the signal from only one of these sampling heads is of interest, the signal from the other sampling head may be positioned off screen using DC offset. One sampling head should not be selected for operation by both channels.

TABLE 3-2
Vertical Scale Programming

Units	AMPS Bit	Multiplier	X10 Bit	X0.1 Bit
Volts	H	X1	H	H
Amps	L	X10	L	0
		X0.1	H	L

PROGRAMMING A MULTIPLEXER SYSTEM USING A TYPE 241

A Type 241 may be used to program either a small or a medium multiplexer system (up to 16 sampling heads). Sampling heads and vertical scale are programmed by a Type 241, by placing diodes in the proper locations on the Type 241 program cards. The resulting head selection data is transmitted from J303 of the Type 241 to J1 of the Type 286 or J521 of the Type 287.

Fig. 3-3 shows a partial Type 241 test format and indicates the pairs of diode clips used to program a Type 286, a Type 287 and vertical scale. Note that the diode clips are labeled to correspond to the bits discussed under General Programming Information.

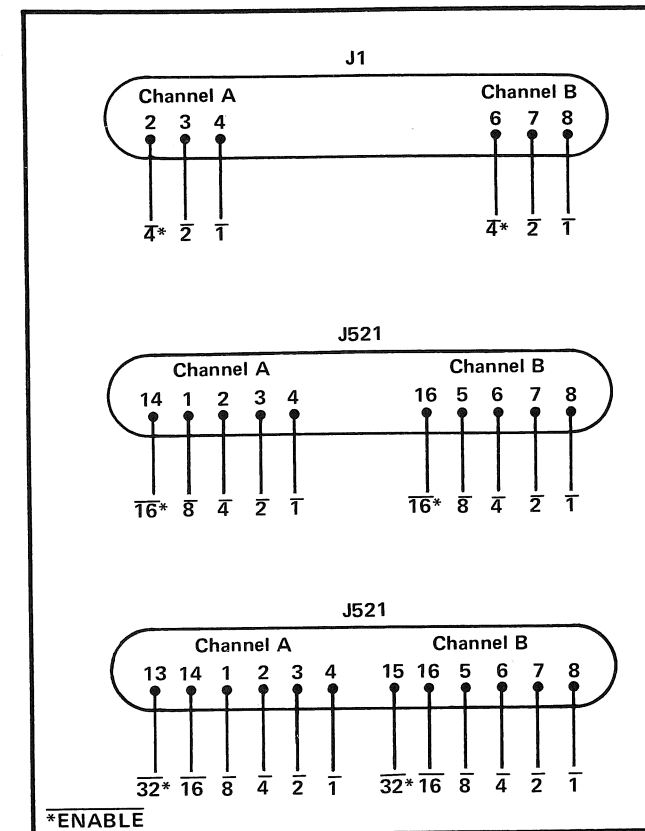


Fig. 3-2. Head selector data applied to program connectors: (A) J1 of the Type 286; (B) J521 of the Type 287; and (C) J521 of the Type R288.

The vertical scale of the sampling unit is partially dependent on the types of sampling heads installed in the multiplexer system. Units of Volts or Amps and multipliers of X0.1, X1 and X10 are possible depending on which sampling heads are switched into the sampling unit. Normally, the vertical scale of the Type 230 should coincide with the vertical scale of the sampling unit. When a vertical scale other than volts and X1 occurs due to the sampling head choice, therefore, the Type 230 must be programmed to coincide with the new vertical scale.

Vertical scale programming is available through the Type 287 or the Type R288. Fig. 3-2 shows the pins on J521 of both the Type 287 and Type R288 which are used to program vertical scale. Table 3-2 indicates the logic levels necessary on these pins to obtain the desired vertical scale. If no vertical scale is programmed, the vertical scale will be volts and X1, which is normal for most sampling heads. The vertical scale is the same for both channels of the sampling unit.

Vertical scale programming through the multiplexer system is not useful when the Type 230 is in the EXT SCALE mode.

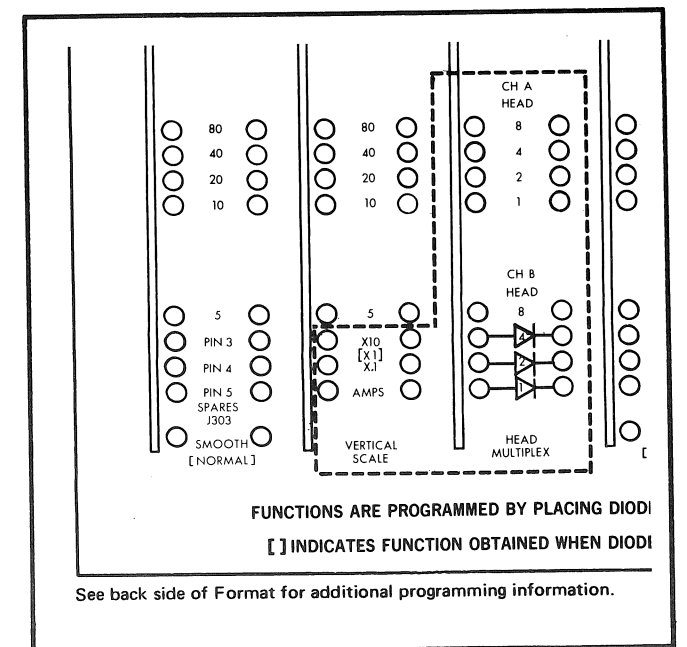


Fig. 3-3. Partial Type 241 Test Format.

Each pair of diode clips programs one bit of head selection data for the Type 287 and/or Type 286. If a pair of clips is left open, the bit will be high. If a diode is inserted between a pair of clips, the bit will be low. A Type 287 and/or a Type 286 can be programmed by placing diodes between diode clips according to Tables 3-1 and 3-2. An alternative to Table 3-1 is to place diodes between pairs of diode clips whose associated numbers add up to the number of the chosen sampling head.

For example, assume that sampling head 7 is to be connected to channel B of the sampling unit. Diodes should be placed between pairs of diode clips labeled 4, 2 and 1 (4 + 2 + 1 = 7) for the group of diode clips labeled channel B. In placing diodes on a program card, the anodes of the diodes should be to the left of the card as viewed from the top. See the Type 241 instruction manual for complete information about inserting and removing diodes on program cards.

If a small multiplexer system is being programmed, pairs of diode clips labeled 8 can be disregarded. Diodes should be installed between pairs of diode clips labeled 4 to enable the Type 286 head selector circuits³. If a medium multiplexer system is being programmed, enable bits $\overline{A16}$ and $\overline{B16}$ are grounded through the program cable (Tektronix Part No. 012-0176-00).

PROGRAMMING A MULTIPLEXER SYSTEM USING A TYPE 240

A Type 240 may be used to program either a small or a medium multiplexer system. Sampling heads and vertical scale are programmed by the Type 240, by storing the proper numbers in the Type 240 for the characters used to program the Type 287 and/or Type 286. The resulting head selection data is transmitted from J238 of the Type 240 to J1 of the Type 286 or J521 of the Type 287.

Fig. 3-4 shows a partial Type 240 Test Format and indicates the bits and characters used to program a multiplexer system. Note that the bits are labeled to correspond to the bits discussed under General Programming Information.

To program a sampling head, store the sampling head number in the character associated with the sampling unit channel the head is to be connected to. For example, if sampling head 8 is to be connected to channel A, store an 8 in character 45.

³An alternate method of enabling the Type 286 head selector circuits is given in Section 2 under Preparation of Tektronix Programmers.

If a small multiplexer system is being programmed, always add 4 to the number stored in each character.³ For example, if sampling head 2 is to be programmed for operation by channel A, store a 6 (2 + 4) in character 45. Adding 4 to the number stored enables the transistor logic circuits in the Type 286. If a medium multiplexer system is being programmed by the Type 240, the $\overline{A16}$ and $\overline{B16}$ ENABLE bits are grounded through the cable connecting the Type 240 to the Type 287.

Vertical scale is programmed by adding the bit value (1, 2, 4 or 8) of each vertical scale bit chosen to the number stored in the bit's associated character. For example, to program units of amps, add 4 (the bit value of the AMPS bit) to the number stored in character 20. No programming is necessary to program VOLTS and X1.

PROGRAMMING A MULTIPLEXER SYSTEM USING A TYPE R250

A Type R250 is normally used to program a large multiplexer system. It may also be used, however, to program a medium or small multiplexer system if the Type 240 characters previously discussed are not available. Sampling heads and vertical scale are programmed by a Type R250 exactly as they are by a Type 240. The resulting logic data

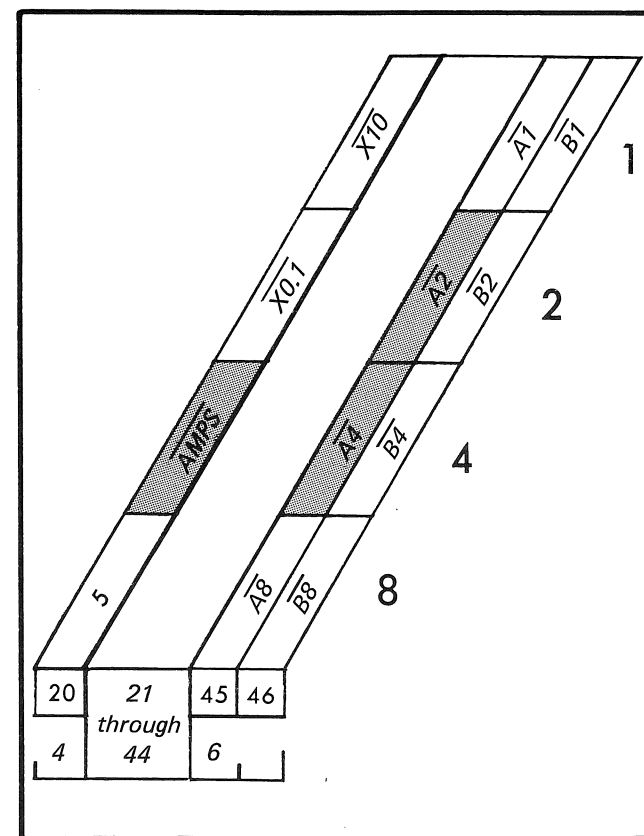


Fig. 3-4. Partial Type 240 Test Format.

is transmitted from J231 of the Type R250 to J1 of the Type 286, J521 of the Type 287 or J521 of the Type R288.

The Type R250 characters used to select sampling heads and vertical scale depend on where the Type R250 program assemblies are placed in the Type R250. See the discussion of Type R250 program assembly preparation under Preparation of Tektronix Programmers in Section 2. For this discussion, assume that characters 49 through 52 are used to program the multiplexer system. Fig. 3-5 shows a partial Type R250 Test Format and indicates how the bits of these characters are labeled.

The method of programming a medium or a small multiplexer system is the same for a Type R250 as for a Type 240.

Use the following procedure to program a large multiplexer system:

1. Select bits from characters 49, 50 and 52 so that:
 - a. The letters (A or B) in the bit titles chosen for each sampling head coincide with the sampling unit channel the head is to be connected to.

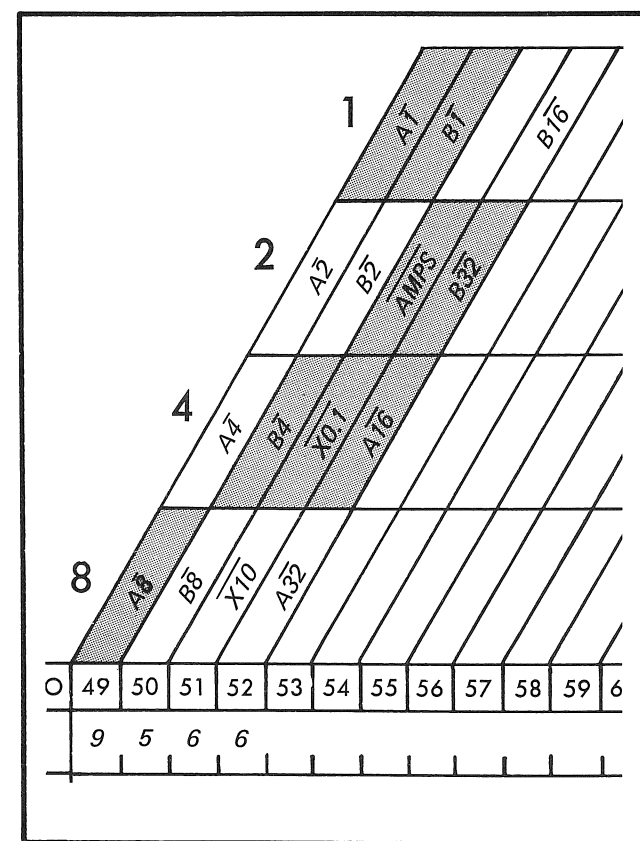


Fig. 3-5. Partial Type R250 Test Format.

b. The numbers (1, 2, 4, 8, 16 or 32) in the bit titles chosen for each sampling head add up to the head number.

2. Select bits from character 51 according to the desired vertical scale. (No bits are chosen to program volts or X1.)
3. Add the bit values (1, 2, 4 or 8) of the chosen bits for each character. The bit values are indicated on both sides of the Type R250 test format. (Note that for characters 49 and 50, the bit values are identical to the numbers in the bit titles.)
4. Store the resulting numbers from step 3 for each character.

For example, assume that sampling head 25 is to be connected to channel A, sampling head 37 to channel B and the vertical scale is to be amperes and X0.1. Bits $\overline{A8}$ and $\overline{A1}$ of character 49 should be selected (see Fig. 3-5); bits $\overline{B4}$ and $\overline{B1}$ of character 50; bits $\overline{X0.1}$ and AMPS of character 51; and bits $\overline{A16}$ and $\overline{B32}$ of character 52. The resulting numbers stored for each of these characters are: 9 for character 49, 5 for character 50, 6 for character 51 and 6 for character character 52.

CONTROLS, LIGHTS AND CONNECTORS

Type 286

Each Type 286 has four sampling head compartments. Each of these compartments has associated with it two screwdriver adjustments, two lights, a sampling head connector and a trigger connector. In addition, the Type 286 has two rear panel connectors. See Fig. 3-6.

- | | |
|----------------------------------|---|
| DLY Adjustment | Adjusts time position over range of at least 20 ns. |
| BAL Adjustment | Adjusts DC offset over range of at least 200 mV. |
| A Light | When on, indicates sampling head is connected to channel A of sampling unit. |
| B Light | When on, indicates sampling head is connected to channel B of sampling unit. |
| J50, J51, J52 and J53 Connectors | 12 pin connectors which provide sampling head with the strobe pulses, offset and feedback voltages and DC power. Transmits signal samples back to Type 286. |

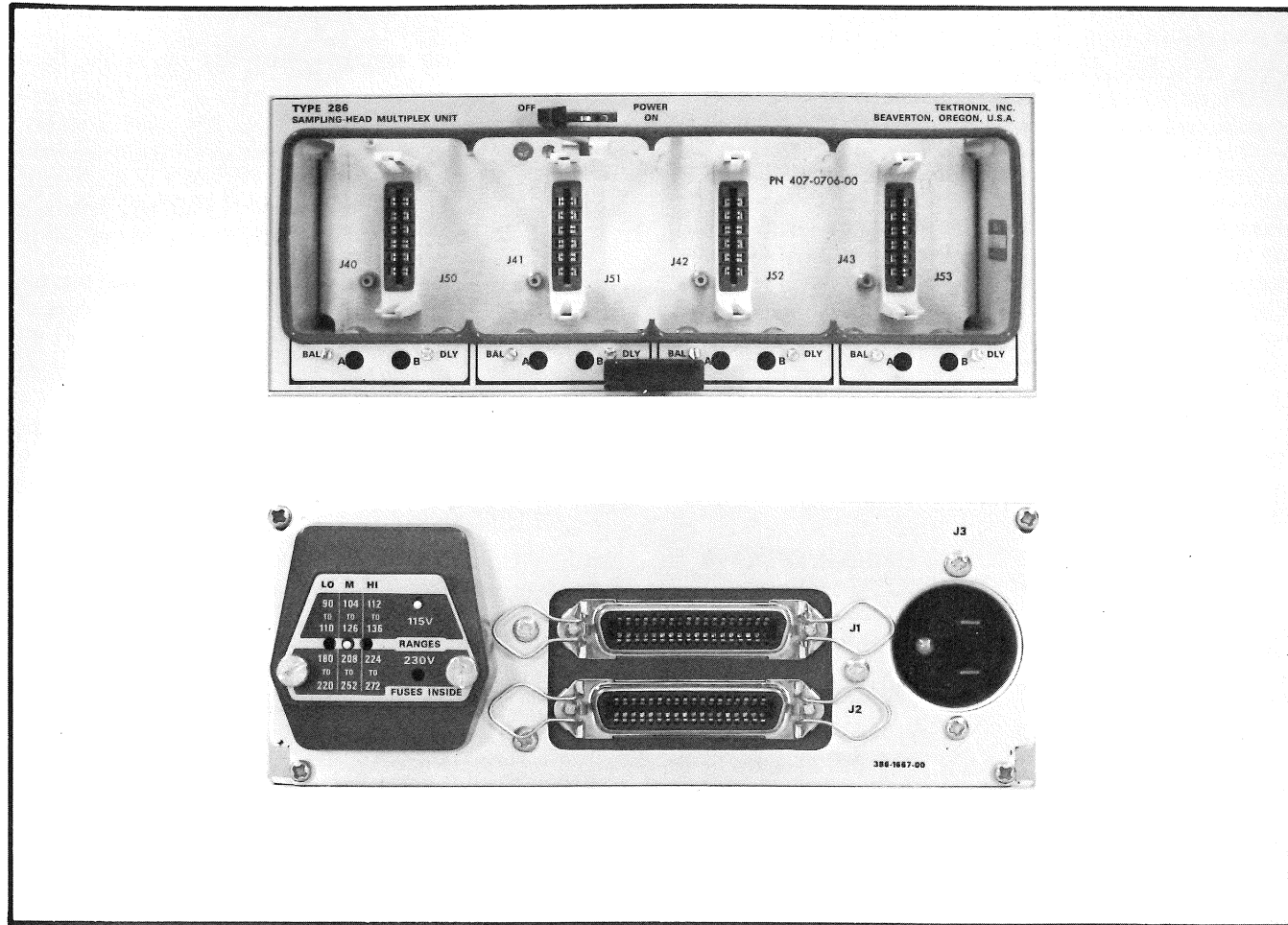


Fig. 3-6. Type 286 front and rear panels.

J40, J41, J42 and J43 Connectors

Trigger pickoff connectors. (Only the J50 connector can transmit a trigger pickoff signal. The other three connectors are terminated.)

J1 Connector

Receives programming data from Type 287, Type R288 or external programmer. Transmits sampling head data to Type 287 or Type R288.

J2 Connector

Receives strobe pulses, offset and feedback voltages and reference voltages from Type 287, Type R288 or Sampling Unit; transmits signal samples to Type 287, Type R288 or Sampling Unit.

J3 Connector

Power Input to Type 286.

Type 287 and Type R288

The Type 287 has no controls and no lights, but has 20 connectors. The Type R288 has no controls and no lights,

but has 26 connectors. The connectors on the Type R288 are identical to those on the Type 287 except for the additions of J522, J523, J524, J532, J533 and J534. See Figs. 3-7 and 3-8.

J10, J11, J12 and J13 Connectors

Provide programming data for Type 286's. Receive sampling head data from Type 286's.

J20, J21, J22 and J23 Connectors

Provide strobe pulses, offset and feedback voltages and reference voltages for Type 286. Receive signal samples from Type 286.

J31, J32, J33 and J34 Connectors

Power plug receptacles.

J510, J511, J512 and J513 Connectors

Provide chopper logic and power supplies for operation of chopper quads. J510 controls chopper quad to be used with Type 286-0; J511

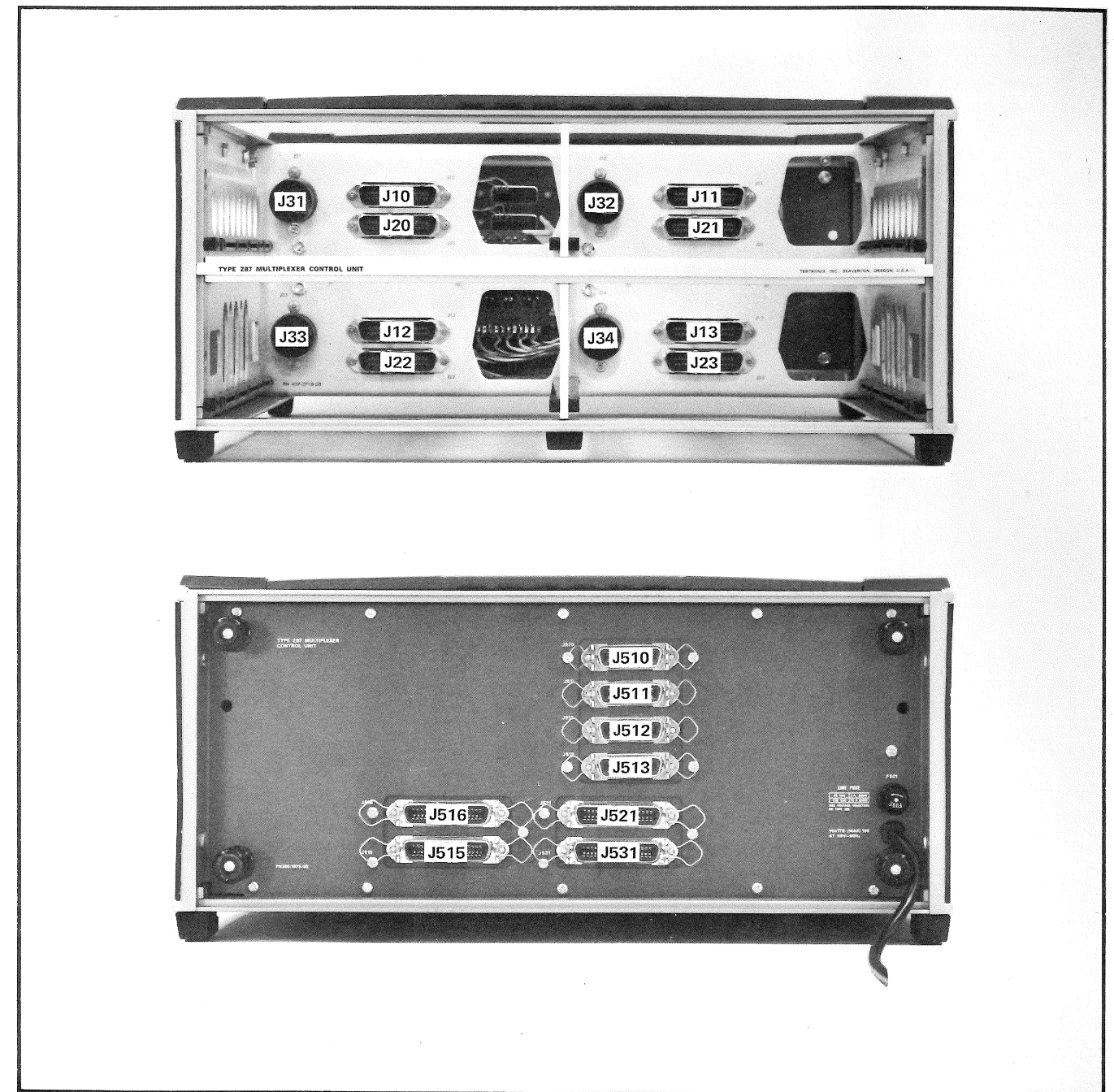


Fig. 3-7. Type 287 front and rear panels.

J515 Connector

controls chopper quad to be used with Type 286-1; J512 for Type 286-2; and J513 for Type 286-3.

J516 Connector

Receives chopper drive logic from Type 230, Type 241 or Type 240. Provides sampling head data from each of the Type 286's installed in the instrument.

J521 Connector

Receives programming data from external programmer or Type R288.

J531 Connector

Receives strobe pulses, offset and feedback voltage and reference voltages from the sampling unit or from the Type R288. Provides signal samples for Type R288 or sampling unit.

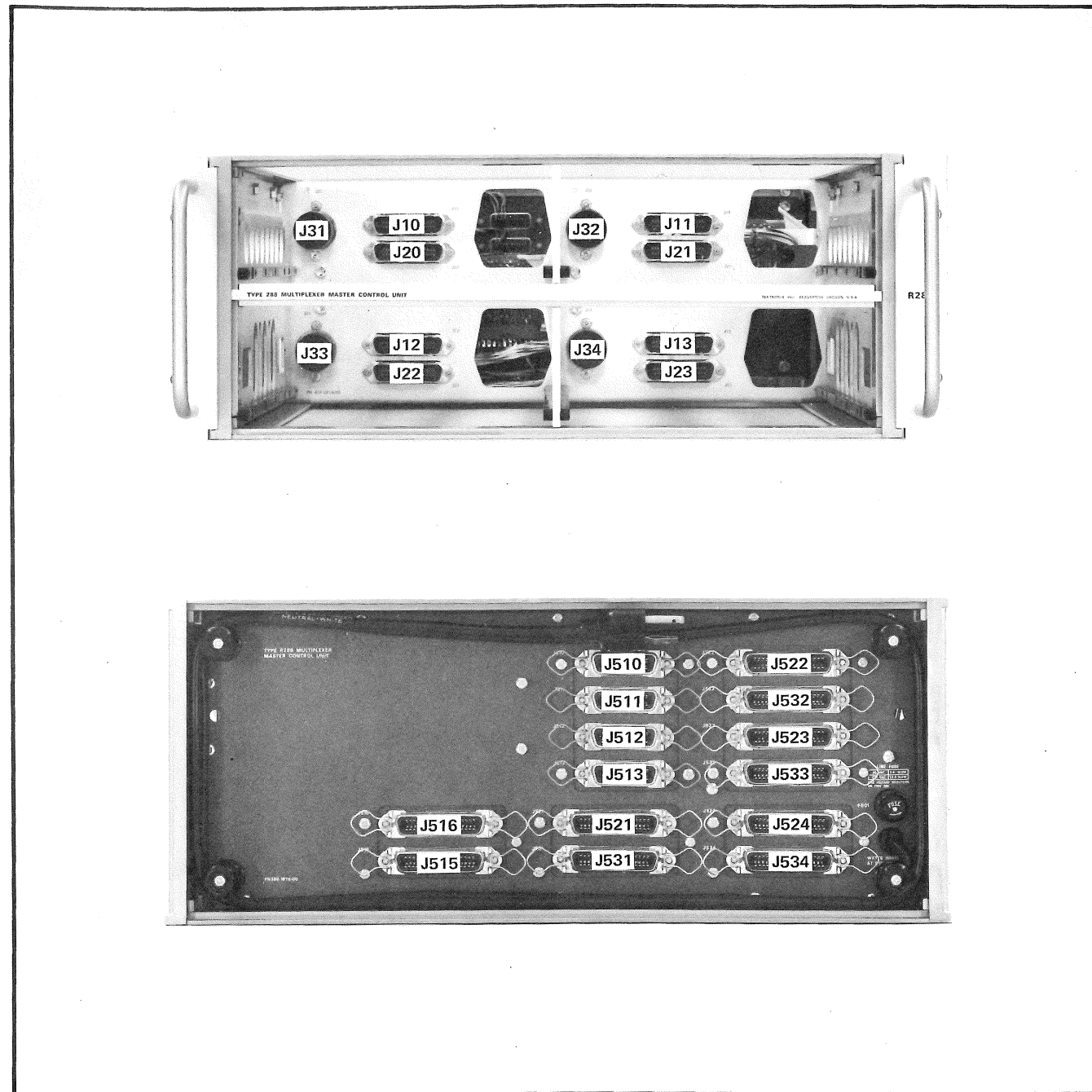


Fig. 3-8. Type R288 front and rear panels.

MISCELLANEOUS OPERATING INFORMATION

Operation of the Type S-50 and Type S-51

The Type S-50 Pulse Generator Head and the Type S-51 Trigger Countdown Head can be operated in a multiplexer system. These heads only require power to operate, so they operate whenever the Type 286 they are installed in is turned on. Programming the sampling head location of a Type S-50 or a Type S-51 has no effect on its operation.

Operating a Chopper Quad from a Type 230

When a chopper quad is connected to a Type 230 (through the special chopper adapter cable) two signal choppers are programmed at a time. When A CHOP is programmed, signal choppers 0 and 1 chop and when B CHOP is programmed signal choppers 2 and 3 chop. If neither A CHOP or B CHOP is programmed, each pair of signal choppers can be enabled by switching the On-Off switch on one of them to On. The On-Off switches have no effect when the chopper quads are connected to a Type 287 or a Type R288.

(CONNECTORS ON TYPE R288 ONLY)

J522 Connector	Provides programming data for Type 287-1.	J533 Connector	Provides strobe pulses, offset and feedback voltages and reference voltages for Type 287-2. Receives signal samples from Type 287-2.
J523 Connector	Provides programming data for Type 287-2.	J534 Connector	Provides strobe pulses, offset and feedback voltages and reference voltages for Type 287-3. Receives signal samples from Type 287-3.
J524 Connector	Provides programming data for Type 287-3.		
J532 Connector	Provides strobe pulses, offset and feedback voltages and reference		

NOTES

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SECTION 4 CIRCUIT DESCRIPTION

Change information, if any, affecting this section will be found at the rear of this manual.

INTRODUCTION

The following discussion contains an explanation of the electrical operation of the Type 286, Type 287 and Type R288 Sampling-Head Multiplexer System. It includes an overall description of the multiplexer system, and how it is made up of smaller systems. Also included are descriptions of the circuitry in the individual instruments (Type 286, Type 287 and Type R288). This section is divided into three parts.

The second part of this section describes the circuitry of the Type 286. This part is divided into a block diagram description and a circuit description.

The third part describes the circuitry of the Type 287 and Type R288. They are discussed together, because they have almost identical circuitry. This part includes a block diagram description and a circuit description of each instrument.

The first part covers the function of the multiplexer system, the data transmitted and processed, and the methods of data processing and transmission within the multiplexer system. Also included in this part is an overall block diagram description.

The information contained in Section 8 should be referred to while reading this section. Section 8 contains an overall system block diagram, circuit diagrams, interconnection tables, and cable diagrams. In addition, individual block diagrams or simplified schematics are given within this section for some of the circuits.

OVERALL SYSTEM EXPLANATION

SYSTEM DESCRIPTION

The sampling-head multiplexer system allows the signals from many test points to be applied to a two-input sampling unit without moving the test probes. This is done by attaching a test probe to each test point and switching the signals sensed by these probes into the sampling unit, two at a time. An external programming unit determines which signals will be connected to the sampling unit.

the system. A Type R288 contains the circuitry of one Type 287 and can control three more Type 287's.¹ A multiplexer system using a Type R288 is called a large multiplexer system and can operate up to 64 sampling heads.

DATA TRANSMITTED IN MULTIPLEXER SYSTEM

There are three classes of data transmitted in a multiplexer system: head selection data, signal data, and chopper drive data.

The multiplexer system is divided into three units: the Type 286, the Type 287 and the Type R288. The basic unit is the Type 286. Four sampling heads can be installed in a Type 286. A multiplexer system using only a Type 286 is called a small multiplexer system. Four Type 286's can be installed in one Type 287, which allows the operation of up to 16 sampling heads. A multiplexer system using one Type 287 is called a medium multiplexer system. If more sampling heads are desired, a Type R288 may be added to

Head selection data determines which sampling heads are switched into the sampling unit. It is digital information: a high state is a voltage between +5 volts and +15 volts and a low state is a voltage between 0 volt and +2 volts. There are two types of head selection data: programming data and sampling head data. Programming data is applied to the multiplexer system by the external programmer. It is received by the multiplexer system through connectors J521 on the Type R288, J521 on the Type 287 or J1 on

¹ For convenience of discussion, the Type 287 circuitry contained in a Type R288 will be considered separately from the Type R288.

the Type 286, depending on the size of the system. (See the Multiplexer System Block Diagram at the beginning of the Diagrams section.) Programming data is decoded by the multiplexer system head selector circuits and used to control the other circuits in the Type R288 and/or Type 287. Sampling head data consists of the outputs of the head selector circuits of the Type 286's. This data is used to control the other circuits of the Type 286's and directly determines which sampling heads will transmit signal samples to the sampling unit. The sampling head data is also transmitted back through J1 to a Type 287 or Type 288. In the Type 287 or Type R288, it is combined with the chopper drive data to control the signal choppers.

Signal data is applied to and received from the multiplexer system by the sampling unit. It is analog information, and consists of: strobe pulses which activate the sampling heads; feedback and offset voltages; signal samples which are transmitted from the sampling head to the sampling unit; and reference voltages for the Type 286 Power Supply Regulator circuits. Signal data is transmitted to and from the multiplexer system through connectors J531 on the Type R288, J531 on the Type 287 or J2 on the Type 286, depending on the size of the system.

Chopper drive data is applied to the multiplexer system by the Type 230, Type 240 or Type 241. This data consists of two chopper enable signals, A CHOP and B CHOP. These signals are combined with the sampling head data to enable the signal choppers in the signal chopper quads. Chopper drive data is applied to the multiplexer system through connectors J531 or J515 on the Type R288 on the Type 287.

DATA PROCESSING AND TRANSMISSION

Head Selection

Head Selector circuits decode programming data, producing sampling head data. Each head selector circuit, when enabled, can decode two bits of programming data, producing four enable bits. Each of these enable bits can then be used to enable another head selector circuit. The head selector circuits are connected together to form decoding trees (Fig. 4-1). There are two decoding trees in each multiplexer system, one for each sampling unit channel.

The head selector circuit in the first stage of the decoding tree decodes two bits of programming data. (The other four bits of programming data are transmitted to the second and third decoding stages.) The four resulting enable bits are transmitted to the four head selector circuits in the next stage of the decoding tree. (Only one of these enable bits will be low; therefore, only one of the head selector circuits in the second stage of the decoding tree will be enabled.) The enabled head selector circuit in the second stage then decodes two more bits of programming data,

producing four more enabled bits. These enabled bits are then applied to four head selector circuits in the third stage of the decoding tree, enabling one of the circuits. The enabled head selector circuit in the third stage then decodes the remaining two bits of logic data. It should be noted that the bits to be decoded by one stage of the decoding tree are applied to each head selector circuit in that stage. Only the enabled circuit in that stage, however, will decode that data.

The data resulting from the final state of decoding is called the sampling head data. It is this data that determines which sampling heads are enabled.

This decoding process is the same, regardless of the size of the multiplexer system. The number of decoding stages becomes greater, however, as a system is increased in size. A small system has one stage of decoding, a medium system has two stages and a large system has three stages.

Strobe Pulses

The strobe pulses from the sampling unit cause the sampling heads to take signal samples. The strobe pulse is essentially unaltered by the Type R288 and Type 287 (see Fig. 4-2). In these instruments it is transmitted through strobe dividers which distribute strobe pulses to all instruments in the multiplexer system. In the Type 286, the strobe pulse is delayed from 0 to 20 ns. The delay time is determined by the front panel DLY adjustment. The head selector circuits in the Type 286's determine which sampling heads receive strobe pulses.

Signal Preamps

The signal preamp circuits provide paths for the signal samples between the sampling heads and the sampling unit inputs (see Fig. 4-3). Since some losses in signal amplitude occur while the signal samples are being transmitted through the multiplexer system, the signal preamp circuits also provide enough gain to maintain the signal amplitude throughout the system.

In the Type 286's each sampling head has an associated signal preamp circuit. Each of these circuits has one input from the sampling head and two outputs, one to each sampling unit input. When a sampling head takes a signal sample, it is applied to the input of that sampling head's signal preamp circuit. A path is then provided to the signal preamp output which directs the signal sample to the desired sampling unit input.

The preamp circuits in the Type 287 and Type R288 are divided into channel A and channel B preamps. Each of these circuits takes the outputs from one of four preamps and transmits it through a single output.

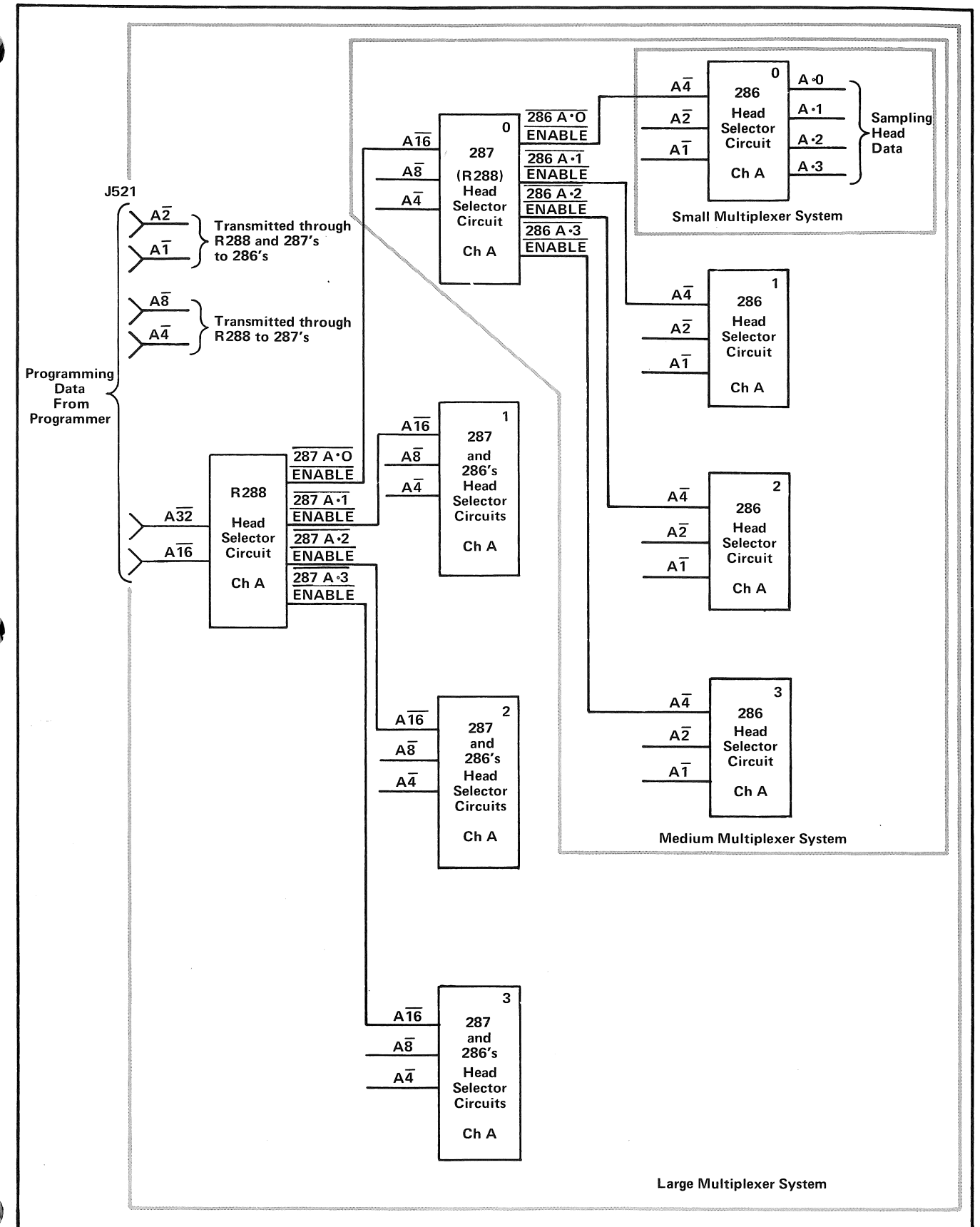


Fig. 4-1. Block Diagram of Multiplexer System Transistor Logic Circuits.

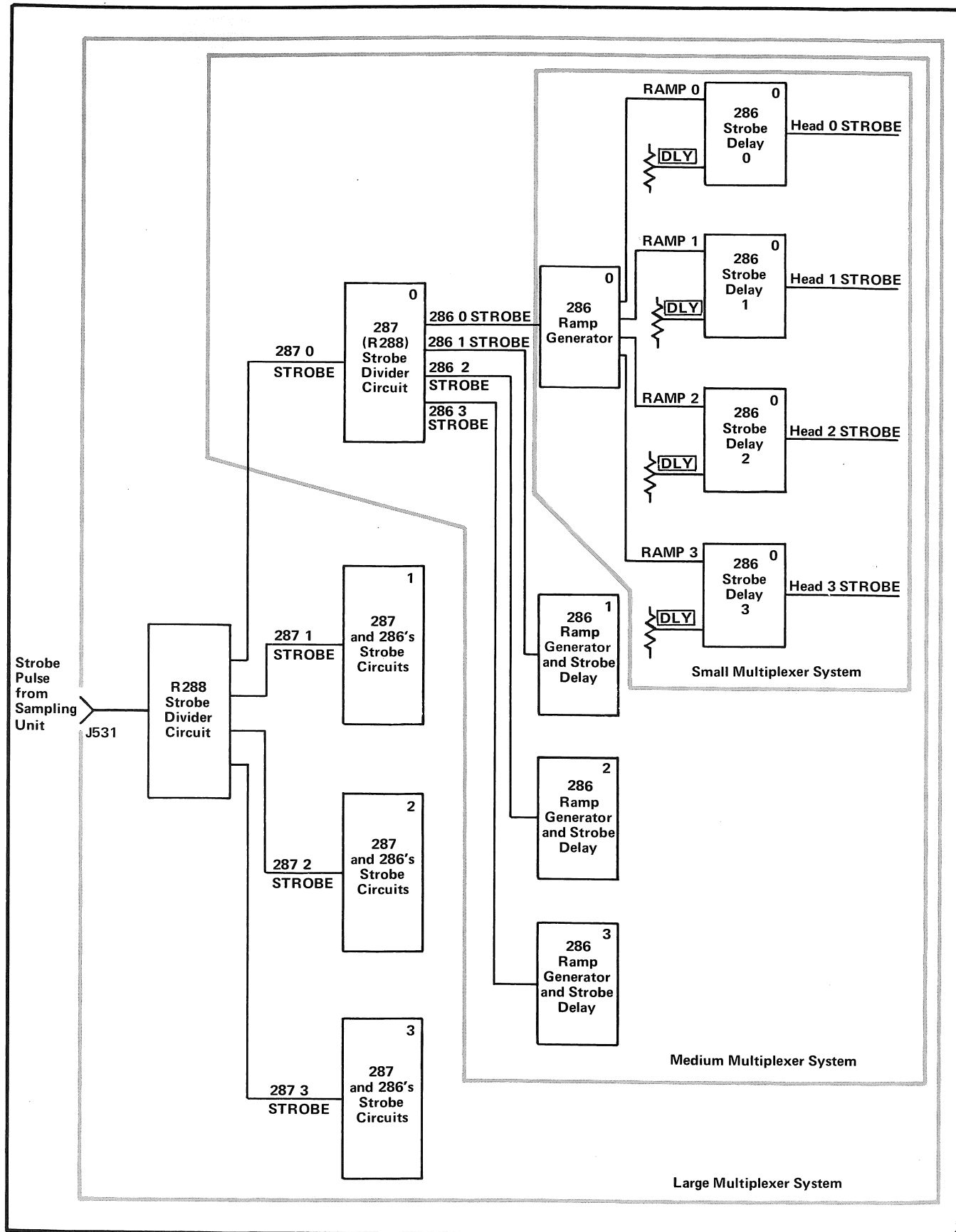


Fig. 4-2. Block Diagram of Multiplexer System Strobe Circuits.

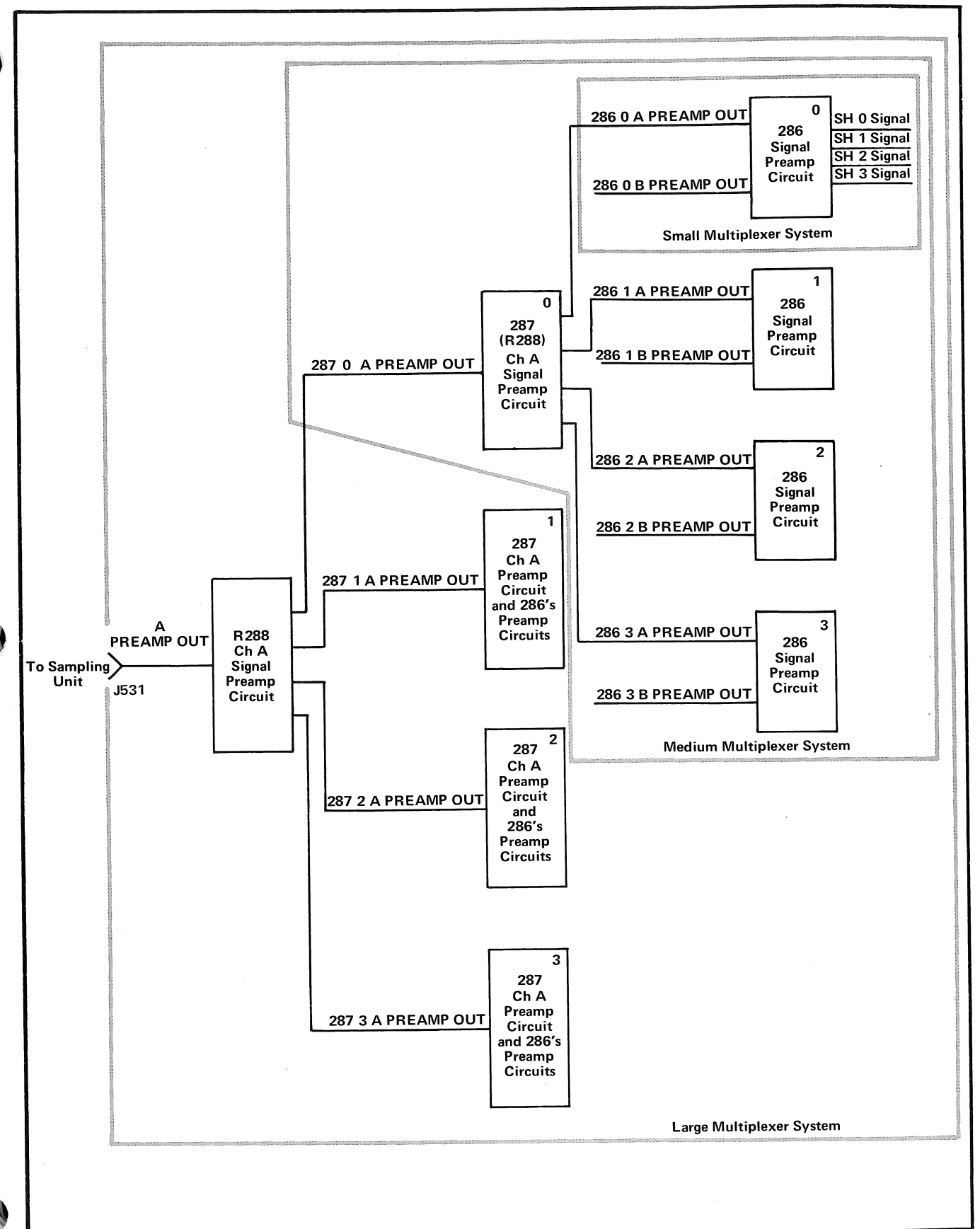


Fig. 4-3. Block Diagram of Multiplexer System Preamp Circuits.

All the preamp circuits in a multiplexer system are controlled by the outputs of the head selector circuits.

Offset and Feedback Switching

The offset and feedback switching circuits allow the offset and feedback voltages from the two sampling unit inputs to be applied to only the sampling heads which are taking signal samples (see Fig. 4-4). There is a group of offset and feedback switching circuits for each sampling unit input. The FET's in these circuits are operated by the head selector circuits. When an offset and feedback switching circuit is turned on, it provides a low impedance path for offset or feedback current from the sampling unit inputs to the sampling heads. When they are off, they provide a high impedance path. Only the Type 286's and Type R288 have offset and feedback switching circuits.

Signal Chopping

The Chopper Drive circuits are located in the Type 287's and the Type R288. Their use is optional. Their purpose is to turn on the signal choppers which are available for use with the Type S-1 sampling head probes. The chopper drive circuits decode the chopper drive data from the Type 230 and the sampling head data from the Type 286's. The resulting data enables the signal choppers connected to the sampling heads which are taking signal samples.

BLOCK DIAGRAM DESCRIPTION OF MULTIPLEXING SYSTEM

A complete multiplexing system (see the Complete Multiplexing System Block Diagram in the Diagrams Section) consists of one Type R288, three Type 287's, sixteen Type 286's and 64 sampling heads.

TYPE 286

BLOCK DIAGRAM DESCRIPTION

The Type 286 receives programming data through its J1 connector (see Fig. 4-5). This data may originate either from a Type 287 (or 287 part of a Type R288) or an external programming unit. The Type 286 head selector circuits when enabled (by the A4 ENABLE and/or the B4 ENABLE bits) decode A₂, A₁, B₂ and B₁ producing eight sampling head data bits (A·0, A·1, A·2, A·3, B·0, B·1, B·2, and B·3). These eight bits of decoded programming data are used to control the other circuits in the Type 286. The sampling head data is also transmitted back to the Type 287.

The strobe pulse which causes the sampling head to take a sample is a reshaped strobe driver pulse coming from the sampling unit either directly or through a Type R288 and/

The Type R288 receives programming data from an external programmer at connector J521, signal data from the sampling unit at connector J531, and chopper drive data from the Type 230 at connector J515 (chopper drive data can also be applied to the system through J521). This data is processed and distributed to the Type 287's. The programming and chopper drive data is transmitted through connectors J522, J523 and J524, and the signal data is transmitted through connectors J532, J533 and J534. Data is transmitted internally to the Type 287 circuitry contained in the Type R288.

The Type 287's receive programming data and signal data through connectors J521 and J531, respectively. Chopper drive data may be received either through connectors J521 or J515. The programming and signal data is processed by the Type 287's and distributed to the appropriate Type 286's. The logic data is transmitted through connectors J10, J11, J12 and J13, and the signal data is transmitted through connectors J20, J21, J22 and J23.

The Type 286's receive programming data and signal data through connectors J1 and J2, respectively (see Fig. 4-5). The programming data is decoded into sampling head data. The sampling head data causes strobe pulses to be applied to one or two sampling heads. The strobe pulses cause the sampling heads to take signal samples. These signal samples are then transmitted through the appropriate signal preamp circuits to the sampling unit or a Type 287.

In addition, the sampling head data is transmitted back through J1 to the Type 287 or Type R288, where it is applied along with chopper drive data to the chopper drive circuits. The sampling head data is also available for external use at the J516 connectors on the Type 287 and Type R288.

or Type 287. The sampling unit strobe driver pulse is processed by the Type 286 ramp generator and strobe delay circuits. In the ramp generator circuit, the strobe pulse is widened, changed to a ramp and transmitted to the strobe delay circuit. In the strobe delay circuit, the ramp is compared with a DC level (determined by the front-panel DLY adjustment). The result of this comparison is a delayed pulse (the delay range being 20 ns or more). This delay is used to compensate for sampling head delay difference. The delayed strobe pulse is transmitted to the sampling head where it triggers the strobe generator circuit, causing the sampling head to take a sample of the input signal. Only sampling heads that have been selected by the head selector circuits receive delayed strobe pulses, since the strobe delay circuit is controlled by the sampling head data.

Each sampling head installed in the Type 286 has a separate signal preamp circuit associated with it. Each signal

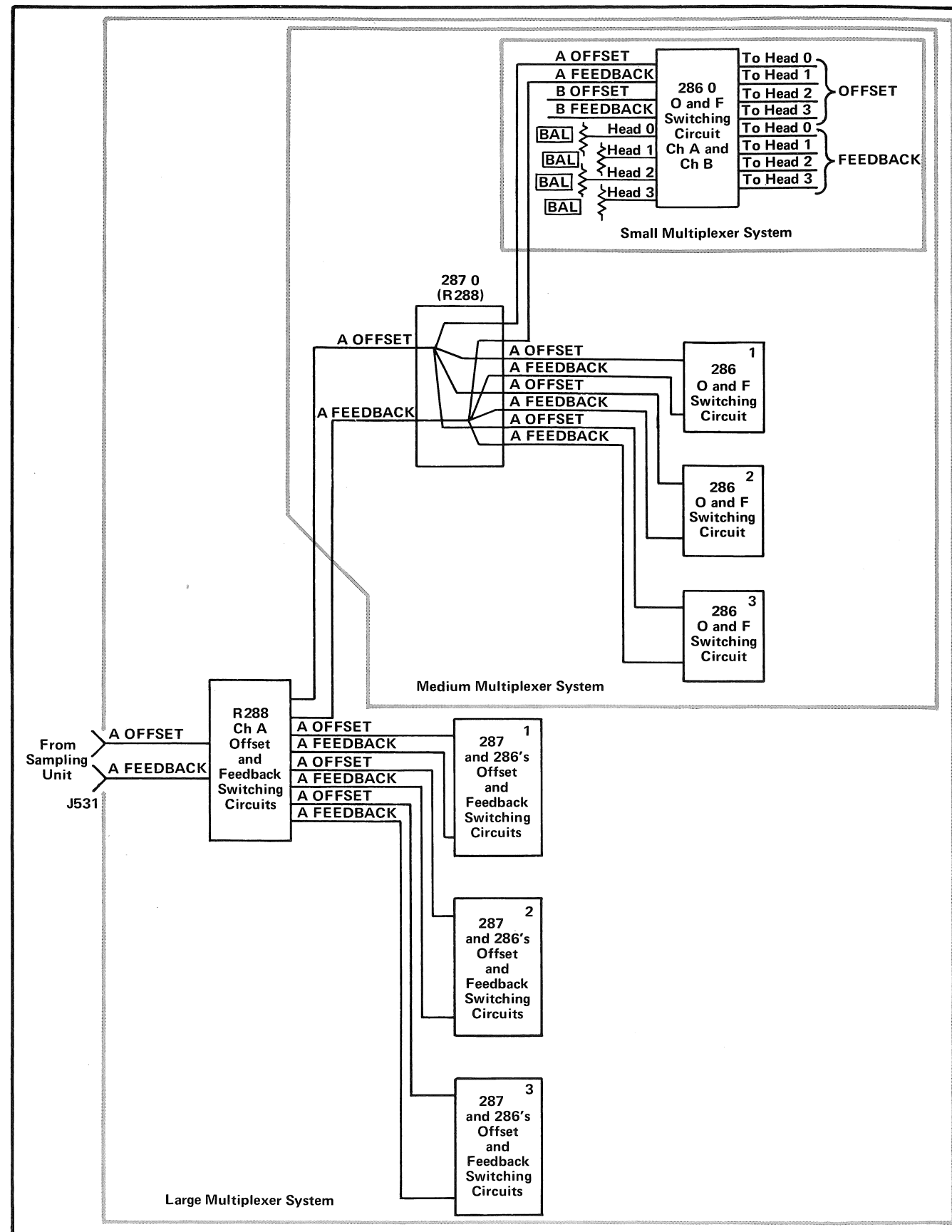


Fig. 4-4. Block Diagram of Multiplexer System FET Switching Circuits.

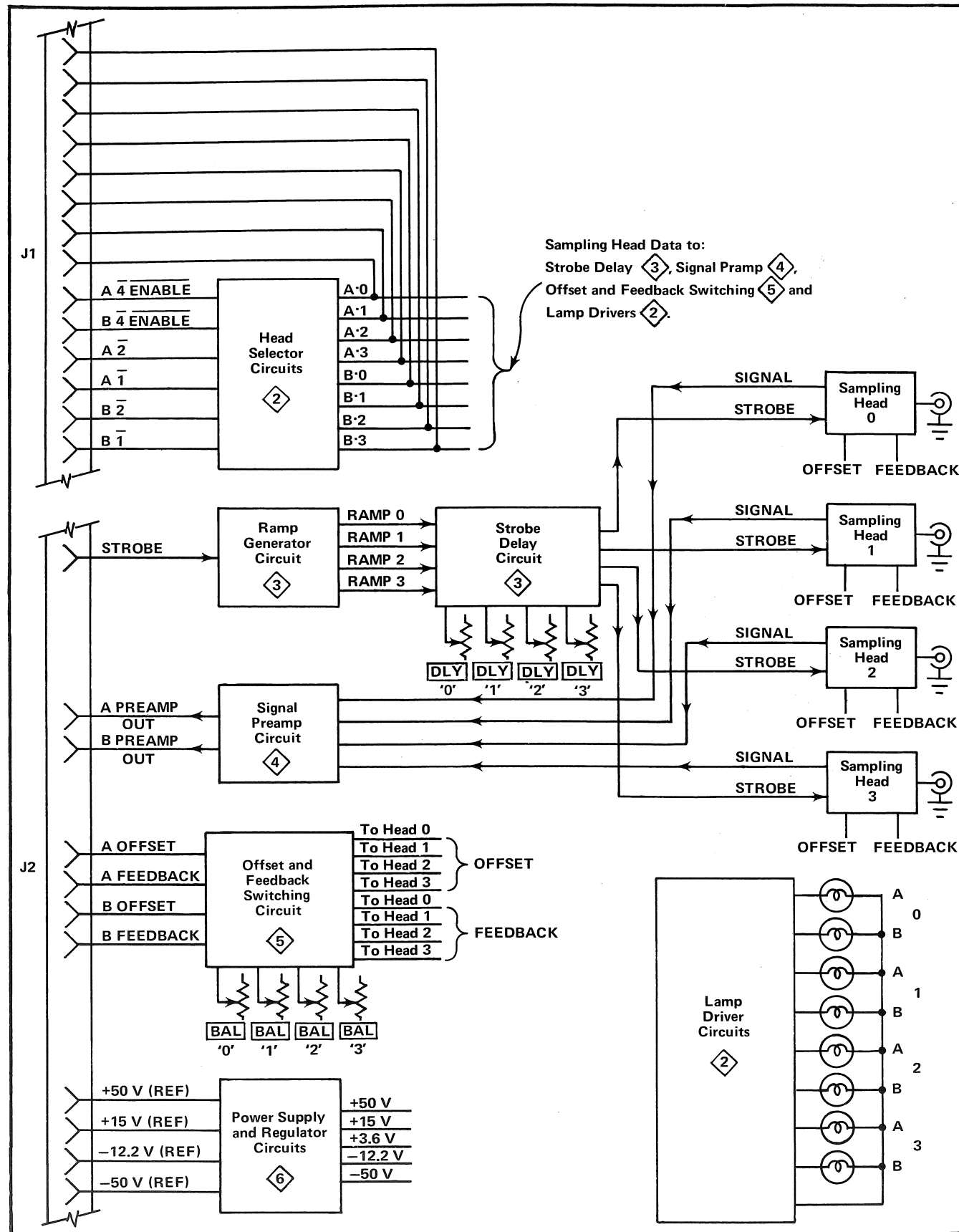


Fig. 4-5. Block Diagram of the Type 286.

preamp circuit is divided into an A channel and a B channel, corresponding with the A and B inputs of the sampling unit. Signal samples are received by those signal preamp circuits whose associated sampling heads are getting delayed strobe pulses. Whenever a signal sample is applied to a signal preamp circuit, it is transmitted through whichever channel has been turned on by the sampling head data. The output of a signal preamp circuit is applied to the sampling unit either directly or after being transmitted through Type 287 and Type R288 preamp circuits. The gain of each preamp circuit is one.

The offset and feedback switching circuits are low impedance switching circuits used to apply the offset and feedback voltages from the sampling unit to the selected sampling head. In addition, 200 mV of offset voltage may be added to the signal as determined by the front-panel BAL adjustment. A BAL adjustment is provided for each sampling head. The BAL adjustments are provided to ensure uniform trace positioning while switching from one head to another.

The lamp drivers supply current for the front panel indicator lamps. The lamps indicate which sampling heads are operating, and to which channel each head is connected.

The power supply regulator circuits provide the regulated DC voltages needed to operate the sampling heads, the circuitry in the Type 286 and some of the circuitry in the Type 287 and Type R288. Reference voltages for the voltage regulators are provided by the sampling unit.

TYPE 286 CIRCUIT DESCRIPTION

Head Selector Circuits

There are two identical head selector circuits, one causing one sampling head to be connected to channel A of the sampling unit, and the other causing another head to be connected to channel B (see the Type 286 Head Selector and Lamp Driver Circuits diagram). Programming data is applied to the head selector circuits through six lines in the form of lows and highs.² Two of these lines, A4 ENABLE and B4 ENABLE are used to enable the two head selector circuits. The other four lines A2, A1, B2 and B1 are decoded by the head selector circuits.

A head selector circuit is enabled whenever a low is applied to its associated enable line. For example, if pin P is held low, enabling transistor Q344 is turned on, enabling the channel A head selector circuit.³

² A low is a voltage level between 0 V and +2 V, and a high is a voltage level between +5 V and +15 V. The block diagrams and schematics are drawn in positive logic (true state is the high voltage level).

³ When only one Type 286 is being used, pins P and E of P80 should always be held low.

When the channel A head selector circuit is enabled, pins N and M determine the logic levels at pins U, R, T and S. For example, if sampling head 2 is to be connected to channel A of the sampling unit, a high must occur on pin T and lows on pins U, R and S. A high can be obtained on pin T by applying a low on pin N and a high on pin M (see Table 4-1). The low at pin N reverse biases the emitter-base junction of Q346, turning it off and allowing Q348 to conduct. The current conducted by Q348 turns on Q350, raising the emitter voltages of Q364 and Q366. The high at pin M causes Q356 to turn on, which pulls down on the base voltage of Q364, turning it on. With Q364 on, its collector voltage is raised, producing a high at pin T. Sampling head 2 is thus selected for operation. Under the same conditions, pins U and R are low because Q360 and Q362 are held off by Q352. Pin S is low because Q366 is held off by Q358.

The channel B head selector circuit operates the same as the channel A circuit; however, the signal sampled by the sampling head is applied to the channel B input rather than the channel A input of the sampling unit. If the same sampling head is chosen for use by both the channel A and channel B sampling unit inputs, no useful signal display will be obtained. In this case, the instrument will not be damaged.

TABLE 4-1

Truth Table for Transistor Logic Circuits

Inputs		Outputs A (or B)			
A2 (or B2)	A1 (or B1)	0	1	2	3
H	H	H	L	L	L
H	L	L	H	L	L
L	H	L	L	H	L
L	L	L	L	L	H

Ramp Generator

The ramp generator circuit reshapes the strobe driver pulse which it receives from the sampling unit (or Type 287). The strobe driver pulse is not of sufficient width to allow 20 ns of delay comparison by the strobe delay circuit. The ramp generator circuit, therefore, stretches the strobe driver pulse and integrates it into a well-defined ramp to be used by the strobe delay circuit.

The strobe driver pulse is inverted by T180 and applied to the bases of ramp generator transistors Q184, Q186, Q188 and Q190 (see the Type 286 Ramp generator and Strobe Delay Circuits diagram). This positive-going pulse turns on the transistors, driving them into saturation. The transistors will remain in saturation until the input pulse

falls and the stored charge in their bases is removed. The time required to remove the stored charge from the bases causes a stretching of the strobe pulse.

Each negative-going stretched strobe pulse is integrated by a 1 k Ω resistor (R184, R186, R188 and R190) and an associated shunt capacitor (C209, C229, C249 and C269) into a ramp. The values of the shunt capacitors are selected so that the ramps all have the same slope. These capacitance values vary from network to network, since the cables coupling the stretched strobe pulses from the ramp generator circuit to the strobe delay circuit are of different lengths. The cable capacitance shunts the integrator capacitors.

Strobe Delay

The strobe delay circuit receives four ramps from the ramp generator circuit and transforms one or two of the ramps into delayed strobe pulses which are applied to their associated sampling heads. The sampling head data determines which ramps are transformed into delayed strobe pulses.

Using sampling head 0 as an example, RAMP 0 coming from integrating network R184-C209 is applied to the cathode of diode CR209 of the strobe delay circuit. This ramp is compared to the DC voltage level on the anode of CR209 which is set by the DLY (delay) control, R200, on the Type 286 front panel. When the ramp voltage is 0.6 volt below the voltage on the anode of CR209, CR209 is forward biased and the voltage at the base of Q212 is pulled down rapidly, turning on Q212 and drawing current from C211. The resulting Q212 collector current causes CR216 to become reverse biased and Q216 to turn on. Q216 further turns on Q212 due to regenerative feedback through C216. The resulting negative-going pulse at the collector of Q216 is coupled through C218 and R218 as the delayed STROBE 0 and is applied to sampling head 0. The delay of this pulse is variable from about zero to at least 20 ns as determined by the voltage at the anode of CR209. This voltage determines how far negative RAMP 0 must go before CR209 is forward biased and turns on Q212.

RAMP 0 can only be coupled through to the base of Q212 if sampling head 0 has been chosen for operation by the sampling head data. When a low is applied to pin K and pin 9 of the Strobe Delay Comparator Card, diode CR208 is forward biased and the base of Q212 is held at a voltage more negative than the most negative excursion of the ramp. The ramp, therefore, can never forward-bias CR209. With the ramp blocked by CR209, C211 has DC voltages on both its leads and cannot supply the current needed to turn on Q216. When a high is applied to either pin K or pin 9, CR208 is reverse biased and the base voltage of Q212 is determined by the setting of R200. RAMP 0 now can forward bias CR209 and cause a delayed strobe pulse 0 to be generated at strobe delay output 0.

Signal Preamp

The signal preamp circuits perform two functions. They provide isolated signal paths through the Type 286 between the sampling head and the chosen sampling unit input. They also provide amplification of the signal to compensate for signal losses resulting from the transmission of signals through the Type 286.

Since the amplifier and logic circuits for each head are essentially the same, only signal preamp circuit 0 is discussed in this description.

Signal preamp circuit 0 consists of two inhibitor transistors, Q106 and Q116, and two common base amplifiers, Q108 and Q118 (see the Type 286 Signal Preamp Circuits diagram). Signals from sampling head 0 are applied to signal preamp circuit 0 through pin 20 of P60. A signal may be transmitted either through Q108 to the channel A sampling unit input or through Q118 to the channel B sampling unit input, depending on the logic levels at pin Y and pin J of P60. These logic levels are provided by the sampling head data. Assume a low on pin J of P60 and a high on pin Y, indicating that sampling head 0 has been chosen to be connected to the channel A input of the sampling unit. With pin J held low, Q116 is turned off, permitting current conducted by R117 to reverse bias CR118 and the base-emitter junction of Q118. With Q118 turned off, the signal path from sampling head 0 to the Sampling Unit channel B input is blocked. The high at pin Y turns on Q106, causing it to conduct current through CR108 and the base emitter junction of Q108, thus clamping the voltage at the junction of R106 and R107 to about -1.3 volts. When a signal from the sampling head is applied to pin 20 of P60, it is permitted to pass through C101 and CR108, is amplified by Q108 and coupled through C109 to pin 24 of P60. From pin 24, the signal is sent to channel A of the sampling unit, either directly or through the Type R288 and/or Type 287 signal preamp circuits.

Each individual preamp circuit provides a voltage gain of approximately one between the sampling head and the input to the sampling unit (or the input to the Type 287).

Offset and Feedback Switching

The offset and feedback voltages, which are applied to the sampling heads by the sampling unit, are normally applied to a load resistance of about 2 k Ω . If this offset and feedback were applied to all the sampling heads in the system simultaneously, the increase in load would cause incorrect offset and feedback voltages. Offset and feedback switching circuits have been provided so that the offset and feedback voltages from one channel are applied to only one sampling head at a time.

Offset and feedback switching is provided by FET's which furnish low impedance current paths to the sampling heads when turned on and high impedance current blocks when they are turned off (see Fig. 4-6). Each offset or feedback line coming from the sampling unit is applied to the drains of four FET's. The source of each of these FET's is connected to a sampling head and the gate of each is attached to a transistor logic circuit output.

For example, the channel A offset line is connected through pin 36 of P80 to the drains of Q300, Q304, Q308 and Q312. The source of Q300 is connected to sampling head 3, the source of Q304 to sampling head 2, of Q308 to sampling head 1 and of Q312 to sampling head 0. The gate of Q300 is connected to the A·3 head selector circuit output, of Q304 to A·2, of Q308 to A·1 and of Q312 to A·0. If sampling head 3 is to be connected to the channel A sampling unit input, a high from A·3 will be applied to the gate of Q300. This voltage will cause Q300 to turn on and provide a low impedance path to sampling head 3 for channel A offset current. The other three sets of FET's in this circuit operate in an identical fashion (see the Type 286 Offset and Feedback Switching diagram).

The BAL (balance) adjustments, R330, R332, R334 and R336, on the front panel of the Type 286 provide 200 mV of offset voltage to be added to the signal sample taken by each sampling head. This voltage allows separate adjustment of the vertical position of the CRT display for each sampling head.

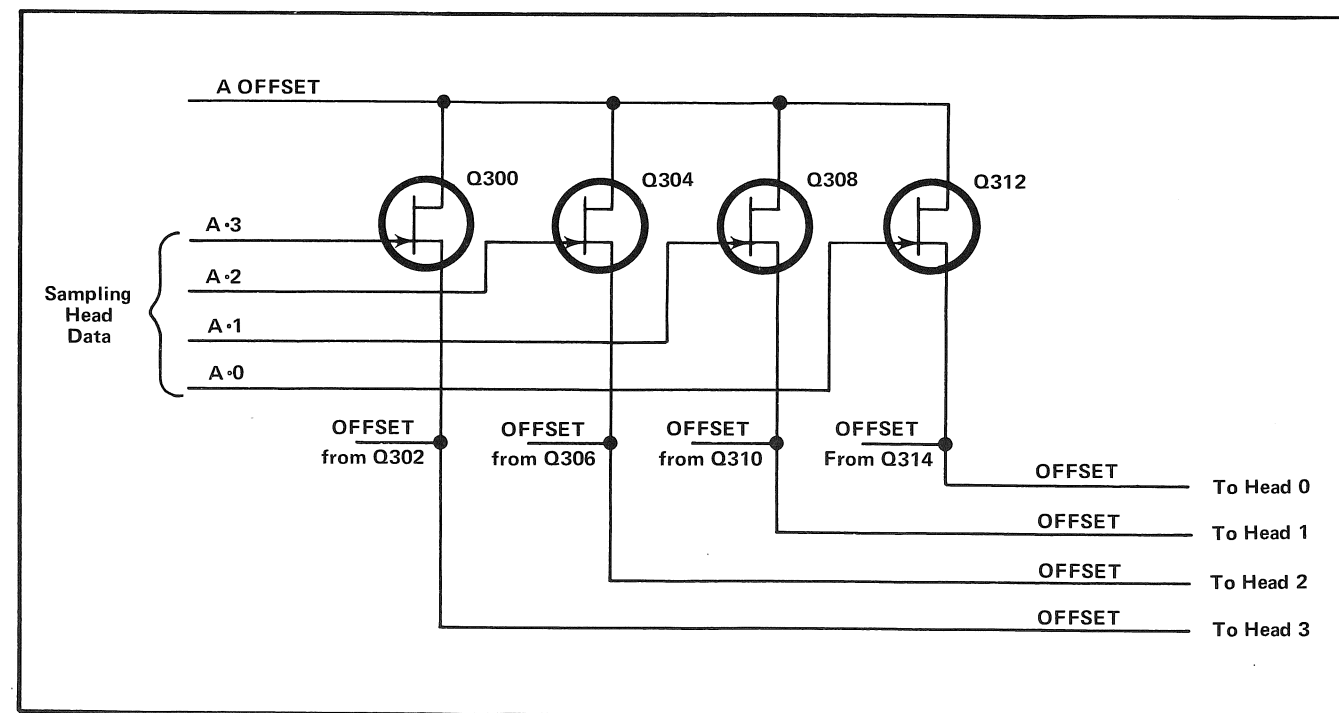


Fig. 4-6. Simplified Schematic of Type 286 Offset and Feedback Switching Circuit.

Diode clamps CR332, CR334, CR336 and CR338 are used to limit the negative voltage that can be applied to each of the feedback lines, either by the memory or by the BAL adjustments. These clamps prevent the source of an FET from being subjected to a negative voltage large enough to turn that FET on when there is a low level applied to its gate.

Power Supply and Regulator

The power supply and regulator circuits provide the necessary power to operate the sampling heads and all circuitry inside the Type 286. They also provide +3.6 V for the Type 287 and Type R288 circuitry.

Power Input

Power is applied to the primary of T3 (see the Type 286/287/R287/R288 Power Supply and Regulator Circuits diagram) through 115 V line fuse F3, POWER switch S3, Voltage Selector switch S5 and Range Selector switch S4. Voltage selector switch S5 connects the split primaries of T3 in parallel for 115-volt operation or in series for 230-volt operation. A second line fuse (F4) is connected into the circuit when the Voltage Selector switch is set to the 230-volt position, providing proper protection for 230-volt operation.

The inputs to the regulator circuit are the unregulated voltages from the power supply of the Type 286 and four reference voltages from the sampling unit.

+50-Volt and -50-Volt Supplies

Because the +50- and -50-volt supplies are identical except for polarity, only the +50-volt supply is discussed here.

The unregulated 50 volts from the power supply is applied to pin \bar{B} of J90. The +50 volts reference voltage from the sampling unit is applied to pin 25. The return for the supply is through series regulator Q412 (out pin 23). If the load current increases, the emitter voltage and collector current of Q404 decrease, causing the base voltage of Q410 to drop toward -50 volts. This decrease in base voltage causes Q410 to conduct harder, which increases the base current of Q412, causing it also to conduct harder. The increased conduction of Q412 supplies additional current to the supply and returns the supply voltage to the same voltage level as the reference voltage. Regulation of the -50-volt supply occurs in the same manner as previously described except that it is opposite in polarity.

Resistor-diode network R404-CR401-CR402-CR403-R403 provide protection for the +50-volt supply. If the sampling unit is turned off while the Type 286 remains on, CR401 and CR402 are reverse-biased and turn on Q404, thus protecting the Type 286 +50-volt supply. If the Type 286 is turned off while the sampling unit remains on, CR403 is reverse-biased, protecting the base-emitter junction of Q404 and disconnecting the loading effects of the regulator from the sampling unit +50-volt supply. CR401, CR402 and CR403 are temperature-compensated diodes. They aid in maintaining the proper output voltage despite temperature changes.

+15-Volt and -12.2 Volt Supplies

Only the +15-volt supply is discussed here, since the +15- and -12.2-volt supplies are essentially identical.

Differential comparator Q418 and Q420 compares the reference voltage from the sampling unit (pin K of P90) with the regulated output voltage (pins L, M and N). Any difference between the two voltages is amplified by the comparator and transmitted through Q422 to series regulator Q424. Q424 keeps the supply voltage equal to the reference voltage by increasing or decreasing conduction according to changes in supply load.

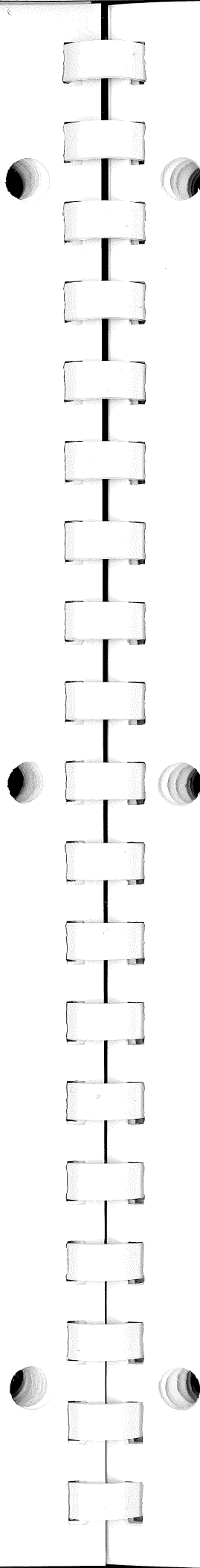
CR419 protects Q420 if the reference voltage is applied to the circuit when the Type 286 is turned off.

+3.6-Volt Supply

If more current is demanded by the +3.6-volt supply load, less current is available for the emitter-base junction of Q432, reducing its collector-emitter current. The reduced conduction of Q432 causes Q434 to reduce conduction, thus furnishing the additional current needed by the load on the +3.6 volt supply. If the +3.6 volt supply is shorted to ground or to another supply, the operational amplifier gives up nearly all its current. No damage results to this supply in the event of a shorted output condition. Also note that the +3.6-volt supply operates whenever the sampling unit is turned on; the supply is essentially independent of the Type 286 POWER switch.

Lamp Drivers

The lamp drivers and switching transistors used to furnish current to the Type 286 front-panel indicator lamps (see the Type 286 Head Selector and Lamp Driver circuits diagram). The lamp drivers are controlled by sampling head data; thus, when a particular sampling head is selected, the corresponding lamp driver and indicator lamp are both energized.

**TYPE R288 AND TYPE 287****TYPE 288 and TYPE 287
BLOCK DIAGRAM DESCRIPTION****General**

The Type R288 is very similar to the Type 287. The Type R288 merely provides an additional stage of data processing. To conserve space, the extra circuitry of the Type R288 has been included with the circuitry of a Type 287 in the same box. This combination instrument is called a Type R288. The Type 287 circuitry included in the Type R288 box will be covered in the discussion of the Type 287.

Type R288

The Type R288, excluding its 287 circuitry, provides one stage of data processing (see Fig. 4-7). Programming data from the external programmer is applied to the Type R288 through connector J521. Of these twelve bits of data four bits (A $\bar{3}$, A $\bar{1}$, B $\bar{3}$ and B $\bar{1}$) are decoded by the two Type R288 head selector circuits and the remaining eight bits are transmitted directly to the Type 287's and Type 286's.

Signal data from the sampling unit is applied to and received from the Type R288 through connector J531. Of this signal data, the strobe driver pulse is applied to the strobe divider in the Type R288. The strobe divider splits the strobe driver pulse into four strobe pulses that are distributed to the four Type 287's.

Each Type 287 signal preamp circuit output is connected to a Type R288 signal preamp circuit. Each Type R288 signal preamp circuit provides a signal path to a sampling unit input for signal samples applied to it from the Type 287's. These signal preamps also provide amplification to compensate for signal losses.

The offset and feedback voltages from the sampling unit are distributed to the Type 287's through two offset and feedback switching circuits. These circuits are controlled by the outputs of the Type R288 head selector circuits.

The vertical scale circuits allow the programming of the Type 230 units and decimal point placement (sampling unit Units/Div bits also control the decimal point).

Type 287

The Type 287 provides another stage of data processing. The circuits in the Type 287 (or the 287 circuitry which is a part of the Type R288) are almost identical to the Type R288 circuits previously discussed. The exceptions are that

the Type 287 does not have offset and feedback switching circuits and the Type R288 does not have chopper drive circuit (see Fig. 4-8).

The Type 287's receive programming data through their J521 connectors (or internally in the case of the 287 in the Type R288). This data may originate either from a Type R288 or an external programming device. Of the ten bits of programming data applied to a Type 287 (8 bits if the Type 287 head selector circuits are being enabled externally), six bits are decoded by the two Type 287 head selector circuits and the remaining four are transmitted directly to the Type 286's. Vertical scale circuits are contained in all the Type 287's except the one inside the Type R288.

Signal data is applied to and received by the Type 287's through their J531 connectors. As in the Type R288, the strobe pulse is divided into four strobe pulses by the strobe divider and applied to four Type 286's. Preamp circuits provide signal paths between the Type 286's and the Type R288 (or sampling unit). Since there are no offset and feedback switching circuits in the Type 287's, the offset and feedback voltages are applied directly to the Type 286's.

Chopper drive data is applied to the Type 287's through connector J515 or connector J521. This data plus the sampling head data from the Type 286's is used to control the chopper driver circuits.

TYPE R288 CIRCUIT DESCRIPTION**Head Selector Circuits**

The head selector circuits in the Type R288 are identical to those in the Type 286 (see the Type 287/R287/R288 Head Selector Circuits diagram). They are permanently enabled by grounds at pin P and E of P202. The head selector circuits decode the A $\bar{3}$, A $\bar{1}$, B $\bar{3}$ and B $\bar{1}$ bits of programming data. The resulting 8 bits of decoded programming data are used to enable the Type 287 head selector circuits as well as to control the other circuits in the Type R288. See the description of the Type 286 head selector circuits for an explanation of the Type R288 head selector circuits.

Strobe Divider

The strobe divider in the Type R288 is used to split the strobe driver pulse, received from the sampling unit, into four strobe pulses, one for each Type 287. It is made up of four common emitter amplifiers (see the Type 287/R287/R288 Strobe Distribution diagram). The strobe driver pulse from pin 17 of J102 is divided and applied through 100 Ω resistor to the bases of Q184, Q186, Q188 and Q190. The resulting strobe pulses at the emitters of

each of these transistors are applied to their respective Type 287's. Since each of these amplifiers is in an emitter follower configuration, the voltage gain of each is approximately one.

Signal Preamp Circuits

There is one signal preamp circuit per sampling unit input. The channel A signal preamp circuit is used as an example (see the Type 287/R287/R288 Signal Preamp Circuits diagram). A signal preamp circuit consists of four inhibitor transistors (Q106, Q116, Q126 and Q136) and four common-base amplifiers (Q108, Q118, Q128 and Q138). The inhibitor transistors operate identically to those in the Type 286 signal preamp circuits. For example, if Q106 is turned on, it forward biases its associated common-

base amplifier, Q108, thus allowing any signal applied to pin 4 of P102 to be transmitted through Q108 to the channel A sampling unit input. If Q106 is off, the voltage at the cathode of CR108 goes to +15 volts and reverse biases Q108, thus blocking any signal transmission through Q108. The inhibitor transistors are controlled by the outputs of the Type R288 head selector circuits applied to the channel A signal preamp circuit at pins D, F, K and N of P102.

Since only one signal should be applied to a sampling unit input at a time, the head selector circuits turn on only one inhibitor transistor per signal preamp circuit at a time. Keeping a common-base amplifier turned off except when a Type 287 signal is applied to it helps to eliminate cross talk

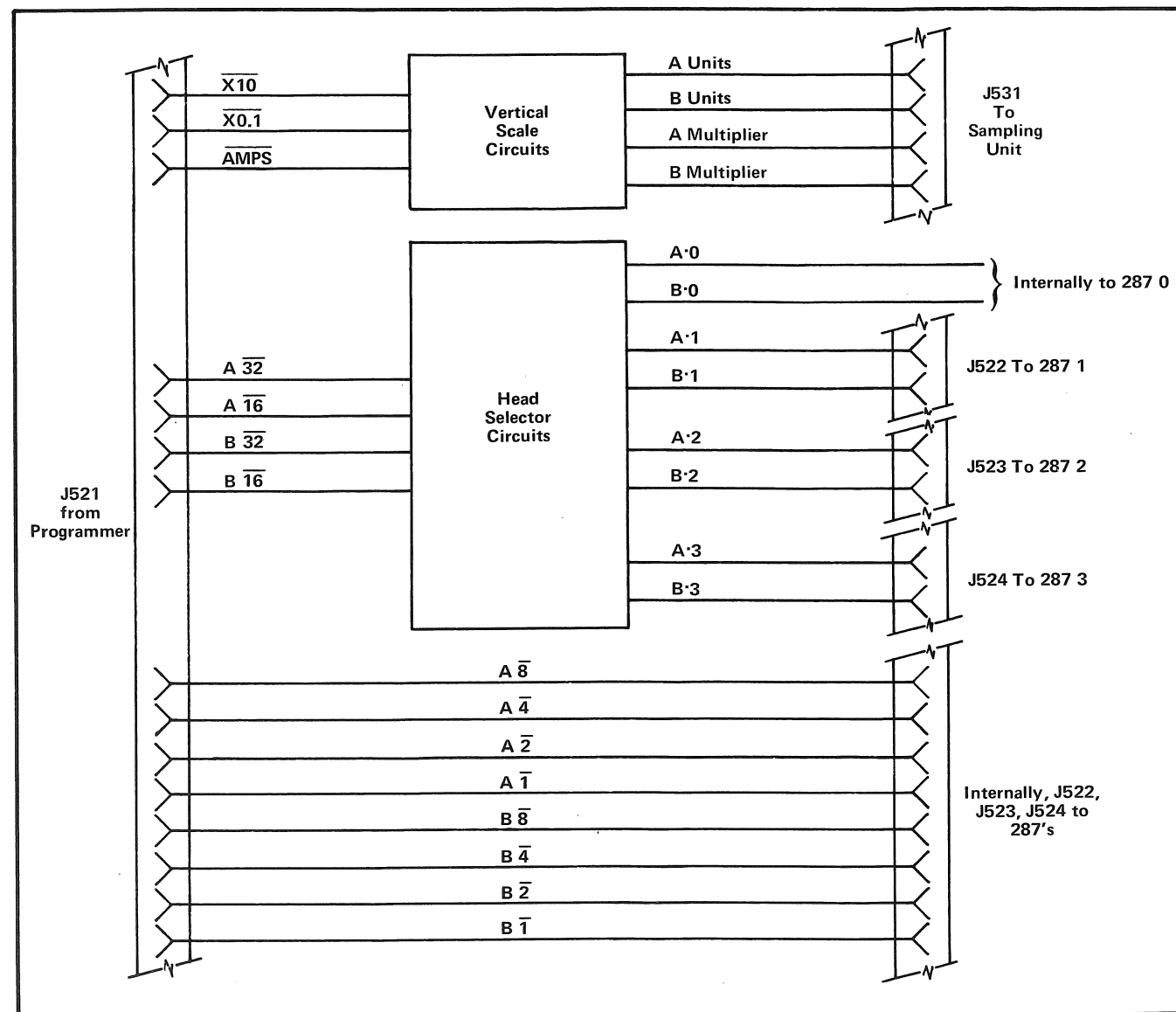


Fig. 4-7A. Block Diagram of flow of program data through Type R288.

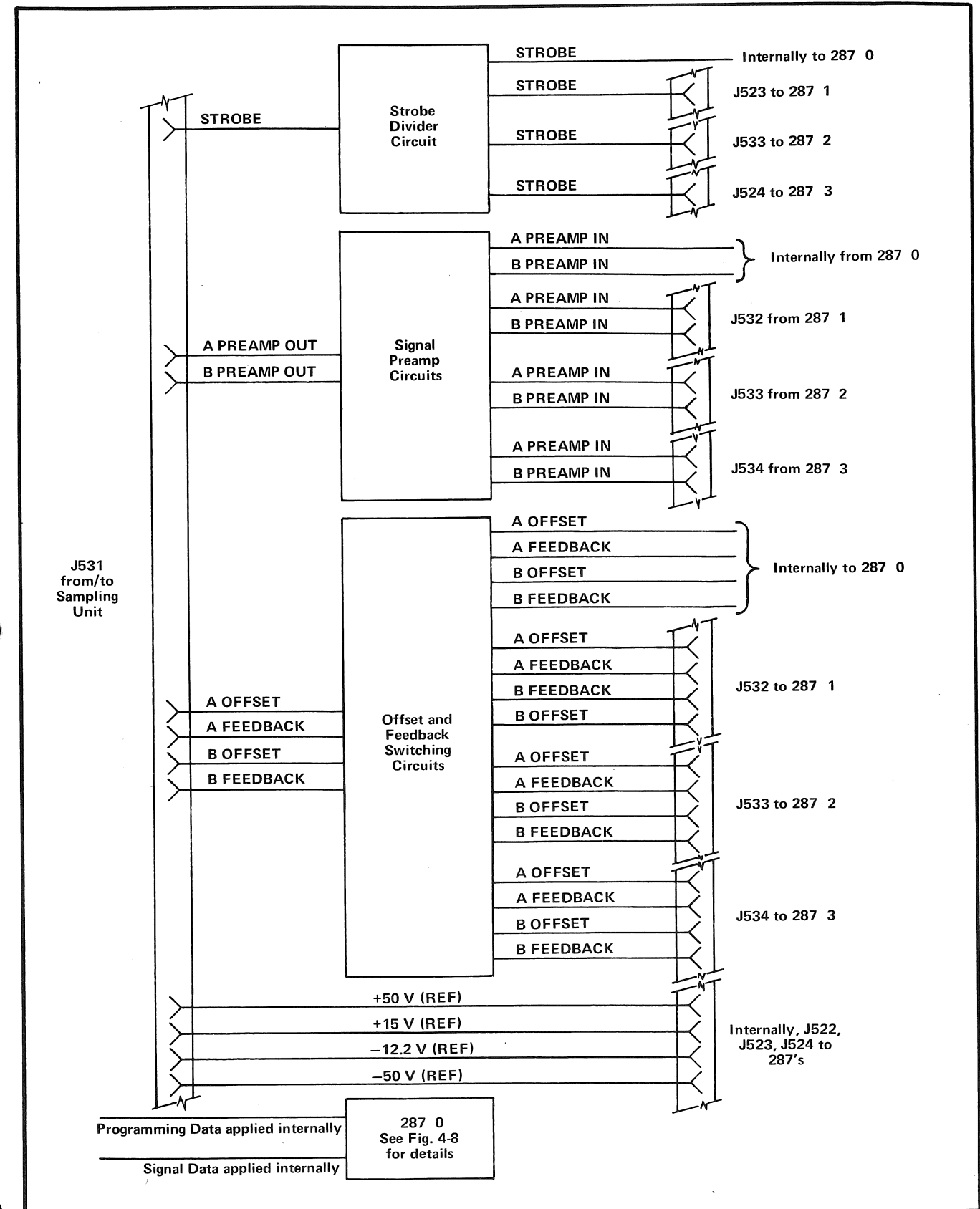


Fig. 4-7B. Block Diagram of flow of signal data through Type R288.

and unwanted feedback between channels. The Type R288 signal preamp circuits, like those in the Type 286, also provide enough voltage gain to compensate for any losses in signal amplitude due to signal transmission.

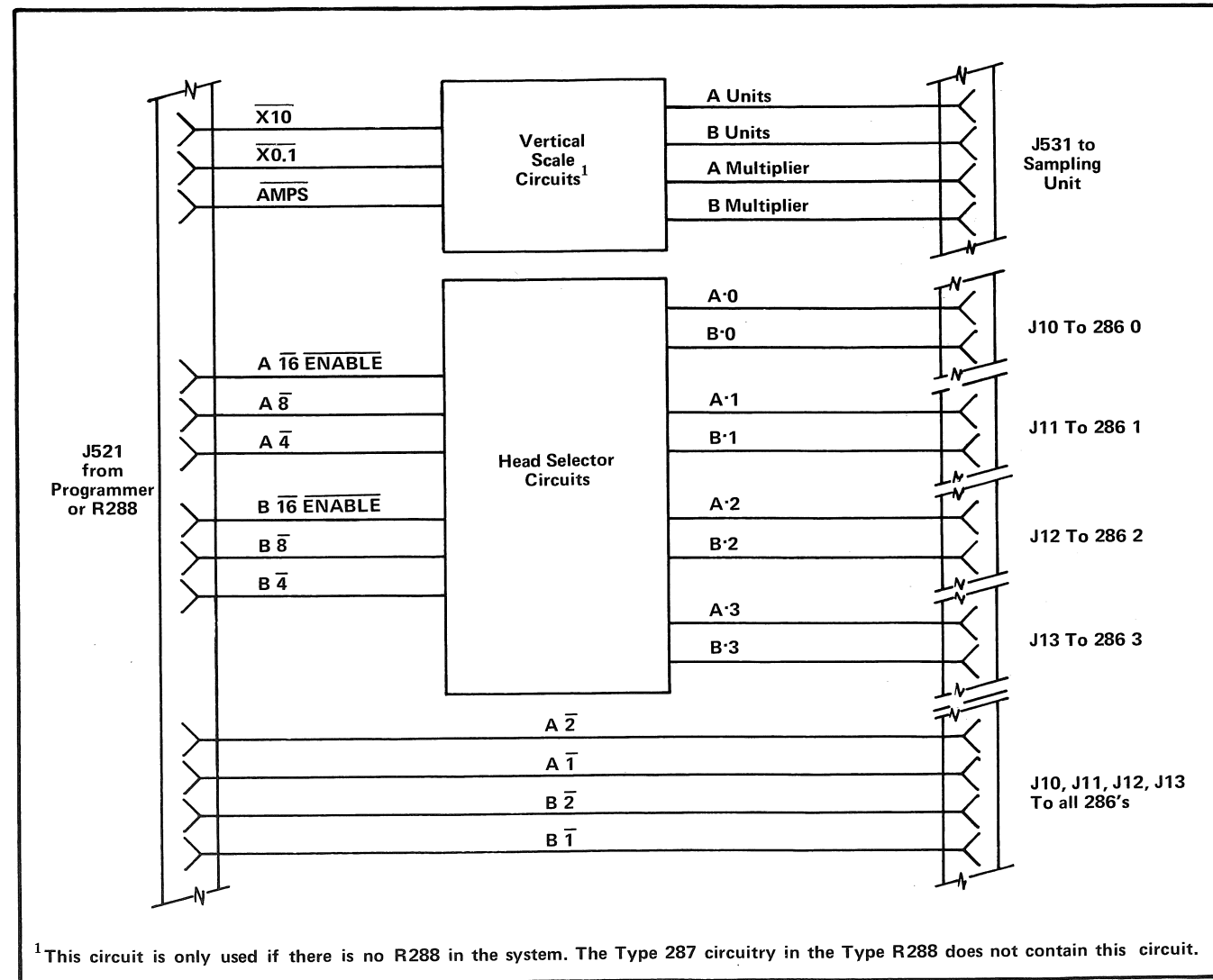
Offset and Feedback Switching

The offset and feedback switching circuits in the Type R288 are identical to those used in the Type 286, except that they do not provide balance controls (see the Type 287/R287/R288 Vertical Scale and Type R288 Offset and Feedback Switching Circuits diagram). The purpose of these circuits is to distribute the offset and feedback voltages to the Type 287's which contain the sampling heads chosen for operation. The Type R288 head selector circuit outputs control the offset and feedback switching circuits. The description of the Type 286 offset and feedback switching circuits explains the operation of the Type R288 offset and feedback switching circuits.

Vertical Scale

The vertical scale circuits allow the Type 230 readout logic circuits to be programmed according to the type of sampling head used. It allows programming the units (Amps or Volts) and shifting the decimal point if the sampling head provides multiplication of the sampling unit Units/Div (X0.1, X1 and X10). Program information is applied to this circuit through the Type R288 J521 connector and the circuit outputs are transmitted to the Sampling Unit through J521. These circuits program both channels of the sampling unit at one time.

Q304 and Q306 allow the programming of units (see the Type 287/R287/R288 Vertical Scale and Type R288 Offset and Feedback Switching Circuits diagram). If a high is applied to pin 15 (AMPS) of P301, Q304 and Q306 are turned on and a low (Volts) results at pins 2 and 3. If a low is applied to pin 15, Q304 and Q306 are turned off and a high (Amps) results at pins 2 and 3.



¹This circuit is only used if there is no R288 in the system. The Type 287 circuitry in the Type R288 does not contain this circuit.

Fig. 4-8A. Block Diagram of flow of programming data through Type 287 or 287 circuitry contained in Type R288.

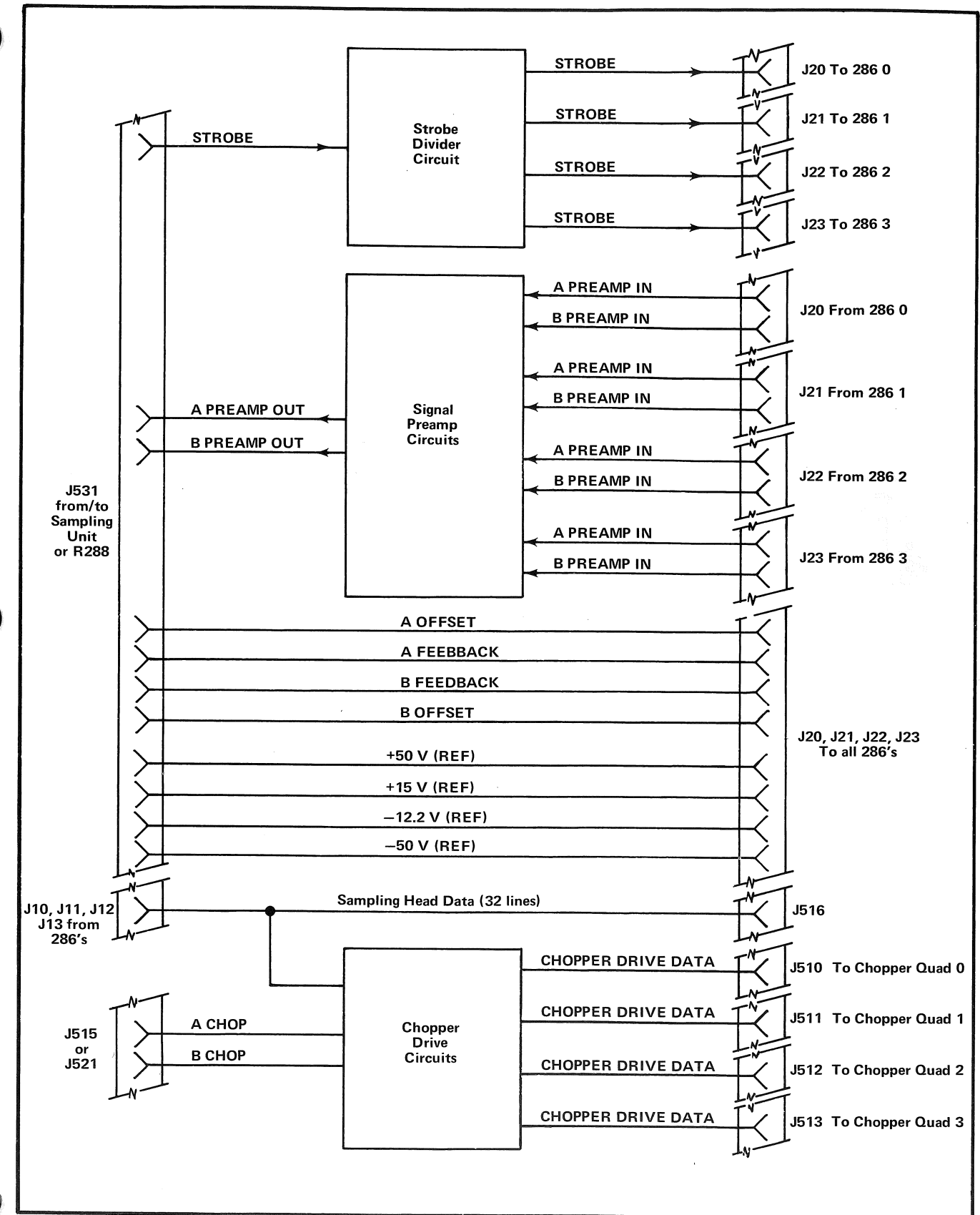


Fig. 4-8B. Block Diagram of flow of signal data and chopper drive data through Type 287 or 287 circuitry contained in Type R288.

Q314, Q316 and Q324 allow the programming of the Units/Div multiplier. This is a ternary circuit which produces three different voltage levels at its output. When pins 4 (X10) and 14 (X0.1) are both high, Q314 and Q316 are off and Q324 is on. In this case CR324 and CR325 are forward biased and the output at pins 12 and 13 is held at ground (X1 multiplication). When pin 4 is low and pin 14 is high, Q314, Q316 and Q324 are all on. In this case CR324 is reverse biased and the voltage at pins 12 and 13 goes to +15 volts (X10 multiplication). When pin 4 is high and pin 14 is low, all the transistors are off. In this case the voltage at pins 12 and 13 is -12.2 volts (X0.1 multiplication).

Table 4-2 gives a summary of the operation of the vertical scale circuits. Pin numbers in the table refer to P301.

TABLE 4-2
Operation of Vertical Scale Circuits

Units		Multiplier		
Input Pin 15 (AMPS)	Output Pin 2 and 3	Input Pin 4 (X10)	Input Pin 14 (X0.1)	Output Pin 12 and 13
H	L (Volts)	H	H	0 volt (X1)
L	H (Amps)	L	H	+15 volts (X10)
		H	L	-12.2 volts (X0.1)
		L	L	+15 volts (X10)

NOTE

The head selector circuits, strobe dividers, signal preamp circuits, chopper drive circuits and vertical scale circuits which are physically in the Type R288 but are actually a part of the Type 287 circuitry, are discussed in the Type 287 circuit description.

TYPE 287 CIRCUIT DESCRIPTION

Head Selector Circuits

The head selector circuits in the Type 287 are identical to those in the Type R288 and Type 286 (see the Type 287/R287/R288 Head Selector Circuits diagram). They are enabled by the A16 ENABLE and the B16 ENABLE bits obtained either from the Type R288 or externally. The head selector circuits decode the A8, A4, B8 and B4 bits of programming data. The eight bits of decoded programming

data are used to enable the Type 286 head selector circuits as well as to control the other circuits in the Type 287. The description of the Type 286 head selector circuits explains the operation of the Type 287 head selector circuits.

Strobe Divider

The strobe divider circuit in the Type 287 is identical to that in the Type R288 (see the Type 287/R287/R288 Strobe Distribution diagram). The purpose of the strobe divider in the Type 287 is to split the strobe pulse received from the Type R288 or from the sampling unit, into four strobe pulses, one for each Type 286 installed in a Type 287. The description of the Type R288 strobe divider circuit explains the operation of the Type 287 strobe divider circuit.

Signal Preamp Circuit

The signal preamp circuits in the Type 287 are identical to those in the Type R288 (see the Type 287/R287/R288 Signal Preamp Circuits diagram). The signal preamp circuits transmit the outputs of the Type 286 signal preamp circuits to the proper sampling unit input, or to the Type R288 signal preamp circuits. The description of the Type R288 signal preamp circuits explains the operation of the Type 287 signal preamp circuits.

Vertical Scale

The Type 287 vertical scale circuits are used only if there is no Type R288 in the multiplexer system. See the description of the Type R288 vertical scale circuits for an explanation of how the Type 287 vertical scale circuit operates.

Chopper Driver Circuits

The chopper driver circuits are included in both the Type 287 and Type R288. Their use is optional. Signal choppers are devices attached to the noses of S-3 Sampling Head probes to provide a ground reference for measurements made by the Type 230. Chopper drive data originates in the Type 230 and may be applied to a multiplexing system either through connector J521 or J515 on a Type R288 or a Type 287. The chopper drive data and the sampling head data from the Type 286's control the chopper driver circuits. They enable the correct signal choppers when signal chopping is desired.

The chopper driver circuits consist of pairs of transistors. The collectors of each pair of transistors are attached to a chopper drive line of a signal chopper. Whenever this enable line is pulled low, the associated signal chopper will be enabled. The enable line will be pulled low whenever one of the two transistors is turned on.

TABLE 4-3
Relationship Between Chopper
Quad Connectors and Type 286 Compartments

Connectors	Compartments
J510	0
J511	1
J512	2
J513	3

Sampling head data from the Type 286's installed in the Type 287 is applied to the bases of the transistors in the chopper drive logic circuit. Sampling head data indicates which sampling head is operating and to which sampling unit input the signal samples are being applied. Therefore, if sampling head 0 of Type 286 0 has been chosen to apply signal samples to the channel A input of the sampling unit, a high is applied to the base of Q402 through R402 (see the Chopper Driver diagram). If the signal were to be applied to the channel B input, the high would be applied to the base of Q404. Assume the signal samples are to be applied to channel A. If signal chopping is also desired, a low will be applied to the emitter of Q402 through the A CHOP DRIVE line applied to pin 36 of P401. With a high on the base of Q402 and a low on its emitter, Q402 turns on and enables the signal chopper connected to the Type 286 0 sampling head 0 probe.

Chopper Quads

The signal choppers are connected to the Type 287's or Type R288's in groups of four, called chopper quads. One chopper quad can provide signal choppers for all the sampling heads in one Type 286. The chopper quads may be connected to connectors J511, J512, J513 or J514 on the Type 287 or Type R288, depending on which Type 286 they are to be used with. Table 4-3 shows the relationship between the chopper quad connectors and the Type 286 compartments. The signal choppers of each chopper quad are numbered according to the Type 286 sampling heads.

Each signal chopper in a chopper quad operates the same way. The CHOPPER DRIVE signal from the Type 287 or Type R288 activates K11 (see the Chopper Quad diagram). When K11 is activated, read relay K11A is closed and the input to the signal probe is grounded. When the activating signal is removed, K11A is opened and D11 clamps off any inductive kick which may occur due to K11. CHOPPER DRIVE control R11 allows the current through K11 to be set for stable operation. GROUND REF SET control R18 allows the display no-signal trace to be set to ground when K11A is closed.

representative. However, many electrical parts are available locally. Before purchasing or ordering replacement parts, consult the Parts List for value, tolerance and rating.

Calibration Procedure. Use the calibration procedure to locate instrument problems. Recalibration may reveal and correct minor problems not apparent during normal use.

Circuit Description. Knowing circuit operation can help locate the trouble.

Circuit Board Replacement. If a circuit board is damaged beyond repair, either the entire assembly or the board only can be replaced. Part numbers are given in the Mechanical Parts List for either the completely wired or the unwired board.

Wiring Color Code. All insulated conductors in these instruments are color-coded as noted in Fig. 5-1.

Resistor Color Code. In addition to the composition resistors, some metal-film resistors are used in these instruments. Nearly all resistors are color-coded for resistance value and tolerance using EIA color code (a metal-film resistor may have the value printed on the body). Composition resistors have four stripes which represent two significant figures, the multiplier and the tolerance value (see Fig. 5-1). Metal-film resistors have five stripes which represent three significant figures, the multiplier and the tolerance value.

Capacitor marking. The capacitance of a disc or electrolytic capacitor is marked in microfarads on the side of the component body. The white ceramic capacitors used in these instruments are color-coded in picofarads using a modified EIA code (see Fig. 5-1).

Diode Color Code. The cathode end of each glass-encased diode is indicated by a stripe, a series of stripes or a dot. For most striped diodes, the color code identifies the unique portion of the Tektronix Part number using the EIA

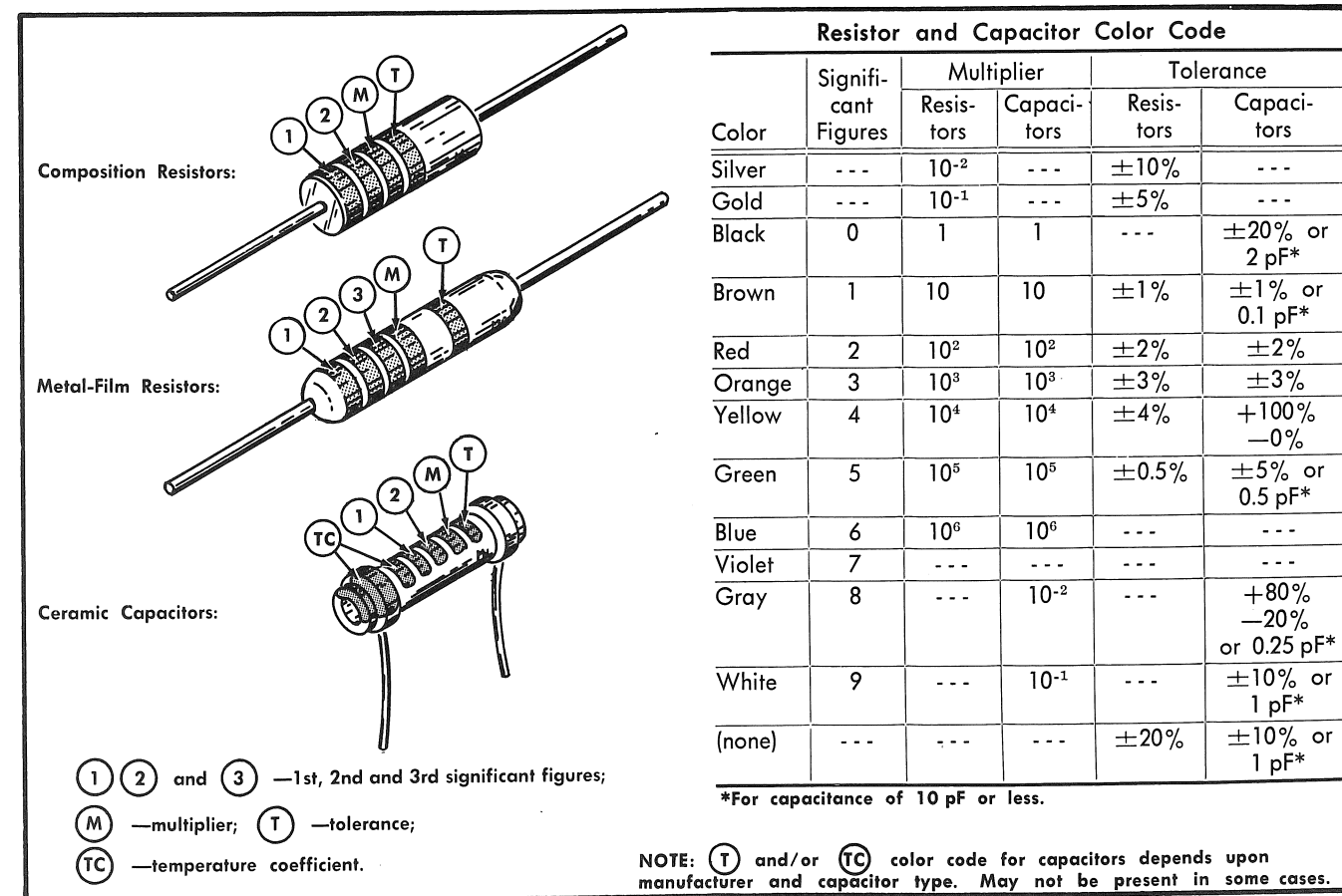


Fig. 5-1. Standard EIA color coding for resistors and capacitors.

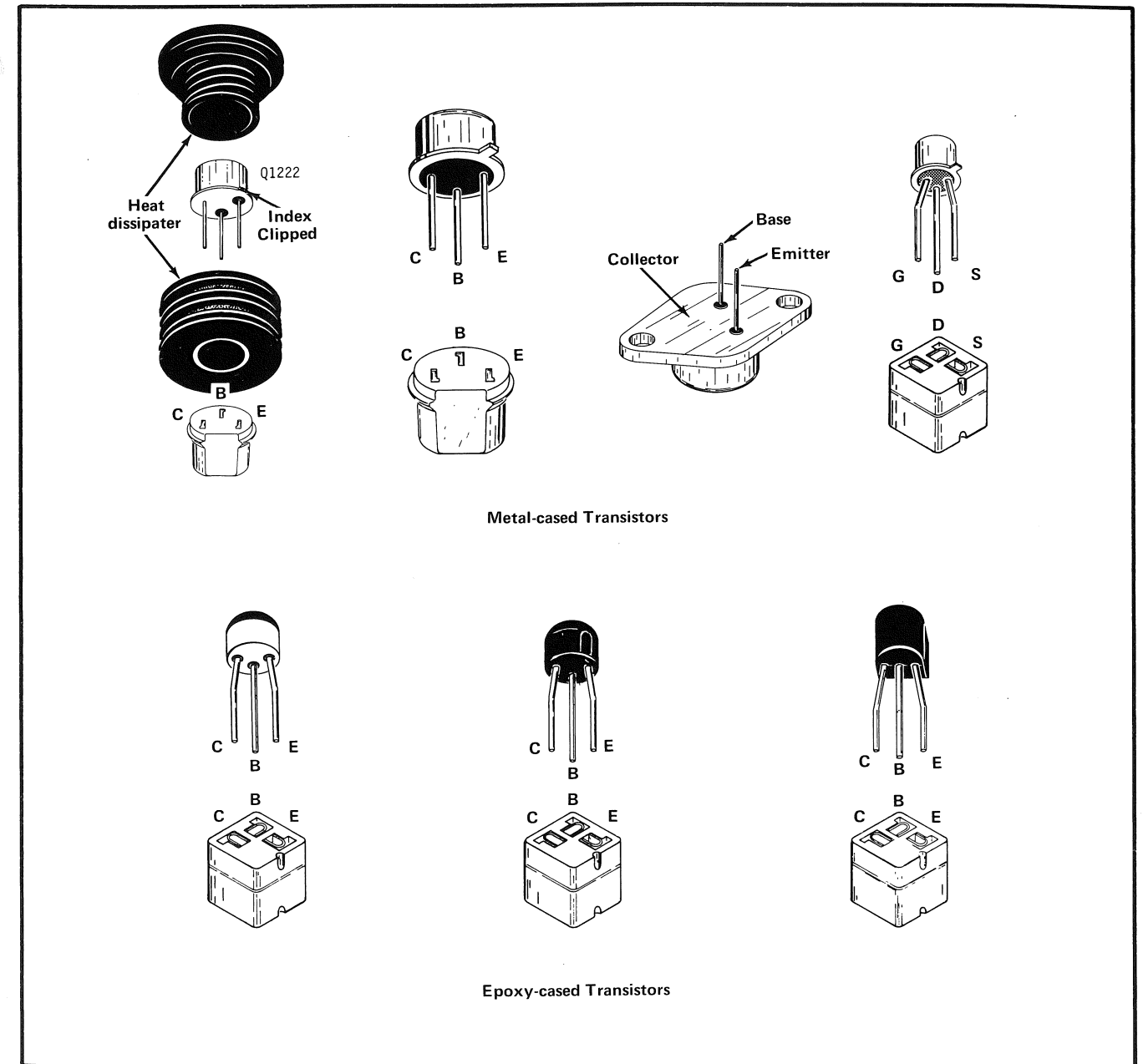


Fig. 5-2. Semiconductor installation information.

color-code system (e.g., a diode color-coded pink-, or blue-, brown-gray-green indicates Tektronix Part Number 152-0185-00).

Semiconductor Lead Configuration. Fig. 5-2 shows the lead configurations of semiconductors used in these instruments. This view is from the bottom of the semiconductors.

Troubleshooting Techniques

The following steps aid in locating the defective component. When the defective component is located, it should

be replaced following the replacement procedures given under Corrective Maintenance.

1. **Check Control Settings.** Incorrect control settings can mislead the troubleshooter. If there is doubt about a control, see the Programming and Operating Instructions section.

2. **Check Associated Equipment.** Before going further, check that the equipment used with these instruments is

operating correctly. Check for improper signal connections and flaws in interconnecting cables. Also, check the power source.

3. Visual Check. Inspect the suspected trouble area. Possible troubles include unsoldered connections, broken wires, damaged circuit boards, damaged components, etc.

4. Isolate Trouble to a Circuit. The symptom often identifies the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, check affected circuits by taking voltage and waveform readings. If the signal is correct, the circuit is working correctly up to that point.

5. Check Voltages and Waveforms. The defective component can often be located by checking for the correct voltage or waveform in the circuit. Typical voltages and waveforms are given on the diagrams.

NOTE

Voltages and waveforms given on the diagrams are not absolute and may vary slightly between instruments. To obtain operating conditions similar to those used to take these readings, see the first diagram page.

6. Check Individual Components. The following procedures describe methods of checking components. Components which are soldered in place should first be isolated by disconnecting one end.

A. Semiconductors

CAUTION

Power switch must be turned off before removing or replacing semiconductors.

To check a transistor, substitute another which is known to be good. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check for dynamic operation.

B. Diodes

A diode can be checked for an open or shorted condition by measuring the resistance between terminals. Using an ohmmeter having an internal source of between 800 millivolts and 3 volts, the diode resistance should be very high in one direction and very low when the meter leads are reversed.

CAUTION

Do not use an ohmmeter scale that involves the supply of large internal current to the diode. (For this use, avoid the lower ranges, such as RX1 and RX10.)

C. Resistors

Check the resistors with an ohmmeter. See the Electrical Parts List for the tolerance of the resistors used in this instrument. Resistors normally do not need to be replaced unless the measured value varies widely from the specified value.

D. Inductors

Check for open inductors by checking continuity with an ohmmeter. Shorted or partially shorted inductors can usually be found by checking the waveform response when high-frequency signals are passed through the circuit. Partial shorting often reduces high-frequency response.

E. Capacitors

Use an ohmmeter (high resistance scale) to check a capacitor for leakage or short-circuit. Do not exceed the voltage rating of the capacitor. The resistance reading should be high after initial charge of the capacitor. An open capacitor can best be detected with a capacitance meter or by checking whether the capacitor passes AC signals.

7. Repair and Readjust the Circuit. If any defective parts are located, follow the replacement procedures given in this section. Be sure to check the performance of any circuit that has been repaired.

CORRECTIVE MAINTENANCE

General

Corrective maintenance consists of component replacement and instrument repair. Special techniques required to replace components in this instrument are given here.

Obtaining Replacement Parts

Standard Parts. All replacement parts for the instrument can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating and description.

NOTE

When selecting replacement parts, remember that the physical size and shape of a component may affect its performance in the instrument, particularly at high frequencies. All replacement parts should be direct replacements unless it is known that a different component will not adversely affect instrument performance.

Special Parts. In addition to the standard electronic components, some special components are used in these instruments. These components are manufactured or selected by Tektronix, Inc. to meet specific performance requirements, or are manufactured for Tektronix, Inc. in accordance with our specifications. These special components are indicated in the Electrical Parts List by an asterisk preceding the part number. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

Ordering Parts. When ordering replacement parts from Tektronix, Inc. include the following information:

1. Instrument type.
2. Instrument serial number.
3. A description of the part (if electrical, include circuit number).
4. Tektronix Part Number.

Soldering Techniques

WARNING

Disconnect the instrument from the power source before soldering.

Circuit Boards. Use ordinary 60/40 solder and a 35- to 40-watt pencil type soldering iron on the circuit boards. The tip of the iron should be clean and properly tinned for best heat transfer to the solder joint. A higher wattage soldering iron may separate the wiring from the base material.

The following technique should be used to replace a component on a circuit board. Use the procedures given under Component Replacement to remove the boards from the instrument before soldering.

1. Grip the component lead with long-nose pliers. Touch the soldering iron to the lead at the solder connections. Do not lay the iron directly on the board as it may damage the board.

2. When the solder begins to melt, pull the lead out gently. This should leave a clean hole in the board. If not, insert a sharp object such as a toothpick into the hole to clean it out. A vacuum-type desoldering tool can also be used for this purpose.

3. Bend the leads of the new component to fit the holes in the board. Insert the leads into the holes in the boards so the component is firmly seated against the board, or as positioned originally. If it does not seat properly, heat the solder and gently press the component into place.

4. Touch the iron to the connection and apply a small amount of solder to make a firm solder joint; do not apply too much solder. To protect heat-sensitive components, hold the lead between the component body and the solder joint with a pair of long-nose pliers or other heat sink.

5. Clip the excess lead that protrudes through the board.

6. Clean the area around the solder connection with a flux-remover solvent. Be careful not to remove information printed on the board.

Metal Terminals. When soldering metal terminals (e.g., switch terminals, potentiometers, etc.), ordinary 60/40 solder can be used. Use a soldering iron with a 40- to 75-watt rating and a 1/8-inch wide wedge-shaped tip.

Observe the following precautions when soldering metal terminals:

1. Apply only enough heat to make the solder flow freely. Use a heat sink to protect heat-sensitive components.

2. Apply only enough solder to form a solid connection. Excess solder may impair the function of the part.

3. If a wire extends beyond the solder joint, clip off the excess.

4. Clean the flux from the solder joint with a flux-remover solvent.

Component Replacement

WARNING

Disconnect the instrument from the power source before replacing components.

General. The exploded-view drawings associated with the Mechanical Parts List (located on the backs of diagram

pullout pages) may be helpful in the removal or disassembly of components or subassemblies.

Circuit Board Replacement. If a circuit board is damaged beyond repair, either the entire assembly including all soldered components, or the board only, can be replaced. Part numbers are given in the Mechanical Parts List for either the completely wired or the unwired board.

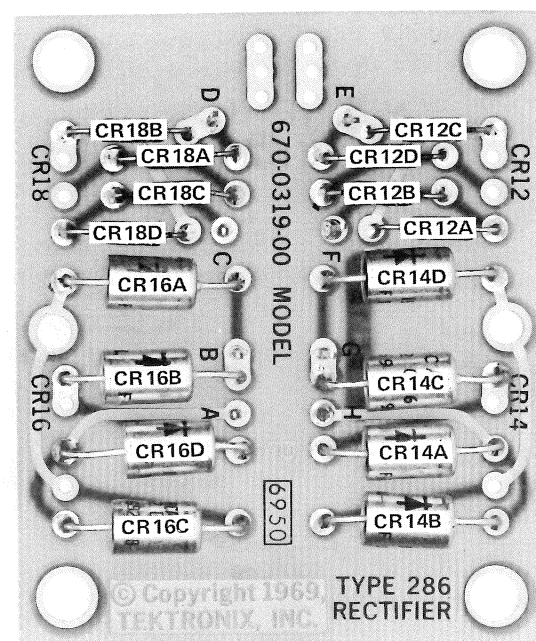


Fig. 5-3. Component locations on the Type 286 Rectifier board.

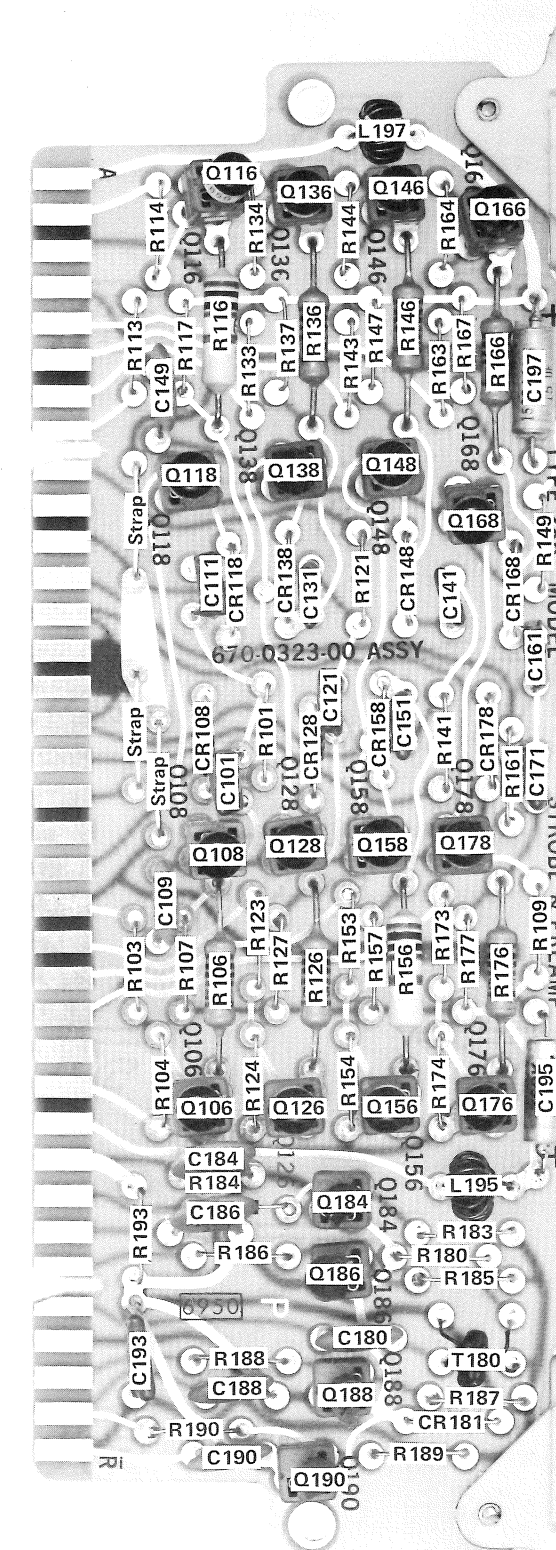


Fig. 5-4. Component locations on Type 286 P60 Strobe and Preamp circuit card, Model 1-up.

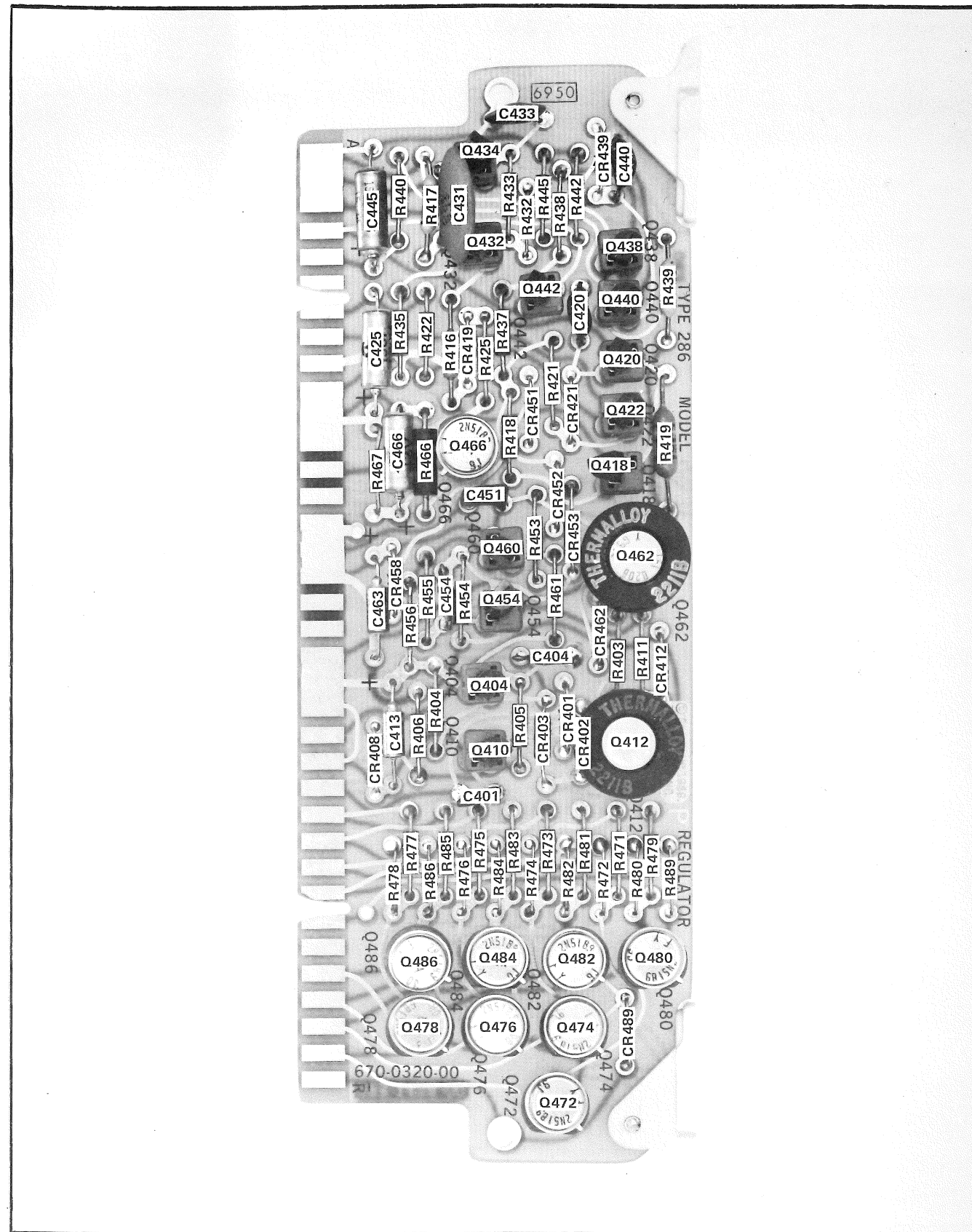


Fig. 5-7. Component locations on Type 286 P90 Regulator circuit card, Model 1-up.

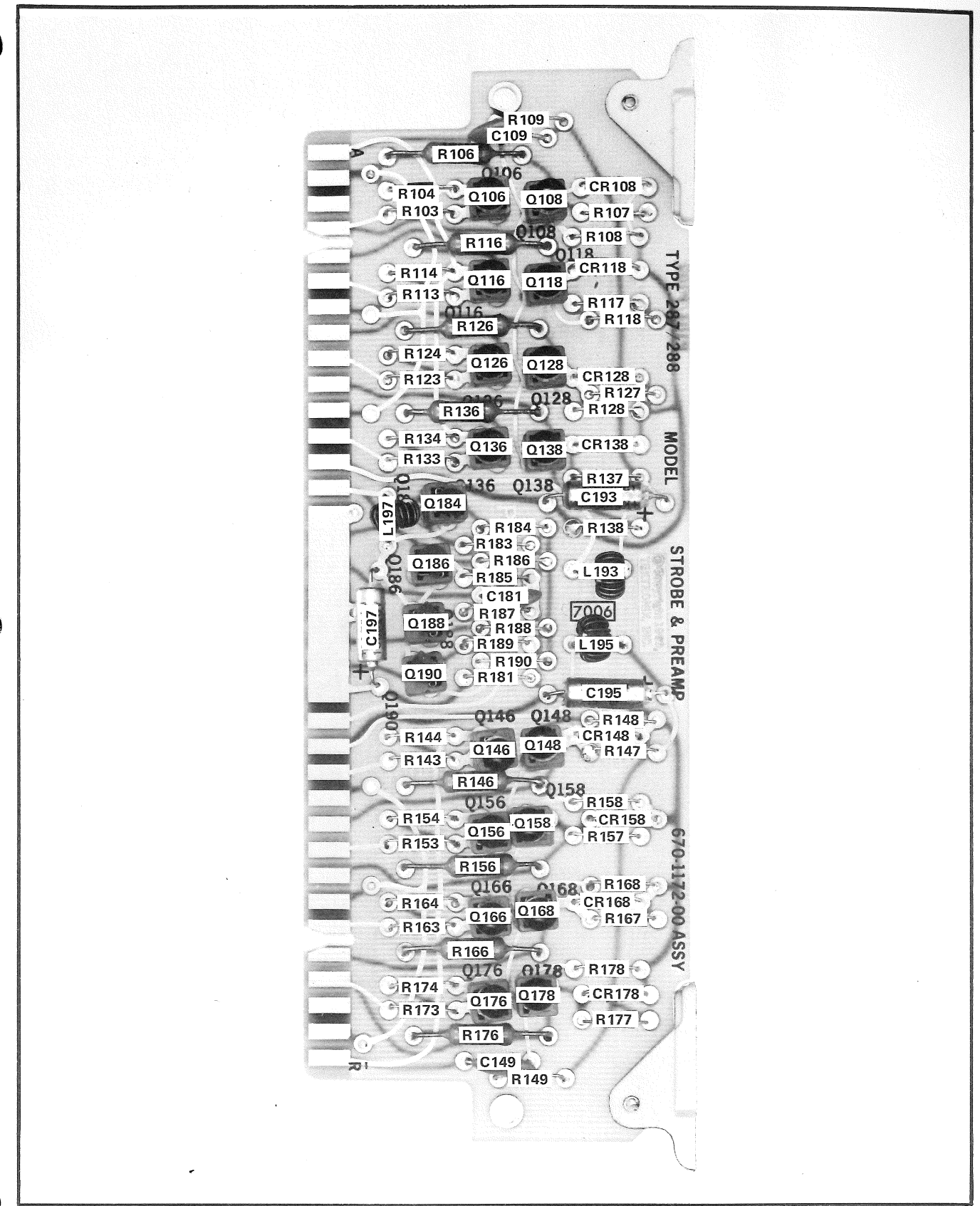


Fig. 5-8. Component locations on Type 287/R288 P101 or P102 Strobe and Preamp circuit card, Model 1-up.

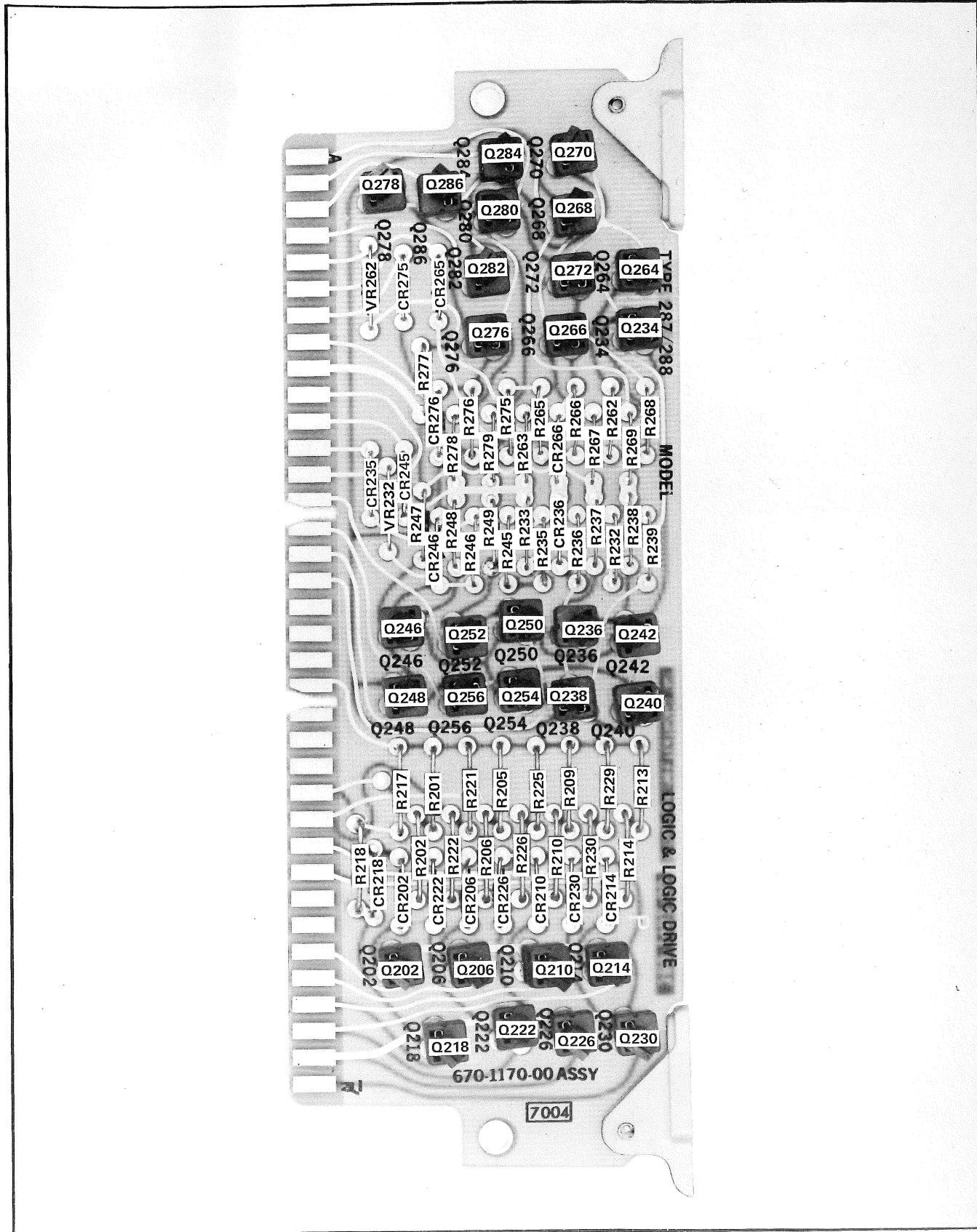


Fig. 5-9. Component locations on Type 287/R288 P201 or P202 Logic and Logic Drive circuit card, Model 1-up.

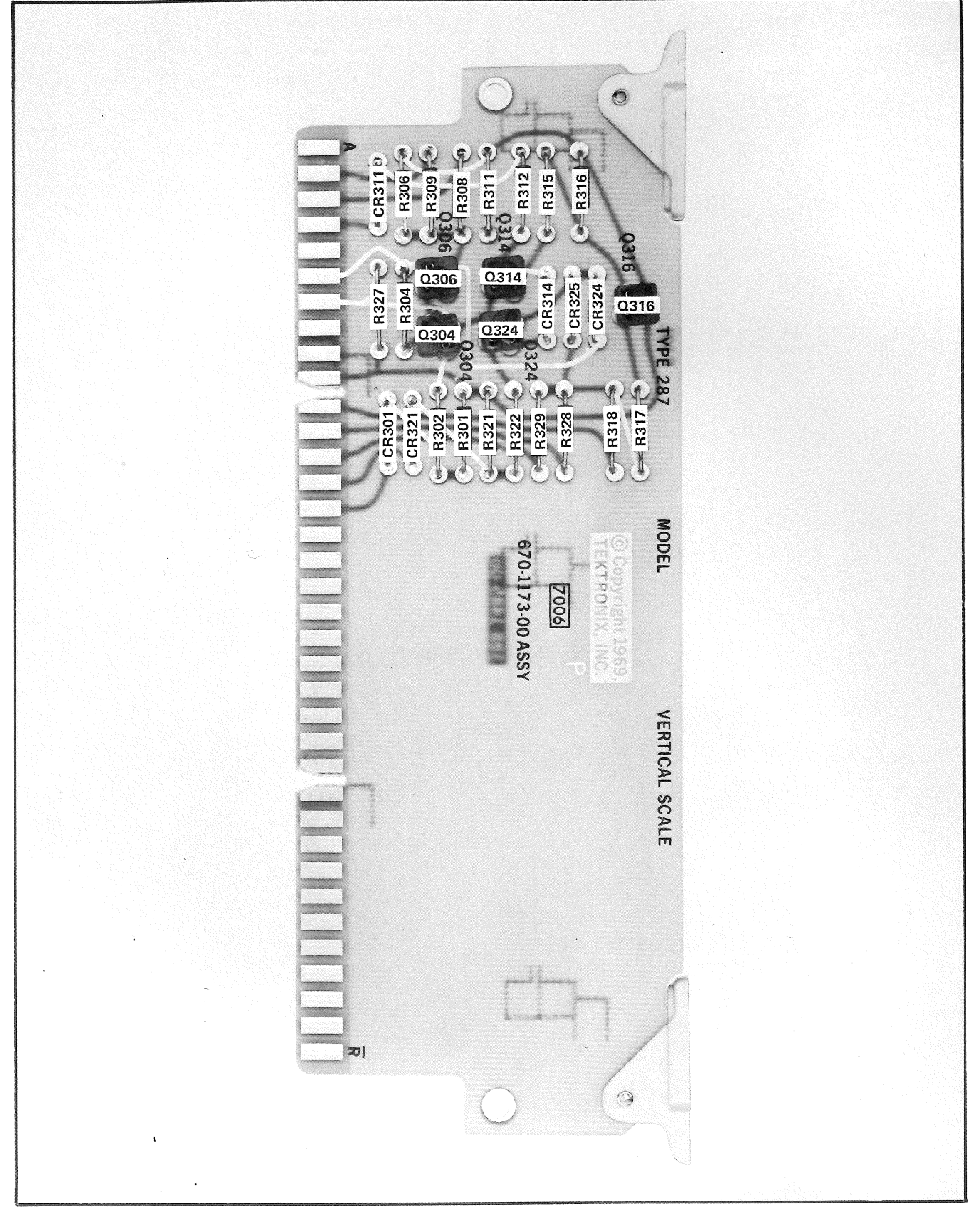


Fig. 5-10. Component locations on Type 287 P301 Vertical Scale circuit card, Model 1-up.

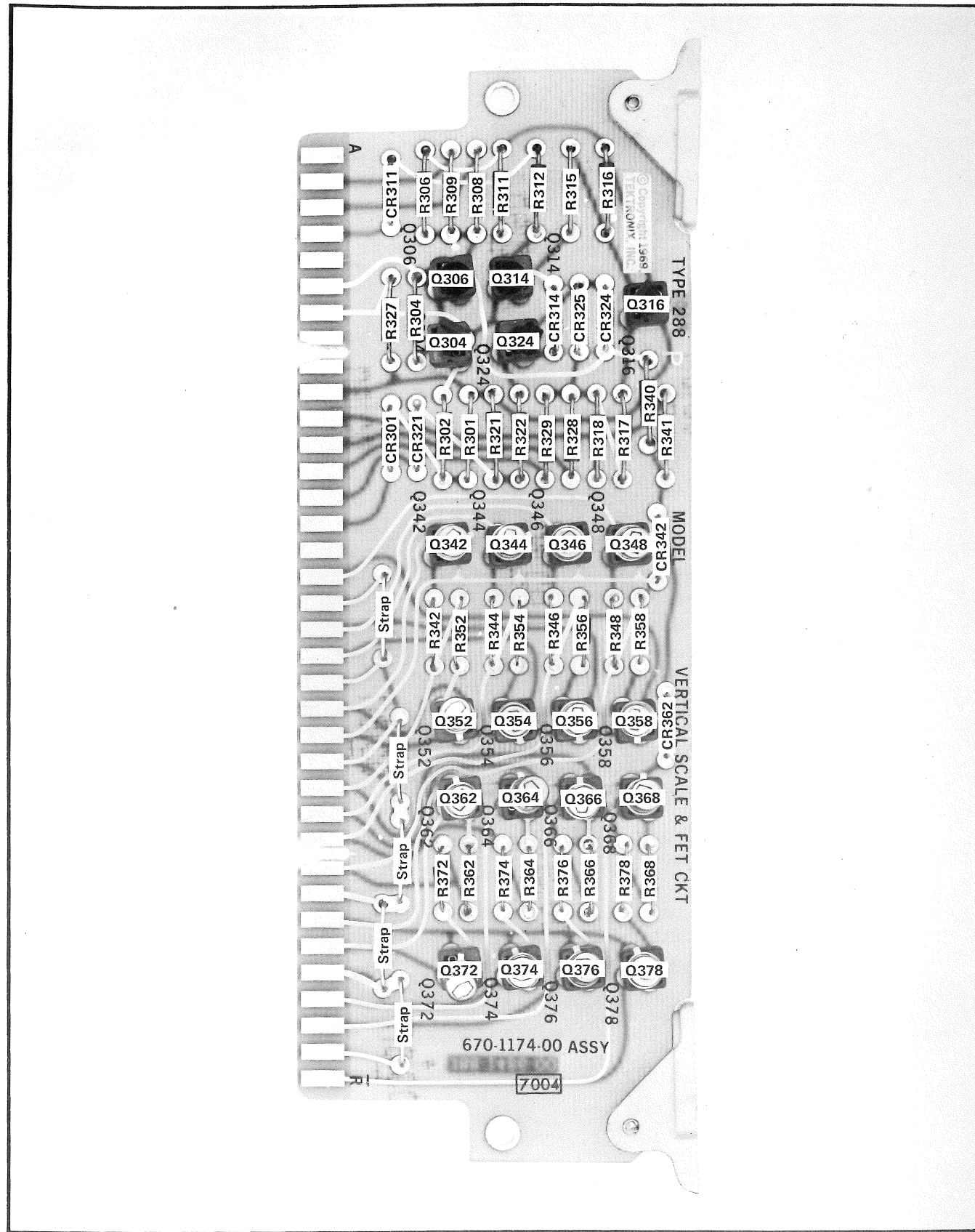


Fig. 5-11. Component locations on Type R288 P301 Vertical Scale and FET CKT circuit card, Model 1-up.

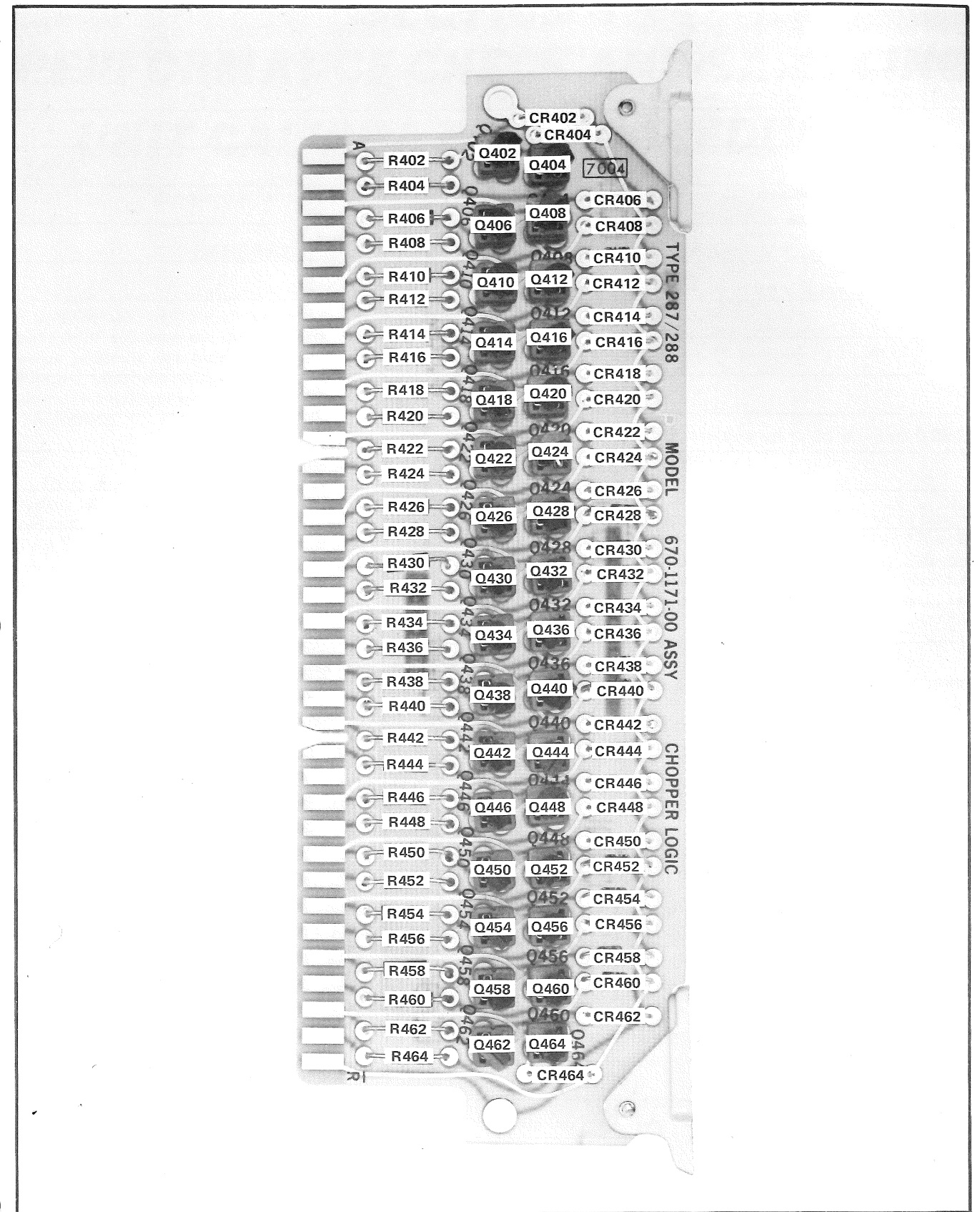


Fig. 5-12. Component locations on Type 287/R288 P401 Chopper Logic circuit card, Model 1-up.

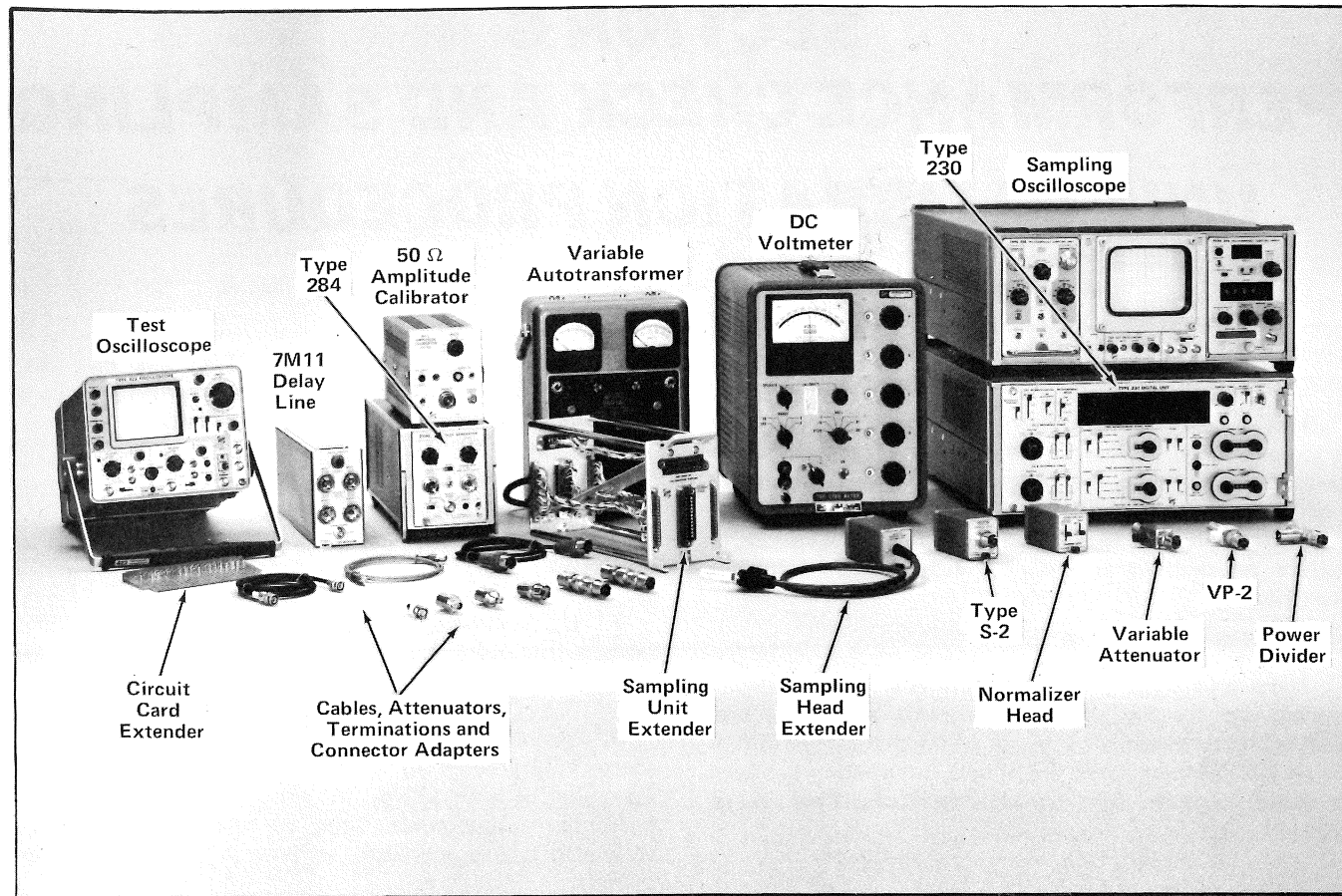


Fig. 6-1. Test equipment.

15. 50 Ω end-line termination with GR connectors (Tektronix Part No. 017-0081-00). One required if Type S-3 is used in system, two required if Type S-3's are used to adjust Type 286 DLY adjustments.

16.³ 5 ns coaxial cable, 50 Ω with 3 mm connectors (Tektronix Part No. 015-1006-00).

17.³ 3 mm male-to-GR connector adapter (Tektronix Part No. 015-1007-00).

18.⁴ 50 Ω feedthrough termination with BNC connectors (Tektronix Part No. 011-0049-01).

19. 50 Ω coaxial cable with BNC connectors, 42-inch (Tektronix Part No. 012-0057-01). Two required if Type S-5 is used in system.

20.⁴ BNC female-to-GR connector adapter (Tektronix Part No. 017-0063-00).

21.² 5X attenuator, 50 Ω with GR connectors (Tektronix Part No. 017-0079-00).

22.² Special variable attenuator with 100 Ω potentiometer across 50 Ω line (Tektronix Part No. 067-0511-00).

23.² Power divider, 50 Ω with GR connectors (Tektronix Part No. 017-0082-00).

24.¹ Sampling unit extender (Tektronix Part No. 067-0590-00) to operate Type 3S6 or Type 3S5 outside mainframe.

25.² Sampling head interconnection cable (Tektronix Part No. 012-0130-00). Required for use with Type 3S6 only. (Not shown in Fig. 6-1.)

26.¹ 3 ft. sampling head extender (Tektronix Part No. 012-0124-00).

27. Circuit card extender (Tektronix Part No. 670-1186-00).

28.¹ Small screwdriver.

³ Required only if Type S-4 Sampling head is used in system.

⁴ Required only if Type S-5 Sampling head is used in system.

INSTRUCTIONS FOR USING PROCEDURE

Index and Record

Table 6-1, preceding the calibration procedure, and Table 6-3, preceding the performance check procedure, are indexes and/or records of the procedures. Each table may be used as a guide for an experienced calibrator or to locate individual adjustments or checks. These tables may also be used to record correct calibration or performance.

Control Settings

A list of control settings for the multiplexer system components, the sampling system components and other test equipment precedes step one of the calibration procedure. This list pertains to both procedures.

Adjust Steps

Any step which has an adjustment in it has an adjust symbol **Ⓐ** next to its title.

Alternate Instruments

The following procedures have been written for a sampling-head multiplexer system operated with a Type 3S6 (3S5)/Type 568/Type 3T6 (3T5)/Type 230 digital measurement system and a programmer (Tektronix Type 241, Type 240/R240 or Type R250, or Non-Tektronix). Additional information is provided in the procedures and at the end of each procedure to allow the calibration and performance check of a multiplexer system connected to one of the other sampling systems listed in Table 2-1.

Programming

No instructions have been given for programming the instruments used in the following procedures. Almost all of the instruments are programmable, however, and calibration and performance check programs can be written using the manual control settings as a guide. The multiplexer system must be programmed.

PRELIMINARY CALIBRATION PROCEDURE

1. Assemble the digital measurement system. It is assumed that these instruments have been calibrated and are performing within their specified characteristics.

2. Extend the Type 3S6 or Type 3S5 on a rigid plug-in extender (Tektronix Part No. 067-0590-00).

3. Set the Line Voltage Selector assemblies on the rear panels of the Type 286's in accordance with the line voltage to be used to operate the system.

4. Remove the top and bottom protective covers from the Type 286's and the top and bottom dust covers from the Type 287's and the Type R288.

5. Assemble the sampling-head multiplexer system and connect it to the digital measurement system and the programmer (see Section 2). Install the sampling heads in the sampling head compartments in which they will normally be operated.

6. Connect the autotransformer and other test instruments to the chosen power source. Connect the multiplexer system and digital measurement system to the autotransformer.

7. Turn on the autotransformer, the sampling head multiplexer system, digital measurement system, programmer and other test equipment. Allow at least 5 minutes warmup at an ambient temperature of +25°C ±5°C (+77°F ±9°F) before making any adjustments.

8. Connect the test probe to the vertical input of the test oscilloscope.

9. Set the instrument controls as shown at the beginning of the procedure and start the calibration procedure.

Multiplexer System

BAL	As is
DLY	Mechanical center

Sampling Oscilloscope

	Type 3S6
Mode	Channel A
Normal-Smooth	Normal
DC Offset (Ch A & B)	0.00
Units/Div Ch A & B)	100 (calibrated)
Dot Response (Ch A & Ch B)	As is
Gain	As is
Centering	As is
B Delay	As is

	Type 568
Inten	Visible display
Astig	As is
Focus	Display in focus
Scale Illum	Desired scale illumination
Calibrator	Off
Ext CRT Cathode-Chopped Blanking (Rear panel)	Chopped blanking

Type 3T6 (3T5)	
Horiz Pos	Display centered horizontally
Horiz Gain	As is
Samples/Sweep	1000
Time/Div Decade	7
Time/Div Multiplier	2
Delay	0000
Program Selector	Int
Trigger Sensitivity	Fully clockwise
Trigger Recovery Time	Fully clockwise
Trigger Mode	Ext
Trigger Polarity	+

Type 230	
Measurement Averaging	8
CRT Intensification	
Ref Zones	Both
Time Measurement	On
Measurement Mode	A Volts
Ch A Reference Zones	
0% Position	Sweep start
100% Position	Sweep start
0% Level	10 cm
100% Level	10 cm
Ch B Reference Zones	
0% Position	Sweep start
100% Position	Sweep start
0% Level	10 cm
100% Level	10 cm
Time Measurement	Channel A, 50% Between
Start Point	Zones, 1st, + slope
Time Measurement	Channel B, 50%, Between
Stop Point	Zones, 1st, + slope
Display Time	Control centered
Triggered Measurement	Off
Upper limit	Requires no settings
Lower limit	Requires no settings

PROGRAMMER

Channel A of Sampling Unit	Type 286 0, Sampling Head 0
Channel B of Sampling Unit	Type 286 0, Sampling Head 1

Type 284	
Mode	Square Wave Or Sine Wave Output
Square Wave Amplitude	1.0 V
Period	1 μs Square Wave
Lead Time	75 ns

Normalizer Head	
Units/Div Multiplier	X1
Units	Volts

Step No.	Title	Adjust	Req'd Previous Steps	Page
1	Check Power Supplies			6-4
2	Center Type 286 BAL Controls	BAL	1	6-5
3	Adjust Dot Response, Memory Gate Width and Loop Gain	Dot Response, R580, C184, R550, C384	1, 2	6-5
4	Adjust Smoothing Balance	R387, R167	1, 2, 3	6-6
5	Re-adjust Loop Gain	C184, C384	1, 2, 3, 4	6-7
6	Adjust Dot Response Controls (Optional)	Dot Response	1, 2, 3, 4, 5	6-7
7	Adjust Centering Control	Centering	1	6-8
8	Adjust Sampling Head Bridge Balance	R22	1, 7	6-9
9	Adjust Digital and Analog Gain	R404, R424 Gain	1, 7, 8	6-9
10	Adjust Type 286 DLY Controls	DLY	1	6-10
11	Adjust Signal Choppers (Optional)	C2, R13 R18	1	6-10

CALIBRATION PROCEDURE

1. Check Power Supplies

a. Turn off all the Type 286's in the multiplexer system and turn off the sampling oscilloscope.

b. Orient a Type 286 so that a DC voltmeter can be attached to its power supply test points in one of the following ways:

1. If the Type 286 is being operated alone, turn the Type 286 on its side exposing the solder connections on the J90 connector.

2. If the Type 286 is being operated in one of the lower compartments of a Type 287 or Type R288, turn the mainframe on its side (or tilt it up if the mainframe is mounted on slide-out tracks) so that the J90 connector of the Type 286 is exposed.

3. If the Type 286 is being operated in one of the top compartments of a Type 287 or Type R288, extend the Regulator circuit card (P90) on a circuit card extender.

c. Turn on the Type 286's and the sampling oscilloscope.

d. CHECK FOR—Reference voltages from the sampling unit within the tolerances shown in Table 6-2. (See Table 6-2 for the locations of the reference voltage test points on J90.)

e. CHECK FOR—Type 286 power supply voltages within the tolerances shown in Table 6-2. Measure between reference voltage and Type 286 power supply voltage or between Type 286 power supply voltage on a chassis (ground).

f. Connect the probe ground clip from the test oscilloscope to the Type 286 chassis and connect the probe tip to each of the Type 286 power supply voltage test points listed in Table 6-2.

g. CHECK FOR—Power supply ripple within the tolerances given in Table 6-2. For each measurement, turn the autotransformer voltage throughout the range set on the voltage selector assembly on the rear panel of the Type 286.

h. Repeat a through g for each Type 286 in the multiplexer system.

2. Adjust Type 286 BAL Controls

a. Position the trace onto the CRT using a sampling unit DC offset control.

b. With a small screwdriver, turn the Type 286 0 sampling head 0 BAL control throughout its range.

c. CHECK FOR—Trace moving vertically on the CRT over a range of at least 2 divisions (200 millivolts).

TABLE 6-2
Check Power Supplies

Supply	Pin on J70/P90	Accuracy	Ripple
+50 V (Ref)	25	±2%	
+15 V (Ref)	K	±1%	
-12.2 V (Ref)	1	±3%	
-50 V (Ref)	16	±1%	
+3.6 V	3	±5%	10 mV or less
+50 V	X	±0.5 of Reference	10 mV or less
+15 V	L	Reference Voltage	5 mV or less
-12.2 V	A		5 mV or less
-50 V	S		10 mV or less

d. ADJUST—The BAL control to the electrical center of its range (trace in vertical center of its range).

e. Set the sampling unit Mode switch to Ch B.

f. Repeat parts a through d for the Type 286 0 sampling head 1 BAL control.

g. Program two other Type 286 sampling heads to be connected to the sampling unit, one for channel A and another for channel B.

h. Set the sampling unit Mode switch to Ch A.

i. Repeat parts a through f until all the Type 286 BAL controls in the multiplexer system have been electrically centered.

3. Adjust Dot Response Memory Gate Width and Loop Gain

a. Turn off Type 286 0. Remove the sampling head from sampling head compartment 0 and install the normalizer head in that compartment. Turn on Type 286 0.

b. Set the sampling unit Mode switch to Ch A.

c. Program sampling head 0 of Type 286 0 for channel A of the sampling unit and sampling head 1 for channel B.

d. Adjust a sampling unit DC Offset control so that two traces are visible on the CRT.

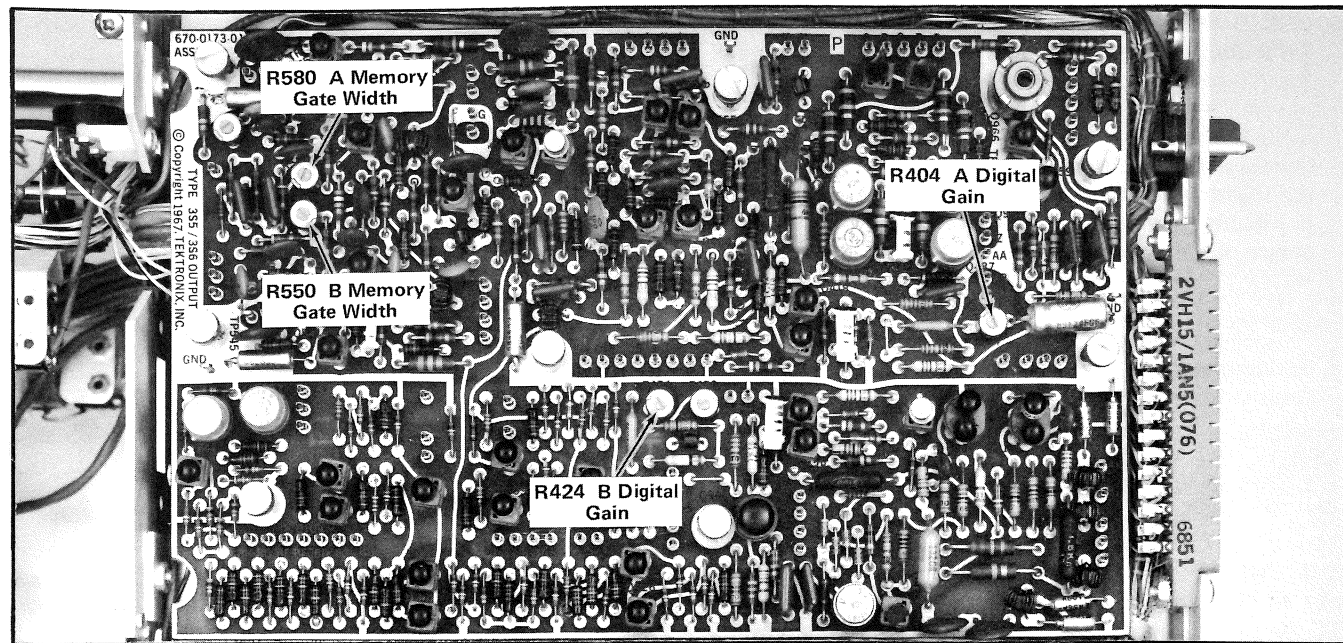


Fig. 6-2. Type 3S6 or Type 3S5 Output circuit board.

e. With a small screwdriver, turn the sampling unit Channel A Dot Response control (front-panel adjustment) throughout its range. Note the Type 230 readout (separation of traces on CRT graticule) at extreme positions of control.

f. ADJUST—Dot Response control for electrical center (average Type 230 readout or average separation of traces).

g. ADJUST—R580, the A Memory Gate Width adjustment, (see Fig. 6-2) for maximum Type 230 readout (greatest separation of traces on CRT graticule).

h. ADJUST—C184, the A Loop Gain (200, 100, 50, 20) adjustment, (see Fig. 6-3) for 500 millivolts as measured by the Type 230 (trace separation of 5 divisions on CRT graticule).

i. Program sampling head compartment 0 of the Type 286 0 for channel B of the sampling unit and sampling head compartment 1 for channel A.

j. Set the sampling unit Mode switch to Ch B and Type 230 Measurement Mode switch to B Volts.

k. Repeat parts d through h for the Channel B Dot Response control, B Memory Gate Width adjustment R550

(see Fig. 6-2) and B Loop Gain (200, 100, 50, 20) adjustment C384 (see Fig. 6-3).

4. Adjust Smoothing Balance

a. Program sampling head 1 of Type 286 0 for channel A of the sampling unit and sampling head 2 for channel B.

b. Position the trace onto the CRT using a sampling unit DC Offset control.

c. Switch the sampling unit Normal-Smooth control back and forth between its two positions.

d. CHECK FOR—Trace in same position on the CRT when the Normal-Smooth switch is switched between its positions.

e. ADJUST—R387, the B Smoothing Balance adjustment, (see Fig. 6-3) so that there is no shift in the trace when the Normal-Smooth switch is switched between its two positions.

f. Set the sampling unit Mode switch to Ch A and the Normal-Smooth switch to Normal.

g. Repeat parts b through e for the A Smoothing Balance adjustment, R167, (see Fig. 6-3).

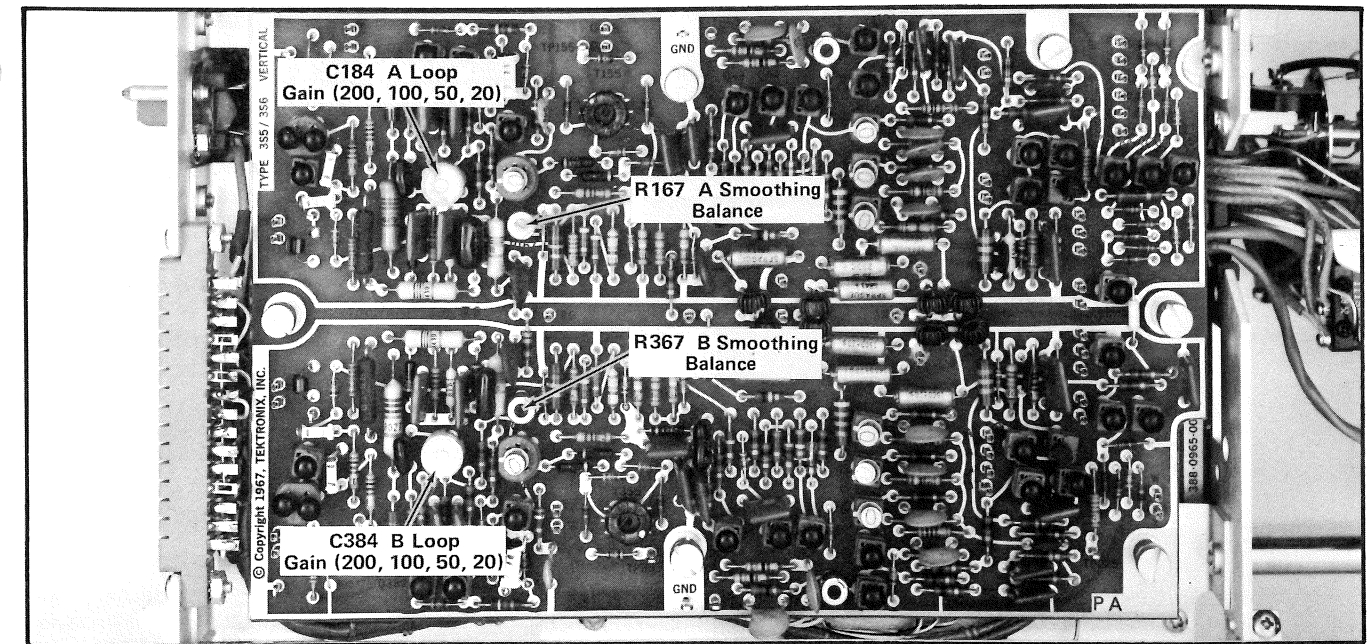


Fig. 6-3. Type 3S6 or Type 3S5 Vertical circuit board.

5. Re-adjust Loop Gain

a. Program sampling head 0 of Type 286 0 for channel A of the sampling unit and sampling head 1 for channel B.

b. Set the Type 230 Measurement Mode switch to A Volts.

c. Re-adjust C184 for 500 millivolts.

d. Program sampling head 0 of the Type 286 for channel B and sampling head 1 for channel A.

e. Set the sampling unit Mode switch to Ch B and the Type 230 Measurement Mode switch to B Volts.

f. Re-adjust C384 for 500 millivolts.

g. Turn off Type 286 0. Remove the normalizer head from sampling head compartment 0 and replace it with the sampling head removed in step 3. Turn on Type 286 0.

6. Adjust Dot Response Controls (Optional)

NOTE

Steps 3 through 5 allow adjustment of the sampling unit loop gain for a nominal value (within 10% of unity) for any type of sampling head used in the

multiplexer system. If only one type of sampling head (or two) is being used in a multiplexer system, it may be desirable to adjust the sampling unit Dot Response controls for best loop gain. The following step can be used for this purpose.

a. Connect a 2X attenuator with GR connectors to the Type 284 Square Wave Or Sine Wave Output connector. Connect the sampling head to be used to adjust the sampling unit Dot Response controls to the 2X attenuator, using one of the following methods depending on the choice of sampling head:

1. Type S-1 or Type S-2—Connect the sampling head through a 5-ns coaxial cable with GR connectors to the 2X attenuator.

2. Type S-3—Connect a VP-2 voltage pickoff to the 2X attenuator and a 50 Ω end-line termination to the VP-2, both with GR connectors. Insert the Type S-3 probe tip into the hole provided for it in the VP-2.

3. Type S-4—Connect the sampling unit to the 2X attenuator through a 5 ns coaxial cable with 3 mm connectors and a 3 mm male-to-GR connector adapter.

4. Type S-5—Connect the sampling unit to the 2X attenuator through a 50 Ω feedthrough termination and a 42 inch 50 Ω coaxial cable, both with BNC connectors, and a BNC female-to-GR connector adapter.

b. Connect a 42-inch 50 Ω coaxial cable with BNC connectors between the Type 284 Trigger Output connector and the sampling oscilloscope sampling sweep Trigger Input connector.

c. Program the sampling head connected to the Type 284 to be connected to channel B of the sampling unit and some other head for channel A.

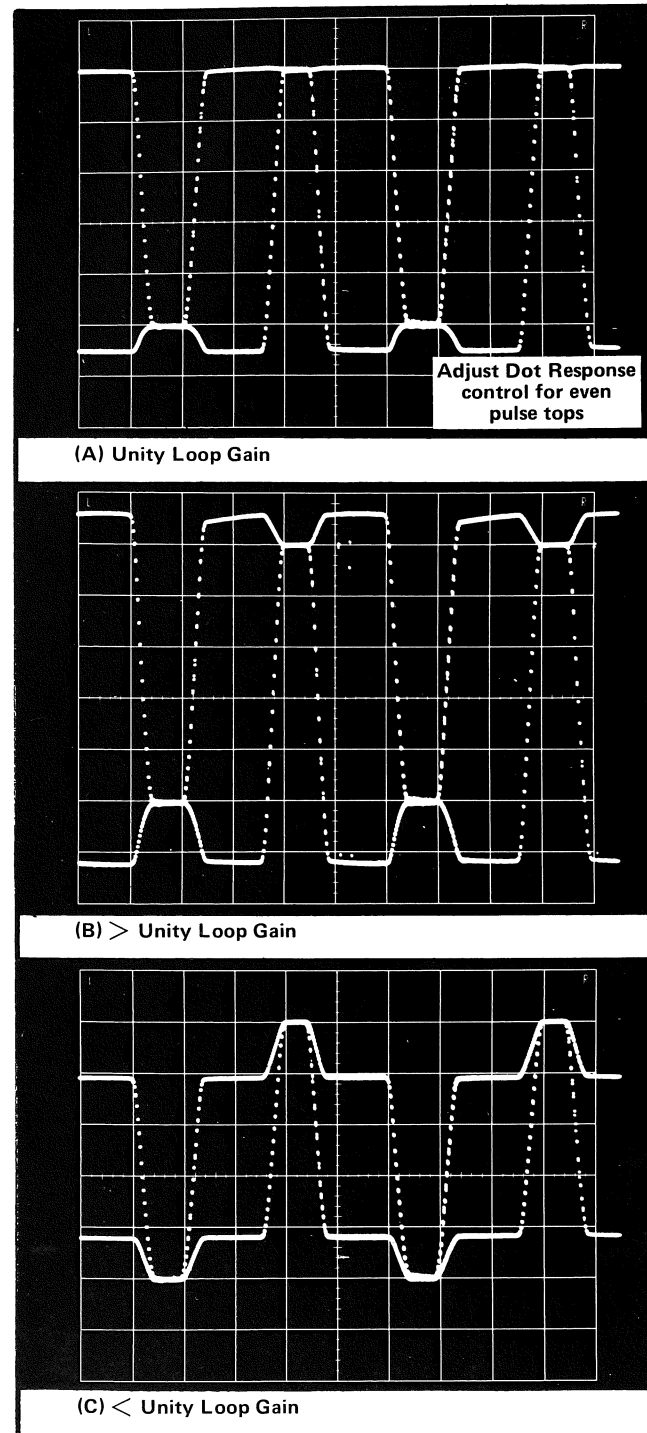


Fig. 6-4. Waveforms demonstrating adjustment of Dot Response controls.

d. Set the Type 284 controls as indicated in the list of initial control settings.

e. Position the display onto the sampling oscilloscope CRT with a sampling unit DC Offset control.

f. Using the sampling oscilloscope sampling sweep trigger sensitivity and trigger recovery time controls, obtain a mis-triggered display similar to one of the waveforms in Fig. 6-4.

g. Turn the sampling unit Channel B Dot Response adjustment throughout its range.

h. ADJUST—The Channel B Dot Response control so that the top of the pulse is flat as shown in Fig. 6-4A.

i. Program the sampling head connected to the Type 284 to be connected to channel A of the sampling unit and the other sampling head for channel B.

j. Set the sampling unit Mode switch to Ch A.

k. Repeat parts e through h to adjust the sampling unit Channel A Dot Response control.

l. Disconnect the cables, attenuators and/or terminations from the Type 284 and the sampling head.

7. Adjust Centering Control

a. Turn off Type 286 0 and extend its 0 sampling head on a 3-foot sampling head extender (Tektronix Part Number 012-0124-00). Turn on the Type 286.

b. Program sampling head 0 of Type 286 0 for channel A of the sampling unit and sampling head 1 for channel B.

c. Set the sampling unit Channel A Units/Div switch to 200 and the Channel A and Channel B DC Offset controls to 0.00. Lock the DC Offset controls at these positions.

d. ADJUST—The sampling unit Centering control (front-panel) to vertically center the trace on the CRT.

e. Turn the sampling unit Channel A Units/Div switch fully clockwise.

f. ADJUST—The sampling head Bridge Bal adjustment R22 (through the hole in the side of the sampling head case) to center the trace. Some of the sampling heads will not have a usable display on the 2 position of the Units/Div switch. In such cases set the switch for a higher deflection factor.

g. Set the sampling unit Channel A Units/Div switch to 200.

h. Repeat parts d through g until there is no more than one centimeter movement of the trace when the Units/Div switch is switched throughout its range.

8. Adjust Sampling Head Bridge Balance

a. Turn off Type 286 0 and re-install sampling head 0 in the Type 286. Extend sampling head 1 on the sampling head extender. Turn on the Type 286.

b. Program sampling head 1 of Type 286 0 to be connected to the sampling unit channel it will normally be operated from. Program another sampling head in the multiplexer system for the other sampling unit channel.

c. Turn the associated sampling unit Units/Div switch throughout its usable range.

d. ADJUST—The sampling head 1 Bridge Bal adjustment for no more than 1 division shift in the trace when the Units/Div switch is switched throughout its usable range.

e. Repeat this step for each sampling head in the multiplexer system.

f. Turn off any Type 286 with an extended Sampling head and re-install the sampling head. Turn on the Type 286.

9. Adjust Digital and Analog Gain

a. Connect one of the Type S-1 sampling heads in the multiplexer system through a 5-ns coaxial cable with GR connectors to the Output connector of the 50 Ω Amplitude Calibrator (Tektronix Part No. 067-0508-00).

NOTE

It is desirable to use a Type S-1 sampling head to adjust the digital and analog gain, because of its low noise characteristic. If there is no Type S-1 being used in the multiplexer system, connect one of the other

types of sampling heads to the 50 Ω Amplitude Calibrator using the instructions given in step 6, part a. (Do not use a 2X attenuator.)

b. Connect a 42-inch 50- Ω coaxial cable with BNC connectors between the sampling unit sampling sweep Trigger Input connector and the Trigger Output connector of the 50 Ω Amplitude Calibrator.

c. Set the sampling unit Units/Div switches to 100 and the sampling sweep Time/Div to 1 μ s.

d. Program the sampling head connected to the 50 Ω Amplitude Calibrator for channel A of the Sampling Unit and some other sampling head for channel B.

e. Set the Type 230 Measurement Mode switch to A Volts and the Ch A and Ch B Reference Zones as follows:

0% Position	1 div from sweep start
100% Position	9 div from sweep start
0% Level	.3 Cm Average
100% Level	.3 Cm Average

f. Set the 50 Ω Amplitude Calibrator for a 0.6 volt square wave output.

g. Trigger the display and center it on the CRT using a sampling unit DC Offset control and the sampling sweep Delay controls.

h. CHECK FOR—Amplitude of pulse, as measured by the Type 230, of 600 mV.

i. ADJUST—R404, the A Digital Gain adjustment, (see Fig. 6-2) for 600 mV.

j. Adjust the sampling unit Gain control (front panel) for a CRT display of 6 divisions.

k. Program the sampling head connected to the 50 Ω Amplitude Calibrator for channel B of the sampling unit and the other sampling head for channel A.

l. Set the sampling unit Mode switch to Ch B and the Type 230 Measurement Mode switch to B Volts.

m. Repeat parts g through i to adjust the B Digital Gain adjustment, R424, (see Fig. 6-2).

n. Disconnect the cables from the 50 Ω Amplitude Calibrator and the multiplexer system.

10. Adjust Type 286 DLY Controls

a. Connect a T-power divider to the Square Wave Or Sine Wave Output connector of the Type 284. Connect a 5 ns coaxial cable with GR connectors between one arm of the T-power divider and sampling head 0 (Type S-1 or Type S-2) of Type 286 0. Connect another 5 ns cable between the other arm of the power divider and sampling head 1 (Type S-1 or Type S-2).

NOTE

If Type S-3 sampling heads are being used, see step 6, part a for instructions for connecting them to the power divider. (Do not use the 2X attenuators.) Use two heads of the same type to adjust the DLY controls.

b. Connect a 42-inch 50-Ω coaxial cable with BNC connectors between the Trigger Output connector of the Type 284 and the Trigger Input connector of the sampling sweep.

c. Set the sampling unit Mode switch to Dual Trace and the Units/Div switches to 200. Set the sampling sweep Time/Div controls for 50 ns.

d. Set the Type 230 Measurement Mode switch to Time.

e. Program sampling head 0 of the Type 286 0 for channel A of the sampling unit and sampling head 1 for channel B.

f. Trigger the display and center the two pulses on the CRT using the sampling unit DC Offset controls and the sampling sweep Delay controls.

g. Turn the sampling head 0, Type 286 0 DLY control throughout its range.

h. CHECK FOR—DLY control range of at least 20 ns measured either on the Type 230 or on the CRT.

i. ADJUST—The sampling head 0 DLY control to the electrical center of its range.

j. Turn the sampling head 1 DLY control throughout its range.

k. CHECK FOR—DLY control range of at least 20 ns.

l. ADJUST—The sampling head 1 DLY control for zero delay between the two pulses (zero reading on the Type 230 readout).

m. Turn off Type 286 0 and exchange sampling head 1 with some other sampling head in the multiplexer system (other than sampling head 0 of Type 286 0). Turn on the Type 286.

n. Program the new sampling head location for channel B of the sampling unit and leave sampling head 0 of Type 286 0 programmed for channel A.

o. Repeat parts j through n for each sampling head in the system.

p. Disconnect all the cables and adapters from the Type 284 Square Wave Or Sine Wave output connector and the multiplexer system.

11. Adjust Signal Choppers (Optional)

a. Install the signal choppers in the multiplexer system. (See the Chopper Quad installation instructions in Section 2.)

b. Connect the 10X attenuator and Type S-3 probe tips to the signal choppers. (Be sure the sampling head compartment numbers match the numbers on the signal choppers.)

c. Connect a VP-2 voltage pickoff to the Square Wave Or Sine Wave Output connector of the Type 284. Connect a 50 Ω end-line termination with GR connectors to the other end of the VP-2. (The trigger cable should still be connected between the Type 284 and the sampling sweep unit.)

d. Insert one of the signal chopper assemblies into the VP-2.

e. Set the sampling unit Mode switch the Ch A and the Channel A Units/Div switch to 20. Set the sampling sweep Time/Div controls to 100 ns.

f. Program the sampling head connected to the Type 284 for channel A of the sampling unit and other sampling head for channel B. Program A CHOP and B CHOP.

g. Set the Type 230 Measurement Mode switch to A Volts and the Ch B Reference Zones 0% Position to the start of the sweep.

h. Trigger the pulse and position it to the center of the CRT using the sampling unit DC Offset and sampling sweep Delay controls (see Fig. 6-5).

i. Set the Type 230 Ch A Reference Zones 0% Position on the baseline of the pulse (but beyond the start of the sweep) and the 100% position on the pulse top.

j. CHECK FOR—Pulse amplitude of 100 mV (5 divisions).

k. ADJUST—C2 on the 10X attenuator (see Fig. 6-6) for a 100 mV pulse amplitude.

m. Set the Type 284 Period switch to 100 ns Square Wave.

n. Turn the signal chopper Chopper Drive adjustment, R13, (see Fig. 6-6) fully counterclockwise, then turn it slowly clockwise.

o. ADJUST—R13 15° beyond the point where the display of square waves begins to be chopped.

p. Remove the signal chopper assembly from the VP-2 and ground the probe tip on the chassis of one of the instruments.

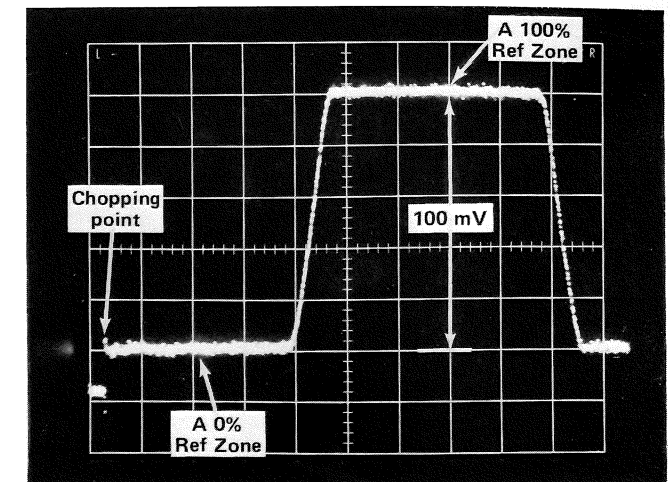


Fig. 6-5. Waveform for adjusting gain of signal chopper (C2 on 10X attenuator).

q. Turn the signal chopper Ground Ref adjustment, R18, (see Fig. 6-6) throughout its range. Note the movement of the trace to the right of the reference zones.

r. ADJUST—R18 for no step after the reference zones.

s. Connect another signal chopper assembly to the VP-2.

t. Repeat parts f through s for each signal chopper used in the multiplexer system.

This completes the calibration procedure for the sampling unit and the multiplexer system.

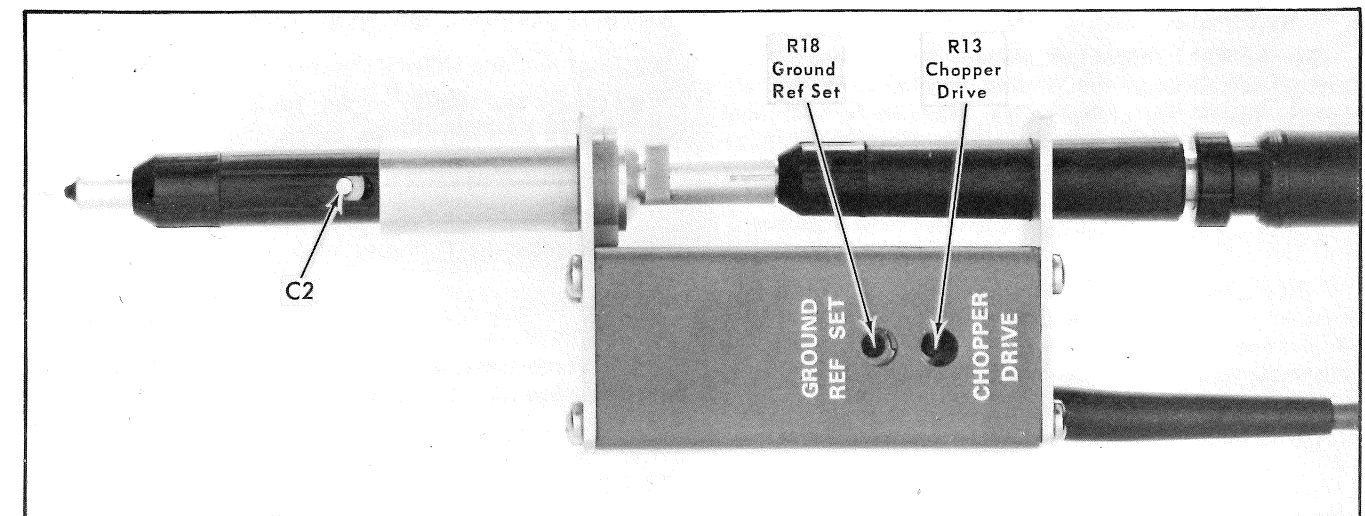


Fig. 6-6. Location of signal chopper adjustments.

Notes for Adjusting a Type 3S2

The Type 3S2 can be adjusted for use with a multiplexer system using the procedure given for the Type 3S5, with the following exceptions:

- Step 3. Memory Gate Width adjustments are R80 (Ch A) and R50 (Ch B). Memory Gain adjustments (Loop Gain) are C276 (Ch A) and C576 (Ch B).
- Step 4. Smoothing Balance adjustments are R247 (Ch A) and R547 (Ch B).
- Step 7. Use step 12 of the Type 3S2 Instruction Manual Performance Check/Calibration procedure.
- Step 9. Digital Gain adjustments are R301 (Ch A) and R601 (Ch B).

Notes for Adjusting a 7S11

The 7S11 can be adjusted for use with a multiplexer system using the procedure given for the Type 3S5, with the following exceptions:

- Step 3. Memory Gate Width adjustment is R460.
 - Step 4. Memory Gain adjustment (Loop Gain) is C275.
 - Step 7. Use step 14 of the 7S11 Instruction Manual Performance Check/Calibration procedure.
 - Step 9. There is no Digital Gain adjustment on the 7S11.
- Use the 7S11 Instruction Manual Performance Check/Calibration procedure for setting up the 7S11 for calibration. Check this procedure for alternate or additional equipment. Calibrate one 7S11 at a time. If only one 7S11 is going to be used, program the Type 286 B4 ENABLE bit high to disable the channel B head selector circuits.

PRELIMINARY PERFORMANCE CHECK PROCEDURE

1. Assemble the digital measurement system. It is assumed that these instruments have been calibrated and are performing within their specified characteristics.
2. Set the Line Voltage Selector assemblies on the rear panels of the Type 286's in accordance with the line voltage to be used to operate the multiplexer system.

3. Assemble the sampling-head multiplexer system and connect it to the digital measurement system and the programmer (see Section 2). Install sampling heads in the sampling head compartments in which they will normally be operated.
4. Connect the multiplexer system, digital measurement system and programmer to the chosen power source. Allow at least 5 minutes warmup at an ambient temperature between 0°C and 50°C (32°F and 122°F) before making any checks.
5. Set the instrument controls as shown at the beginning of the calibration procedure and start the performance check procedure.

TABLE 6-3
Performance Check Procedure
Index and Record

Step No.	Title	Page
1	Check Loop Gain	6-12
2	Check Deflection Factor Accuracy	6-13
3	Check Display Noise	6-13
4	Check Display Jitter	6-14
5	Check Vertical Scale Programming	6-15

PERFORMANCE CHECK PROCEDURE

1. Check Loop Gain

- a. Turn off Type 286 0 and remove the sampling head from its sampling head 0 compartment. Install a normalizer head (Tektronix Part Number 067-0572-01) in the sampling head 0 compartment. Turn on the Type 286.
- b. Center the display of two horizontal traces on the CRT using a sampling unit DC Offset control.
- c. CHECK FOR—Type 230 reading of 500 millivolts \pm 50 millivolts (CRT display of 5 divisions of \pm 0.5 division).
- d. Program sampling 0 of Type 286 0 for channel B of the sampling unit and sampling head 1 for channel A.
- e. Set the sampling unit Mode switch to Ch B and the Type 230 Measurement Mode switch to B Volts.
- f. Repeat parts c and d for channel B of the sampling unit.

2. Check Deflection Factor Accuracy

- a. Turn off Type 286 0 and remove the normalizer head from sampling head compartment 0. Re-install the sampling head removed from this compartment in step 1 and turn on the Type 286.
- b. Connect sampling head 0 of the Type 286 0 to the Output connector of the 50 Ω Amplitude Calibrator using one of the following methods (depending on the type of sampling head):
 1. Type S-1 or Type S-2—Connect the 50 Ω Amplitude Calibrator through a 5 ns coaxial cable with GR connectors to the sampling head.
 2. Type S-3—Connect a VP-2 voltage pickoff to the 50 Ω Amplitude Calibrator and a 50 Ω end-line termination with GR connectors to the VP-2. Insert the Type S-3 probe tip into the hole provided for it in the VP-2.
 3. Type S-4—Connect the 50 Ω Amplitude Calibrator to the sampling head through a GR to 3 mm connector adapter and a 5 ns coaxial cable with 3 mm connectors.
 4. Type S-5—Connect the 50 Ω Amplitude Calibrator to the sampling head through a GR to BNC female connector adapter, a 42-inch 50 Ω coaxial cable and a 50 Ω feedthrough termination, both with BNC connectors.
- c. Connect a 42-inch 50 Ω coaxial cable with BNC connectors between the Trigger Output connector of the 50 Ω Amplitude Calibrator and the Trigger Input connector of the sampling sweep unit.
- d. Set the sampling sweep Time/Div controls for 1 μ s. Set the Type 230 Ch A and Ch B Reference Zones Levels to .3 cm Average and the 100% Position to 9 div from sweep start.
- e. Set the 50 Ω Amplitude Calibrator for a 0.6 volt square wave output.
- f. Program the sampling head connected to the 50 Ω Amplitude Calibrator for channel A of the sampling unit and some other sampling head in the multiplexer system for channel B.
- g. Set the sampling unit Mode switch to Ch A and the Type 230 Measurement Mode switch to A Volts.

- h. Trigger the display and center the pulse on the CRT using the sampling unit DC Offset control and the sampling sweep Delay controls.
- i. CHECK FOR—Pulse amplitude of 600 mV \pm 24 mV (6 div \pm 0.24 div).
- j. Program the sampling head connected to the 50 Ω Amplitude Calibrator for channel B of the sampling unit and the other sampling head for channel A.
- k. Set the sampling unit Mode switch to Ch B and the Type 230 Measurement Mode switch to B Volts.
- l. Repeat parts h and i for channel B of the sampling unit.
- m. Turn off the Type 286's and disconnect sampling head 0 from the 50 Ω Amplitude Calibrator. Connect another sampling head in the multiplexer system to the 50 Ω Amplitude Calibrator using one of the methods given in part b. Turn on the Type 286's.

- n. Repeat parts f through m for each sampling head in the multiplexer system.
- o. Disconnect all the cables from the 50 Ω Amplitude Calibrator.

3. Check Display Noise

NOTE

When making a visual noise reading from a sampling display, the eye interprets a noise value which is neither the RMS nor the peak-to-peak value. Since most observers agree that the displayed noise value is approximately 3 times the RMS value, the tangentially-measured noise here defined is 3 times the RMS value. (The following measurement technique produces acceptable agreement between various operators as to the instrument's noise value.)

- a. Install a GR 5X 50 Ω attenuator on the Type 284 Square Wave Or Sine Wave Output connector. Install a special variable attenuator (item 22 in the equipment list) onto the 5X attenuator. The arrow labeled Signal on the body of the variable attenuator should point away from the Type 284.
- b. Connect one of the sampling heads in the multiplexer system to the variable attenuator using one of the methods given in step 2 part b.

c. Set the following sampling unit controls to:

Mode	Ch A
Units/Div (Ch A)	
Type S-1	5 mV
Type S-2	20 mV
Type S-3	5 mV
Type S-4	10 mV
Type S-5	2 mV

d. Program the sampling head connected to the Type 284 for channel A of the sampling unit and some other sampling head for channel B.

e. Turn the sampling sweep Trigger Sensitivity control fully clockwise for free run operation and position the display onto the CRT with the sampling unit Ch A DC Offset control.

f. Set the Type 284 controls as listed in the initial list of control settings. (Set the Square Wave Amplitude switch to 100 mV.)

g. Turn the variable attenuator control throughout its range and obtain a display of two traces (see Fig. 6-7 display one).

h. Adjust the variable attenuator just to the point where the two traces blend together and appear as one trace (see Fig. 6-7 display two).

i. Set the Type 284 Amplitude switch to 1 V.

j. CHECK FOR—The bottom edges of the two traces separated no more than indicated in Table 6-4. (See Fig. 6-7 display three.)

k. Repeat parts b through j for each sampling head in the multiplexer system.

TABLE 6-4

Check Displayed Noise

Sampling Head	Displayed Noise Measured Tangentially	Separation of Traces on CRT
Type S-1	2.4 mV	3.2 div
Type S-2	7.2 mV	2.4 div
Type S-3	3.6 mV	4.8 div
Type S-4	6 mV	4 div
Type S-5	500 μ V	2 div

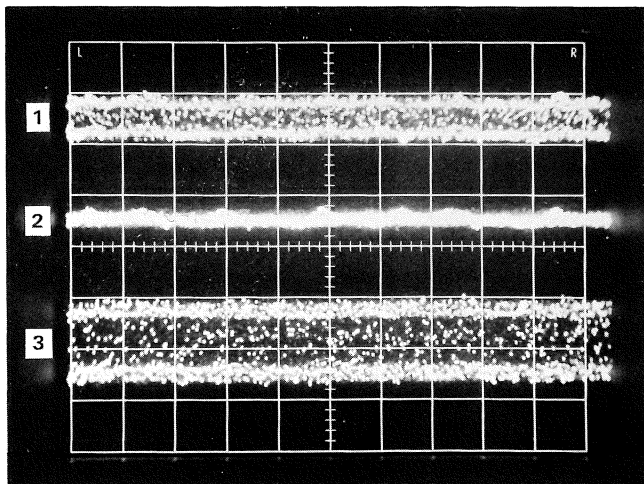


Fig. 6-7. Display for checking sampling head noise.

l. Disconnect all the cables and attenuators from the Type 284 and the multiplexer system.

4. Check Display Jitter

a. Turn off the Type 286's and the sampling oscilloscope.

b. Do one of the following, depending on the type of sampling unit being used:

1. Type 3S6—Disconnect the multiplexer system signal cable from J113 on the rear panel of the Type 568. Connect a sampling head interconnection cable (Tektronix Part No. 012-0130-00) to J113 of the Type 568. Connect a Type S-2 sampling head to the channel A connector on the sampling head extender.

2. Type 3S5—Remove the multiplexer system signal cable from the Type 3S5 sampling head compartments. Install a Type S-2 sampling head in sampling head compartment A.

c. Turn on the sampling oscilloscope.

d. Set the sampling unit Ch A Units/Div switch to 50. Set the sampling sweep unit Time/Div to 100 ps.

e. Connect the Type 284 Output connector through a 5 ns coaxial cable with GR connectors to the input of a 75 ns delay line. Connect the output of the delay line through another 5 ns cable to the Type S-2 sampling head.

f. Connect a 42-inch 50- Ω coaxial cable with BNC connectors between the Type 284 Trigger Output connector and the sampling sweep Trigger Input connector.

g. Set the Type 284 Mode switch to Pulse Output.

h. Trigger the pulse, and position the rise of the pulse onto the CRT using the sampling unit Ch A DC Offset control and the sampling sweep unit Delay controls.

i. Note the horizontal width of the trace on the rise portion of the pulse.

j. Turn off the sampling oscilloscope.

k. Do one of the following, depending on the type of sampling unit being used:

1. Type 3S6—Disconnect the sampling head extender from J113 of the Type 568. Reconnect the multiplexer system signal cable to J113. Disconnect the Type S-2 sampling head from the sampling head extender.

2. Type 3S5—Remove the Type S-2 Sampling Head from the Ch A sampling head compartment of the Sampling Unit. Re-install the multiplexer system signal cable in the sampling unit sampling head compartments.

l. Install the Type S-2 sampling head in the sampling head 0 compartment of Type 286 0.

m. Turn on the Type 286's and the sampling oscilloscope.

n. Program sampling head 0 of Type 286 0 to be connected to channel A of the sampling unit, and some other sampling head in the multiplexer system to be connected to channel B.

o. Position the rise of the pulse onto the CRT using the sampling sweep Delay control.

p. Note the horizontal width of the trace at the rise of the pulse.

q. Square the value determined for trace width in part i and add it to 400 ps².

r. Square the value determined for trace width in part p.

s. CHECK FOR—Number calculated in part r less than number calculated in part q.

t. Turn off the Type 286's.

u. Exchange the Type S-2 sampling head in sampling head compartment 0 of Type 286 0 with some other sampling head in the multiplexer system.

v. Program the new location of the Type S-2 sampling head for channel A of the sampling unit and some other sampling head in the multiplexer system for channel B.

w. Repeat parts o through v for each sampling head location being used in the multiplexer system.

5. Check Vertical Scale Programming

NOTE

Use this step only if the multiplexer system includes a Type 287 or a Type R288.

a. Set the sampling unit Mode switch to Ch B and the Channel B Units/Div switch to 10.

b. Program vertical scale of AMPS.

c. CHECK FOR—Type 230 units readout of mA. (Some Type 230's do not have an A in the units readout position so the unit READOUT will be blank when AMPS is PROGRAMMED.)

d. Program a vertical scale multiplier of X0.1.

e. CHECK FOR—A shift in the Type 230 decimal point from decimal 4 to decimal 3.

f. Program a vertical scale multiplier of X10.

g. CHECK FOR—A shift in the Type 230 decimal point from decimal 3 to decimal 5.

This completes the performance check procedure for the multiplexer system.

Notes for Checking the Performance of a Multiplexer System Connected to a Type 3S2 or 7S11

Use the performance check procedure for the Type 3S5.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip	Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204							
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222					670-0319-00	80009	670-0319-00
02660	BUNKER RAMO CORP., CONNECTOR DIVISION	2801 S 25TH AVENUE	BROADVIEW, IL 60153					670-0320-00	80009	670-0320-00
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876					670-0321-00	80009	670-0321-00
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036					670-0321-01	80009	670-0321-00
05574	VIKING INDUSTRIES, INC.	21001 NORDHOFF STREET	CHATSWORTH, CA 91311					670-0322-00	80009	670-0322-00
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042					670-0322-01	80009	670-0322-01
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112					670-0323-00	80009	670-0323-00
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172					670-0323-01	80009	670-0323-01
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820					670-0323-02	80009	670-0323-02
13511	AMPHENOL CARDRE DIV., BUNKER RAMO CORP.		LOS GATOS, CA 95030							
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402					670-0319-00	80009	670-0319-00
17856	SILICONIX, INC.	2201 LAURELWOOD DRIVE	SANTA CLARA, CA 95054							
24796	AMF, INC., POTTER AND BRUMFIELD DIV.	26181 AVENIDA AEROPUERTO P O BOX 116	SAN JUAN CAPISTRANO, CA 92675	CR12A,B)	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
29587	BUNKER-RAMO CORP., AMPHENOL INDUSTRIAL DIV.	1830 S. 54TH AVE.	CHICAGO, IL 60650	CR14A,B)	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
50434	HEWLETT-PACKARD COMPANY	640 PAGE MILL ROAD	PALO ALTO, CA 94304	CR14C,D)						
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247	CR16A,B)	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.			CR16C,D)						
71468	ITT CANNON ELECTRIC	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107	CR18A,B)	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
71785	TRW, CINCH CONNECTORS	666 E. DYER RD.	SANTA ANA, CA 92702	CR18C,D)						
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007							
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	644 W. 12TH ST.	ERIE, PA 16512							
80009	TEKTRONIX, INC.	401 N. BROAD ST.	PHILADELPHIA, PA 19108					670-0320-00	80009	670-0320-00
91637	DALE ELECTRONICS, INC.	P O BOX 500 P. O. BOX 609	BEAVERTON, OR 97077 COLUMBUS, NE 68601							
				C401	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
				C404	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
				C413	290-0327-00			CAP.,FXD,ELCTLT:0.56UF,20%,100V	56289	150D564X0100A2
				C420	283-0032-00	B010100	B029999	CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
				C420	283-0067-00	B030000		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
				C425	290-0135-00			CAP.,FXD,ELCTLT:15UF,20%,20V	56289	150D156X0020B2
				C431	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
				C433	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
				C440	283-0032-00	B010100	B029999	CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
				C440	283-0067-00	B030000		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
				C445	290-0135-00			CAP.,FXD,ELCTLT:15UF,20%,20V	56289	150D156X0020B2
				C451	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
				C454	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
				C463	290-0327-00			CAP.,FXD,ELCTLT:0.56UF,20%,100V	56289	150D564X0100A2
				C466	290-0114-00			CAP.,FXD,ELCTLT:47UF,20%,6V	56289	150D476X0006B2
				CR401	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR402	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR403	152-0233-00			SEMICOND DEVICE:SILICON,85V,100MA	80009	152-0233-00
				CR408	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	07263	FDH-6012
				CR412	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR419	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR421	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR439	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR451	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR452	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR453	152-0233-00			SEMICOND DEVICE:SILICON,85V,100MA	80009	152-0233-00
				CR458	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	07263	FDH-6012
				CR462	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
				CR489	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	07263	FDH-6012

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
Q404	151-0188-00		TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q410	151-0188-00		TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q412	151-0136-00		TRANSISTOR: SILICON, NPN	02735	35495
Q418	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q420	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q422	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q432	151-0188-00		TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q434	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q438	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q440	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q442	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q454	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q460	151-0190-00		TRANSISTOR: SILICON, NPN	07263	S032677
Q462	151-0208-00		TRANSISTOR: SILICON, PNP	80009	151-0208-00
Q466	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q472	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q474	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q476	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q478	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q480	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q482	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q484	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q486	151-0260-00		TRANSISTOR: SILICON, NPN	80009	151-0260-00
R403	315-0513-00		RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R404	315-0362-00		RES., FXD, CMPSN: 3.6K OHM, 5%, 0.25W	01121	CB3625
R405	315-0153-00		RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R406	315-0473-00		RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R411	315-0163-00		RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R416	321-0326-00		RES., FXD, FILM: 24.3K OHM, 1%, 0.125W	91637	MFF1816G24301F
R417	321-0336-00		RES., FXD, FILM: 30.9K OHM, 1%, 0.125W	91637	MFF1816G30901F
R418	315-0163-00		RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R419	322-0338-00		RES., FXD, FILM: 32.4K OHM, 1%, 0.25W	75042	CEBTO-3242F
R421	315-0333-00		RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R422	315-0153-00		RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R425	315-0242-00		RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R432	317-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R433	315-0102-00		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R435	315-0622-00		RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R437	315-0473-00		RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R438	315-0621-00		RES., FXD, CMPSN: 620 OHM, 5%, 0.25W	01121	CB6215
R439	321-0313-00		RES., FXD, FILM: 17.8K OHM, 1%, 0.125W	91637	MFF1816G17801F
R440	315-0622-00		RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R442	315-0133-00		RES., FXD, CMPSN: 13K OHM, 5%, 0.25W	01121	CB1335
R445	315-0242-00		RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R453	315-0513-00		RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R454	315-0362-00		RES., FXD, CMPSN: 3.6K OHM, 5%, 0.25W	01121	CB3625
R455	315-0153-00		RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R456	315-0473-00		RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R461	315-0163-00		RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R466	301-0510-00		RES., FXD, CMPSN: 51 OHM, 5%, 0.50W	01121	EB5105
R467	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R471	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R472	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R473	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R474	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R475	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R476	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R477	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R478	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R479	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R480	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R481	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R482	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R483	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R484	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R485	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R486	317-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R489	317-0473-00		RES., FXD, CMPSN: 47K OHM, 5%, 0.125W	01121	BB4735

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-0321-00	B010100	B019999	CKT BOARD ASSY:FET & LOGIC	80009	670-0321-00
	670-0321-01	B020000		CKT BOARD ASSY:FET & LOGIC	80009	670-0321-01
C331	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%, 25V	56289	19C611
C333	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%, 25V	56289	19C611
C335	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%, 25V	56289	19C611
C337	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%, 25V	56289	19C611
CR332	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR334	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR336	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR338	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR345	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR355	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR356	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR375	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR376	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR385	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR386	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
Q300	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q300	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q302	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q302	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q304	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q304	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q306	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q306	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q308	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q308	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q310	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q310	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q312	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q312	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q314	151-1021-00	B010100	B019999	TRANSISTOR:SILICON, JFE	17856	FN815
Q314	151-1022-00	B020000		TRANSISTOR:SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q316	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q318	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q320	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q322	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q324	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q326	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q328	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q330	151-1021-00			TRANSISTOR:SILICON, JFE	17856	FN815
Q344	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q346	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677
Q348	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677
Q350	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q352	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q356	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677
Q358	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677
Q360	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q362	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q364	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q366	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q374	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q376	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677
Q378	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q380	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q382	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q386	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677
Q388	151-0190-00			TRANSISTOR:SILICON, NPN	07263	S032677
Q390	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q392	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q394	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
Q396	151-0188-00			TRANSISTOR:SILICON, PNP	04713	SPS6868K
R300	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R302	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R304	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R306	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R308	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R310	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R312	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R314	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R316	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R318	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R320	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R322	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R324	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R325	317-0122-00			RES., FXD, CMPSN:1.2K OHM, 5%, 0.125W	01121	BB1225
R326	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R327	317-0472-00			RES., FXD, CMPSN:4.7K OHM, 5%, 0.125W	01121	BB4725
R328	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R330	317-0106-00			RES., FXD, CMPSN:10M OHM, 5%, 0.125W	01121	BB1065
R331	317-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.125W	01121	BB2025
R332	321-0421-00			RES., FXD, FILM:237K OHM, 1%, 0.125W	91637	MFF1816G23702F
R333	317-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.125W	01121	BB2025
R334	321-0421-00			RES., FXD, FILM:237K OHM, 1%, 0.125W	91637	MFF1816G23702F
R335	317-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.125W	01121	BB2025
R336	321-0421-00			RES., FXD, FILM:237K OHM, 1%, 0.125W	91637	MFF1816G23702F
R337	317-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.125W	01121	BB2025
R338	321-0421-00			RES., FXD, FILM:237K OHM, 1%, 0.125W	91637	MFF1816G23702F
R342	317-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.125W	01121	BB1035
R343	317-0512-00			RES., FXD, CMPSN:5.1K OHM, 5%, 0.125	01121	BB5125
R345	317-0753-00			RES., FXD, CMPSN:75K OHM, 5%, 0.125W	01121	BB7535
R346	317-0622-00			RES., FXD, CMPSN:6.2K OHM, 5%, 0.125W	01121	BB6225
R347	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R348	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R349	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R355	317-0753-00			RES., FXD, CMPSN:75K OHM, 5%, 0.125W	01121	BB7535
R356	317-0622-00			RES., FXD, CMPSN:6.2K OHM, 5%, 0.125W	01121	BB6225
R357	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R358	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R359	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R372	317-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.125W	01121	BB1035
R373	317-0512-00			RES., FXD, CMPSN:5.1K OHM, 5%, 0.125	01121	BB5125
R375	317-0753-00			RES., FXD, CMPSN:75K OHM, 5%, 0.125W	01121	BB7535
R376	317-0622-00			RES., FXD, CMPSN:6.2K OHM, 5%, 0.125W	01121	BB6225
R377	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R378	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R379	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525
R385	317-0753-00			RES., FXD, CMPSN:75K OHM, 5%, 0.125W	01121	BB7535
R386	317-0622-00			RES., FXD, CMPSN:6.2K OHM, 5%, 0.125W	01121	BB6225
R387	317-0752-00			RES., FXD, CMPSN:7.5K OHM, 5%, 0.125W	01121	BB7525

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R388	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R389	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
VR342	152-0149-00			SEMICONV DEVICE: ZENER, 0.4W, 10V, 5%	80009	152-0149-00
VR372	152-0149-00			SEMICONV DEVICE: ZENER, 0.4W, 10V, 5%	80009	152-0149-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-0322-00	B010100	B039999	CKT BOARD ASSY: STROBE DELAY	80009	670-0322-00
	670-0322-01	B040000		CKT BOARD ASSY: STROBE DELAY	80009	670-0322-01
C202	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C208	283-0060-00			CAP., FXD, CER DI: 100PF, 5%, 200V	72982	855-535U2J101J
C209	281-0579-00			CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050C0G0210J
C211	283-0032-00	B010100	B039999	CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C211	281-0052-00	B040000		CAP., VAR, CER DI: 7-45PF, 500V	72982	503-041D2P033R
C216	283-0109-00			CAP., FXD, CER DI: 27PF, 5%, 1000V	56289	20C376
C218	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C219	290-0135-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	56289	150D156X0020B2
C222	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C228	283-0060-00			CAP., FXD, CER DI: 100PF, 5%, 200V	72982	855-535U2J101J
C229	281-0511-00			CAP., FXD, CER DI: 22PF, +/-2.2PF, 500V	72982	301-000C0G0220K
C231	283-0032-00	B010100	B039999	CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C231	283-0052-00	B040000		CAP., FXD, CER DI: 105PF, 1%, 500V	72982	0841541C0G01050F
C236	283-0109-00			CAP., FXD, CER DI: 27PF, 5%, 1000V	56289	20C376
C238	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C239	290-0135-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	56289	150D156X0020B2
C242	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C248	283-0060-00			CAP., FXD, CER DI: 100PF, 5%, 200V	72982	855-535U2J101J
C249	283-0109-00			CAP., FXD, CER DI: 27PF, 5%, 1000V	56289	20C376
C251	283-0032-00	B010100	B039999	CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C251	283-0052-00	B040000		CAP., FXD, CER DI: 105PF, 1%, 500V	72982	0841541C0G01050F
C256	283-0109-00			CAP., FXD, CER DI: 27PF, 5%, 1000V	56289	20C376
C258	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C259	290-0135-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	56289	150D156X0020B2
C262	283-0032-00			CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C268	283-0060-00			CAP., FXD, CER DI: 100PF, 5%, 200V	72982	855-535U2J101J
C269	281-0629-00			CAP., FXD, CER DI: 33PF, 5%, 600V	72982	308-000C0G0330J
C271	283-0032-00	B010100	B039999	CAP., FXD, CER DI: 470PF, 5%, 500V	72982	0831085Z5E00471J
C271	283-0052-00	B040000		CAP., FXD, CER DI: 105PF, 1%, 500V	72982	0841541C0G01050F
C276	283-0109-00			CAP., FXD, CER DI: 27PF, 5%, 1000V	56289	20C376
C278	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C279	290-0135-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	56289	150D156X0020B2
CR202	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR205	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR206	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR208	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR209	152-0141-02	B010100	B039999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR209	152-0322-00	B040000		SEMICONV DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR216	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR222	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR225	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR226	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR228	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR229	152-0141-02	B010100	B039999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR229	152-0322-00	B040000		SEMICONV DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR236	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR242	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR245	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR246	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR248	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR249	152-0141-02	B010100	B039999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR249	152-0322-00	B040000		SEMICONV DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR256	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR262	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Name & Description	Mfr Code	Mfr Part Number
CR265	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR266	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR268	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR269	152-0141-02	B010100	B039999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR269	152-0322-00	B040000		SEMICONV DEVICE: SILICON, 15V, HOT CARRIER	50434	5082-2672
CR276	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
L219	120-0382-00			XFMR, TOROID: 14 TURNS, SINGLE	80009	120-0382-00
L239	120-0382-00			XFMR, TOROID: 14 TURNS, SINGLE	80009	120-0382-00
L259	120-0382-00			XFMR, TOROID: 14 TURNS, SINGLE	80009	120-0382-00
L279	120-0382-00			XFMR, TOROID: 14 TURNS, SINGLE	80009	120-0382-00
Q212	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q216	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q232	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q236	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q252	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q256	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q272	151-0188-00			TRANSISTOR: SILICON, PNP	04713	SPS6868K
Q276	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
R201	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R202	315-0124-00			RES., FXD, CMPSN: 120K OHM, 5%, 0.25W	01121	CB1245
R206	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R207	315-0623-00			RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R211	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R212	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R213	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R217	317-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.125W	01121	BB2735
R218	317-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.125W	01121	BB3015
R221	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R222	315-0124-00			RES., FXD, CMPSN: 120K OHM, 5%, 0.25W	01121	CB1245
R226	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R227	315-0623-00			RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R231	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R232	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R233	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R237	317-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.125W	01121	BB2735
R238	317-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.125W	01121	BB3015
R241	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R242	315-0124-00			RES., FXD, CMPSN: 120K OHM, 5%, 0.25W	01121	CB1245
R246	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R247	315-0623-00			RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R251	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R252	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R253	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R257	317-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.125W	01121	BB2735
R258	317-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.125W	01121	BB3015
R261	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R262	315-0124-00			RES., FXD, CMPSN: 120K OHM, 5%, 0.25W	01121	CB1245
R266	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R267	315-0623-00			RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R271	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R272	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R273	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R277	317-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.125W	01121	BB2735
R278	317-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.125W	01121	BB3015

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-0323-00	B010100	B019999	CKT BOARD ASSY: STROBE & PREAMP	80009	670-0323-00
	670-0323-01	B020000	B039999	CKT BOARD ASSY: STROBE & PREAMP	80009	670-0323-01
	670-0323-02	B040000		CKT BOARD ASSY: STROBE & PREAMP	80009	670-0323-02
C101	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C109	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C111	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C121	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C131	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C141	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C149	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C151	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C161	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C171	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145651 104Z
C180	283-0080-00	B010100	B039999	CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C180	283-0100-00	B040000		CAP., FXD, CER DI: 0.0047UF, 10%, 200V	56289	273C3
C184	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C186	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C188	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C190	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C193	283-0059-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	72982	8131N031Z5U0105Z
C195	290-0135-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	56289	150D156X0020B2
C197	290-0135-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	56289	150D156X0020B2
CR108	152-0141-02	B010100	B019999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR108	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR118	152-0141-02	B010100	B019999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR118	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR128	152-0141-02	B010100	B019999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR128	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR138	152-0141-02	B010100	B019999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR138	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR148	152-0141-02	B010100	B019999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR148	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR158	152-0141-02	B010100	B019999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR158	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR168	152-0141-02	B010100	B01999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR168	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR178	152-0141-02	B010100	B019999	SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR178	152-0107-00	B020000		SEMICONV DEVICE: SILICON, 400V, 400MA	01295	G727
CR181	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
L195	120-0382-00			XFMR, TOROID: 14 TURNS, SINGLE	80009	120-0382-00
L197	120-0382-00			XFMR, TOROID: 14 TURNS, SINGLE	80009	120-0382-00
Q106	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q108	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q116	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q118	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q126	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q128	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q136	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q138	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q146	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q148	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q156	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q158	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q166	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q168	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q176	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q178	151-0224-00			TRANSISTOR: SILICON, NPN	07263	S24850
Q184	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q186	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q188	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q190	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
R101	317-0560-00			RES., FXD, CMPSN: 56 OHM, 5%, 0.125W	01121	BB5605
R102	317-0221-00	XB020000		RES., FXD, CMPSN: 220 OHM, 5%, 0.125W	01121	BB2215
R103	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R104	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R106	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R107	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R109	317-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.125W	01121	BB6215
R113	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R114	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R116	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R117	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R121	317-0560-00			RES., FXD, CMPSN: 56 OHM, 5%, 0.125W	01121	BB5605
R122	317-0221-00	XB020000		RES., FXD, CMPSN: 220 OHM, 5%, 0.125W	01121	BB2215
R123	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R124	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R126	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R127	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R133	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R134	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R136	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R137	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R141	317-0560-00			RES., FXD, CMPSN: 56 OHM, 5%, 0.125W	01121	BB5605
R142	317-0221-00	XB02000		RES., FXD, CMPSN: 220 OHM, 5%, 0.125W	01121	BB2215
R143	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R144	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R146	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R147	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R149	317-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.125W	01121	BB6215
R153	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R154	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R156	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R157	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R161	317-0560-00			RES., FXD, CMPSN: 56 OHM, 5%, 0.125W	01121	BB5605
R162	317-0221-00	XB020000		RES., FXD, CMPSN: 220 OHM, 5%, 0.125W	01121	BB2215
R163	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R164	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R166	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R167	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R173	317-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.125W	01121	BB8235
R174	317-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.125W	01121	BB7525
R176	322-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.25W	75042	CEBT0-1001F
R177	317-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 0.125W	01121	BB1635
R180	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R183	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R184	317-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.125W	01121	BB1025
R185	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R186	317-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.125W	01121	BB1025
R187	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R188	317-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.125W	01121	BB1025
R189	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R190	317-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.125W	01121	BB1025

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R193	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
T180	120-0478-00			XFMR, TOROID: 5 TURNS, BIFILIAR, 1A5	80009	120-0478-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CHASSIS PARTS						
C12	290-0408-00			CAP., FXD, ELCTLT: 100UF, +50-10%, 100V		
C14	290-0317-00			CAP., FXD, ELCTLT: 1000UF, +100-10%, 40V	56289	D44560-DFP
C16	290-0317-00			CAP., FXD, ELCTLT: 1000UF, +100-10%, 40V	56289	D44560-DFP
C18	290-0408-00			AP., FXD, ELCTLT: 100UF, +50-10%, 100V		
DS472	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
DS474	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
DS476	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
DS478	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
DS480	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
DS482	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
DS484	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
DS486	150-0046-00			LAMP, INCAND: 10V, 0.04A	08806	2107D
F3	159-0022-00	B010100	B049999	FUSE, CARTRIDGE: 3AG, 1A, 250V, FAST-BLOW	71400	AGC 1
F3	159-0025-00	B050000	B050439	FUSE, CARTRIDGE: 3AG, 0.5A, 250V, FAST-BLOW	71400	AGC 1/2
F3	159-0032-00	B050440		FUSE, CARTRIDGE: 3AG, 0.5A, 250V, SLOW-BLOW	71400	MDL 1/2
F4	159-0025-00	B010100	B049999	FUSE, CARTRIDGE: 3AG, 0.5A, 250V, FAST-BLOW	71400	AGC 1/2
F4	159-0028-00	B050000	B050439	FUSE, CARTRIDGE: 3AG, 0.25A, 250V, FAST-BLOW	71400	AGC 1/4
F4	159-0029-00	B050440		FUSE, CARTRIDGE: 3AG, 0.3A, 250V, SLOW-BLOW	71400	MDL3/10
J1	131-0294-06			CONNECTOR, RCPT, : 36 PIN, FEMALE	02660	57-41360-06
J2	131-0294-03			CONNECTOR, RCPT, : 36 CONT, FEMALE	13511	57-41360-03
J3	131-0572-00			CONN, RCPT, ELEC: PWR, MALE, 125VAC, 15A		
J40	-----			(FURNISHED AS A UNIT WITH 179-1490-00)		
J41	131-0410-00			CONN, RCPT, ELEC:	71468	DM53741-5001
J42	131-0410-00			CONN, RCPT, ELEC:	71468	DM53741-5001
J43	131-0410-00			CONN, RCPT, ELEC:	71468	DM53741-5001
J50	131-0581-00			CONNECTOR, RCPT, : 12 FEMALE CONTACTS	05574	000221-0355
J51	131-0581-00			CONNECTOR, RCPT, : 12 FEMALE CONTACTS	05574	000221-0355
J52	131-0581-00			CONNECTOR, RCPT, : 12 FEMALE CONTACTS	05574	000221-0355
J53	131-0581-00			CONNECTOR, RCPT, : 12 FEMALE CONTACTS	05574	000221-0355
J60	131-0849-00			CONN, RCPT, ELEC: CKT BD, 36/72 CONT	05574	000201-5430
J70	131-0849-00			CONN, RCPT, ELEC: CKT BD, 36/72 CONT	05574	000201-5430
J80	131-0849-00			CONN, RCPT, ELEC: CKT BD, 36/72 CONT	05574	000201-5430
J90	131-0849-00			CONN, RCPT, ELEC: CKT BD, 36/72 CONT	05574	000201-5430
Q424	151-0148-00			TRANSISTOR: SILICON, NPN	02735	36568
Q444	151-0148-00			TRANSISTOR: SILICON, NPN	02735	36568
R2	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R12	317-0047-00	XB050000		RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R15	315-0100-00	XB050000		RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R16	315-0100-00	XB050000		RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R18	317-0047-00	XB050000		RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R37	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R41	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R42	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R43	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R200	311-0310-00			RES., VAR, NONWIR: 5K OHM, 20%, 0.50W	01121	W-7350A
R220	311-0310-00			RES., VAR, NONWIR: 5K OHM, 20%, 0.50W	01121	W-7350A
R240	311-0310-00			RES., VAR, NONWIR: 5K OHM, 20%, 0.50W	01121	W-7350A
R260	311-0310-00			RES., VAR, NONWIR: 5K OHM, 20%, 0.50W	01121	W-7350A
R360	311-0642-00			RES., VAR, NONWIR: 20K OHM, 20%, 0.50W	12697	382-CM39820
R361	311-0642-00			RES., VAR, NONWIR: 20K OHM, 20%, 0.50W	12697	382-CM39820
R362	311-0642-00			RES., VAR, NONWIR: 20K OHM, 20%, 0.50W	12697	382-CM39820
R362	311-0642-00			RES., VAR, NONWIR: 20K OHM, 20%, 0.50W	12697	382-CM39820
S3	260-0834-00			SWITCH, TOGGLE: DPDT, 5A, 125VAC, 0.25-40 THD	09353	U21-SHZQE

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
S4	-----	-----		(SEE MPL. LINE VOLTAGE SELECTOR)		
S5	-----	-----		(SEE MPL. LINE VOLTAGE SELECTOR)		
T3	120-0655-00			XFMR, PWR, STPDN: 286	80009	120-0655-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-1170-00			CKT BOARD ASSY:LOGIC & LOGIC DRIVE	80009	670-1170-00
CR202	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR206	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR210	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR214	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR218	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR222	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR226	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR230	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR235	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR236	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR245	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR246	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR265	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR266	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR275	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR276	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
Q202	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q206	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q210	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q214	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q218	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q222	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q226	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q230	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q234	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q236	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q238	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q240	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q242	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q246	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q248	151-0190-00			TRANSISTOR:SILICON,NPN	04713	SPS6868K
Q250	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q252	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q254	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q256	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q264	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q266	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q268	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q270	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q272	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q276	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q278	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q280	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q282	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q284	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q286	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
R201	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R202	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R205	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R206	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R209	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R210	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R213	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R214	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R217	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Name & Description	Mfr Code	Mfr Part Number
R218	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R221	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R222	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R225	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R226	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R229	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R230	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R232	317-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.125W	01121	BB1035
R233	317-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.125	01121	BB5125
R235	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R236	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R237	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R238	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R239	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R245	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R246	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R247	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R248	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R249	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R262	317-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.125W	01121	BB1035
R263	317-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.125	01121	BB5125
R265	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R266	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R267	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R268	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R269	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R275	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R276	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R277	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R278	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R279	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
VR232	152-0149-00			SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR262	152-0149-00			SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-1172-00			CKT BOARD ASSY:STROBE & PREAMP(2)	80009	670-1172-00
C109	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%,25V	56289	19C611
C149	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%,25V	56289	19C611
C181	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%,25V	56289	19C611
C193	290-0135-00			CAP., FXD, ELCTLT:15UF,20%,20V	56289	150D156X0020B2
C195	290-0135-00			CAP., FXD, ELCTLT:15UF,20%,20V	56289	150D156X0020B2
C197	290-0135-00			CAP., FXD, ELCTLT:15UF,20%,20V	56289	150D156X0020B2
CR108	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR118	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR128	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR138	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR148	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR158	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR168	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR178	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
L193	120-0382-00			XFMR, TOROID:14 TURNS,SINGLE	80009	120-0382-00
L195	120-0382-00			XFMR, TOROID:14 TURNS,SINGLE	80009	120-0382-00
L197	120-0382-00			XFMR, TOROID:14 TURNS,SINGLE	80009	120-0382-00
Q106	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q108	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q116	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q118	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q126	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q128	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q136	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q138	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q146	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q148	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q156	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q158	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q166	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q168	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q176	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q178	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q184	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q186	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q188	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q190	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
R103	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R104	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R106	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R107	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R108	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R109	317-0621-00			RES., FXD, CMPSN:620 OHM,5%,0.125W	01121	BB6215
R113	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R114	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R116	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R117	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R118	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R123	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R124	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R126	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R127	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R128	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R133	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R134	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R136	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R137	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R138	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R143	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R144	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R146	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R147	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R148	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R149	317-0621-00			RES., FXD, CMPSN:620 OHM,5%,0.125W	01121	BB6215
R153	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R154	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R156	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R157	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R158	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R163	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R164	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R166	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R167	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R168	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R173	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R174	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R176	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBT0-1001F
R177	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R178	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R181	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R183	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R184	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535
R185	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R186	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535
R187	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R188	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535
R189	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R190	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-1173-00			CKT BOARD ASSY:VERTICAL SCALE	80009	670-1173-00
CR301	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR311	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR314	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR321	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR324	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR325	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
Q304	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q306	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q314	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q316	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q324	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
R301	315-0513-00			RES.,FXD,CMPSPN:51K OHM,5%,0.25W	01121	CB5135
R302	315-0432-00			RES.,FXD,CMPSPN:4.3K OHM,5%,0.25W	01121	CB4325
R304	315-0752-00			RES.,FXD,CMPSPN:7.5K OHM,5%,0.25W	01121	CB7525
R306	315-0622-00			RES.,FXD,CMPSPN:6.2K OHM,5%,0.25W	01121	CB6225
R308	315-0391-00			RES.,FXD,CMPSPN:390 OHM,5%,0.25W	01121	CB3915
R309	315-0391-00			RES.,FXD,CMPSPN:390 OHM,5%,0.25W	01121	CB3915
R311	315-0103-00			RES.,FXD,CMPSPN:10K OHM,5%,0.25W	01121	CB1035
R312	315-0821-00			RES.,FXD,CMPSPN:820 OHM,5%,0.25W	01121	CB8215
R315	315-0512-00			RES.,FXD,CMPSPN:5.1K OHM,5%,0.25W	01121	CB5125
R316	315-0752-00			RES.,FXD,CMPSPN:7.5K OHM,5%,0.25W	01121	CB7525
R317	315-0102-00			RES.,FXD,CMPSPN:1K OHM,5%,0.25W	01121	CB1025
R318	315-0622-00			RES.,FXD,CMPSPN:6.2K OHM,5%,0.25W	01121	CB6225
R321	315-0332-00			RES.,FXD,CMPSPN:3.3K OHM,5%,0.25W	01121	CB3325
R322	315-0431-00			RES.,FXD,CMPSPN:430 OHM,5%,0.25W	01121	CB4315
R327	315-0622-00			RES.,FXD,CMPSPN:6.2K OHM,5%,0.25W	01121	CB6225
R328	315-0391-00			RES.,FXD,CMPSPN:390 OHM,5%,0.25W	01121	CB3915
R329	315-0391-00			RES.,FXD,CMPSPN:390 OHM,5%,0.25W	01121	CB3915

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Name & Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
C31	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C33	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C35	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C37	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
CR501	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
F501	159-0015-00			FUSE,CARTRIDGE:3AG,3A,250V,FAST-BLOW	71400	AGC 3
J10	131-0892-06			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J11	131-0892-06			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J12	131-0892-06			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J13	131-0892-06			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J20	131-0892-03			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J21	131-0892-03			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J22	131-0892-03			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J23	131-0892-03			CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J31	131-0884-00			CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J32	131-0884-00			CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J33	131-0884-00			CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J34	131-0884-00			CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J101	131-0849-00			CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J201	131-0849-00			CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J301	131-0849-00			CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J401	131-0849-00			CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J510	131-0324-00			CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J511	131-0324-00			CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J512	131-0324-00			CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J513	131-0324-00			CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J515	131-0294-05			CONNECTOR,RCPT,:FEMALE,36 CONTACT,5 KEY	02660	57-41360-05
J516	131-0294-04			CONNECTOR,RCPT,:FEMALE,36 CONTACT,4 KEY	02660	57-41360-04
J521	131-0294-06			CONNECTOR,RCPT,:36 PIN,FEMALE	02660	57-41360-06
J531	131-0294-03			CONNECTOR,RCPT,:36 CONT,FEMALE	13511	57-41360-03
K501	148-0056-00	B010100	B020176	RELAY,ARMATURE:2 FORM C,12VDC,5A,26.5VDC		
K501	148-0045-00	B020177		RELAY,ARMATURE:12VDC,185 OHMCOIL	24796	R10-E 1105-1
Q501	151-0136-00			TRANSISTOR:SILICON,NPN	02735	35495
R21	317-0510-00			RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R22	317-0510-00			RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R23	317-0510-00			RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R27	317-0510-00			RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R501	315-0152-00			RES.,FXD,CMPSPN:1.5K OHM,5%,0.25W	01121	CB1525
VR501	152-0149-00			SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-1170-00			CKT BOARD ASSY:LOGIC & LOGIC DRIVE(2)	80009	670-1170-00
CR202	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR206	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR210	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR214	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR218	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR222	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR226	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR230	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR235	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR236	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR245	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR246	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR265	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR266	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR275	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR276	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
Q202	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q206	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q210	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q214	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q218	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q222	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q226	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q230	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q234	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q236	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q238	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q240	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q242	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q246	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q248	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q250	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q252	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q254	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q256	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q264	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q266	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q268	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q270	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q272	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q276	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q278	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q280	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q282	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q284	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q286	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
R201	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R202	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R205	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R206	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R209	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R210	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R213	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R214	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R217	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R218	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R221	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R222	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R225	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R226	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R229	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R230	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R232	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R233	317-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.125	01121	BB5125
R235	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R236	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R237	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R238	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R239	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R245	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R246	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R247	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R248	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R249	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R262	317-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.125W	01121	BB1035
R263	317-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.125	01121	BB5125
R265	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R266	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R267	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R268	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R269	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R275	317-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.125W	01121	BB7535
R276	317-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.125W	01121	BB6225
R277	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R278	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R279	317-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.125W	01121	BB7525

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-1172-00			CKT BOARD ASSY:STROBE & PREAMP(2)	80009	670-1172-00
C109	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%,25V	56289	19C611
C149	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%,25V	56289	19C611
C181	283-0080-00			CAP., FXD, CER DI:0.022UF,+80-20%,25V	56289	19C611
C193	290-0135-00			CAP., FXD, ELCTLT:15UF,20%,20V	56289	150D156X0020B2
C195	290-0135-00			CAP., FXD, ELCTLT:15UF,20%,20V	56289	150D156X0020B2
C197	290-0135-00			CAP., FXD, ELCTLT:15UF,20%,20V	56289	150D156X0020B2
CR108	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR118	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR128	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR138	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR148	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR158	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR168	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
CR178	152-0141-02			SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
L193	120-0382-00			XFMR, TOROID:14 TURNS,SINGLE	80009	120-0382-00
L195	120-0382-00			XFMR, TOROID:14 TURNS,SINGLE	80009	120-0382-00
L197	120-0382-00			XFMR, TOROID:14 TURNS,SINGLE	80009	120-0382-00
Q106	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q108	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q116	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q118	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q126	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q128	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q136	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q138	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q146	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q148	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q156	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q158	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q166	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q168	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q176	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q178	151-0224-00			TRANSISTOR:SILICON,NPN	07263	S24850
Q184	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q186	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q188	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q190	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
R103	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R104	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R106	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R107	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R108	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R109	317-0621-00			RES., FXD, CMPSN:620 OHM,5%,0.125W	01121	BB6215
R113	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R114	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R116	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R117	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R118	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R123	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R124	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R126	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R127	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R128	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R133	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R134	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R136	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R137	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R138	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R143	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R144	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R146	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R147	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R148	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R149	317-0621-00			RES., FXD, CMPSN:620 OHM,5%,0.125W	01121	BB6215
R153	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R154	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R156	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R157	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R158	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R163	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R164	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R166	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R167	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R168	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R173	317-0823-00			RES., FXD, CMPSN:82K OHM,5%,0.125W	01121	BB8235
R174	317-0752-00			RES., FXD, CMPSN:7.5K OHM,5%,0.125W	01121	BB7525
R176	322-0193-00			RES., FXD, FILM:1K OHM,1%,0.25W	75042	CEBTO-1001F
R177	317-0163-00			RES., FXD, CMPSN:16K OHM,5%,0.125W	01121	BB1635
R178	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R181	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R183	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R184	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535
R185	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R186	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535
R187	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R188	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535
R189	317-0101-00			RES., FXD, CMPSN:100 OHM,5%,0.125W	01121	BB1015
R190	317-0153-00			RES., FXD, CMPSN:15K OHM,5%,0.125W	01121	BB1535

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-1174-01			CKT BOARD ASSY:VERTICAL SCALE & FET LOGIC	80009	670-1174-01
CR301	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR311	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR314	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR321	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR324	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR325	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR342	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
CR362	152-0141-02			SEMICON D DEVICE:SILICON,30V,50NA	01295	1N4152R
Q304	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q306	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q314	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q316	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q324	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q342	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q344	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q346	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q348	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q352	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
Q354	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
Q356	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
Q358	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
Q362	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q364	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q366	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q368	151-1022-00			TRANSISTOR:SILICON,JFE,SEL FROM 2N4392	80009	151-1022-00
Q372	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
Q374	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
Q376	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
Q378	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
R301	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R302	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R304	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R306	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R308	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R309	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R311	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R312	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R315	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R316	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R317	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R318	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R321	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R322	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R327	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R328	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R329	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R340	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R341	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R342	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R344	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R346	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R348	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R352	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R354	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R356	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R358	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R362	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R364	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R366	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R368	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R372	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R374	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R376	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065
R378	317-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.125W	01121	BB1065

SECTION 8 DIAGRAMS and MECHANICAL PARTS ILLUSTRATIONS

Change information, if any, affecting this section will be found at the rear of the manual.

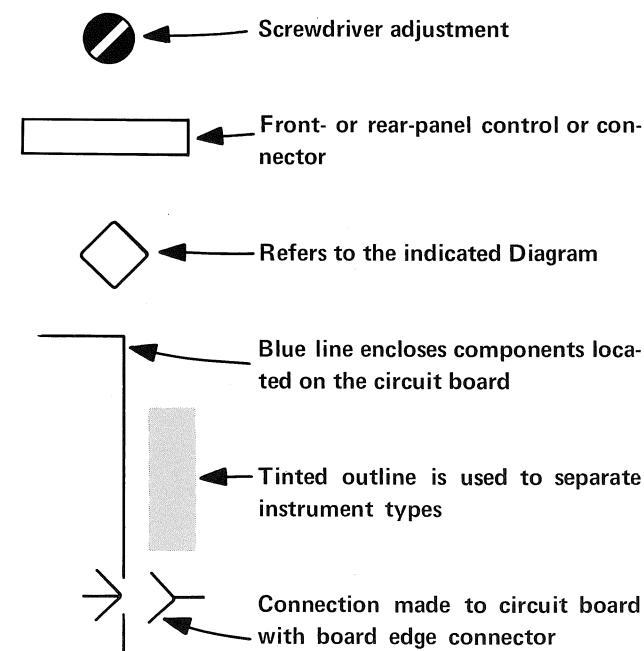
Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
CHASSIS PARTS					
C31	283-0178-00		CAP., FXD, CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C33	283-0178-00		CAP., FXD, CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C35	283-0178-00		CAP., FXD, CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C37	283-0178-00		CAP., FXD, CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
CR501	152-0141-02		SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
F501	159-0015-00		FUSE,CARTRIDGE:3AG,3A,250V,FAST-BLOW	71400	AGC 3
J10	131-0892-06		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J11	131-0892-06		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J12	131-0892-06		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J13	131-0892-06		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY #6		
J20	131-0892-03		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J21	131-0892-03		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J22	131-0892-03		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J23	131-0892-03		CONN,RCPT,ELEC:36 CONTACT,MALE,KEY NO 3	29587	57-10360 (398)
J31	131-0884-00		CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J32	131-0884-00		CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J33	131-0884-00		CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J34	131-0884-00		CONN,RCPT,ELEC:PWR,FEM,125VAC,15A	80009	131-0884-00
J101	131-0849-00		CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J102	131-0849-00		CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J201	131-0849-00		CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J202	131-0849-00		CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J301	131-0849-00		CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J401	131-0849-00		CONN,RCPT,ELEC:CKT BD,36/72 CONT	05574	000201-5430
J510	131-0324-00		CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J511	131-0324-00		CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J512	131-0324-00		CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J513	131-0324-00		CONNECTOR,RCPT,:24 PIN,FEMALE	71785	222-42-24-060
J515	131-0294-05		CONNECTOR,RCPT,:FEMALE,36 CONTACT,5 KEY	02660	57-41360-05
J516	131-0294-04		CONNECTOR,RCPT,:FEMALE,36 CONTACT,4 KEY	02660	57-41360-04
J521	131-0294-06		CONNECTOR,RCPT,:36 PIN,FEMALE	02660	57-41360-06
J522	131-0294-06		CONNECTOR,RCPT,:36 PIN,FEMALE	02660	57-41360-06
J523	131-0294-06		CONNECTOR,RCPT,:36 PIN,FEMALE	02660	57-41360-06
J524	131-0294-06		CONNECTOR,RCPT,:36 PIN,FEMALE	02660	57-41360-06
J531	131-0294-03		CONNECTOR,RCPT,:36 CONT,FEMALE	13511	57-41360-03
J532	131-0294-03		CONNECTOR,RCPT,:36 CONT,FEMALE	13511	57-41360-03
J533	131-0294-03		CONNECTOR,RCPT,:36 CONT,FEMALE	13511	57-41360-03
J534	131-0294-03		CONNECTOR,RCPT,:36 CONT,FEMALE	13511	57-41360-03
K501	148-0056-00	B010100	RELAY,ARMATURE:12VDC,185 OHM COIL	24796	R10-E 1105-1
K501	148-0045-00	B020144 B020145	RELAY,ARMATURE:12VDC,185 OHM COIL	24796	R10-E 1105-1
Q501	151-0136-00		TRANSISTOR:SILICON,NPN	02735	35495
R21	317-0510-00		RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R22	317-0510-00		RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R23	317-0510-00		RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R32	317-0510-00		RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R34	317-0510-00		RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R36	317-0510-00		RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R37	317-0510-00		RES.,FXD,CMPSPN:51 OHM,5%,0.125W	01121	BB5105
R501	315-0152-00		RES.,FXD,CMPSPN:1.5K OHM,5%,0.25W	01121	CB1525
VR501	152-0149-00		SEMICONV DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00

General Information

The following section contains wiring tables, cable diagrams, a block diagram, circuit diagrams and mechanical parts illustrations for the Type 286/R287 and Type R288. Reference standard for this section is Graphic Symbol standard USAS 32.2-1967.

Special Symbols

The following special symbols are used on the diagrams:



Wiring Tables

The wiring tables show complete interconnection information for circuit card and rear panel connectors in the multiplexer system. There is one wiring table for each connector. The more important interconnections shown in these tables are also shown in the circuit diagrams.

Cable Diagrams

The cable diagrams show the internal wiring of each cable which may be used in a multiplexer system.

Block Diagram

The block diagram shows the source of signals (Programmer, Type 3S6 and Type 568) for the Type R288 and interconnections between the Type R288 and interconnections between the Type R288 and the Type 287's. Internal block diagrams of the Type 286, Type 287 and Type R288 are included in the Circuit Description.

Circuit Diagrams

The foldout circuit diagrams are complete schematic diagrams showing the location of each electrical part in each circuit in the multiplexer system, along with significant interconnection information. Some of the diagrams (see Table 8-1) are combination circuit/block diagrams which show the transmission of a particular signal through the multiplexer system.

Table 8-1
Combination Circuit/Block Diagrams

No.	Title	Signal(s) Described
7	Type 287/R287/R288 Head Selector Circuits	Head Selection Data
8	Type 287/R287/R288 Strobe Distribution	Strobe Pulse
9	Type 287/R287/R288 Signal Preamp Circuits	Signal Pathes

Circuit Diagrams and the Electrical Parts List. To locate an electrical component on a Diagram in the electrical parts list, note the circuit card title, its model number and the component number. The Electrical Parts List section has a separate list of electrical components for each circuit card. Each list is in alphabetical order by circuit number.

To locate an electrical component in the electrical parts list on a particular circuit diagram, note the circuit card title and see Table 8-2. Table 8-2 tells the circuit diagram each circuit card is illustrated on.

Most chassis mounted components are on diagrams 2, 5 and 6.

Table 8-2
Locations of Circuit Cards in Diagrams

Fig.	Title	Diagram No.
5-3	Type 286 Rectifier board	6
5-4	Type 286 P60 Strobe and Preamp circuit card	3 and 4
5-5	Type 286 P70 Strobe Delay Comparator circuit card	3
5-6	Type 286 P80 FET and Logic circuit card	5
5-7	Type 286 P90 Regulator circuit card	6
5-8	Type 287/R288 P101 or P102 Strobe and Preamp circuit card ¹	8 and 9
5-9	Type 287/R288 P201 or P202 Logic and Logic Drive circuit card ²	7
5-10	Type 287 P301 Vertical Scale circuit card	10
5-11	Type R288 P301 Vertical Scale and FET CKT circuit card	10
5-12	Type 287/R288 P401 Chopper Logic circuit card ³	11

¹ Can be operated in either J101 of the Type 287 or J101 on J102 of the Type R288.

² Can be operated in either J201 of the Type 287, or J201 or J202 of the Type R288.

³ Can be operated in J401 of Type 287 or Type R288.

Electrical components are identified in the circuit diagrams by their circuit numbers and electrical values (only circuit numbers are given for active components). For more complete information about an electrical component or for parts ordering information, see the Electrical Parts List.

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

Capacitors—Values one or greater are in picofarads (pf).
Values less than one are in microfarads (μ F).

Resistors—Ohms (Ω).

Circuit Diagrams and the Circuit Card Pictures. To physically locate an electrical component in the multiplexer system, note the circuit card title and Model number. Fig. 8-1 through Fig. 8-3 show the locations of the circuit cards in the Type 286, Type 287 and Type R288. Figs. 5-3 through 5-12 show the location of components on the circuit cards.

The circuit numbers of chassis mounted components are silk-screened on the chassis near the component.

Three of the circuit cards are made to be operated in either of three connectors. See the footnotes to Table 8-2.

Voltage and Waveform Information. Typical voltage

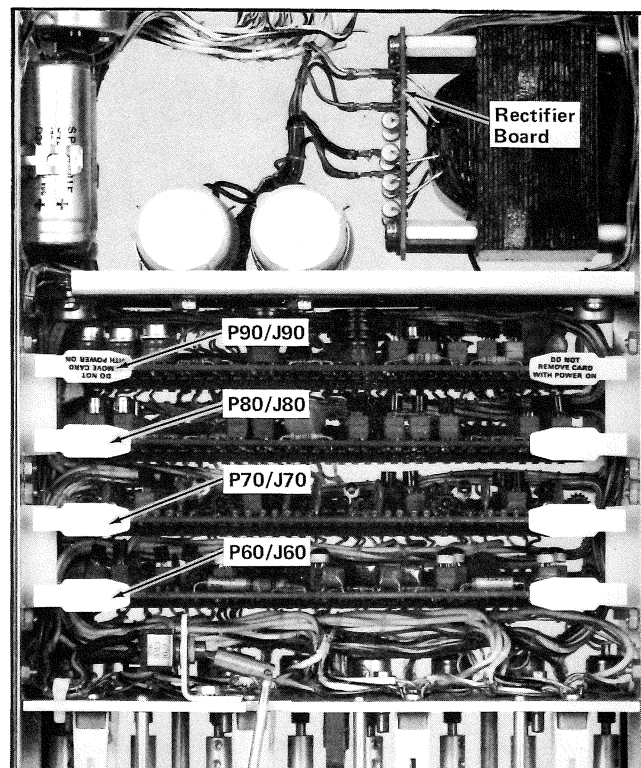


Fig. 8-1. Locations of circuit cards in the Type 286.

measurements and waveform photographs are shown in blue on the diagrams. These voltages and waveforms are not absolute and may vary between instruments because of differing component tolerances, internal calibration or front-panel settings.

The typical voltage measurements and waveform photographs were obtained under following conditions unless noted otherwise on the individual diagrams:

Test Oscilloscope, with 10X Probe:

Bandwidth	DC to 50 MHz
Probe Input Impedance	10 Megohms, 7 picofarads
Probe Ground	Clipped to Multiplexer Unit Chassis
Triggering	Internal

DC Voltmeter

Type	Digital Volt-Ohmmeter
Sensitivity	
Reference Voltage	Multiplexer Unit Chassis

Mechanical Parts

Mechanical parts illustrations are given on the back of the foldout circuits diagrams. The mechanical parts lists following these diagrams provide a list of mechanical parts for each diagram. See the beginning of the Mechanical Parts List section for parts ordering information.

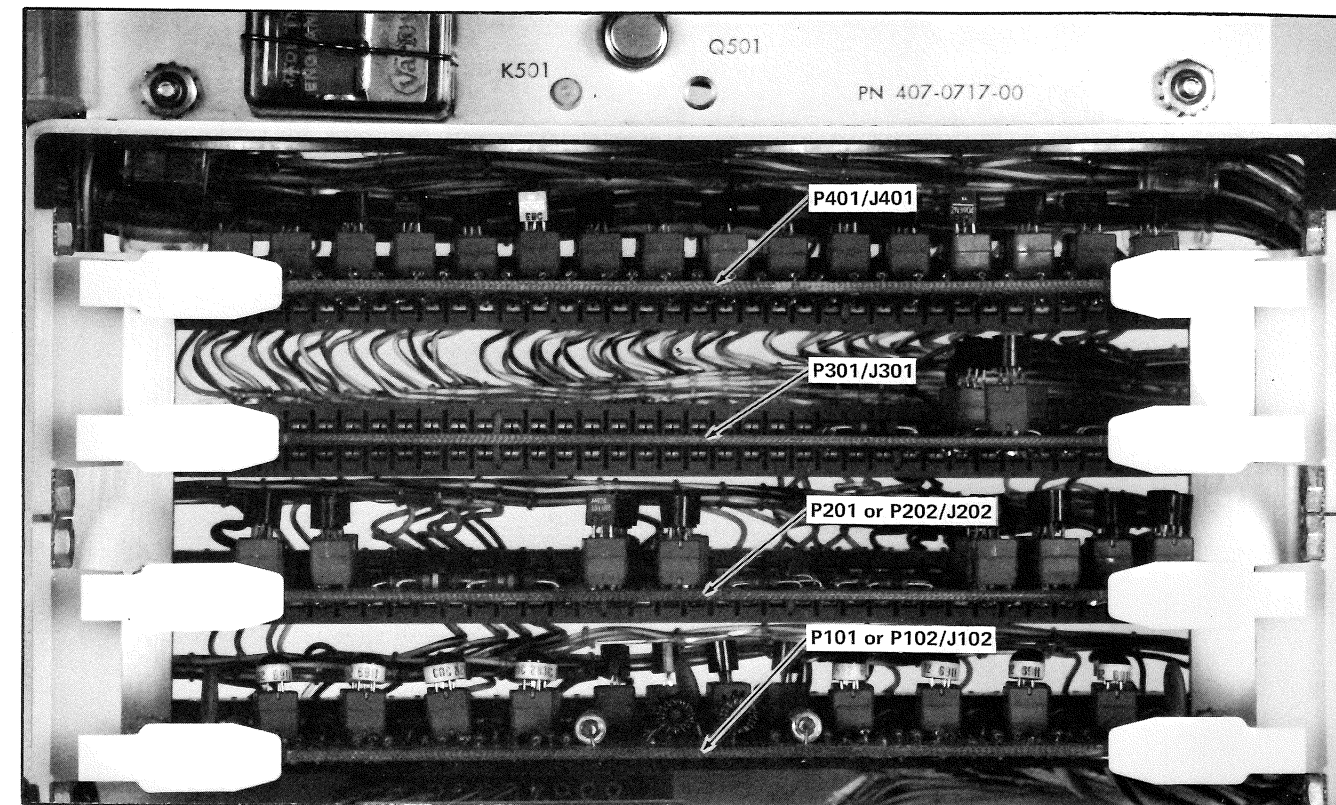


Fig. 8-2. Location of circuit cards in the Type 287.

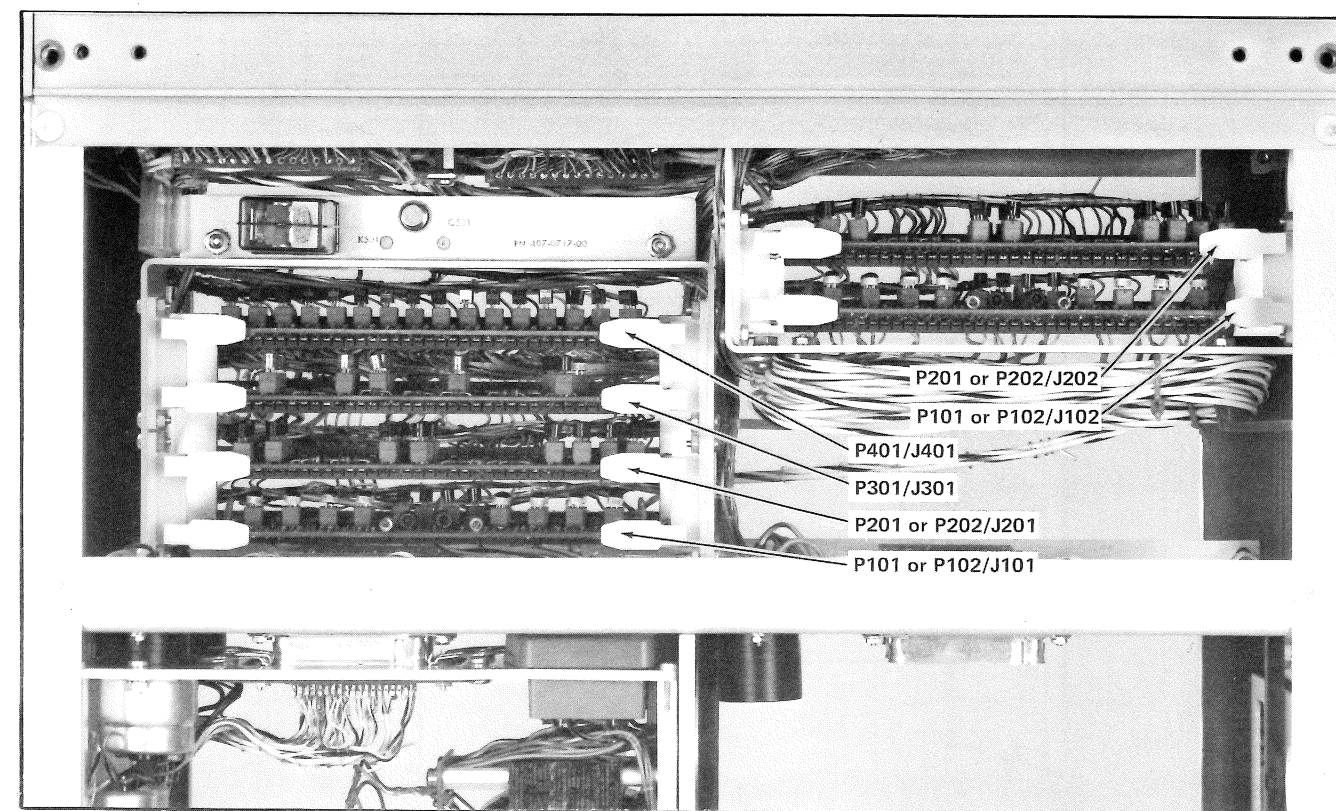


Fig. 8-3. Locations of circuit cards in the Type R288.

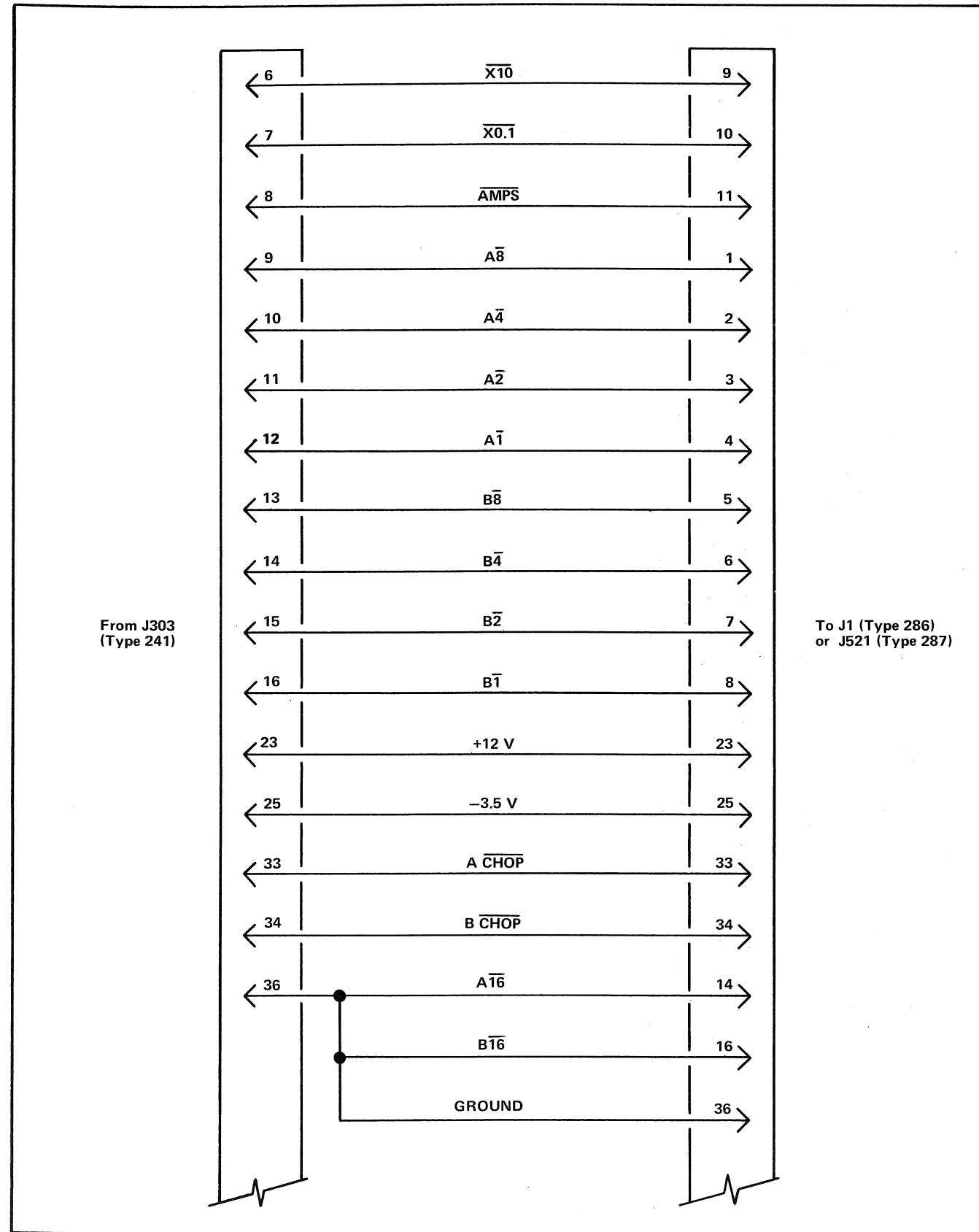


Fig. 8-4. Diagram of cable used between Type 241 and multiplexer (Tektronix Part No. 012-0176-00).

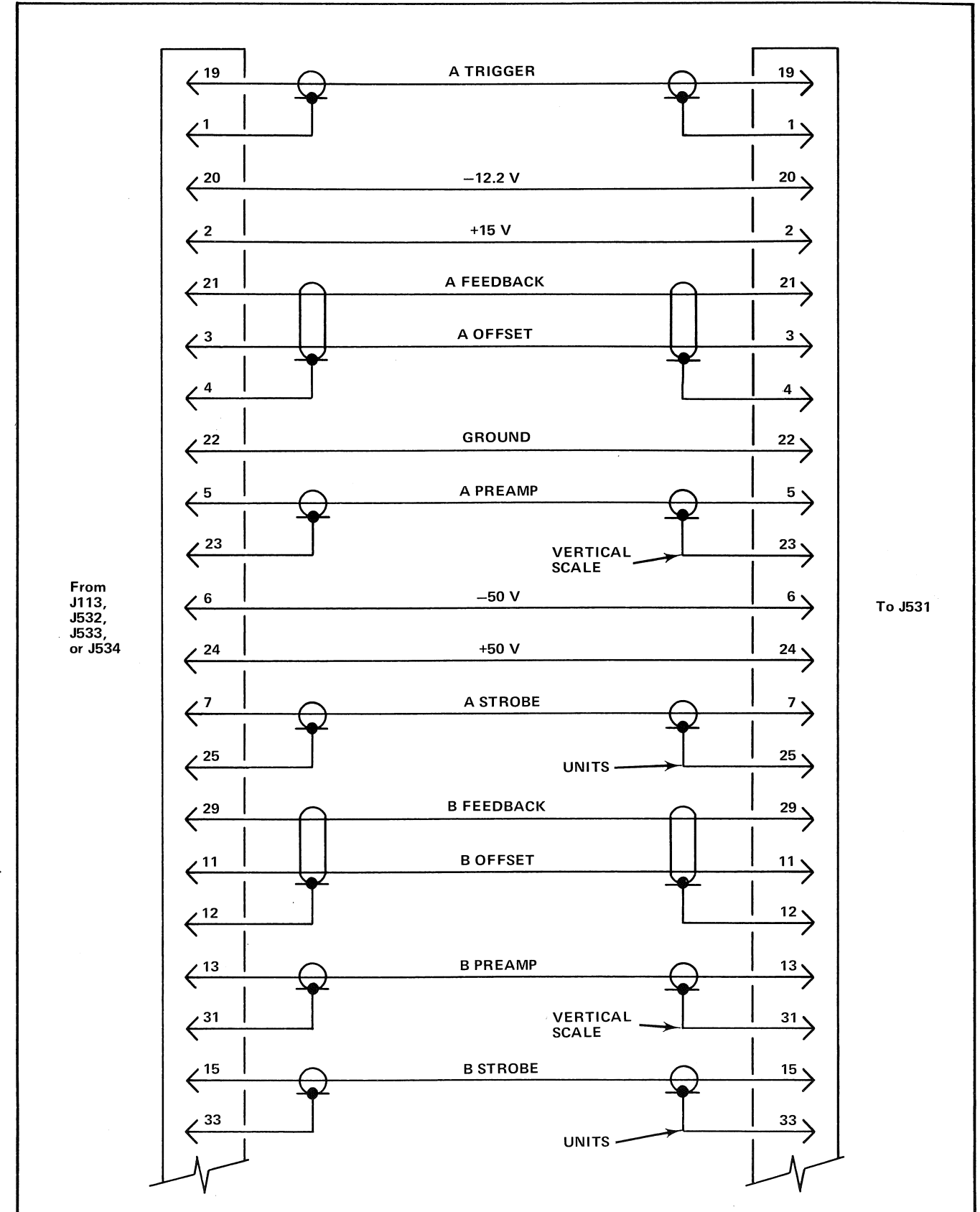


Fig. 8-5. Signal cable for connection from Type 568 to multiplexer, or Type R288 to Type 287 (Tektronix Part No. 012-0177-00).

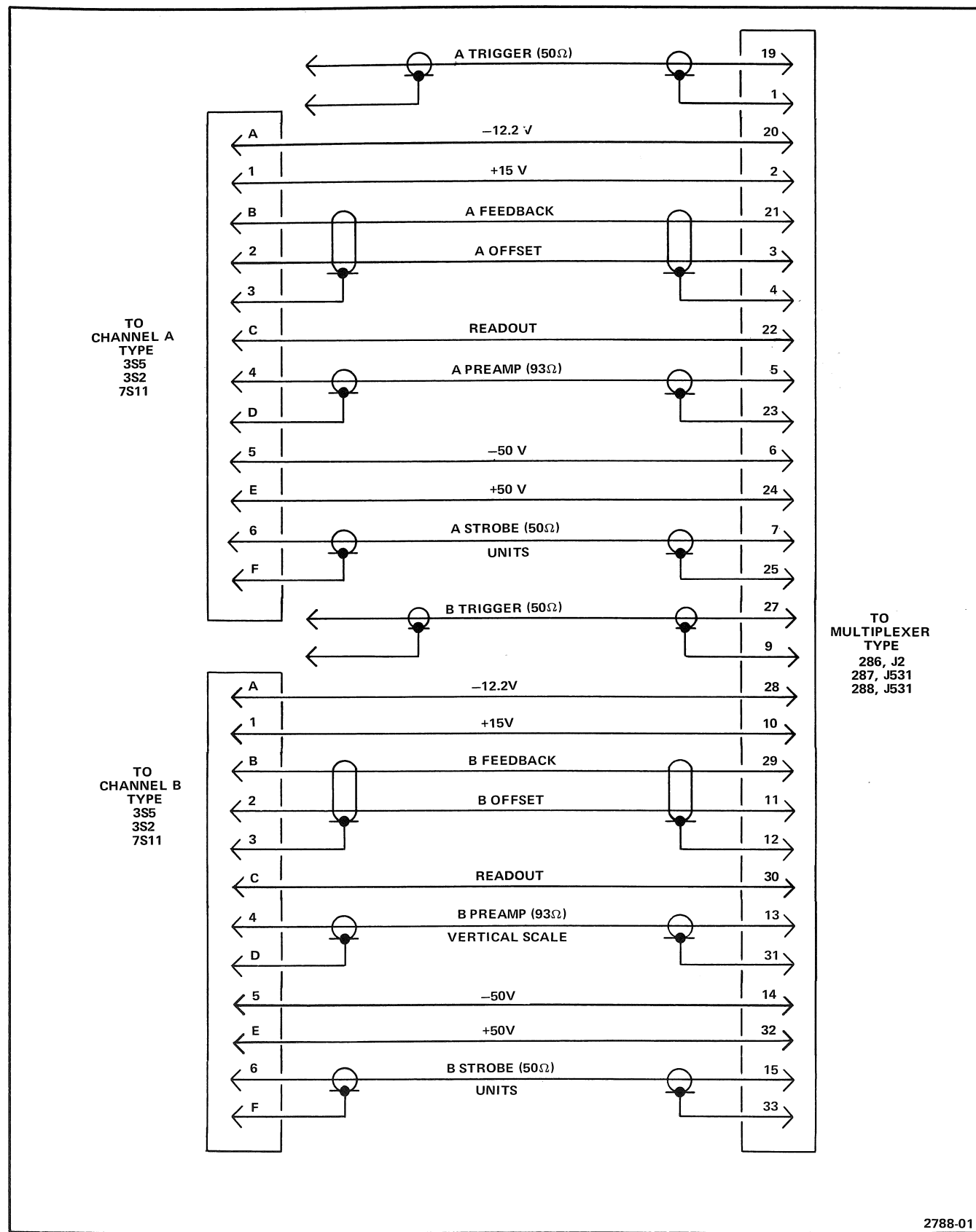


Fig. 8-6. Diagram of cable for connecting Type 3S2, 3S5 or 7S11 to multiplexer (Tektronix Part No. 012-0178-00).

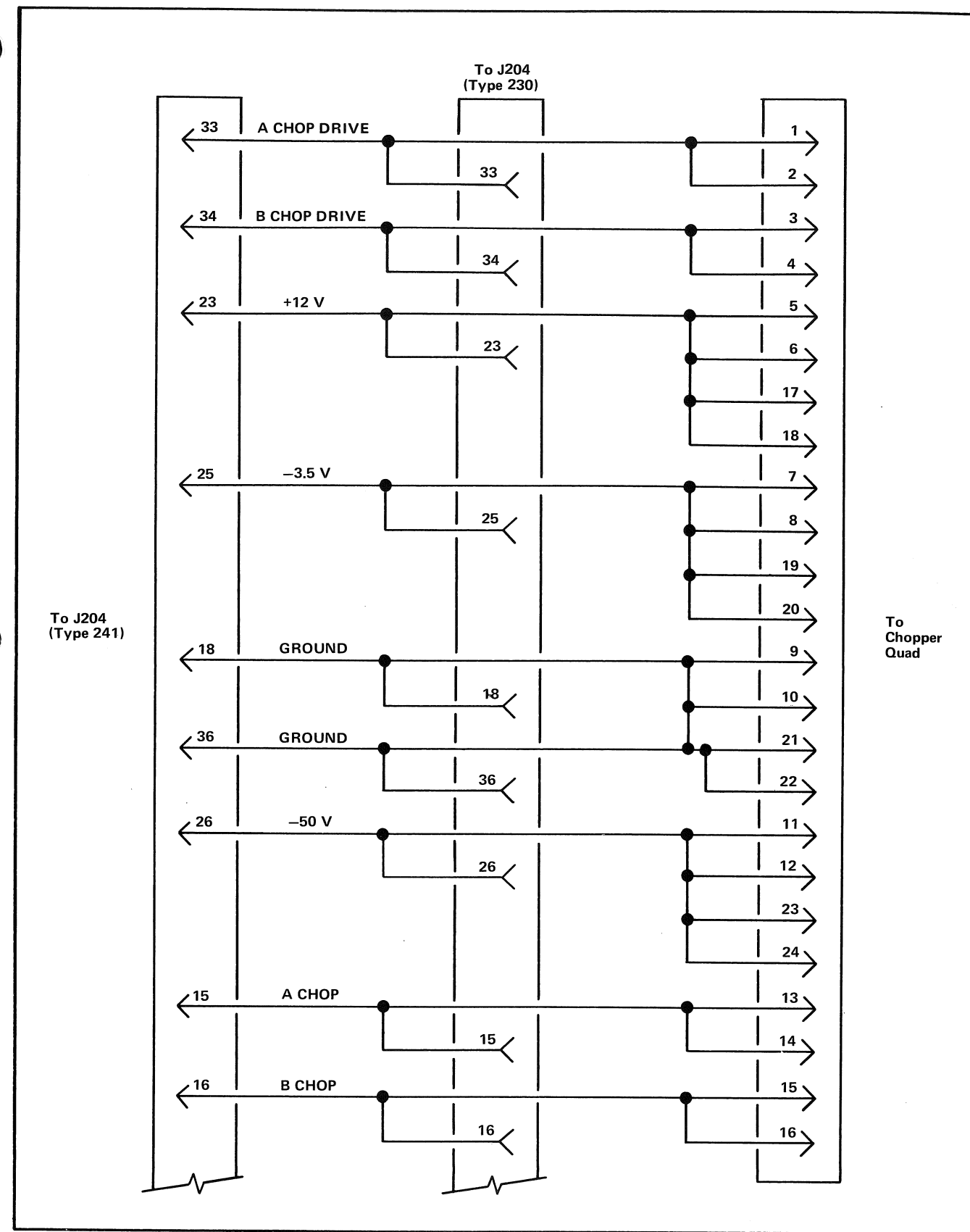


Fig. 8-7. Diagram of cable used for chopper operation with Type 286 only (Tektronix Part No. 012-0186-00).

		J2	J50	J51	J52	J53	J70	J90
1								
2	Ground							
3	Shield 4	31						
4	B Preamp out	13						
5								
6								
7								
8								
9	1 Preamp		4					
10	Shield 9		D					
11	Ground							
12	3 Preamp				4			
13	Shield 12				D			
14	Ground						19	
15	Ground							
16	Shield 17			D				
17	2 Preamp			4				
18	Ground							
19	Shield 20		D					
20	0 Preamp		4					
21	Ground							
22	Ground							
23	Shield 24	23						
24	A Preamp out	5						
25								
26								
27								
28	Shield 29					7		
29	Ramp 0					8		
30	Shield 31					15		
31	Ramp 1					16		
32	Strobe	7						
33	Shield 32							
34	Ramp 2					21		
35	Shield 34					22		
36	Ground							

		J1	J70	J80	J90
A	+15 V				M
B	-12.2 V				B
C					
D					
E	B.3	30	F̄	C, J̄	29
F	B.2	29	X	B, K̄	28
H	B.1	28	U	D, L̄	27
J	B.0	27	K	A, M̄	26
K					
L					
M					
N					
P					
R					
S					
T					
U					
V					
W					
X					
Y	A.0	18	9	U, D̄	D̄
Z	A.1	19	17	R, Ē	Ē
Ā	A.2	20	20	T, F̄	F̄
B̄	A.3	21	28	S, H̄	H̄
C̄					
D̄	-12.2 V				B
Ē	+15 V				M
F̄	-12.2 V				B
H̄					
J̄					
K̄					
L̄					
M̄					
N̄					
P̄	Ramp 3	29			
R̄	Shield P	30			

		J1	J50	J51	J52	J53	J60	J70	J80	J90
1										
2	Ground									
3	Ground									19
4	Shield 5		F							
5	Strobe 0		6							
6										
7	Shield 8						28			
8	RAMP 0						29			
9	A.0	18				Y	9	U, D̄	D̄	
10										
11	Ground									
12	Ground									18
13	Shield 14			F						
14	Strobe 1			6						
15	Shield 16						30			
16	RAMP 1						31			
17	A.1	19				Z	17	Ē, R̄	Ē	
18	+50 V									Y
19	+50 V									
20	A.2	20				Ā	20	F̄, T̄	F̄	
21	RAMP 2						34			
22	Shield 21						35			
23	Strobe 2			6						
24	Shield 23			F						
25	Ground									
26	Ground									17
27										
28	A.3	21				B̄	28	H̄, S̄	H̄	
29	RAMP 3					P̄				
30	Shield 29					R̄				
31										
32	Strobe 3				6					
33	Shield 32				F					
34	Ground									
35	Ground									17
36										

		J1	J60	J70	J80	J90	R200	R220	R240	R260
A	-12.2 V					B				
B	Ground						√			
C							√			
D							√			
E										
F	+15 V					M				
H										
J	Ground									
K	B.0	27	J	K	M̄, A	26				
L										
M	Ground							√		
N								√		
P								√		
R										
S	+15 V					M				
T										
U	B.1	28	H	U	L̄, D	27				
V										
W										
X	B.2	29	F	X	K̄, B	28				
Y	Ground									
Z	+15 V					M				
Ā										
B̄									√	
C̄									√	
D̄	Ground								√	
Ē										
F̄	B.3	30	E	F̄	J̄, C	29				
H̄										
J̄										
K̄	+15 V					M				
L̄										
M̄										√
N̄										√
P̄	Ground									√
R̄	-50 V					T				

J10 (287)

		J201	J401	J521	J11	J12	J13
1							
2	286 A·0 (A4)	K					
3	A2			3	3	3	3
4	A1			4	4	4	4
5							
6	286 B·0 (B4)	33					
7	B2			7	7	7	7
8	B1			8	8	8	8
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	A·0 (286 0)	1					
19	A·1 (286 0)	3					
20	A·2 (286 0)	6					
21	A·3 (286 0)	8					
22							
23							
24							
25							
26							
27	B·0 (286 0)	2					
28	B·1 (286 0)	4					
29	B·2 (286 0)	7					
30	B·3 (286 0)	9					
31							
32							
33							
34							
35							
36							

J11 (287)

		J10	J12	J13	J201	J401	J521
1							
2	286 A·1 (A4)				L		
3	A2	3	3	3			3
4	A1	4	4	4			4
5							
6	286 B·1 (B4)				34		
7	B2	7	7	7			7
8	B1	8	8	8			8
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	A·0 (286 1)					10	
19	A·1 (286 1)					12	
20	A·2 (286 1)					15	
21	A·3 (286 1)					17	
22							
23							
24							
25							
26							
27	B·0 (286 1)					11	
28	B·1 (286 1)					13	
29	B·2 (286 1)					16	
30	B·3 (286 1)					18	
31							
32							
33							
34							
35							
36							

J12 (287)

		J10	J11	J13	J201	J401	J521
1							
2	286 A·2 (A4)				M		
3	A2	3	3	3			3
4	A1	4	4	4			4
5							
6	286 B·2 (B4)				35		
7	B2	7	7	7			7
8	B1	8	8	8			8
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	A·0 (286 2)					19	
19	A·1 (286 2)					21	
20	A·2 (286 2)					23	
21	A·3 (286 2)					26	
22							
23							
24							
25							
26							
27	B·0 (286 2)					20	
28	B·1 (286 2)					22	
29	B·2 (286 2)					24	
30	B·3 (286 2)					27	
31							
32							
33							
34							
35							
36							

J13 (287)

		J10	J11	J12	J201	J401	J521
1							
2	286 A·3 (A4)				N		
3	A2	3	3	3			3
4	A1	4	4	4			4
5							
6	286 B·3 (B4)				36		
7	B2	7	7	7			7
8	B1	8	8	8			8
9							
10							
11							
12							
13							
14							
15							
16							
17							
18	A·0 (286 3)						28
19	A·1 (286 3)						30
20	A·2 (286 3)						32
21	A·3 (286 3)						34
22							
23							
24							
25							
26							
27	B·0 (286 3)						29
28	B·1 (286 3)						31
29	B·2 (286 3)						33
30	B·3 (286 3)						35
31							
32							
33							
34							
35							
36							

J20 (287)

		J21	J22	J23	J101	J201	J531
1	Shield 19						
2	+15 V	2	2	2			2
3	A Offset	3	3	3			3
4	Shield 3, 21	4	4	4			4
5	A Preamp				4		
6	-50 V	6	6	6			6
7	Strobe				14		
8							
9							
10							
11	B Offset	11	11	11			11
12	Shield 11, 29	12	12	12			
13	B Preamp				27		
14							
15							
16							
17							
18							
19	A Trigger						19
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21			21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield 7						
26							
27							
28							
29	B Feedback	29	29	29			29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6 V					J	

J21 (287)

		J20	J22	J23	J101	J201	J531
1							
2	+15 V	2	2	2			2
3	A Offset	3	3	3			3
4	Shield 3, 21	4	4	4			4
5	A Preamp				5		
6	-50 V	6	6	6			6
7	Strobe				16		
8							
9							
10							
11	B Offset	11	11	11			11
12	Shield 11, 29	12	12	12			
13	B Preamp				29		
14							
15							
16							
17							
18							
19							
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21			21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield						
26							
27							
28							
29	B Feedback	29	29	29			29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6 V						

J22 (287)

		J20	J21	J23	J101	J201	J531
1							
2	+15 V	2	2	2			2
3	A Offset	3	3	3			3
4	Shield 3, 21	4	4	4			4
5	A Preamp				8		
6	-50 V	6	6	6			6
7	Strobe				20		
8							
9							
10							
11	B Offset	11	11	11			11
12	Shield 11, 29	12	12	12			
13	B Preamp				32		
14							
15							
16							
17							
18							
19							
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21			21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield						
26							
27							
28							
29	B Feedback	29	29	29			29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6 V						

J23 (287)

		J20	J21	J22	J101	J201	J531
1							
2	+15 V	2	2	2			2
3	A Offset	3	3	3			3
4	Shield 3, 21	4	4	4			4
5	A Preamp				10		
6	-50 V	6	6	6			6
7	Strobe				21		
8							
9							
10							
11	B Offset	11	11	11			11
12	Shield 11, 29	12	12	12			
13	B Preamp				33		
14							
15							
16							
17							
18							
19							
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21			21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield						
26							
27							
28							
29	B Feedback	29	29	29			29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6 V						

J101 (287)

		J20	J21	J22	J23	J531
1	A Preamp Out					5
2	Shield 1					
3	Shield 4					
4	A0 Preamp	5				
5	A1 Preamp		5			
6	Shield 5					
7	Shield 8					
8	A2 Preamp			5		
9						
10	A3 Preamp				5	
11	Shield 10					
12						
13						
14	0 Strobe	7				
15	Shield 14, 16					
16	1 Strobe		7			
17	Strobe in					7
18	Shield 17					
19	Shield 20					
20	2 Strobe			7		
21	3 Strobe				7	
22	Shield 21					
23						
24						
25						
26	Shield 27					
27	B0 Preamp	13				
28						
29	B1 Preamp		13			
30	Shield 29					
31	Shield 32					
32	B2 Preamp			13		
33	B3 Preamp				13	
34	Shield 33					
35	Shield 36					
36	B Preamp					13

		J201	J301
A	-12.2 V		
B			
C			
D	206 A·0	U	
E			
F	286 A·1	R	
H			
J			
K	286 A·2	K	
L			
M			
N	286 A·3	S	
P	+15 V		
R	-12.2 V		11
S			
T			
U			
V			
W			
X			
Y			
Z	Ground		
\bar{A}	+15 V		
\bar{B}	+15 V		
\bar{C}	286 B·0	A	
\bar{D}			
\bar{E}			
\bar{F}	286 B·1	D	
\bar{H}			
\bar{J}			
\bar{K}	286 B·2	B	
\bar{L}			
\bar{M}	286 B·3	C	
\bar{N}			
\bar{P}			
\bar{R}	-12.2 V		

		J10	J11	J12	J13	J201
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25	286 B·0					A
26	286 B·1					D
27	286 B·2					B
28	286 B·3					C
29						
30						
31						
32						
33	286 B·0	6				
34	286 B·1		6			
35	286 B·2			6		
36	286 B·3				6	

J201 (287)

		J20	J201	J301	J521	J531	J10	J11	J12	J13
A	286 B·0		25							
B	286 B·2		27							
C	286 B·3		28							
D	286 B·1		26							
E	$\overline{B16}$ (ENABLE)				12					
F	$\overline{B8}$				5					
H	$\overline{B4}$				6					
J	+3.6 V	36		H						
K	Ground									
L	+15 V			10		2				
M	$\overline{A4}$				2					
N	$\overline{A8}$				1					
P	$\overline{A16}$ (ENABLE)				10					
R	286 A·1		\bar{D}							
S	286 A·3		\bar{F}							
T	286 A·2		\bar{E}							
U	286 A·0		\bar{C}							
V										
W										
X										
Y	-12.2 V					20				
Z										
\bar{A}										
\bar{B}										
\bar{C}	286 A·0		U							
\bar{D}	286 A·1		R							
\bar{E}	286 A·2		T							
\bar{F}	286 A·3		S							
\bar{H}										
\bar{J}										
\bar{K}	$\overline{286 A·0}$					2				
\bar{L}	$\overline{286 A·1}$						2			
\bar{M}	$\overline{286 A·2}$							2		
\bar{N}	$\overline{286 A·3}$								2	
\bar{P}	Ground									
\bar{R}										

		J101	J201	J521	J531
1					
2	AMPS				33
3	AMPS				25
4	X10			13	
5					
6					
7					
8					
9					
10	+15 V		L		
11	-12.2 V	R			
12	X10/X0.1				23
13	X10/X0.1				31
14	X0.1			14	
15	AMPS			15	
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					

		J201			
A					
B					
C					
D					
E					
F	Ground				
H	+3.6 V	J			
J					
K					
L					
M					
N					
P					
R					
S					
T					
U					
V					
W					
X					
Y					
Z					
\bar{A}					
\bar{B}					
\bar{C}					
\bar{D}					
\bar{E}					
\bar{F}					
\bar{H}					
\bar{J}					
\bar{K}					
\bar{L}					
\bar{M}					
\bar{N}					
\bar{P}					
\bar{R}					

		J10	J11	J12	J13	J515	J516
1	286 0 A*0	18					1
2	286 0 B*0	27					19
3	286 0 A*1	19					2
4	286 0 B*1	28					20
5							
6	286 0 A*2	20					3
7	286 0 B*2	29					21
8	286 0 A*3	21					4
9	286 0 B*3	30					22
10	286 1 A*0		18				5
11	286 1 B*0		27				23
12	286 1 A*1		19				6
13	286 1 B*1		28				24
14							
15	286 1 A*2		20				7
16	286 1 B*2		29				25
17	286 1 A*3		21				8
18	286 1 B*3		30				26
19	286 2 A*0			18			9
20	286 2 B*0			27			27
21	286 2 A*1			19			10
22	286 2 B*1			28			28
23	286 2 A*2			20			11
24	286 2 B*2			29			29
25							
26	286 2 A*3			21			12
27	286 2 B*3			30			30
28	286 3 A*0				18		13
29	286 3 B*0				27		31
30	286 3 A*1				19		14
31	286 3 B*1				28		32
32	286 3 A*2				20		15
33	286 3 B*2				29		33
34	286 3 A*3				21		16
35	286 3 B*3				30		34
36	B Chop Drive					34	

		J510	J511	J512	J513	J515
A	CHOP 00	1				
B						
C	CHOP 01	2				
D						
E						
F	CHOP 02	3				
H						
J	CHOP 03	4				
K						
L	CHOP 10		1			
M						
N	CHOP 11		2			
P						
R						
S	CHOP 12		3			
T						
U	CHOP 13		4			
V						
W	CHOP 20			1		
X						
Y	CHOP 21			2		
Z						
\bar{A}	CHOP 22			3		
\bar{B}						
\bar{C}						
\bar{D}	CHOP 23			4		
\bar{E}						
\bar{F}	CHOP 30				1	
\bar{H}						
\bar{J}	CHOP 31				2	
\bar{K}						
\bar{L}	CHOP 32				3	
\bar{M}						
\bar{N}	CHOP 33				4	
\bar{P}						
\bar{R}	A Chop Drive					33

J510 (287)

		J401	J511	J512	J513
1	CHOP 00	A			
2	CHOP 01	C			
3	CHOP 02	F			
4	CHOP 03	J			
5	+12 V		5	5	5
6	+12 V		6	6	6
7	-3.5 V		7	7	7
8	-3.5 V		8	8	8
9	Gnd		9	9	9
10	Gnd		10	10	10
11	-50 V		11	11	11
12	-50 V		12	12	12
13					
14					
15					
16					
17	+12 V		17	17	17
18	+12 V		18	18	18
19	-3.5 V		19	19	19
20	-3.5 V		20	20	20
21	Gnd		21	21	21
22	Gnd		22	22	22
23	-50 V		23	23	23
24	-50 V		24	24	24
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					

J511 (287)

		J401	J510	J512	J513	J515
1	CHOP 10	L				
2	CHOP 11	N				
3	CHOP 12	S				
4	CHOP 13	U				
5	+12 V		5	5	5	
6	+12 V		6	6	6	23
7	-3.5 V		7	7	7	
8	-3.5 V		8	8	8	25
9	Gnd		9	9	9	
10	Gnd		10	10	10	35/ 36
11	-50 V		11	11	11	
12	-50 V		12	12	12	
13						
14						
15						
16						
17	+12 V		17	17	17	
18	+12 V		18	18	18	
19	-3.5 V		19	19	19	
20	-3.5 V		20	20	20	
21	Gnd		21	21	21	
22	Gnd		22	22	22	
23	-50 V		23	23	23	
24	-50 V		24	24	24	
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						

J512 (287)

		J401	J510	J511	J513	J515	J531
1	CHOP 20	W					
2	CHOP 21	Y					
3	CHOP 22	A					
4	CHOP 23	D					
5	+12 V		5	5	5	23	
6	+12 V		6	6	5		
7	-3.5 V		7	7	7	25	
8	-3.5 V		8	8	8		
9	Gnd		9	9	9	36	
10	Gnd		10	10	10		
11	-50 V		11	11	11		6
12	-50 V		12	12	12		
13							
14							
15							
16							
17	+12 V		17	17	17		
18	+12 V		18	18	18		
19	-3.5 V		19	19	19	25	
20	-3.5 V		20	20	20		
21	Gnd		21	21	21		
22	Gnd		22	22	22		
23	-50 V		23	23	23		
24	-50 V		24	24	24		
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							

J513 (287)

		J401	J510	J511	J512	J513	J515	J531
1	CHOP 30	F						
2	CHOP 31	J						
3	CHOP 32	L						
4	CHOP 33	N						
5	+12 V		5	5	5		23	
6	+12 V		6	6	6	5		
7	-3.5 V		7	7	7		25	
8	-3.5 V		8	8	8			
9	Gnd		9	9	9		36	
10	Gnd		10	10	10		35	
11	-50 V		11	11	11			6
12	-50 V		12	12	12			
13								
14								
15								
16								
17	+12 V		17	17	17	5		
18	+12 V		18	18	18	5		
19	-3.5 V		19	19	19		25	
20	-3.5 V		20	20	20			
21	Gnd		21	21	21	9		
22	Gnd		22	22	22	10		
23	-50 V		23	23	23	11		
24	-50 V		24	24	24	12		
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								

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		J515					
		J510	J511	J512	J513	J521	J401
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15	Gnd						
16	Gnd						
17							
18							
19							
20							
21							
22							
23	+12 V				5	23	
24							
25	-3.5 V				7	25	
26							
27							
28							
29							
30							
31							
32							
33	A Chop Drive					33	R
34	B Chop Drive					34	34
35	Gnd					35	
36	Gnd					36	

		J516					
		J401					
1	286 0 A*0	1					
2	286 0 A*1	3					
3	286 0 A*2	6					
4	286 0 A*3	8					
5	286 1 A*0	10					
6	286 1 A*1	12					
7	286 1 A*2	15					
8	286 1 A*3	17					
9	286 2 A*0	19					
10	286 2 A*1	21					
11	286 2 A*2	23					
12	286 2 A*3	26					
13	286 3 A*0	28					
14	286 3 A*1	30					
15	286 3 A*2	32					
16	286 3 A*3	34					
17							
18							
19	286 0 B*0	2					
20	286 0 B*1	4					
21	286 0 B*2	7					
22	286 0 B*3	9					
23	286 1 B*0	11					
24	286 1 B*1	13					
25	286 1 B*2	16					
26	286 1 B*3	18					
27	286 2 B*0	20					
28	286 2 B*1	22					
29	286 2 B*2	24					
30	286 2 B*3	27					
31	286 3 B*0	29					
32	286 3 B*1	31					
33	286 3 B*2	33					
34	286 3 B*3	35					
35							
36	Ground						

		J521					
		J10	J201	J301	J515	J11	J401
1	A8		N				
2	A4		M				
3	A2	3				3	
4	A1	4				4	
5	B8		F				
6	B4		H				
7	B2	7				7	
8	B1	8				8	
9	X10			4			
10	X0.1			14			
11	AMPS			15			
12							
13							
14	A16		P				
15							
16	B16		E				
17							
18							
19							
20							
21							
22							
23	+12 V				23		
24							
25	-3.5 V				25		
26							
27							
28							
29							
30							
31							
32							
33	A Chop Drive				33		R
34	B Chop Drive				34		36
35	Gnd				35		
36	Gnd				36		

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		J531									
		J20	J101	J201	J301	J513	J21	J22	J23	J10 Only	J10 thru 13
1	Shield 19									1	
2	+15 V	2		L			2	2	2		2
3	A Offset	3					3	3	3		3
4	Shield 3, 21	4					4	4	4		4
5	A Preamp		1								
6	-50 V	6				11/12	6	6	6		6
7	Strobe		17								
8											
9											
10											
11	B Offset	11									11
12	Shield 11, 29						11	11	11		12
13	B Preamp		36								
14											
15											
16											
17											
18											
19	A Trigger	19									19
20	-12.2 V	20		Y			20	20	20		20
21	A Feedback	21					21	21	21		21
22	Gnd	22					22	22	22		22
23	Shield 5 (Thru C31) A X10, X0.1				12						
24	+50 V	24					24	24	24		24
25	Shield 7 (Thru C33) A AMPS				3						
26											
27											
28											
29	B Feedback	29					29	29	29		29
30											
31	Shield 13 (Thru C35) B X10, X0.1				13						
32											
33	B AMPS				2						
34											
35											
36											

J10

		J11	J12	J13	J201	J401	J521	J522
1								
2	286 A·0				K			
3	A2	3	3	3			3	3
4	A1	4	4	4			4	4
5								
6	286 B·0				33			
7	B2	7	7	7			7	7
8	B1	8	8	8			8	8
9								
10								
11								
12								
13								
14								
15								
16								
17								
18	A·0 (286 0)					1		
19	A·1 (286 0)					3		
20	A·2 (286 0)					6		
21	A·3 (286 0)					8		
22								
23								
24								
25								
26								
27	B·0 (286 0)					2		
28	B·1 (286 0)					4		
29	B·2 (286 0)					7		
30	B·3 (286 0)					9		
31								
32								
33								
34								
35								
36								

J11

		J10	J12	J13	J201	J401	J521	J522
1								
2	A ENABLE (4)				L			
3	A2	3	3	3			3	3
4	A1	4	4	4			4	4
5								
6	B ENABLE (4)				34			
7	B2	7	7	7			7	7
8	B1	8	8	8			8	8
9								
10								
11								
12								
13								
14								
15								
16								
17								
18	A·0 (286 1)					10		
19	A·1 (286 1)					12		
20	A·2 (286 1)					15		
21	A·3 (286 1)					17		
22								
23								
24								
25								
26								
27	B·0 (286 1)					11		
28	B·1 (286 1)					13		
29	B·2 (286 1)					16		
30	B·3 (286 1)					18		
31								
32								
33								
34								
35								
36								

J12

		J10	J11	J13	J201	J401	J521	J522
1								
2	A ENABLE (4)				M			
3	A2	3	3	3			3	3
4	A1	4	4	4			4	4
5								
6	B ENABLE (4)				35			
7	B2	7	7	7			7	7
8	B1	8	8	8			8	8
9								
10								
11								
12								
13								
14								
15								
16								
17								
18	A·0 (286 2)					19		
19	A·1 (286 2)					21		
20	A·2 (286 2)					23		
21	A·3 (286 2)					26		
22								
23								
24								
25								
26								
27	B·0 (286 2)					20		
28	B·1 (286 2)					22		
29	B·2 (286 2)					24		
30	B·3 (286 2)					27		
31								
32								
33								
34								
35								
36								

J13

		J10	J11	J12	J201	J401	J521	J22
1								
2	A ENABLE (4)				N			
3	A2	3	3	3			3	3
4	A1	4	4	4			4	4
5								
6	B ENABLE (4)				36			
7	B2	7	7	7			7	7
8	B1	8	8	8			8	8
9								
10								
11								
12								
13								
14								
15								
16								
17								
18	A·0 (286 3)						28	
19	A·1 (286 3)						30	
20	A·2 (286 3)						32	
21	A·3 (286 3)						34	
22								
23								
24								
25								
26								
27	B·0 (286 3)						29	
28	B·1 (286 3)						31	
29	B·2 (286 3)						33	
30	B·3 (286 3)						35	
31								
32								
33								
34								
35								
36								

(R288)

		J20					
		J21	J22	J23	J101	J301	J531
1	Shield 19						
2	+15 V	2	2	2			2
3	A OFFSET	3	3	3		U	3
4	Shield 3, 21	4	4	4			4
5	A Preamp				4		
6	-50 V	6	6	6			6
7	Strobe				14		
8							
9							
10							
11	B Offset	11	11	11		R	11
12	Shield 11, 29	12	12	12			
13	B Preamp				27		
14							
15							
16							
17							
18							
19	A Trigger						19
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21		17	21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield 7						
26							
27							
28							
29	B Feedback	29	29	29		36	29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6 V					J	

		J21					
		J20	J22	J23	J101	J201	J531
1							
2	+15 V	2	2	2			2
3	A Offset	3	3	3			3
4	Shield 3, 21	4	4	4			4
5	A Preamp				5		
6	-50 V	6	6	6			6
7	Strobe				16		
8							
9							
10							
11	B Offset	11	11	11			11
12	Shield 11, 29	12	12	12			
13	B Preamp				29		
14							
15							
16							
17							
18							
19							
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21			21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield 7						
26							
27							
28							
29	B Feedback	29	29	29			29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6						

		J22					
		J20	J21	J23	J101	J201	J531
1							
2	+15 V	2	2	2			2
3	A Offset	3	3	3			3
4	Shield 3, 21	4	4	4			4
5	A Preamp				8		
6	-50 V	6	6	6			6
7	Strobe				20		
8							
9							
10							
11	B Offset	11	11	11			11
12	Shield 11, 29	12	12	12			
13	B Preamp				32		
14							
15							
16							
17							
18							
19							
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21			21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield 7						
26							
27							
28							
29	B Feedback	29	29	29			29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6 V						

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		J23					
		J20	J21	J22	J101	J201	J531
1							
2	+15 V	2	2	2			2
3	A Offset	3	3	3			3
4	Shield 3, 21	4	4	4			4
5	A Preamp				10		
6	-50 V	6	6	6			6
7	Strobe				21		
8							
9							
10							
11	B Offset	11	11	11			11
12	Shield 12, 29	12	12	12			
13	B Preamp				33		
14							
15							
16							
17							
18							
19							
20	-12.2 V	20	20	20			20
21	A Feedback	21	21	21			21
22	Ground	22	22	22			22
23	Shield 5						
24	+50 V	24	24	24			24
25	Shield 7						
26							
27							
28							
29	B Feedback	29	29	29			29
30							
31	Shield 13						
32							
33							
34							
35							
36	+3.6 V						

J101 (R288)

		J20	J21	J22	J23	J102
1	A Out					4
2	Shield 1					
3	Shield 4					
4	A0 Preamp	5				
5	A1 Preamp		5			
6	Shield 5					
7	Shield 8					
8	A2 Preamp			5		
9						
10	A3 Preamp				5	
11	Shield 10					
12						
13						
14	Strobe 0	7				
15	Shield 14, 16					
16	Strobe 1		7			
17	Strobe in					17
18	Shield 17					
19	Shield 20					
20	Strobe 2			7		
21	Strobe 3				7	
22	Shield 21					
23						
24						
25						
26	Shield 27					
27	B0 Preamp	13				
28						
29	B1 Preamp		13			
30	Shield 29					
31	Shield 32					
32	B2 Preamp			13		
33	B3 Preamp				13	
34	Shield 33					
35	Shield 36					
36	B Preamp					27

		J201	J301
A	-12.2 V		
B			
C			
D	286 A*0	V	
E			
F	286 A*1	R	
H			
J			
K	286 A*2	T	
L			
M			
N	286 A*3	S	
P	+15 V		
R	-12.2 V		11
S			
T			
U			
V			
W			
X			
Y			
Z	Ground		
\bar{A}	+15 V		
\bar{B}	+15 V		
\bar{C}	286 B*0	A	
\bar{D}			
\bar{E}			
\bar{F}	286 B*1	D	
\bar{H}			
\bar{J}			
\bar{K}	286 B*2	B	
\bar{L}			
\bar{M}	286 B*3	C	
\bar{N}			
\bar{P}			
\bar{R}	-12.2 V		

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J102 (R288)

		J101	J531	J532	J533	J534
1	A Out		5			
2	Shield 1					
3	Shield 4					
4	A 287 0 Preamp	1				
5	A 287 1 Preamp			5		
6	Shield 5					
7	Shield 8					
8	A 287 2 Preamp				5	
9						
10	A 287 3 Preamp					5
11	Shield 10					
12						
13						
14	287 0 Strobe	17				
15	Shield 14, 16					
16	287 1 Strobe			7		
17	Strobe in		7			
18	Shield 17					
19	Shield 20					
20	287 2 Strobe				7	
21	287 3 Strobe					7
22	Shield 21					
23						
24						
25						
26	Shield 27					
27	B 287 0 Preamp	36				
28						
29	B 287 1 Preamp			13		
30	Shield 29					
31	Shield 32					
32	B 287 2 Preamp				13	
33	B 287 3 Preamp					13
34	Shield 33					
35	Shield 36					
36	B Out		13			

		J202
A	-12.2 V	
B		
C		
D	287 A*0	U
E		
F	287 A*1	R
H		
J		
K	287 A*2	T
L		
M		
N	287 A*3	S
P	+15 V	
R	-12.2 V	
S		
T		
U		
V		
W		
X		
Y		
Z	Ground	
\bar{A}	+15 V	
\bar{B}	+15 V	
\bar{C}	287 B*0	A
\bar{D}		
\bar{E}		
\bar{F}	287 B*1	D
\bar{H}		
\bar{J}		
\bar{K}	287 B*2	B
\bar{L}		
\bar{M}	287 B*3	C
\bar{N}		
\bar{P}		
\bar{R}	-12.2 V	

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J201 (R288)

		J10	J11	J12	J13	J201
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25	286 B*0					A
26	286 B*1					D
27	286 B*2					B
28	286 B*3					C
29						
30						
31						
32						
33	286 B*0	6				
34	286 B*1		6			
35	286 B*2			6		
36	286 B*3				6	

		J10	J11	J12	J13	J20	J201	J202	J301	J521	J531	J522
A	286 B*0						25					
B	286 B*2						27					
C	286 B*3						28					
D	286 B*1						26					
E	B ENABLE (16)							33				
F	B8								5		5	
H	B4								6		6	
J	+3.6 V					36	J	H				
K	Ground											
L	+15 V							10		2		
M	A4								2		2	
N	A8								1		1	
P	A ENABLE (16)							K				
R	286 A*1						D					
S	286 A*3						F					
T	286 A*2						E					
U	286 A*0						C					
V												
W												
X												
Y	-12.2 V									20		
Z												
A												
B												
C	286 A*0						U					
D	286 A*1						R					
E	286 A*2						T					
F	286 A*3						S					
H												
J												
K	286 A*0	2										
L	286 A*1		2									
M	286 A*2			2								
N	286 A*3				2							
P	Ground											
R												

J202 (R288)

		J201	J202	J301	J522	J523	J524
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25	287 B*0	A	25				
26	287 B*1	D	26				
27	287 B*2	B	27				
28	287 B*3	C	28				
29							
30							
31							
32							
33	287 B*0	E					
34	287 B*1			12			
35	287 B*2				12		
36	287 B*3					12	

		J20	J102	J201	J202	J301	J521	J522	J523	J524
A	287 B*0		C		25					
B	287 B*2		K		27					
C	287 B*3		M		28					
D	287 B*1		F		26					
E	Gnd B ENABLE									
F	B32						11			
H	B16						12			
J	+3.6	36		J						
K	Ground									
L	+15 V									
M	A16						10			
N	A32						9			
P	Gnd A ENABLE									
R	287 A*1		F		D					
S	287 A*3		N		F					
T	287 A*2		K		E					
U	287 A*0		D		C					
V										
W										
X										
Y	-12.2 V									
Z										
A										
B										
C	287 A*0				U	F				
D	287 A*1				R	E				
E	287 A*2				T	D				
F	287 A*3				S	C				
H										
J										
K	287 A*0			P						
L	287 A*1						10			
M	287 A*2							10		
N	287 A*3								10	
P	Ground									
R										

		J20	J101	J201	J202	J521	J531	J532	J533	J534
1										
2	AMPS						33			
3	AMPS						25			
4	X10					13				
5										
6										
7										
8										
9										
10	+15 V			L						
11	-12.2 V		R							
12	X10/X0.1						23			
13	X10/X0.1						31			
14	X0.1					14				
15	AMPS					15				
16										
17	A Feedback 0	21								
18	Shield 17, 19									
19	A Feedback 1						21			
20	A Feedback 2							21		
21	Shield 20, 22									
22	A Feedback 3								21	
23	A Feedback Out						21			
24	Shield 23									
25	287 B*0 ENABLE				25					
26	287 B*1 ENABLE				26					
27	287 B*2 ENABLE				27					
28	287 B*3 ENABLE				28					
29	Shield 30									
30	B Feedback Out						29			
31	B Feedback 3								29	
32	Shield 31, 33									
33	B Feedback 2								29	
34	B Feedback 1						29			
35	Shield 34, 36									
36	B Feedback 0	29								

		J10	J11	J12	J13	J515	J516
1	286 0 A*0	18					1
2	286 0 B*0	27					19
3	286 0 A*1	19					2
4	286 0 B*1	28					20
5							
6	286 0 A*2	20					3
7	286 0 B*2	29					21
8	286 0 A*3	21					4
9	286 0 B*3	30					22
10	286 1 A*0		18				5
11	286 1 B*0		27				23
12	286 1 A*1		19				6
13	286 1 B*1		28				24
14							
15	286 1 A*2		20				7
16	286 1 B*2		29				25
17	286 1 B*3		21				8
18	286 1 B*3		30				26
19	286 2 A*0			18			9
20	286 2 B*0			27			27
21	286 2 A*1			19			10
22	286 2 B*1			28			28
23	286 2 A*2			20			11
24	286 2 B*2			29			29
25							
26	286 2 A*3			21			12
27	286 2 B*3			30			30
28	286 3 A*0				18		13
29	286 3 B*0				27		31
30	286 3 A*1				19		14
31	286 3 B*1				28		32
32	286 3 A*2				20		15
33	286 3 B*3				29		33
34	286 3 A*3				21		16
35	286 3 B*3				30		35
36	B Chop Drive					34	

		J20	J201	J202	J531	J532	J533	J534
A								
B								
C								
D								
E								
F	Ground							
H	+3.6 V		J					
J								
K								
L								
M								
N								
P								
R								
S								
T								
U	A Offset 0	3						
V	Shield W, U							
W	A Offset 1					3		
X	A Offset 2						3	
Y	Shield X, Z							
Z	A Offset 3							3
\bar{A}	A Offset Out					3		
\bar{B}	Shield \bar{A}							
\bar{C}	287 A*3 ENABLE				\bar{F}			
\bar{D}	287 A*2 ENABLE				\bar{E}			
\bar{E}	287 A*1 ENABLE				\bar{D}			
\bar{F}	287 A*0 ENABLE				\bar{C}			
\bar{H}	Shield \bar{J}							
\bar{J}	B Offset Out					11		
\bar{K}	B Offset 3							11
\bar{L}	Shield \bar{M} , \bar{K}							
\bar{M}	B Offset 2							11
\bar{N}	B Offset 1						11	
\bar{P}	Shield \bar{N} , \bar{R}							
\bar{R}	B Offset 0	11						

		J510	J511	J512	J513	J515
A	$\overline{CHOP 00}$	1				
B						
C	$\overline{CHOP 01}$	2				
D						
E						
F	$\overline{CHOP 02}$	3				
H						
J	$\overline{CHOP 03}$	4				
K						
L	$\overline{CHOP 10}$		1			
M						
N	$\overline{CHOP 11}$		2			
P						
R						
S	$\overline{CHOP 12}$		3			
T						
U	$\overline{CHOP 13}$		4			
V						
W	$\overline{CHOP 20}$			1		
X						
Y	$\overline{CHOP 21}$				2	
Z						
\bar{A}	$\overline{CHOP 22}$				3	
\bar{B}						
\bar{C}						
\bar{D}	$\overline{CHOP 23}$				4	
\bar{E}						
\bar{F}	$\overline{CHOP 30}$					1
\bar{H}						
\bar{J}	$\overline{CHOP 31}$					2
\bar{K}						
\bar{L}	$\overline{CHOP 32}$					3
\bar{M}						
\bar{N}	$\overline{CHOP 33}$					4
\bar{P}						
\bar{R}	A Chop Drive					33

J510 (R288)

		J401	J511	J512	J513	J515
1	CHOP 00	A				
2	CHOP 01	C				
3	CHOP 02	F				
4	CHOP 03	J				
5	+12 V		5	5	5	23
6	+12 V		6	6	6	23
7	-3.5 V		7	7	7	25
8	-3.5 V		8	8	8	25
9	Ground		9	9	9	36
10	Ground		10	10	10	36
11	-50 V		11	11	11	6
12	-50 V		12	12	12	6
13						
14						
15						
16						
17	+12 V		17	17	5/17	
18	+12 V		18	18	5/18	
19	-3.5 V		19	19	19	25
20	-3.5 V		20	20	20	25
21	Ground		21	21	21	
22	Ground		22	22	22	
23	-50 V		23	23	23	
24	-50 V		24	24	24	
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						

J511 (R288)

		J401	J510	J512	J513	J515
1	CHOP 10	L				
2	CHOP 11	N				
3	CHOP 12	S				
4	CHOP 13	U				
5	+12 V		5	5	5	23
6	+12 V		6	6	6	23
7	-3.5 V		7	7	7	25
8	-3.5 V		8	8	8	25
9	Ground		9	9	9	36
10	Ground		10	10	10	36
11	-50 V		11	11	11	6
12	-50 V		12	12	12	6
13						
14						
15						
16						
17	+12 V		17	17	5/17	
18	+12 V		18	18	5/18	
19	-3.5 V		19	19	19	25
20	-3.5 V		20	20	20	25
21	Ground		21	21	21	
22	Ground		22	22	22	
23	-50 V		23	23	23	
24	-50 V		24	24	24	
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						

J512

		J401	J510	J513	J515	
1	CHOP 20	W				
2	CHOP 21	Y				
3	CHOP 22	A				
4	CHOP 23	D				
5	+12 V		5	5	5	23
6	+12 V		6	6	6	23
7	-3.5 V		7	7	7	25
8	-3.5 V		8	8	8	25
9	Ground		9	9	9	36
10	Ground		10	10	10	36
11	-50 V		11	11	11	6
12	-50 V		12	12	12	6
13						
14						
15						
16						
17	+12 V		17	17	5/17	
18	+12 V		18	18	5/18	
19	-3.5 V		19	19	19	25
20	-3.5 V		20	20	20	25
21	Ground		21	21	21	
22	Ground		22	22	22	
23	-50 V		23	23	23	
24	-50 V		24	24	24	
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						

J513

		J401	J510	J511	J512	J515	J531
1	CHOP 30	F					
2	CHOP 31	J					
3	CHOP 32	L					
4	CHOP 33	N					
5	+12 V		5	5	5	23	
6	+12 V		6	6	6	23	
7	-3.5 V		7	7	7	25	
8	-3.5 V		8	8	8	25	
9	Ground		9	9	9	35	
10	Ground		10	10	10	36	
11	-50 V		11	11	11	6	6
12	-50 V		12	12	12	6	6
13							
14							
15							
16							
17	+12 V		17	17	17	5/17	
18	+12 V		18	18	18	5/18	
19	-3.5 V		19	19	19	25	
20	-3.5 V		20	20	20	25	
21	Ground		21	21	21		
22	Ground		22	22	22		
23	-50 V		23	23	23		
24	-50 V		24	24	24		
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							

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		J515							
		J401	J510	J511	J512	J513	J522	J523	J524
1									
2									
3									
4									
5									
6	-50 V		11/12	11/12	11/12	11/12	11/12		
7									
8									
9									
10									
11									
12									
13									
14									
15	Ground								
16	Ground								
17									
18									
19									
20									
21									
22									
23	+12 V		5/6	5/6	5/6	5/17	23	23	23
24	-3.5 V		7/8	7/8	7/8	7/18			
25	-3.5 V		25/25	19/20	19/20	19/20	25	25	25
26									
27									
28									
29									
30									
31									
32									
33	A Chop Drive	R					33	33	33
34	B Chop Drive	36					34	34	34
35	Ground				9		35	35	35
36	Ground		9/10	9/10	9/10	9	36	36	36

J516

		J401
1	286 0 A·0	1
2	286 0 A·1	3
3	286 0 A·2	6
4	286 0 A·3	8
5	286 1 A·0	10
6	286 1 A·1	12
7	286 1 A·2	15
8	286 1 A·3	17
9	286 2 A·0	19
10	286 2 A·1	21
11	286 2 A·2	23
12	286 2 A·3	26
13	286 3 A·0	28
14	286 3 A·1	30
15	286 3 A·2	32
16	286 3 A·3	34
17		
18		
19	286 0 B·0	2
20	286 0 B·1	4
21	286 0 B·2	7
22	286 0 B·3	9
23	286 1 B·0	11
24	286 1 B·1	13
25	286 1 B·2	16
26	286 1 B·3	18
27	286 2 B·0	20
28	286 2 B·1	22
29	286 2 B·2	24
30	286 2 B·3	27
31	286 3 B·0	29
32	286 3 B·1	31
33	286 3 B·2	33
34	286 3 B·3	35
35		
36	Ground	

J521 (R288)

		J10	J11	J12	J13	J201	J202	J301	J515	J522 J523 J524	J401
1	A8					N				1	
2	A4					M				2	
3	A2	3	3	3	3					3	
4	A1	4	4	4	4					4	
5	B8					F				5	
6	B4					H				6	
7	B2	7	7	7	7					7	
8	B1	8	8	8	8					8	
9	X10						N	4			
10	X0.1							14			
11	AMPS							15			
12											
13	A32						N				
14	A16						F				
15	B32						M				
16	B16						H				
17											
18											
19											
20											
21											
22											
23	+12 V								23	23	
24											
25	-3.5 V								25	25	
26											
27											
28											
29											
30											
31											
32											
33	A Chop Drive								33	33	R
34	B Chop Drive								34	34	36
35	Ground								35	35	
36	Ground								36	36	

J522 (R288)

		J10	J11	J12	J13	J201	J202	J521 J523 J524	J515
1	A8					N			1
2	A4					M			2
3	A2	3	3	3	3				3
4	A1	4	4	4	4				4
5	B8					F			5
6	B4					H			6
7	B2	7	7	7	7				7
8	B1	8	8	8	8				8
9									
10									
11									
12									
13									
14	A16							L	
15									
16	B16						34		
17									
18									
19									
20									
21									
22									
23	+12 V							23	23
24									
25	-3.5 V							25	25
26									
27									
28									
29									
30									
31									
32									
33	A Chopper Drive							33	33
34	B Chopper Drive							34	34
35	Ground							35	35
36	Ground							36	36

J523 (R288)

		J10	J11	J12	J13	J201	J202	J515	J521 J522 J524
1	$\overline{B8}$					N			1
2	$\overline{A4}$					M			2
3	$\overline{A2}$	3	3	3	3				3
4	$\overline{A1}$	4	4	4	4				4
5	$\overline{B8}$					F			5
6	$\overline{B4}$					H			6
7	$\overline{B2}$	7	7	7	7				7
8	$\overline{B1}$	8	8	8	8				8
9									
10									
11									
12									
13									
14	$\overline{A16}$					\overline{M}			
15									
16	$\overline{B16}$						35		
17									
18									
19									
20									
21									
22									
23	+12 V							23	23
24									
25	-3.5 V							25	25
26									
27									
28									
29									
30									
31									
32									
33	A Chop Drive							33	33
34	B Chop Drive							34	34
35	Ground							35	35
36	Ground							36	36

J524 (R288)

		J10	J11	J12	J13	J201	J202	J515	J521 J522 J523
1	$\overline{A8}$					N			1
2	$\overline{A4}$					M			2
3	$\overline{A2}$	3	3	3	3				3
4	$\overline{A1}$	4	4	4	4				4
5	$\overline{B8}$					F			5
6	$\overline{B4}$					H			6
7	$\overline{B2}$	7	7	7	7				7
8	$\overline{B1}$	8	8	8	8				8
9									
10									
11									
12									
13									
14	$\overline{A16}$					\overline{N}			
15									
16	$\overline{B16}$						36		
17									
18									
19									
20									
21									
22									
23	+12 V							23	23
24									
25	-3.5 V							25	25
26									
27									
28									
29									
30									
31									
32									
33	A Chop Drive							33	33
34	B Chop Drive							34	34
35	Ground							35	35
36	Ground							36	36

J531 (R288)

		J20	J21	J22	J23	J102	J201	J301	J513
1	Shield 19								
2	+15 V	2	2	2	2		L		
3	A Offset	3	3	3	3			\overline{A}	
4	Shield 3, 21	4	4	4	4				
5	A Preamp					1			
6	-50 V	6	6	6	6				11/ 12
7	Strobe					17			
8									
9									
10									
11	B Offset	11	11	11	11			\overline{J}	
12	Shield 11, 29								
13	B Preamp					36			
14									
15									
16									
17									
18									
19	A Trigger	19							
20	-12.2 V	20	20	20	20		Y		
21	A Feedback	21	21	21	21			23	
22	Ground	22	22	22	22				
23	Shield 5 (Thru C31) A X10, X0.1							12	
24	+50 V	24	24	24	24				
25	Shield 7 (Thru C33) A AMPS							3	
26									
27									
28									
29	B Feedback	29	29	29	29			30	
30									
31	Shield 13 (Thru C35) B X10, X0.1							13	
32									
33	B AMPS							2	
34									
35									
36									

J532 (R288)

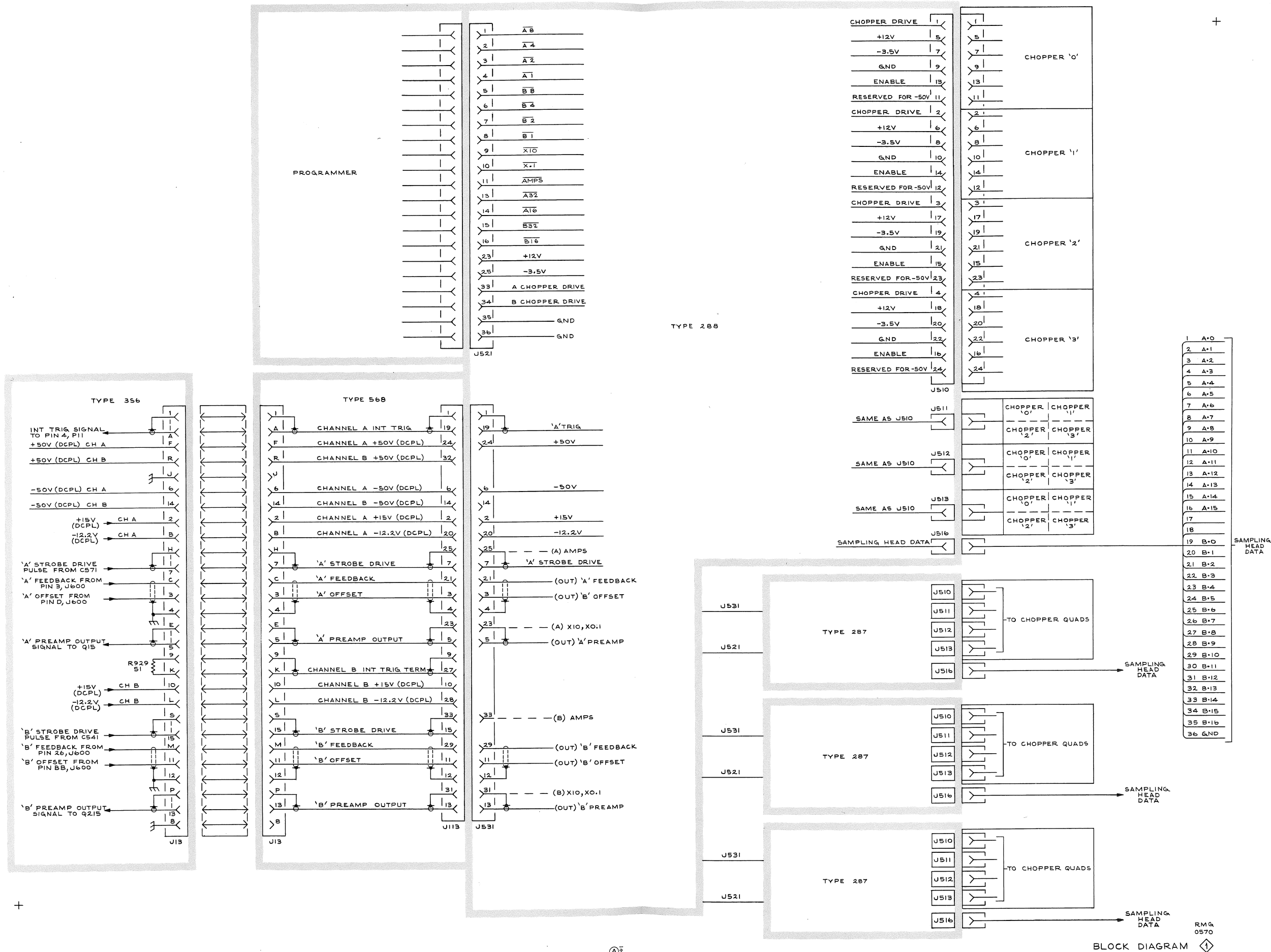
		J20	J21	J22	J23	J102	J201	J301	J531 J533 J534
1									
2	+15 V								2
3	A Offset							W	
4	Shield								
5	A Preamp					5			
6	-50 V								6
7	Strobe					16			
8									
9									
10									
11	B Offset							\overline{N}	
12	Shield								
13	B Preamp					29			
14									
15									
16									
17									
18									
19									
20	-12.2 V								20
21	A Feedback							19	
22	Ground								
23	Shield								
24	+50 V								24
25	Shield								
26									
27									
28									
29	B Feedback							34	
30									
31	Shield								
32									
33									
34									
35									
36									

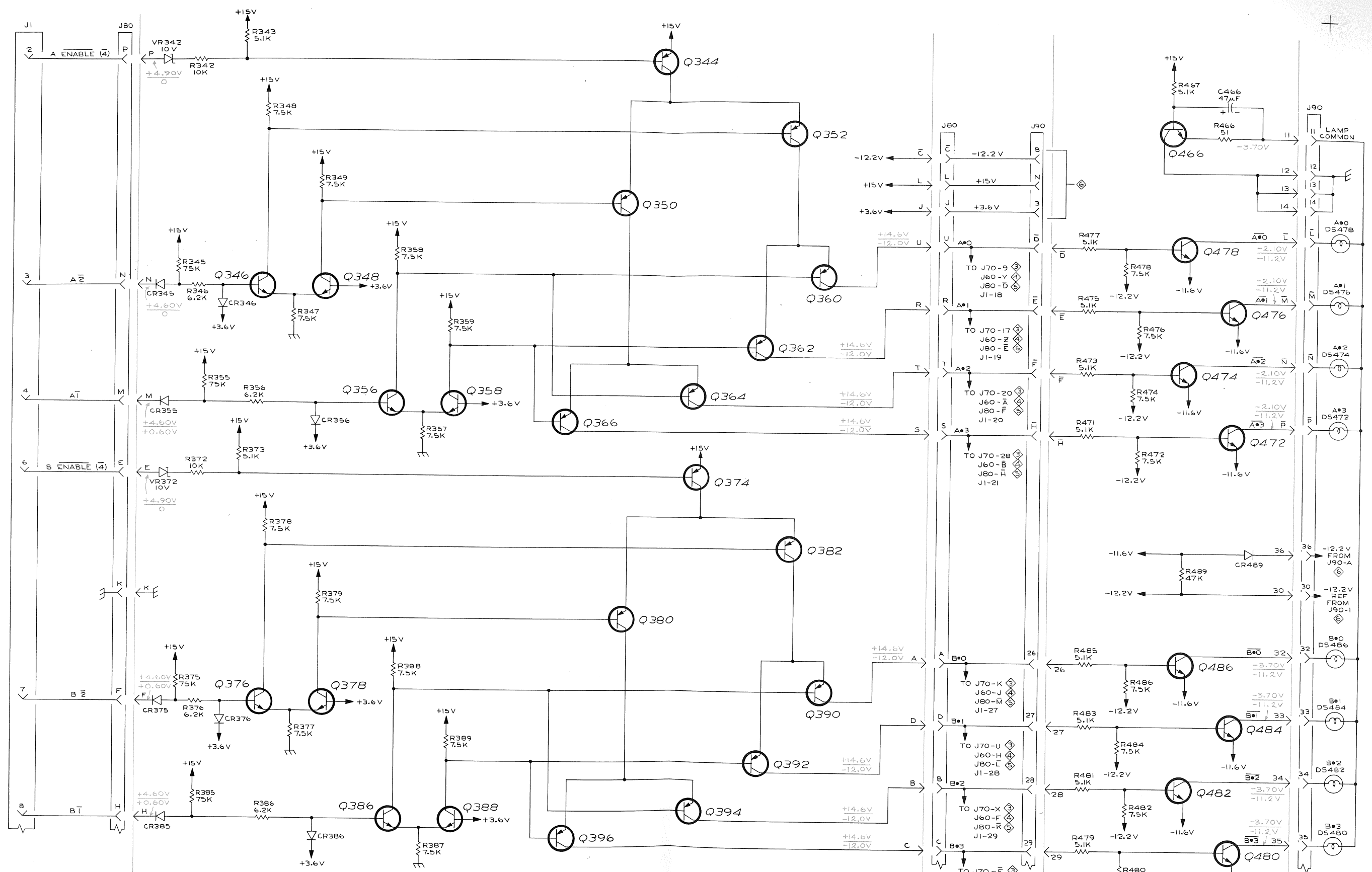
J533 (R288)

		J20	J21	J22	J23	J102	J201	J301	J513 J531 J532 J534
1									
2	+15 V	2	2	2	2				2
3	A Offset	3	3	3	3			X	
4	Shield 3	4	4	4	4				
5	A Preamp					8			
6	-50 V	6	6	6					6
7	Strobe					20			
8									
9									
10									
11	B Offset							M	
12	Shield								
13	B Preamp					32			
14									
15									
16									
17									
18									
19									
20	-12.2 V								20
21	A Feedback							20	
22	Ground								
23	Shield								
24	+50 V								
25	Shield								24
26									
27									
28									
29	B Feedback							33	
30									
31	Shield								
32									
33									
34									
35									
36									

J534 (R288)

		J20	J21	J22	J23	J102	J201	J301	J513	J531 J532 J533
1										2
2	+15 V									
3	A Offset							Z		
4	Shield									
5	A Preamp					10				
6	-50 V									6
7	Strobe					21				
8										
9										
10										
11	B Offset							K		
12	Shield									
13	B Preamp					33				
14										
15										
16										
17										
18										
19										
20	-12.2 V									20
21	A Feedback							22		
22	Ground									
23	Shield									
24	+50 V									24
25	Shield									
26										
27										
28										
29	B Feedback							31		
30										
31	Shield									
32										
33										
34										
35										
36										



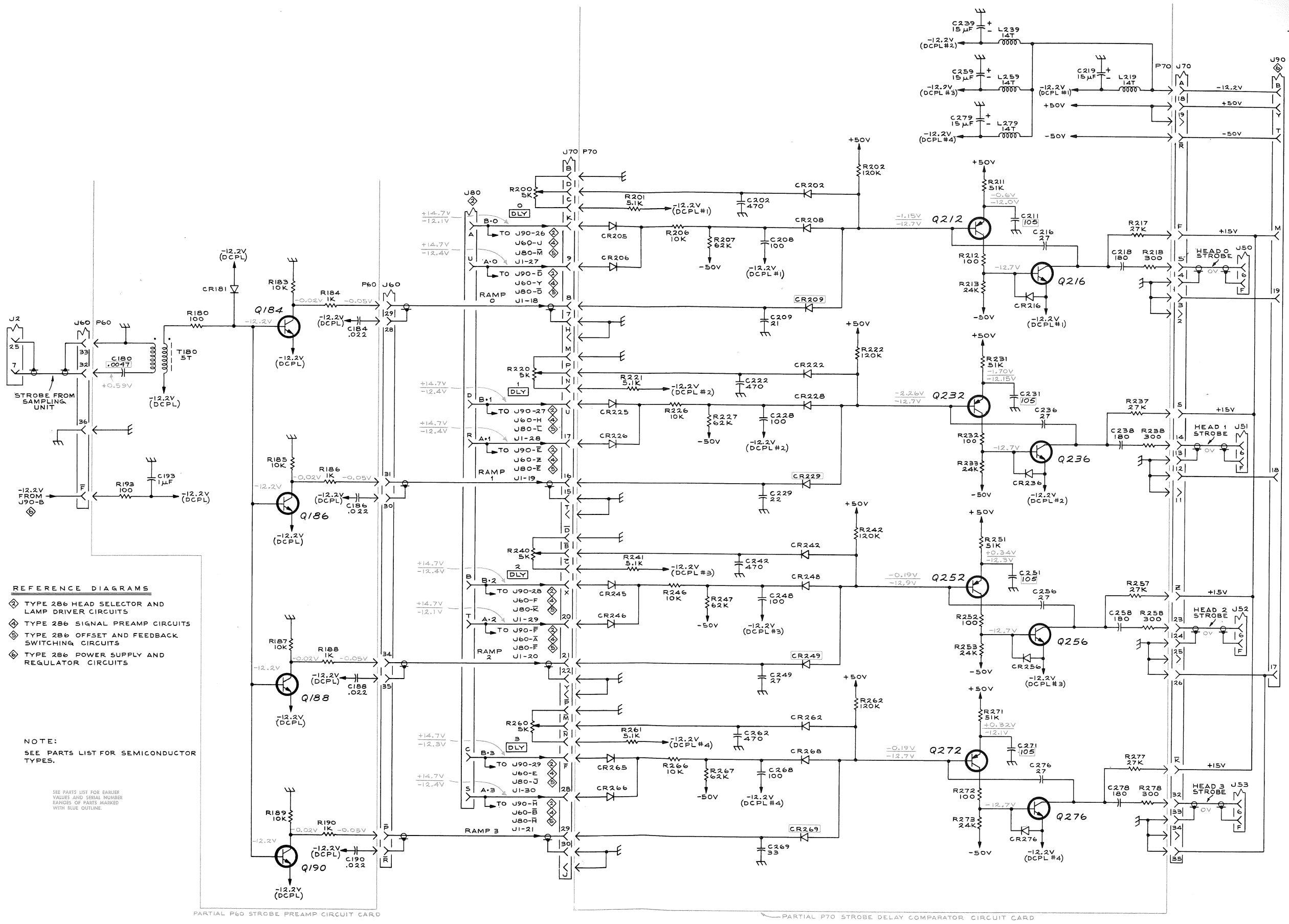


REFERENCE DIAGRAMS

- ◆ TYPE 286 STROBE REGENERATION AND DELAY CIRCUITS
- ◆ TYPE 286 SIGNAL PREAMP CIRCUITS
- ◆ TYPE 286 OFFSET AND FEEDBACK SWITCHING CIRCUITS
- ◆ TYPE 286 POWER SUPPLY AND REGULATOR CIRCUITS

NOTES:

1. SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
2. VOLTAGES SHOWN ARE: HIGHSTATE LOWSTATE



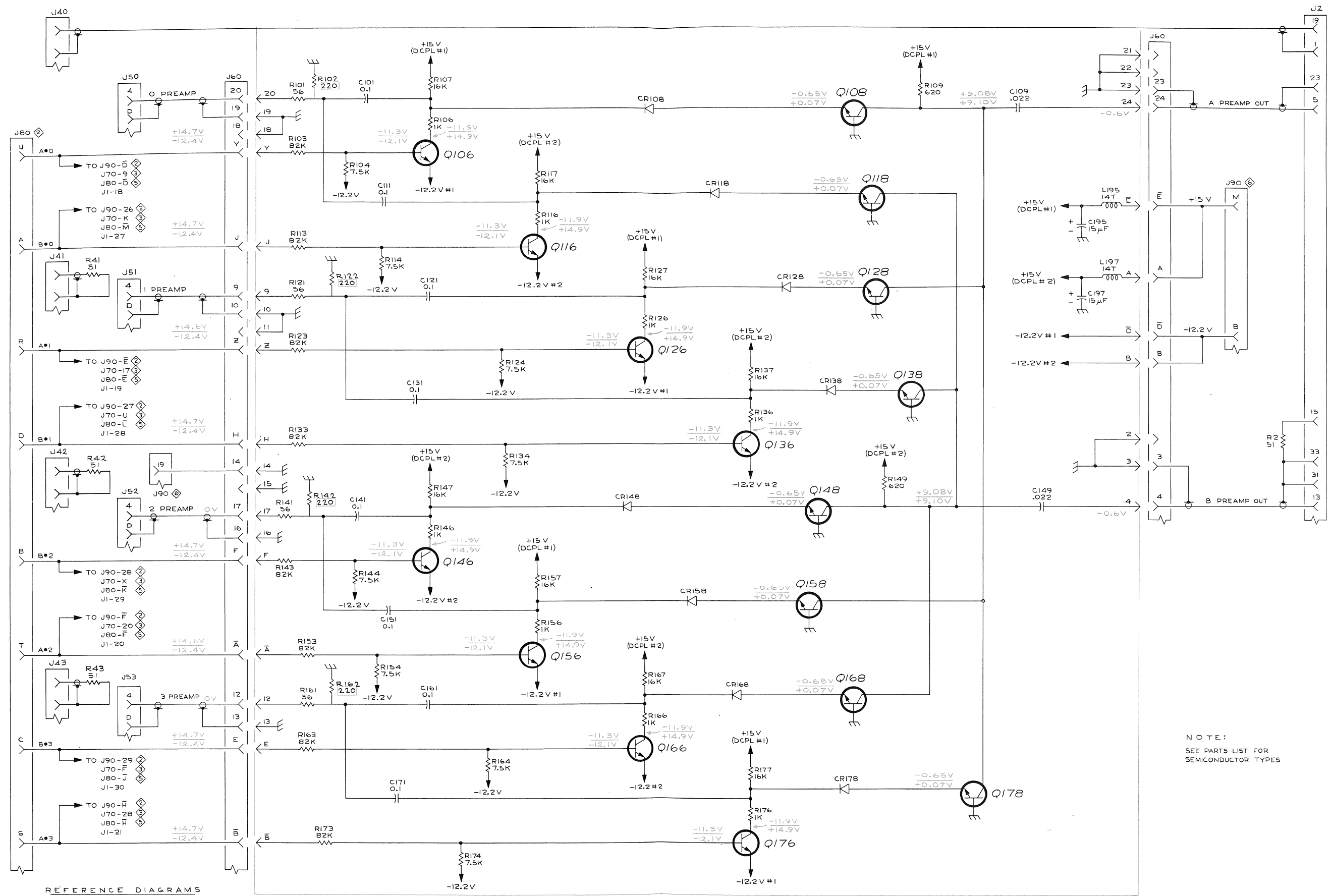
- REFERENCE DIAGRAMS**
- ◆ TYPE 286 HEAD SELECTOR AND LAMP DRIVER CIRCUITS
 - ◆ TYPE 286 SIGNAL PREAMP CIRCUITS
 - ◆ TYPE 286 OFFSET AND FEEDBACK SWITCHING CIRCUITS
 - ◆ TYPE 286 POWER SUPPLY AND REGULATOR CIRCUITS

NOTE:
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS MARKED WITH BLUE OUTLINE.

PARTIAL P60 STROBE PREAMP CIRCUIT CARD

PARTIAL P70 STROBE DELAY COMPARATOR CIRCUIT CARD



REFERENCE DIAGRAMS

- ① TYPE 286 HEAD SELECTOR AND LAMP DRIVER CIRCUITS
- ② TYPE 286 RAMP GENERATOR AND STROBE DELAY CIRCUITS
- ③ TYPE 286 OFFSET AND FEEDBACK SWITCHING CIRCUITS
- ④ TYPE 286 POWER SUPPLY AND REGULATOR CIRCUITS

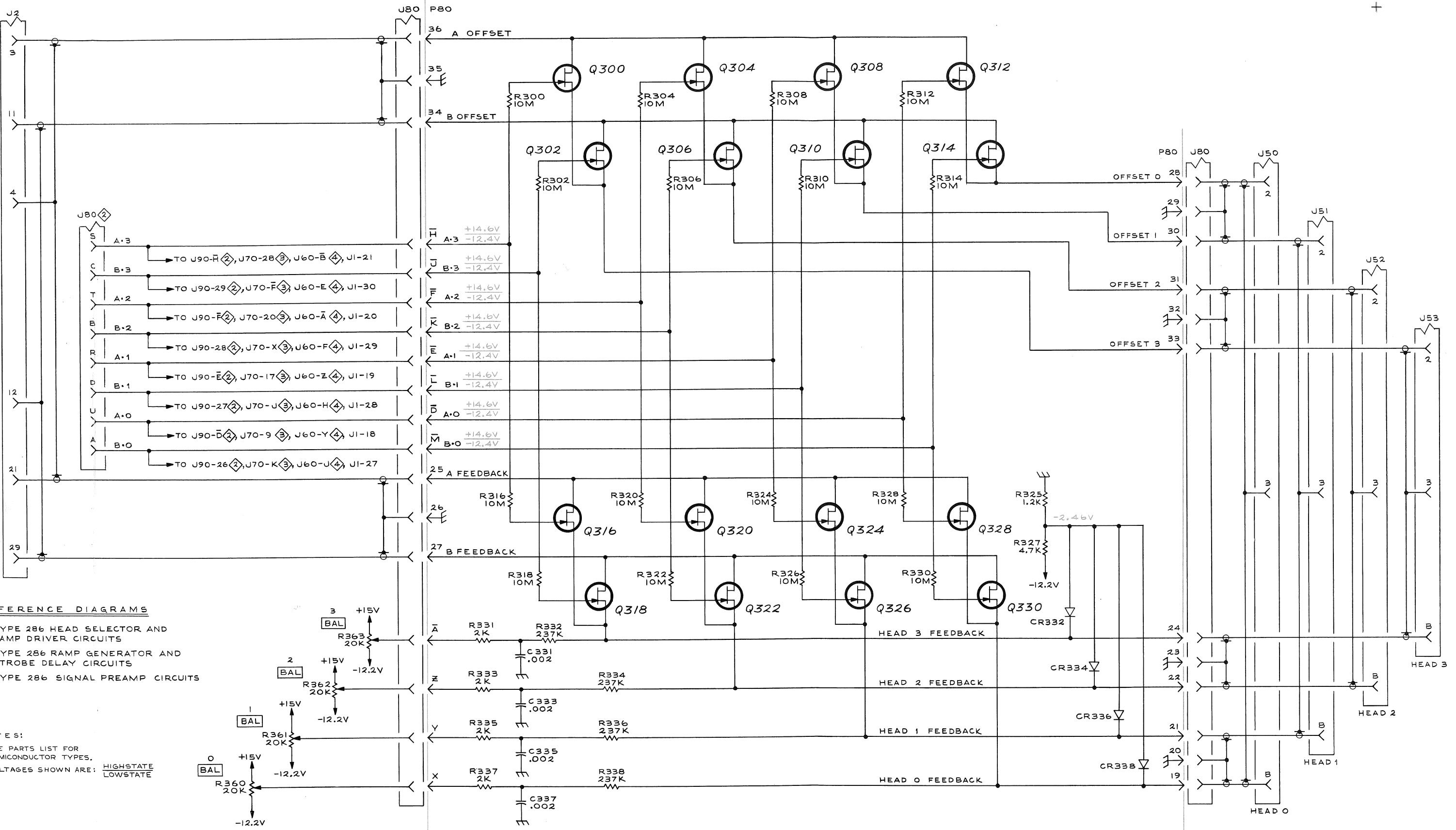
TYPE 286

PARTIAL P60 STROBE & PREAMP CIRCUIT CARD

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS MARKED WITH BLUE OUTLINE.

NOTE:
SEE PARTS LIST FOR SEMICONDUCTOR TYPES

SIGNAL PREAMP CIRCUITS



REFERENCE DIAGRAMS

- ◆ TYPE 286 HEAD SELECTOR AND LAMP DRIVER CIRCUITS
- ◆ TYPE 286 RAMP GENERATOR AND STROBE DELAY CIRCUITS
- ◆ TYPE 286 SIGNAL PREAMP CIRCUITS

NOTES:

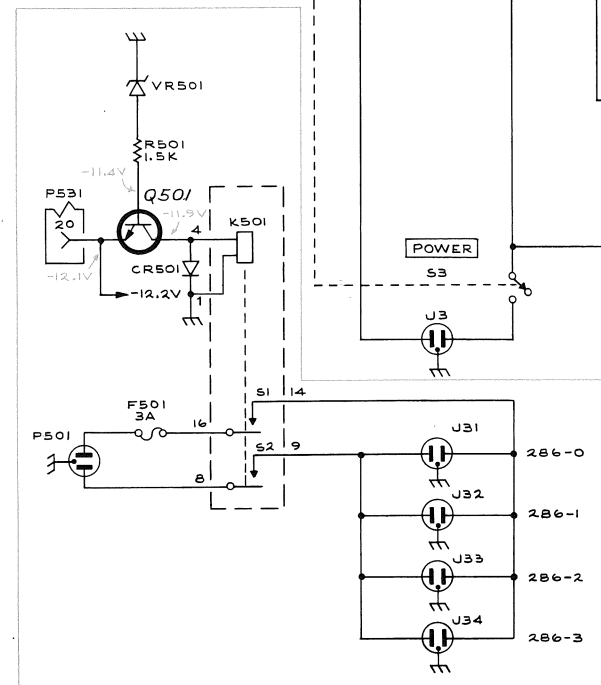
- SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
- VOLTAGES SHOWN ARE: HIGHSTATE LOWSTATE

PARTIAL P80 FET & LOGIC CIRCUIT CARD

- NOTES:
 1. SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
 2. * HEAT SINK.

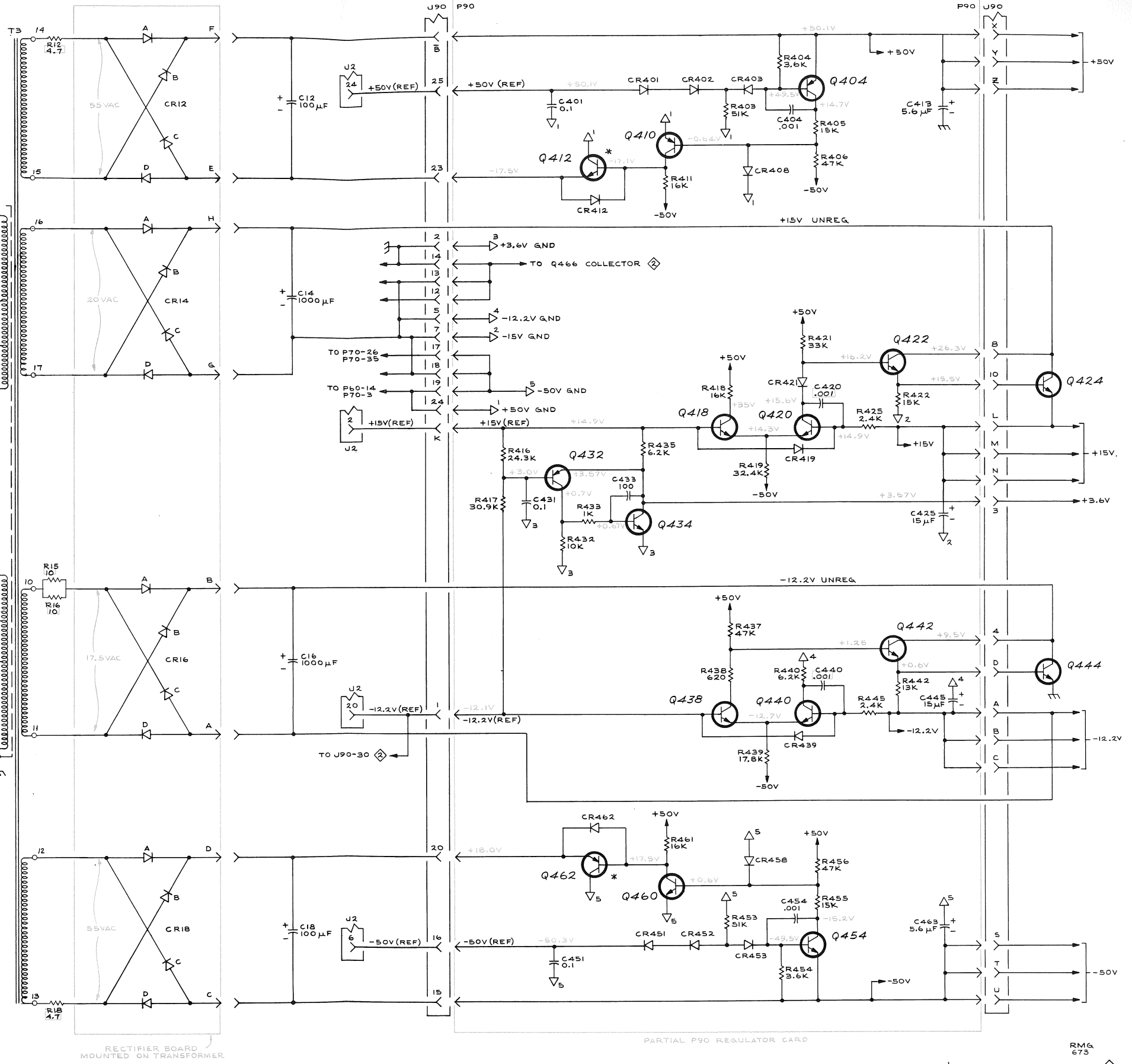
REFERENCE DIAGRAMS
 TYPE 286 HEAD SELECTOR AND LAMP DRIVER CIRCUITS.

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS MARKED WITH BLUE OUTFINE.



TYPE 287/288 POWER DISTRIBUTION

TYPE 286/287/R287/R288



PARTIAL P90 REGULATOR CARD

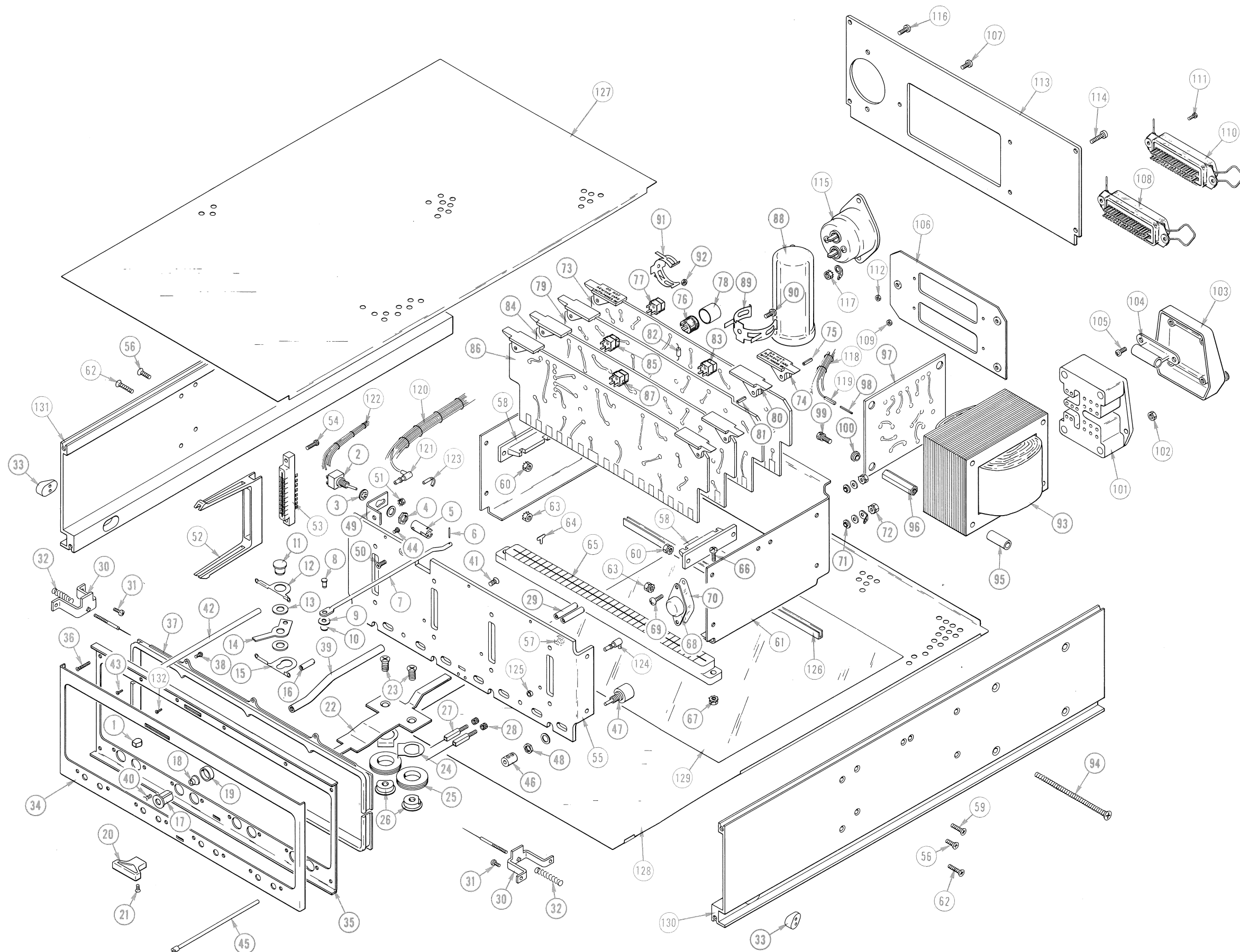
RECTIFIER BOARD MOUNTED ON TRANSFORMER

REV C JUN 1973

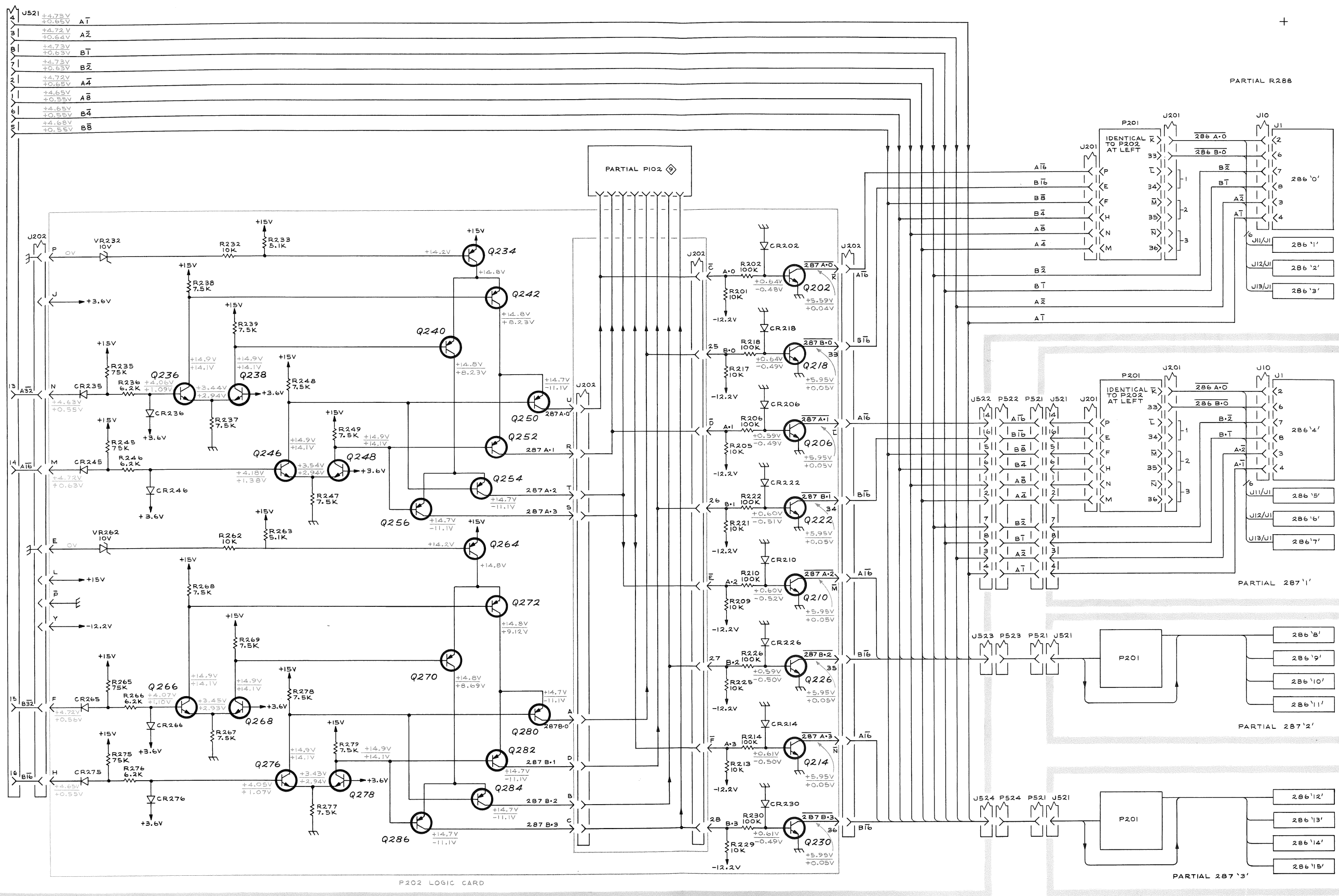
POWER SUPPLY & REGULATOR CIRCUITS

RM6
673

FIG. 1 TYPE 286 EXPLODED



TYPE 286/287/R287/R288 SAMPLING HEAD MULTIPLEXER SYSTEM



+

TYPE 287/R287/R288

NOTE:
SEE PARTS LIST FOR
SEMICONDUCTOR TYPES.

REFERENCE DIAGRAMS
TYPE 287/R287/R288 SIGNAL
PREAMP CIRCUITS

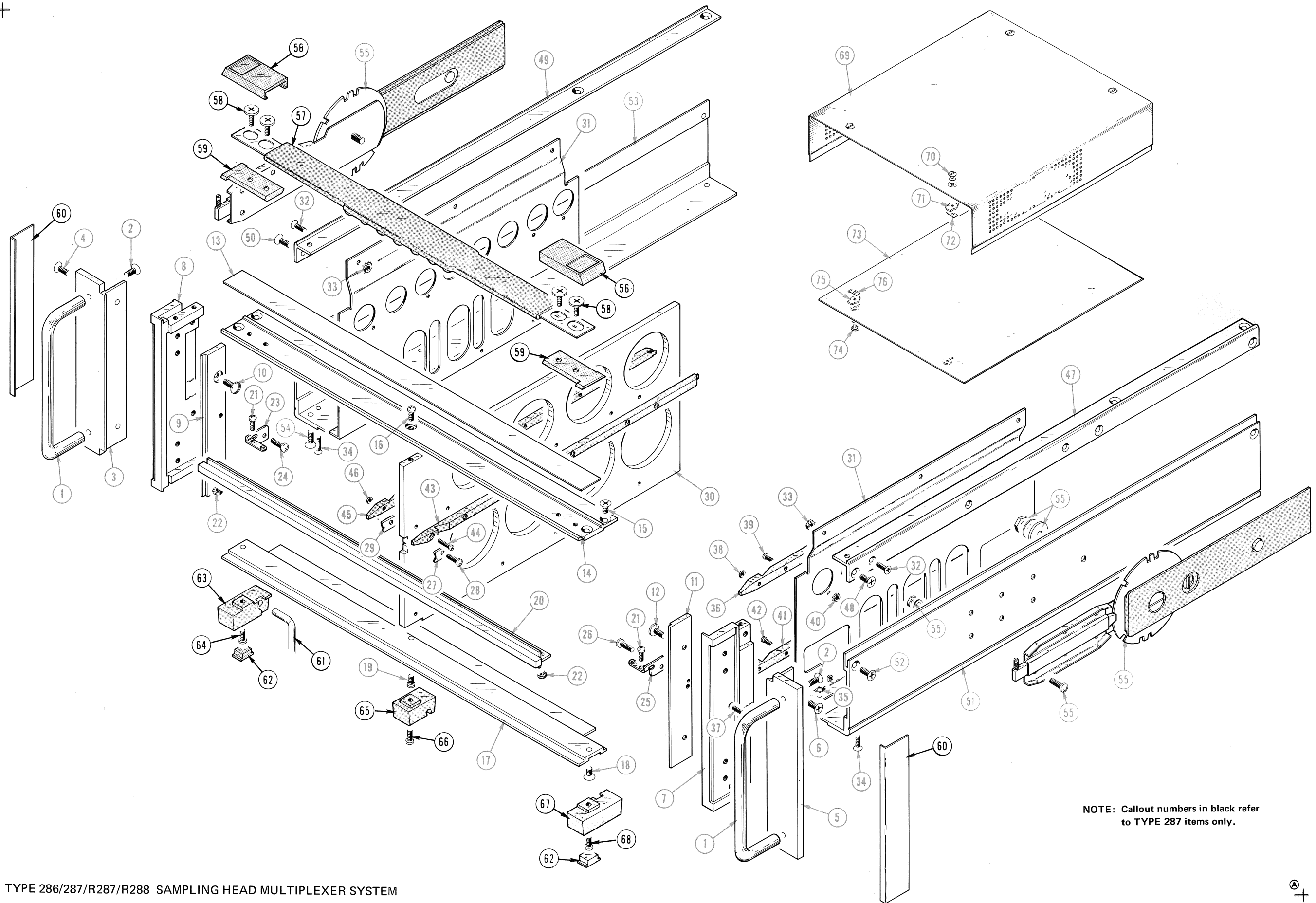
RM6
0570

HEAD SELECTOR CIRCUITS

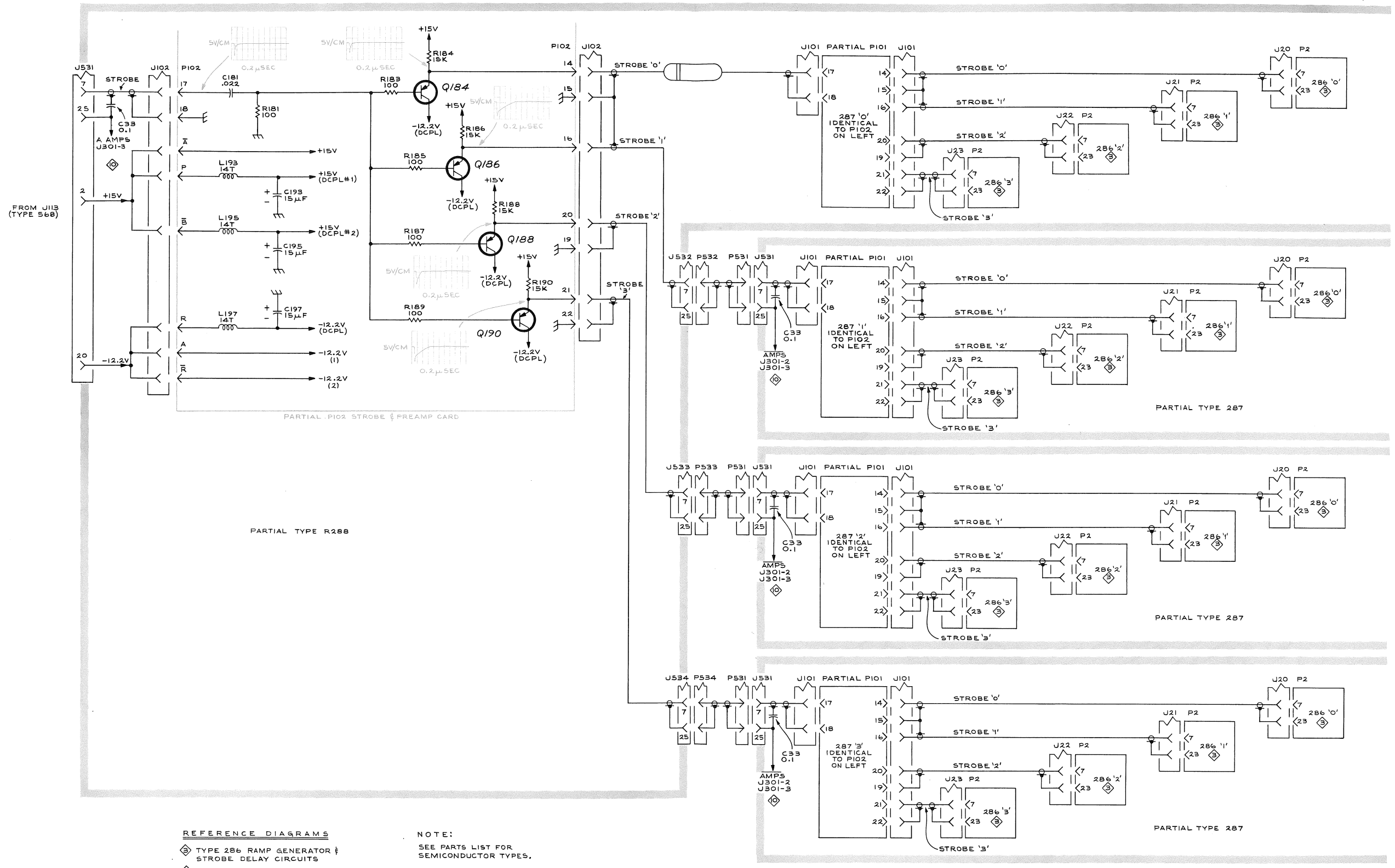
HEAD SELECTOR

7

FIG. 2 TYPE 287/R287
FRONT & CABINET



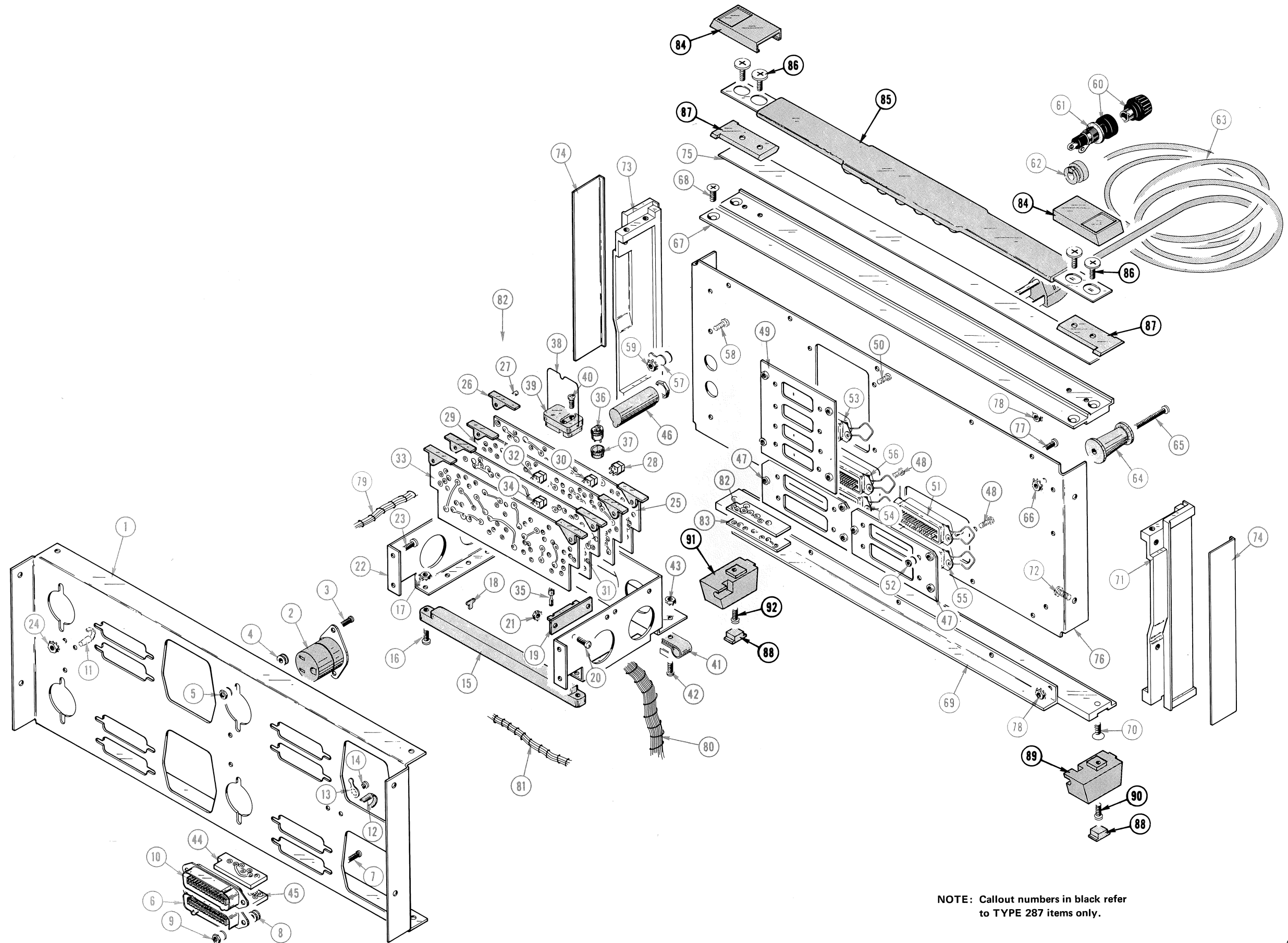
NOTE: Callout numbers in black refer to TYPE 287 items only.



REFERENCE DIAGRAMS
 Ⓢ TYPE 286 RAMP GENERATOR & STROBE DELAY CIRCUITS
 Ⓢ TYPE 286 VERTICAL SCALE CIRCUITS

NOTE:
 SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

+

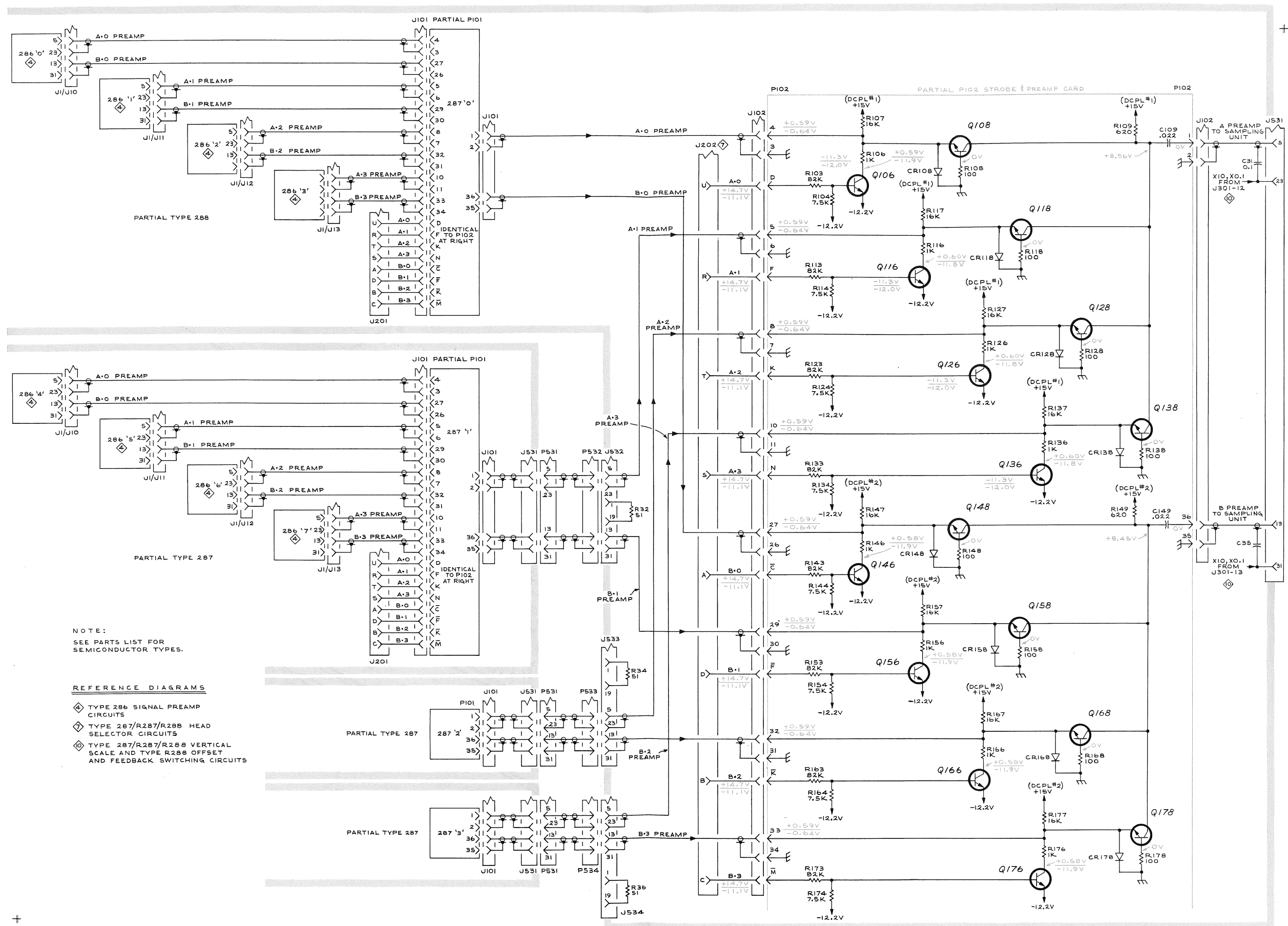


NOTE: Callout numbers in black refer to TYPE 287 items only.

FIG. 3 TYPE 287/R287 REAR

TYPE 286/287/R287/R288 SAMPLING HEAD MULTIPLEXER SYSTEM

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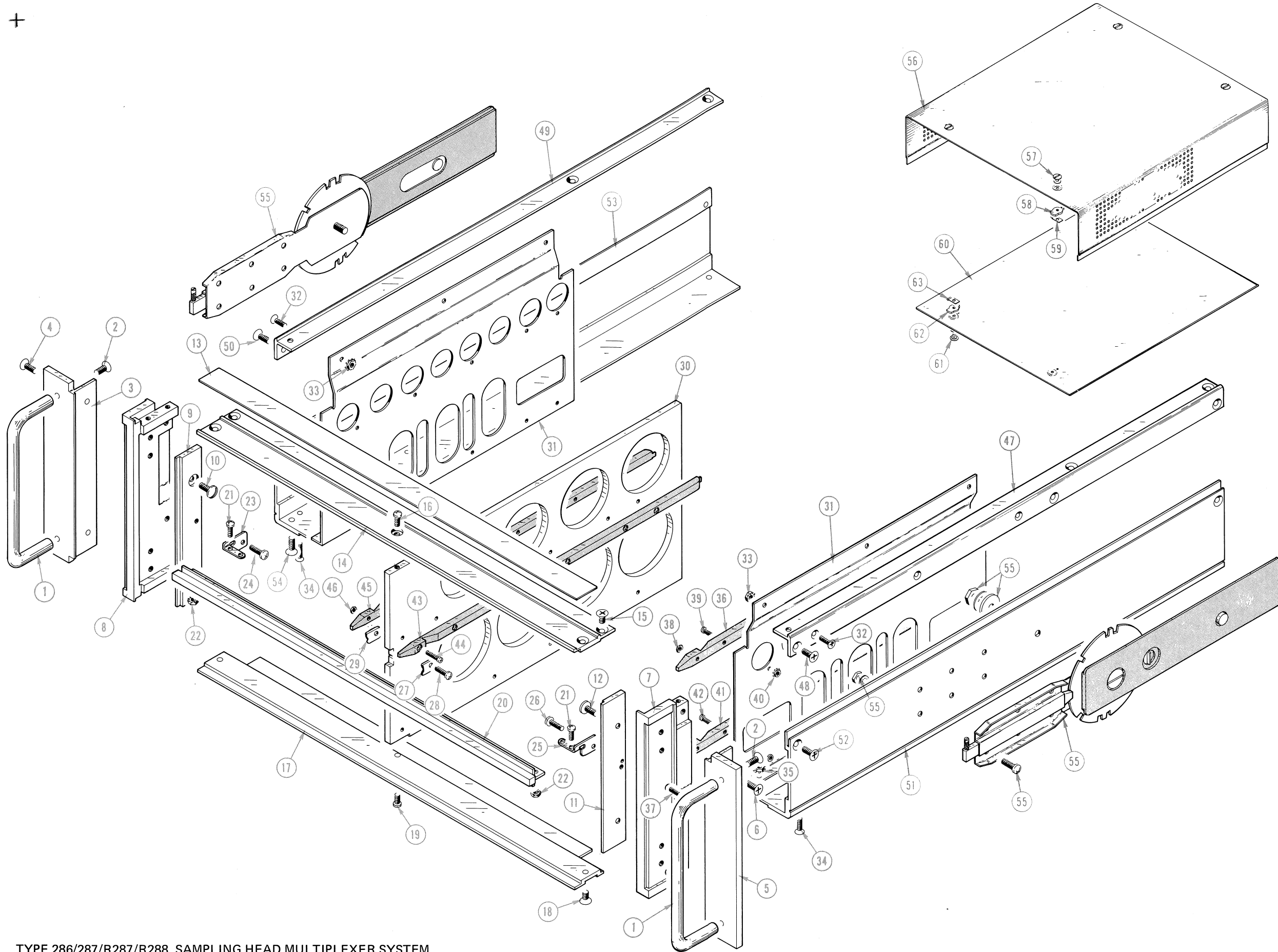


NOTE:
SEE PARTS LIST FOR
SEMICONDUCTOR TYPES.

- REFERENCE DIAGRAMS
- ◆ TYPE 286 SIGNAL PREAMP CIRCUITS
 - ◆ TYPE 287/R287/R288 HEAD SELECTOR CIRCUITS
 - ◆ TYPE 287/R287/R288 VERTICAL SCALE AND TYPE R288 OFFSET AND FEEDBACK SWITCHING CIRCUITS

FIG. 4 TYPE R288
FRONT & CABINET

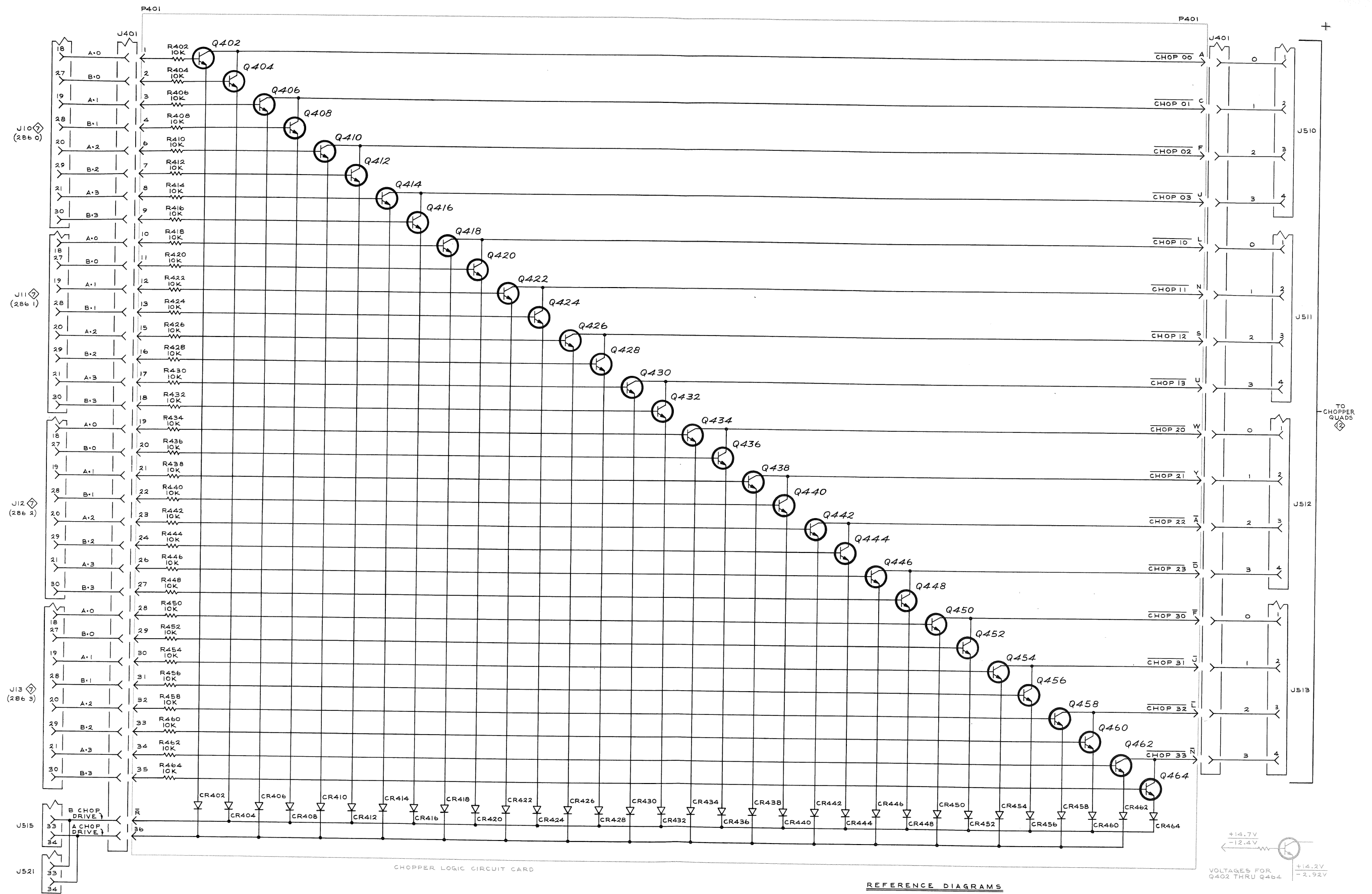
+



TYPE 286/287/R287/R288 SAMPLING HEAD MULTIPLEXER SYSTEM

+

FIG. 3 TYPE R288 REAR

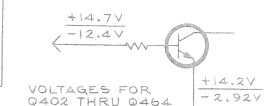


NOTES:

1. SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
2. VOLTAGES SHOWN ARE: $\frac{\text{HIGHSTATE}}{\text{LOWSTATE}}$

REFERENCE DIAGRAM

- ◇ TYPE 287/R287/R288 HEAD SELECTOR CIRCUITS
- ◊ CHOPPER QUAD CIRCUITS



TYPE 287/R287/R288

SIGNAL CHOPPER CONTROL CIRCUITS

CHOPPER CONTROL

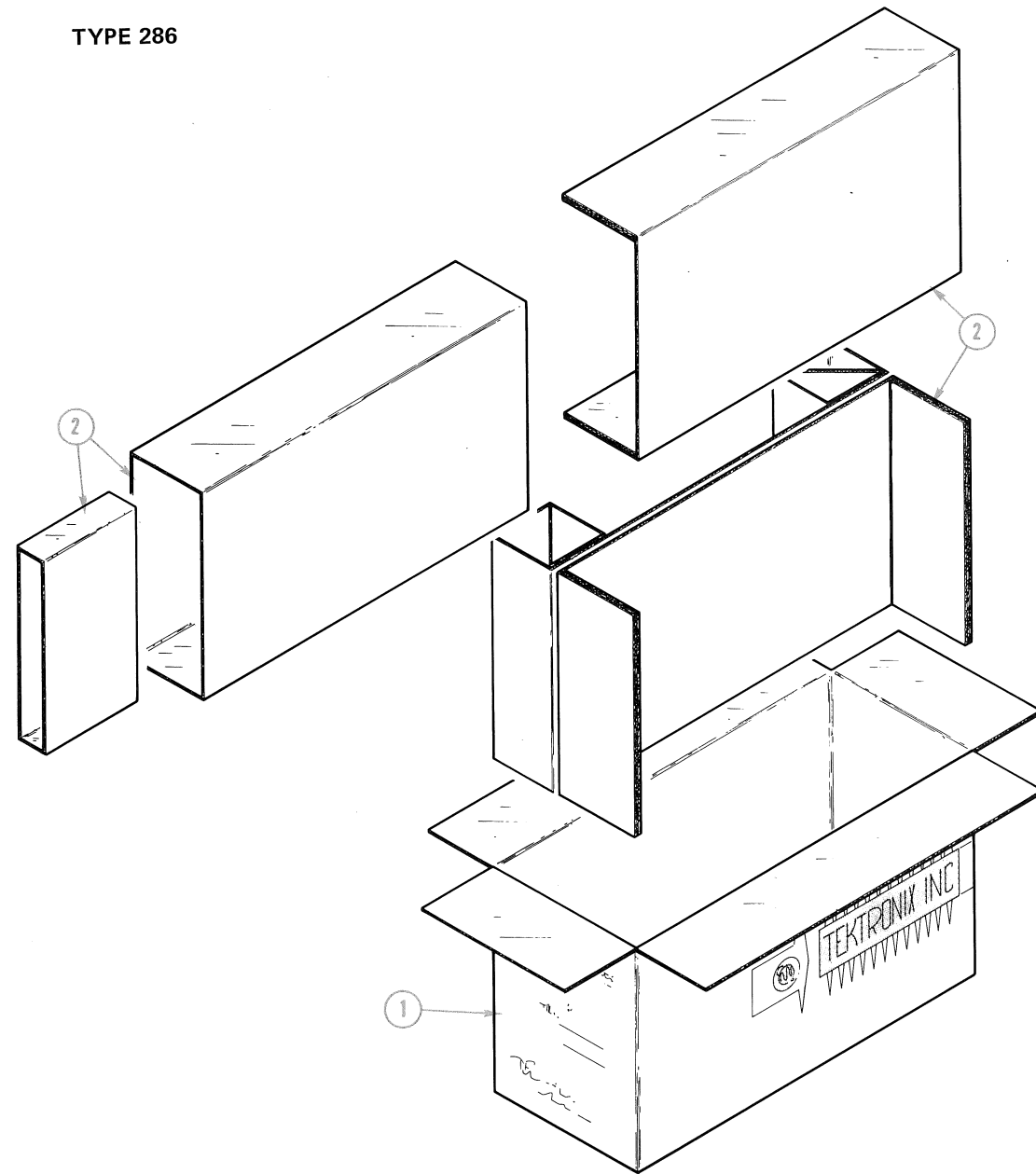
11

RMG
0570

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CARTON ASSEMBLY
(Part No. 065-0128-00)

TYPE 286



CARTON ASSEMBLY
(Part No. 065-0132-01)

TYPE 287

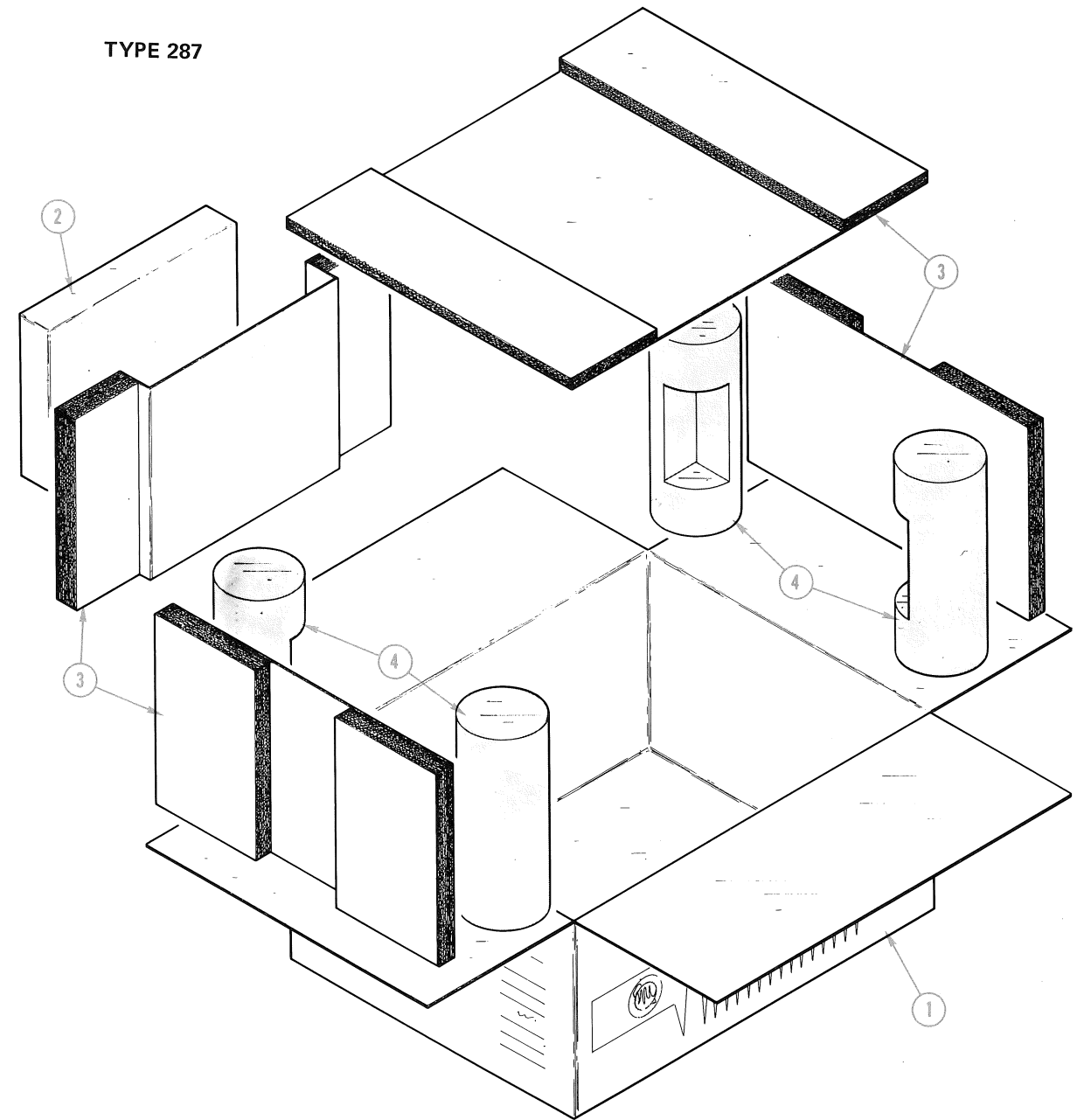


FIG. 6 REPACKAGING,
TYPE 286/287

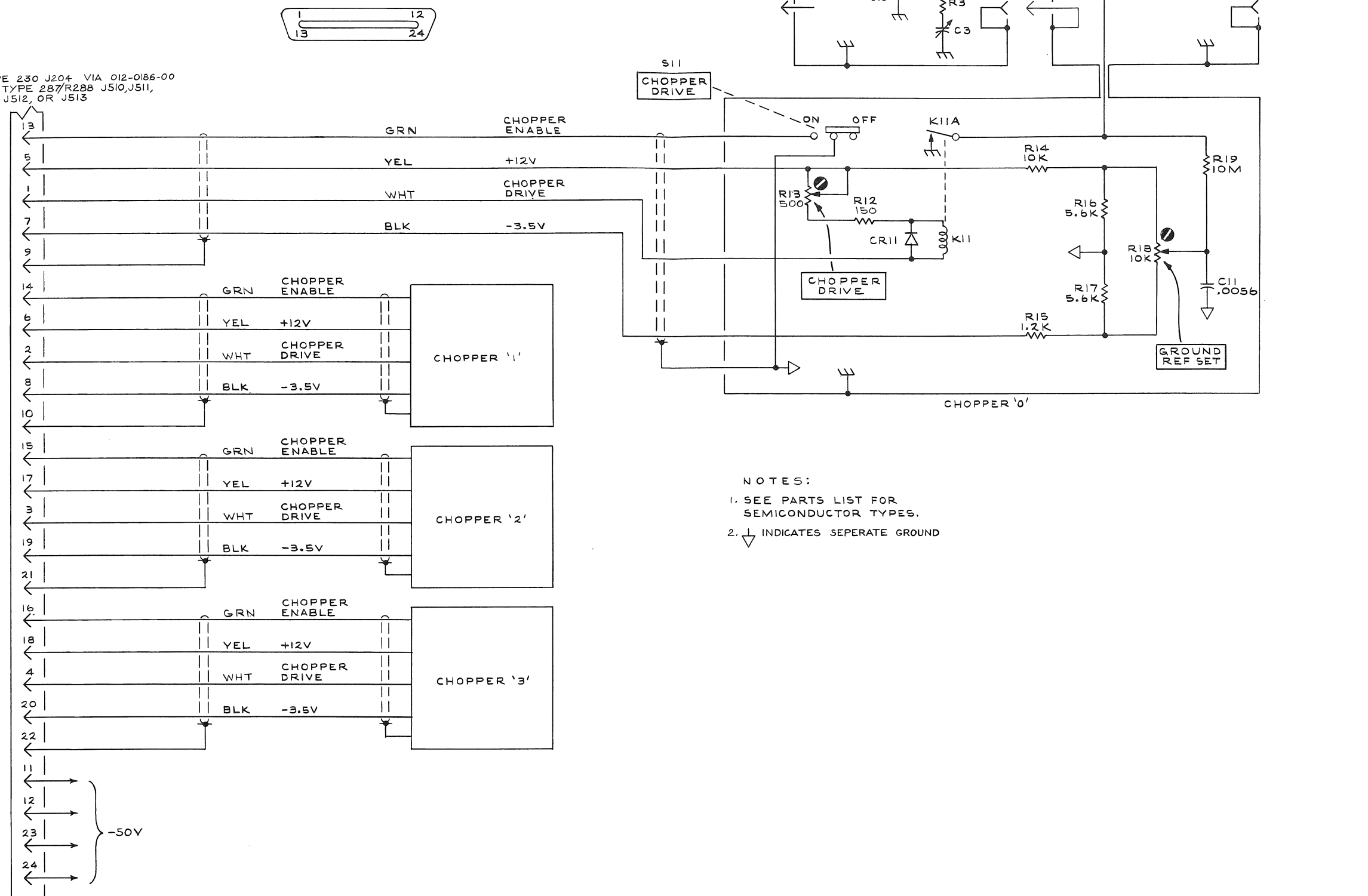
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Q t y	Description				
					1	2	3	4	5
	065-0128-00			1	ASSEMBLY, carton				
	-----			-	assembly includes:				
1	004-0612-00			1	CARTON				
2	004-1068-00			1	PAD SET, 5 piece				

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Q t y	Description				
					1	2	3	4	5
	065-0132-01			1	ASSEMBLY, carton				
	-----			-	assembly includes:				
1	004-0461-00			1	CARTON				
2	004-0462-00			1	CARTON, accessory				
3	004-1006-00			1	PAD SET, 4 piece				
4	004-0230-00			4	POST, corner				

e

+

FROM TYPE 230 J204 VIA 012-0186-00
CABLE, OR TYPE 287/R288 JS10, JS11,
JS12, OR JS13



- NOTES:
1. SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
 2. ∇ INDICATES SEPERATE GROUND

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CARTON ASSEMBLY
(Part No. 065-0132-00)

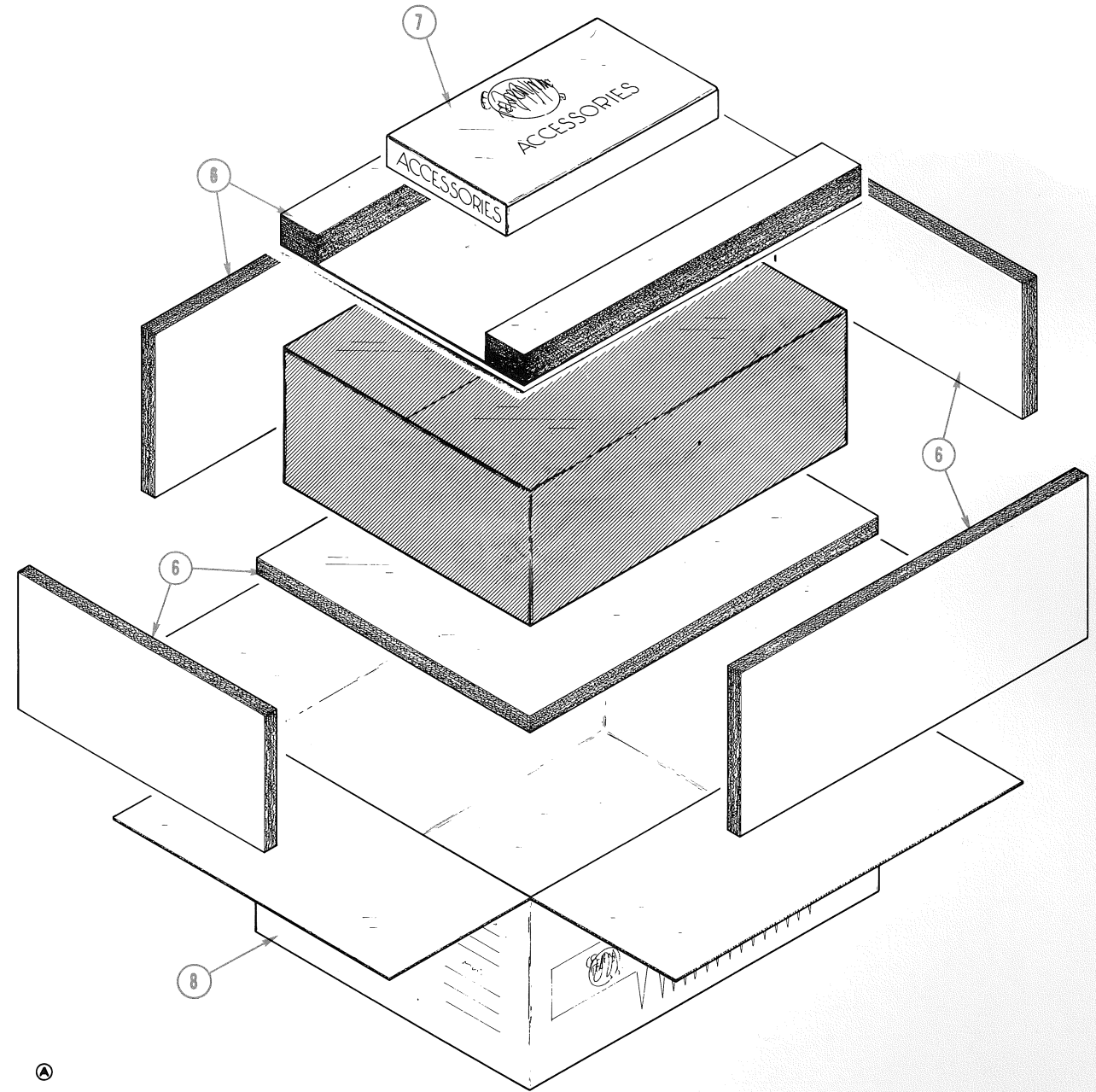
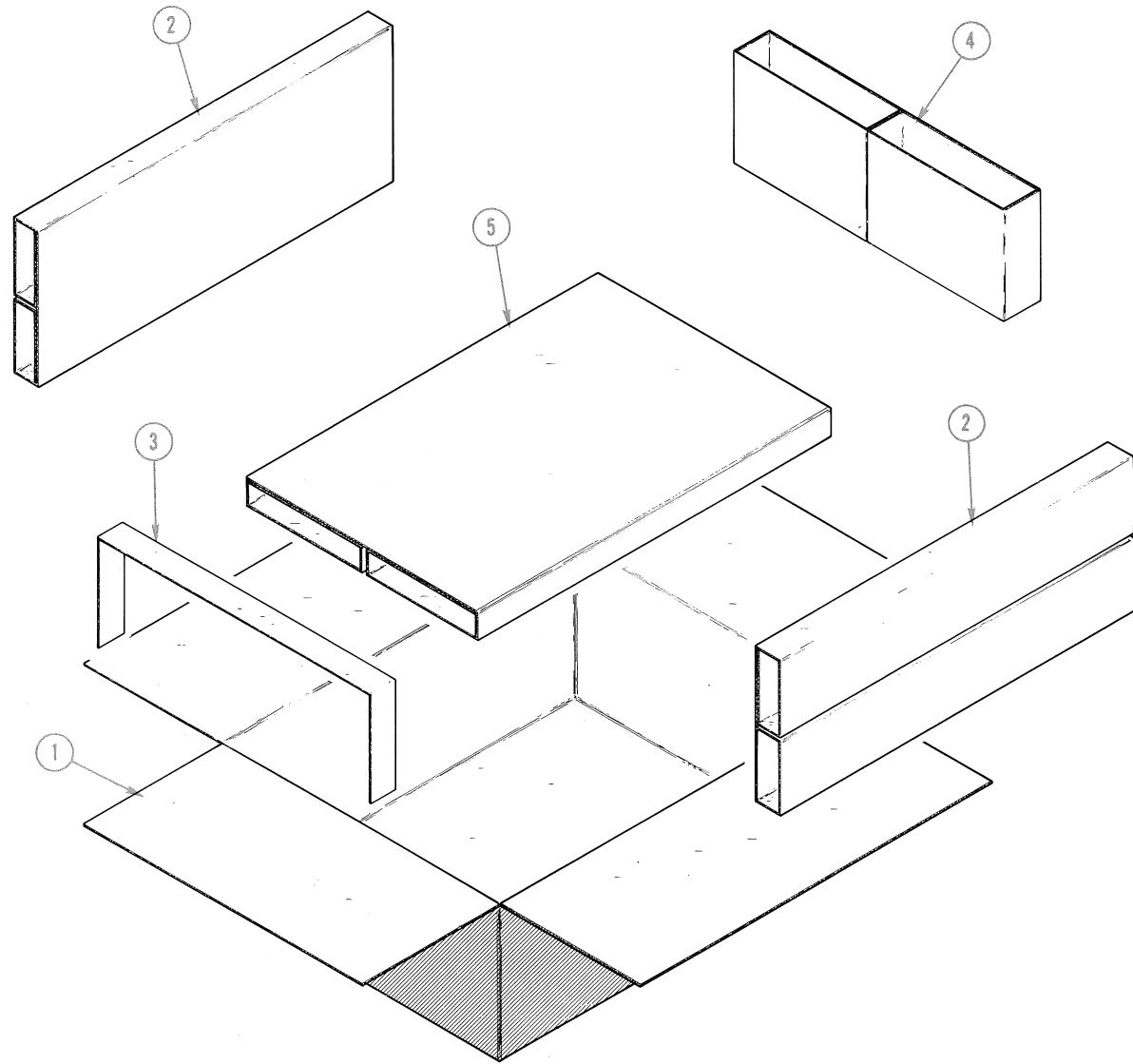


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Q					Description	
				t	1	2	3	4		5
	065-0132-00			1						ASSEMBLY, carton
	- - - - -			-						assembly includes:
1	004-0460-00			1						CARTON, inner
2	004-0360-00			1						PAD SET, 2 piece
3	004-0359-00			1						PAD, front
4	004-1027-00			1						PAD, end
5	004-0357-00			1						PAD, bottom
6	004-0361-00			1						PAD SET, 6 piece
7	004-0462-00			1						CARTON, accessory
8	004-0461-00			1						CARTON, outer

FIG. 7 REPACKAGING,
TYPE R287/R288

TYPE 286/287/R287/R288 SAMPLING HEAD MULTIPLEXER SYSTEM

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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.

SPECIAL NOTES AND SYMBOLS

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

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

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

```

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

```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---*--- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

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

ABBREVIATIONS

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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip	Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214	1-1	366-0215-01		1		1 KNOB:LEVER SWITCH	80009	366-0215-01
02288	GOULD INC., ALLIED CONTROL DIVISION	100 RELAY ROAD	PLANTSVILLE, CT 06479	-2	-----		1		1 SWITCH,TOGGLE:POWER ON(SEE S3 CHASSIS REPL) (ATTACHING PARTS)		
02660	BUNKER RAMO CORP., CONNECTOR DIVISION	2801 S 25TH AVENUE	BROADVIEW, IL 60153								
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876								
05574	VIKING INDUSTRIES, INC.	21001 NORDHOFF STREET	CHATSWORTH, CA 91311	-3	210-0046-00		1		1 WASHER,LOCK:0.261 ID,INFL,0.018 THK,BRS	78189	1214-05-00-0541C
06666	GENERAL DEVICES CO., INC.	525 S. WEBSTER AVE.	INDIANAPOLIS, IN 46219		210-0940-00		1		1 WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	0BD
12136	PHILADELPHIA HANDLE COMPANY, INC.	1643 HADDON AVENUE	CAMDEN, NJ 08103	-4	210-0562-00		1		1 NUT,PLAIN,HEX.:0.25-40 X 0.312 INCH,BBS	73743	2X20224-402
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125								
13103	THERMALLOY COMPANY, INC.	2021 W VALLEY VIEW LANE P O BOX 34829	DALLAS, TX 75234	-5	214-1293-00		1		1 ADAPTER,SW ACTR:POWER	80009	214-1293-00
			LOS GATOS, CA 95030		213-0075-00		1		. SETSCREW:4-40 X 0.094,STL BK OXD,HEX SKT	000BK	0BD
13511	AMPHENOL CARDRE DIV., BUNKER RAMO CORP.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070	-6	214-0110-00		1		1 PIN,SPRING:0.25 L X 0.066 OD,STL,CD PL	22599	52-012-062-0250
22526	BERG ELECTRONICS, INC.	16150 STAGG STREET	VAN NUYS, CA 91409	-7	384-0760-00		1		1 EXTENSION SHAFT:3.465 L X 0.125 OD	80009	384-0760-00
22599	ESNA, DIV. OF AMERACE CORPORATION	147 N. MICHIGAN AVE.	KENILWORTH, NJ 07033	-8	214-1295-00		1		1 PIN,GRVD,HEADED:0.132 OD X 0.208 L,BRS	80009	214-1295-00
28520	HEYMAN MFG. CO.			-9	210-1011-00		1		1 WASHER,NONMETAL:0.13 ID X 0.375 " OD,PLSTC	83309	0BD
29587	BUNKER-RAMO CORP., AMPHENOL INDUSTRIAL DIV.	1830 S. 54TH AVE.	CHICAGO, IL 60650	-10	354-0233-00		1		1 RING,RETAINING:0.100 ID X 0.203 INCH OD	79136	5133-14PP
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875	-11	214-1297-00		1		1 PIN,GRVD,HEADED:0.243 OD X 0.181 L,DELTRIN		
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530	-12	407-0709-00		1		1 BRKT,HALF,SW AC:TOP,SST	80009	407-0709-00
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607	-13	210-0992-00		2		2 WASHER,NONMETAL:0.265 INCH IDX 0.437" OD	80009	210-0992-00
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702	-14	214-1294-00		1		1 LVR ARM,SW ACTR:POWER	80009	214-1294-00
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007	-15	407-0708-00		1		1 BRKT,HALF,SW AC:BOTTOM,SST	80009	407-0708-00
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206	-16	220-0464-00		2		2 NUT,PLAIN,ROUND:2-56 X 0.156 OD X 0.454 L	80009	220-0464-00
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016	-17	352-0084-00		8		8 HOLDER,NEON:0.374 OD X 0.656 INCH LONG	80009	352-0084-00
77250	PHEOLL MANUFACTURING CO., DIVISION OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650	-18	378-0541-00		8		8 LENS,LIGHT:FROSTED	80009	378-0541-00
77342	AMF INC., POTTER AND BRUMFIELD DIV.	200 RICHLAND CREEK DRIVE	PRINCETON, IN 47670	-19	200-0609-00		8		8 BASE,LAMPHOLDER:0.4 OD X 0.16"L,GRAY PLSTC	80009	200-0609-00
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120	-20	366-1172-00		1		1 KNOB:CHARCOAL,1.0 X 0.305 X 0.75 (ATTACHING PARTS)	80009	366-1172-00
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101	-21	211-0105-00		1		1 SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	0BD
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207	-22	105-0155-00		1		1 LATCH,BAR:STAINLESS STEEL	80009	105-0155-00
79963	ZIERICK MFG. CO.	RADIO CIRCLE	MT. KISCO, NY 10549	-23	211-0105-00		2		2 SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	0BD
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077	-24	343-0250-00		2		2 RETAINER,CABLE:STAINLESS STEEL	80009	343-0250-00
80033	PRESTOLE EVERLOCK, INC.	P. O. BOX 278,1345 MIAMI ST.	TOLEDO, OH 43605	-25	401-0071-00		2		2 PULLEY,GROOVE:DELTRIN,0.375 ID X 0.64 OD X 0.075		
83309	ELECTRICAL SPECIALTY CO., SUBSIDIARY OF BELDEN CORP.	213 E. HARRIS AVE. SOUTH	SAN FRANCISCO, CA 94080	-26	401-0072-00		2		2 BEARING,PULLEY:BRASS,0.438 OD X 0.10	80009	401-0072-00
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153	-27	214-1339-00		2		2 CABLE,LCH REL:5.438 L X 0.02 OD W/5-40 THD (ATTACHING PARTS)		
84830	LEE SPRING COMPANY, INC.	30 MAIN STREET	BROOKLYN, NY 11201	-28	220-0563-00		2		2 NUT,PLAIN,KNURL:5-40 X 0.197 OD	80009	220-0563-00
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201	-29	220-0562-00		2		2 NUT,CA TNSN ADJ:5-40 X 0.188 OD X 0.625	80009	220-0562-00
87308	N. L. INDUSTRIES, INC., SOUTHERN SCREW DIV.	P. O. BOX 1360	STATESVILLE, NC 28677	-30	343-0249-00		2		2 RTNR,LATCH SPR:ALUM (ATTACHING PARTS)	80009	343-0249-00
88245	LITTON SYSTEMS, INC., USECO DIV.	13536 SATICOY ST.	VAN NUYS, CA 91409	-31	213-0055-00		4		4 SCR,TPG,THD FOR:2-32 X 0.188 INCH,PNH STL	93907	0BD
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101								
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641	-32	214-1338-00		2		2 SPRING,HLCPS:0.875 INCH LONG	84830	LC-016B-10-SS
98376	ZERO MFG. COMPANY, ZERO-WEST DIV.	777 FRONT STREET	BURBANK, CA 91503	-33	105-0154-00		2		2 CATCH,SLIDE:ACETAL	80009	105-0154-00
				-34	333-1254-00		1		1 PANEL,FRONT:	80009	333-1254-00
				-35	386-1666-00		1		1 SUBPANEL,FRONT: (ATTACHING PARTS)	80009	386-1666-00
				-36	213-0227-00		4		4 SCR,TPG,THD FOR:6-32 X 0.50 DEG,FLH ST	83385	0BD
				-37	200-1056-00		2		2 BEZEL-HALF,SAMP:PLASTIC (ATTACHING PARTS)	80009	200-1056-00
				-38	211-0022-00		6		6 SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	0BD
				-39	386-1668-00		2		2 SPRT,SUBPANEL,:BOTTOM FRONT (ATTACHING PARTS)	80009	386-1668-00
				-40	211-0038-00		2		2 SCREW,MACHINE:4-40 X 0.312,FLH,100 DEG	83385	0BD
				-41	211-0097-00		2		2 SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	0BD
				-42	386-1669-00		3		3 SPRT,SUBPANEL:TOP FRONT (ATTACHING PARTS)	80009	386-1669-00
				-43	211-0030-00		3		3 SCREW,MACHINE:2-56 X 0.25"82 DEG,FLH STL	83385	0BD
				-44	211-0062-00		3		3 SCREW,MACHINE:2-56 X 0.312 INCH,RDH STL	83385	0BD
				-45	384-0495-00		8		8 EXTENSION SHAFT:2.777 L X 0.125 OD	80009	384-0495-00
				-46	376-0039-00		8		8 ADPT,SHAFT,CPLG:0.128 AND 0.082"DIA SHAFT	80009	376-0039-00
					213-0075-00		16		. SETSCREW:4-40 X 0.094,STL BK OXD,HEX SKT	000BK	0BD

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-47	-----	-----	8		RES., VAR: (SEE R200, 220, 240, 260, 360, 361, 362, 363 CHASSIS REPL) (ATTACHING PARTS)		
-48	210-0940-00 210-0583-00		8		WASHER, FLAT: 0.25 ID X 0.375 INCH OD, STL	79807	OBD
			8		NUT, PLAIN, HEX.: 0.25-32 X 0.312 INCH, BRS	73743	2X20317-402
-49	406-0929-00		1		BRACKET, ANGLE: VAR RES MTG, ALUM (ATTACHING PARTS)		
-50	211-0038-00		1		SCREW, MACHINE: 4-40 X 0.312, FLH, 100 DEG	83385	OBD
-51	210-0586-00		1		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-52	351-0132-00		4		GUIDE, CLIP:	80009	351-0132-00
-53	131-0581-00		4		CONNECTOR, RCPT, :12 FEMALE CONTACTS (ATTACHING PARTS)	05574	000221-0355
-54	213-0082-00		8		SCR, TPG, THD CTG: 4-40 X 0.50 INCH, PNH STL	93907	OBD
-55	407-0706-00		1		BRACKET, CONN: ALUM (ATTACHING PARTS)	80009	407-0706-00
-56	211-0025-00		4		SCREW, MACHINE: 4-40 X 0.375 100 DEG, FLH STL	83385	OBD
-57	210-0586-00		4		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-58	351-0222-00		4		GUIDE, CKT BD: DELRIN, 1.719 L (ATTACHING PARTS)	80009	351-0222-00
-59	211-0025-00		2		SCREW, MACHINE: 4-40 X 0.375 100 DEG, FLH STL	83385	OBD
-60	210-0586-00		2		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-61	407-0707-00		1		BRACKET, CMPNT: CONN & CAP, ALUM (ATTACHING PARTS)	80009	407-0707-00
-62	211-0101-00		4		SCREW, MACHINE: 4-40 X 0.25" 100 DEG, FLH STL	83385	OBD
-63	210-0586-00		4		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-64	214-0702-00		8		KEY, CONN PLZN: CKT BD CONN, TSHAPED	80009	214-0702-00
-65	131-0849-00		4		CONN, RCPT, ELEC: CKT BD, 36/72 CONT (ATTACHING PARTS)	05574	000201-5430
-66	211-0012-00		8		SCREW, MACHINE: 4-40 X 0.375, PNH STL CD PL	83385	OBD
-67	210-0586-00		8		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-68	-----		2		TRANSISTOR: (SEE Q424, Q444 CHASSIS REPL) (ATTACHING PARTS)		
-69	211-0510-00		4		SCREW, MACHINE: 6-32 X 0.375, PNH, STL, CD PL	83385	OBD
-70	386-0143-00		2		INSULATOR, PLATE: TRANSISTOR MICA	02735	DF31A
-71	210-0975-00 210-0803-00 210-0202-00		4		WSHR, SHOULDERED: 0.14 ID X 0.247" OD, PLSTC	80009	210-0975-00
			4		WASHER, FLAT: 0.15 ID X 0.032 THK, STL CD PL	12327	OBD
			2		TERMINAL, LUG: 0.146 ID, LOCKING, BRZ TINNED	78189	2104-06-00-2520N
-72	210-0457-00		4		NUT, PL, ASSEM WA: 6-32 X 0.312 INCH, STL	83385	OBD
-73	670-0320-00		1		CKT BOARD ASSY: REGULATOR	80009	670-0320-00
-74	105-0160-04		2		. EJECTOR, CKT BD: WHITE PLASTIC (ATTACHING PARTS)	80009	105-0160-04
-75	214-1337-00		2		. PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
	136-0252-07	B010100 B050809X	3		. SOCKET, PIN CONN: W/O DIMPLE	22526	75060-012
-76	136-0183-00	B010100 B050809	11		. SOCKET, PLUG-IN: 3 PIN, ROUND	80009	136-0183-00
	136-0183-00	B050810	1		. SOCKET, PLUG-IN: 3 PIN, ROUND	80009	136-0183-00
-77	136-0220-00	B010100 B050809X	12		. SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034
-78	214-0668-00		2		HEAT SINK, ELEC: FOR TO-5	13103	2211B
	386-1130-00	XB050810	11		. INSULATOR DISC: TRANSISTOR, NYLON	13103	7717-15N
-79	670-0321-00	B010100 B019999	1		CKT BOARD ASSY: FET & LOGIC	80009	670-0321-00
	670-0321-01	B020000	1		CKT BOARD ASSY: FET & LOGIC	80009	670-0321-01
-80	105-0160-00		2		. EJECTOR, CKT BD: WHITE PLASTIC (ATTACHING PARTS)	80009	105-0160-00
-81	214-1337-00		2		. PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
-82	131-0566-00		3		. BUS CONDUCTOR: DUMMY RES, 2.375, 22 AWG	55210	L-2007-1
-83	136-0220-00	B010100 B050809X	38		. SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-84	670-0322-00 670-0322-01 105-0160-00	B010100 B039999 B040000	1		CKT BOARD ASSY: STROBE DELAY COMPARATOR	80009	670-0322-00
			1		CKT BOARD ASSY: STROBE DELAY COMPARATOR	80009	670-0322-01
			2		. EJECTOR, CKT BD: WHITE PLASTIC (ATTACHING PARTS)	80009	105-0160-00
	214-1337-00		2		. PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
-85	136-0220-00	B010100 B050809X	8		. SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034
-86	670-0323-00 670-0323-01 670-0323-02 105-0160-00	B010100 B019999 B020000 B039999 B040000	1		CKT BOARD ASSY: STROBE & PREAMP	80009	670-0323-00
			1		CKT BOARD ASSY: STROBE & PREAMP	80009	670-0323-01
			1		CKT BOARD ASSY: STROBE & PREAMP	80009	670-0323-02
			2		. EJECTOR, CKT BD: WHITE PLASTIC (ATTACHING PARTS)	80009	105-0160-00
	214-1337-00		2		. PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
	131-0566-00		3		. BUS CONDUCTOR: DUMMY RES, 2.375, 22 AWG	55210	L-2007-1
-87	136-0220-00	B010100 B050809X	20		. SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034
-88	200-0256-00		2		SHLD, CAPACITOR: 2.03 INCHES LONG	80009	200-0256-00
-89	344-0118-00		2		CLIP, SPG TENS: CAPACITOR MTG (ATTACHING PARTS)	80033	E50008-044
	210-0457-00		2		NUT, PL, ASSEM WA: 6-32 X 0.312 INCH, STL	83385	OBD
-90	211-0504-00		2		SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-91	344-0117-00		2		RTNR, CAPACITOR: CAPACITOR MTG (ATTACHING PARTS)	80033	E50005-041
	211-0105-00		2		SCREW, MACHINE: 4-40 X 0.188" 100 DEG, FLH STL	83385	OBD
-92	210-0551-00		2		NUT, PLAIN, HEX.: 4-40 X 0.25 INCH, STL	83385	OBD
-93	-----		1		TRANSFORMER: (SEE T3 CHASSIS REPL) (ATTACHING PARTS)		
-94	211-0618-00		4		SCREW, MACHINE: 6-32 X 2.250 X, FLH, 100 DEG, POZ	80009	166-0037-00
-95	166-0037-00		4		SPACER, SLEEVE: 0.180 ID X 0.250 D X 0.56" LG	80009	166-0037-00
-96	129-0089-00		4		POST, ELEC-MECH: 6-32 X 0.25 X 0.83 INCH L	80009	129-0089-00
-97	670-0319-00		1		CKT BOARD ASSY: RECTIFIER	80009	670-0319-00
-98	131-0589-00		8		. TERM, PIN: 0.46 L X 0.025 SQ. PH BRZ GL (ATTACHING PARTS)	22526	47350
-99	211-0601-00		4		SCR, ASSEM WSHR: 6-32 X 0.312, DOUBLE SEMS	83385	OBD
-100	210-0811-00		4		WSHR, SHOULDERED: 0.125 ID X 0.50 INCH OD	86928	5604-47
-101	204-0279-00		1		BODY ASSY, LINE: 115/230 VOLTS (ATTACHING PARTS)	80009	204-0279-00
	210-0006-00		1		WASHER, LOCK: #6 INTL, 0.018 THK, STL CD PL	78189	1206-00-00-0541C
-102	210-0407-00		2		NUT, PLAIN, HEX.: 6-32 X 0.25 INCH, BRS	73743	3038-0228-402
-103	200-0762-00		1		COV ASSY, LINE V: WITH FUSEHOLDER, 115/230V	80009	200-0762-00
-104	352-0102-00		2		. FUSEHOLDER: 0.262" ID TUBE FOR CRTG FUSE (ATTACHING PARTS)	80009	352-0102-00
-105	213-0088-00		4		. SCR, TPG, THD CTG: 4-24 X 0.25 INCH, PNH STL	83385	OBD
-106	386-1245-00		1		PL, RTNG, ELEC CO: (2) 36 RIBBON CONTACT (ATTACHING PARTS)	80009	386-1245-00
-107	211-0507-00		3		SCREW, MACHINE: 6-32 X 0.312 INCH, PNH STL	83385	OBD
-108	131-0294-03		1		CONNECTOR, RCPT, : 36 CONT, FEMALE (ATTACHING PARTS)	13511	57-41360-03
	211-0062-00		2		SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
	210-0001-00		2		WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
-109	210-0405-00		2		NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-110	131-0294-06		1		CONNECTOR, RCPT, : 36 PIN, FEMALE (ATTACHING PARTS)	02660	57-41360-06
-111	211-0062-00		2		SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
	210-0001-00		2		WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
-112	210-0405-00		2		NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-113	386-1667-00		1		PANEL, REAR: (ATTACHING PARTS)	80009	386-1667-00
-114	213-0192-00		4		SCR, TPG, THD FOR: 6-32 X 0.50 INCH, PNH STL	87308	OBD

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-115	131-0572-00		1		CONN, RCPT, ELEC: PWR, MALE, 125VAC, 15A (ATTACHING PARTS)		
-116	211-0510-00		2		SCREW, MACHINE: 6-32 X 0.375, PNH, STL, CD PL	83385	OBD
	210-0202-00		1		TERMINAL, LUG: 0.146 ID, LOCKING, BRZ TINNED	78189	2104-06-00-2520N
-117	210-0457-00		2		NUT, PL, ASSEM WA: 6-32 X 0.312 INCH, STL	83385	OBD
					* - - - -		
-118	179-1489-00		1		WIRING HARNESS: POWER	80009	179-1489-00
-119	131-0621-00		6		CONNECTOR, TERM: 22-26 AWG, BRS& CU BE GOLD	22526	46231
	131-0792-00		2		CONNECTOR, TERM: 18-20 AWG, CU BE GOLD PL	22526	46221
-120	179-1490-00		1		WIRING HARNESS: COAX	80009	179-1490-00
-121	131-0410-00		1		CONN, RCPT, ELEC:	71468	DM53741-5001
-122	179-1491-00		1		WIRING HARNESS: AC	80009	179-1491-00
-123	343-0213-00		1		CLAMP, LOOP: PRESS MT, PLASTIC	80009	343-0213-00
-124	131-0410-00		4		CONN, RCPT, ELEC:	71468	DM53741-5001
					(ATTACHING PARTS)		
-125	343-0190-00		4		RTNR, CONNECTOR:	80009	343-0190-00
					* - - - -		
-126	255-0249-00		FT		PLASTIC CHANNEL:	80009	255-0249-00
-127	337-1217-00		1		SHIELD, ELEC: TOP		
-128	337-1218-00		1		SHIELD, ELEC: BOTTOM		
-129	342-0015-00		1		INSULATOR, FILM: CONNECTOR, MYLAR		
-130	426-0579-00		1		FRAME, SECT, P-I: RIGHT	80009	426-0579-00
-131	426-0580-00		1		FRAME, SECT, P-I: LEFT	80009	426-0580-00
					(ATT PTS FOR EACH FRAME, SECT)		
-132	211-0030-00		2		SCREW, MACHINE: 2-56 X 0.25" 82 DEG, FLH STL	83385	OBD
					* - - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-1	367-0076-00		2		HANDLE, BOW: U SHAPED	80009	367-0076-00
					(R287 ONLY)		
					(ATTACHING PARTS)		
-2	212-0559-00		4		SCREW, MACHINE: 10-32 X 0.375, FLH, 100DEG, STL	83385	OBD
					(R287 ONLY)		
					* - - - -		
-3	407-0296-00		1		BRACKET, ANGLE: LEFT, RACKMOUNTING, AL	80009	407-0296-00
					(R287 ONLY)		
					(ATTACHING PARTS)		
					212-0574-00		
					(R287 ONLY)		
-5	407-0296-07		1		BRACKET, ANGLE: LEFT, RACKMOUNTING	80009	407-0296-07
					(R287 ONLY)		
					(ATTACHING PARTS)		
-6	212-0574-00		2		SCREW, MACHINE: 10-32 X 0.438" 100 DEG FLH STL	83385	OBD
					(R287 ONLY)		
					* - - - -		
-7	426-0591-00		1		FRAME, SECT, CAB: RIGHT FRONT	80009	426-0591-00
-8	426-0592-00		1		FRAME, SECT, CAB: LEFT FRONT	80009	426-0592-00
-9	377-0272-00		1		INSERT, FR SECT: LEFT FR, 5.894 L	80009	377-0272-00
					(ATTACHING PARTS)		
-10	212-0535-00		2		SCREW, MACHINE: 10-32 X 0.312 INCH, TRH STL	83385	OBD
					* - - - -		
-11	377-0271-00		1		INSERT, FR SECT: RIGHT FR, 5.894 L	80009	377-0271-00
					(ATTACHING PARTS)		
-12	212-0535-00		2		SCREW, MACHINE: 10-32 X 0.312 INCH, TRH STL	83385	OBD
					* - - - -		
-13	124-0188-00		1		STRIP, TRIM: 16.3 X 0.876 X 0.025" THK	80009	124-0188-00
					(R287 ONLY)		
-14	426-0585-00		1		FRAME, SECT, CAB: FRONT TOP	80009	426-0585-00
					(ATTACHING PARTS)		
-15	212-0506-00		4		SCREW, MACHINE: 10-32 X 0.375 INCH, FLH STL	83385	OBD
-16	211-0510-00		1		SCREW, MACHINE: 6-32 X 0.375, PNH, STL, CD PL	83385	OBD
					* - - - -		
-17	426-0587-00		1		FRAME, SECT, CAB: BOTTOM FRONT	80009	426-0587-00
					(ATTACHING PARTS)		
-18	212-0506-00		2		SCREW, MACHINE: 10-32 X 0.375 INCH, FLH STL	83385	OBD
					(R287 ONLY)		
-19	211-0510-00		1		SCREW, MACHINE: 6-32 X 0.375, PNH, STL, CD PL	83385	OBD
					* - - - -		
-20	426-0586-02		1		FRAME, SECT, CAB: FRONT CENTER	80009	426-0586-02
					(ATTACHING PARTS)		
-21	212-0023-00		8		SCREW, MACHINE: 8-32 X 0.375 INCH, PNH STL	83385	OBD
-22	210-0458-00		8		NUT, PL, ASSEM WA: 8-32 X 0.344 INCH, STL	78189	511-081800-00
					* - - - -		
-23	407-0715-00		1		BRACKET, ANGLE: RIGHT, ALUM	80009	407-0715-00
					(ATTACHING PARTS)		
-24	212-0001-00		2		SCREW, MACHINE: 8-32 X 0.250 INCH, PNH STL	77250	OBD
					* - - - -		
-25	407-0716-00		1		BRACKET, ANGLE: LEFT, ALUM	80009	407-0716-00
					(ATTACHING PARTS)		
-26	212-0001-00		2		SCREW, MACHINE: 8-32 X 0.250 INCH, PNH STL	77250	OBD
					* - - - -		
-27	407-0715-00		1		BRACKET, ANGLE: RIGHT ALUM	80009	407-0715-00
					(ATTACHING PARTS)		
-28	212-0008-00		2		SCREW, MACHINE: 8-32 X 0.500 INCH, PNH STL	83385	OBD
-29	407-0716-00		1		BRACKET, ANGLE: LEFT, ALUM	80009	407-0716-00
					210-0458-00		
					(R287 ONLY)		
					(ATTACHING PARTS)		
-30	386-1691-00		1		SUPPORT, GUIDE: P-I, CENTER, ALUM	80009	386-1691-00
-31	386-1674-00		2		SUPPORT, GUIDE: P-I UNIT, R & L, ALUM	80009	386-1674-00
					(ATTACHING PARTS)		
-32	211-0559-00		6		SCREW, MACHINE: 6-32 X 0.375" 100 DEG, FLH STL	83385	OBD
-33	210-0457-00		6		NUT, PL, ASSEM WA: 6-32 X 0.312 INCH, STL	83385	OBD
-34	211-0114-00		6		SCREW, MACHINE: 4-40 X 0.438 INCH, FLH STL	83385	OBD
-35	210-0586-00		6		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
					* - - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-36	351-0228-00		2		GUIDE, SLIDE: (ATTACHING PARTS)	80009	351-0228-00
-37	211-0086-00		2		SCREW, MACHINE: 4-40 X 0.75 100" DEG, FLH STL	83385	OBD
-38	210-0406-00		2		NUT, PLAIN, HEX.: 4-40 X 0.188 INCH, BRS	73743	2X12161-402
-39	211-0173-00		10		SCREW, MACHINE: 4-40 X 0.375, FLH, STL	83385	OBD
-40	210-0586-00		10		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-41	351-0228-00		2		GUIDE, SLIDE: (ATTACHING PARTS)	80009	351-0228-00
	211-0086-00		2		SCREW, MACHINE: 4-40 X 0.75 100" DEG, FLH STL	83385	OBD
	210-0406-00		2		NUT, PLAIN, HEX.: 4-40 X 0.188 INCH, BRS	73743	2X12161-402
-42	211-0173-00		10		SCREW, MACHINE: 4-40 X 0.375, FLH, STL	83385	OBD
-43	351-0228-00		2		GUIDE, SLIDE: (ATTACHING PARTS)	80009	351-0228-00
-44	211-0061-00		12		SCREW, MACHINE: 4-40 X 0.500 INCH, FIL STL	83385	OBD
-45	351-0228-00		2		GUIDE, SLIDE:	80009	351-0228-00
-46	210-0406-00		12		NUT, PLAIN, HEX.: 4-40 X 0.188 INCH, BRS	73743	2X12161-402
-47	426-0588-00		1		FRAME, SECTION, CAB: TOP RIGHT (ATTACHING PARTS)	80009	426-0588-00
-48	212-0506-00		2		SCREW, MACHINE: 10-32 X 0.375 INCH, FLH STL	83385	OBD
-49	426-0600-00		1		FRAME, SECT, CAB: TOP LEFT (ATTACHING PARTS)	80009	426-0600-00
-50	212-0506-00		2		SCREW, MACHINE: 10-32 X 0.375 INCH, FLH STL	83385	OBD
-51	426-0589-00		1		FRAME, SECT, CAB: BOTTOM RIGHT (ATTACHING PARTS)	80009	426-0589-00
-52	212-0574-00		4		SCREW, MACHINE: 10-32 X 0.438" 100 DEG FLH STL	83385	OBD
-53	426-0590-00		1		FRAME, SECT, CAB: BOTTOM LEFT (ATTACHING PARTS)	80009	426-0590-00
-54	212-0574-00		4		SCREW, MACHINE: 10-32 X 0.438" 100 DEG FLH STL	83385	OBD
	351-0086-00	B010100 B020269	1		SLIDE, DWR, EXT: 22.0 X 3.375, L & R	06666	D3230-22
	351-0086-01	B020270	1		SLIDE DWR EXT: W/CLOSED MTNG SLOTS		
-55	351-0027-00		1		SLIDE SECT, DWR: SCOPEMOBILE DWR, RIGHT (R287 ONLY)	98376	D3231-12TK LA-12
-56	200-0728-00		2		COV, HANDLE END: (287 ONLY)	80009	200-0728-00
-57	367-0073-02		1		HANDLE, CARRYING: STRAP TYPE (287 ONLY)	12136	OBD
-58	213-0155-00		4		SCREW, MACHINE: 10-32 X 0.40 INCH LONG, STL (287 ONLY)	77250	OBD
-59	386-1352-00		2		PLATE, HDL MTG: REAR (287 ONLY)	80009	386-1352-00
-60	124-0189-00		2		STRIP, TRIM: CORNER, BLACK VINYL CLAD (287 ONLY)	80009	124-0189-00
-61	348-0095-01		1		STAND, ELEC EQPT: CABINET (287 ONLY)	80009	348-0095-01
-62	348-0097-00		2		PAD, CUSHIONING: FOR FOOT (287 ONLY)	80009	348-0097-00
-63	348-0098-01		1		FOOT, CABINET: LEFT FRONT OR RIGHT REAR (287 ONLY)	80009	348-0098-01
-64	212-0509-00		1		SCREW, MACHINE: 10-32 X 0.625 INCH, PNH STL (ATTACHING PARTS)	83385	OBD
-65	214-0846-01		1		RTRN, FLIPSTAND: L OR R, AL PTD (287 ONLY)	80009	214-0846-01
-66	212-0557-00		1		SCREW, MACHINE: 10-32 X 0.50 INCH, RDH SST (ATTACHING PARTS)	83385	OBD

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-67	348-0096-01		1		FOOT, CABINET: LEFT REAR OR RIGHT FRONT (287 ONLY)	80009	348-0096-01
-68	212-0509-00		1		SCREW, MACHINE: 10-32 X 0.625 INCH, PNH STL (ATTACHING PARTS)	83385	OBD
-69	386-1139-01	B010100 B020178	1		CAB. TOP, SCOPE:	80009	386-1139-01
	390-0374-00	B020179	1		COVER, SCOPE: TOP	80009	390-0374-00
	214-0812-00		4		. FASTENER, PAWL:	80009	214-0812-00
-70	214-0603-01		1		. . . PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
	214-0604-00		1		. . . WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-71	386-0227-00		1		. . . STOP, CLP, RIM CL: ACETAL	80009	386-0227-00
-72	386-0226-00		1		. . . CLAMP, RIM CLENC: SPG STL CD PL	80009	386-0226-00
-73	386-1138-00	B010100 B020178	1		CAB. BOT, SCOPE:	80009	386-1138-00
	390-0375-00	B020179	1		COVER, SCOPE: BOTTOM	80009	390-0375-00
	214-0812-00		4		. FASTENER, PAWL:	80009	214-0812-00
-74	214-0603-01		1		. . . PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
	214-0604-00		1		. . . WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-75	386-0227-00		1		. . . STOP, CLP, RIM CL: ACETAL	80009	386-0227-00
-76	386-0226-00		1		. . . CLAMP, RIM CLENC: SPG STL CD PL	80009	386-0226-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-1	407-0718-00		1		BRACKET, CONN: CENTER (ATTACHING PARTS)	80009	407-0718-00
	212-0574-00		8		SCREW, MACHINE: 10-32 X 0.438" 100 DEG FLH STL	83385	OBD
	220-0410-00		8		NUT, EXTENDED WA: 10-32 X 0.375 INCH, STL	83385	OBD
	211-0510-00		3		SCREW, MACHINE: 6-32 X 0.375, PNH, STL, CD PL	83385	OBD
-2	131-0884-00		4		CONN, RCPT, ELEC: PWR, FEM, 125VAC, 15A (ATTACHING PARTS)	80009	131-0884-00
-3	213-0234-00		8		SCREW, MACHINE: 3-48 X 0.375, PNH, STL CD PL	83385	OBD
-4	361-0306-00		8		SPACER, SLEEVE: 0.184 L X 0.102 ID		
	210-0004-00		8		WASHER, LOCK: #4 INTL, 0.015THK, STL CD PL	78189	1204-00-00-0541C
-5	210-0442-00		8		NUT, PLAIN, HEX.: 3-48 X 0.187 INCH, CD PL BRS	73743	3014-402
-6	131-0892-03		4		CONN, RCPT, ELEC: 36 CONTACT, MALE, KEY NO 3 (ATTACHING PARTS)	29587	57-10360 (398)
-7	213-0234-00		8		SCREW, MACHINE: 3-48 X 0.375, PNH, STL CD PL	83385	OBD
-8	361-0306-00		8		SPACER, SLEEVE: 0.184 L X 0.102 ID		
	210-0004-00		8		WASHER, LOCK: #4 INTL, 0.015THK, STL CD PL	78189	1204-00-00-0541C
-9	210-0442-00		8		NUT, PLAIN, HEX.: 3-48 X 0.187 INCH, CD PL BRS	73743	3014-402
-10	131-0892-06		4		CONN, RCPT, ELEC: 36 CONT, MALE, KEY #6 (ATTACHING PARTS)		
	213-0234-00		8		SCREW, MACHINE: 3-48 X 0.375, PNH, STL CD PL	83385	OBD
	361-0306-00		8		SPACER, SLEEVE: 0.184 L X 0.102 ID		
	210-0004-00		8		WASHER, LOCK: #4 INTL, 0.015THK, STL CD PL	78189	1204-00-00-0541C
	210-0442-00		8		NUT, PLAIN, HEX.: 3-48 X 0.187 INCH, CD PL BRS	73743	3014-402
-11	343-0213-00		3		CLAMP, LOOP: PRESS MT, PLASTIC	80009	343-0213-00
-12	343-0089-00		2		CLAMP, LOOP: LARGE	80009	343-0089-00
-13	210-0201-00		1		TERMINAL, LUG: SE #4 (ATTACHING PARTS)	86928	A373-157-2
-14	213-0044-00		1		SCR, TPG, THD FOR: 5-32 X 0.188 INCH, PNH STL	83385	OBD
-15	131-0849-00		4		CONN, RCPT, ELEC: CKT BD, 36/72 CONT (ATTACHING PARTS)	05574	000201-5430
-16	211-0014-00		8		SCREW, MACHINE: 4-40 X 0.50 INCH, PNH STL	83385	OBD
-17	210-0586-00		8		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-18	214-0702-00		8		KEY, CONN PLZN: CKT BD CONN, TSHAPED	80009	214-0702-00
-19	351-0222-00		4		GUIDE, CKT BD: DELRIN, 1.719 L (ATTACHING PARTS)	80009	351-0222-00
-20	211-0012-00		8		SCREW, MACHINE: 4-40 X 0.375, PNH STL CD PL	83385	OBD
-21	210-0586-00		8		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-22	407-0717-00		1		BRACKET, CMPNT: CKT BD & CONN, ALUM (ATTACHING PARTS)	80009	407-0717-00
-23	212-0023-00		4		SCREW, MACHINE: 8-32 X 0.375 INCH, PNH STL	83385	OBD
-24	210-0458-00		4		NUT, PL, ASSEM WA: 8-32 X 0.344 INCH, STL	78189	511-081800-00
-25	670-1171-00		1		CKT BOARD ASSY: CHOPPER LOGIC	80009	670-1171-00
-26	105-0160-00		2		EJECTOR, CKT BD: WHITE PLASTIC	80009	105-0160-00
-27	214-1337-00		2		PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
-28	136-0220-00	B010100 B020269X	32		SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034
-29	670-1173-00		1		CKT BOARD ASSY: VERTICAL SCALE & FET CKT	80009	670-1173-00
	105-0160-00		2		EJECTOR, CKT BD: WHITE PLASTIC	80009	105-0160-00
	214-1337-00		2		PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
-30	136-0220-00	B010100 B020269X	5		SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034
-31	670-1170-00	B010100 B020264	1		CKT BOARD ASSY: LOGIC	80009	670-1170-00
	670-1170-01	B020265	1		CKT BOARD ASSY: LOGIC	80009	670-1170-01
	105-0160-00		2		EJECTOR, CKT BD: WHITE PLASTIC	80009	105-0160-00
	214-1337-00		2		PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
-32	136-0220-00	B010100 B020264X	30		SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034
-33	670-1172-00		1		CKT BOARD ASSY: STROBE & PREAMP	80009	670-1172-00
	105-0160-00		2		EJECTOR, CKT BD: WHITE PLASTIC	80009	105-0160-00
	214-1337-00		2		PIN, SPRING: 0.10 OD X 0.25 INCH L, STL	80009	214-1337-00
-34	136-0220-00	B010100 B020269X	20		SKT, PL-IN ELEK: TRANSISTOR 3 CONTACT, PCB MT	71785	133-23-11-034
-35	131-0235-00		1		TERMINAL, STUD: 0.213 DIA X 0.455 INCH L	88245	420977-9
	358-0136-00		1		INSULATOR, BSHG:	88245	420971

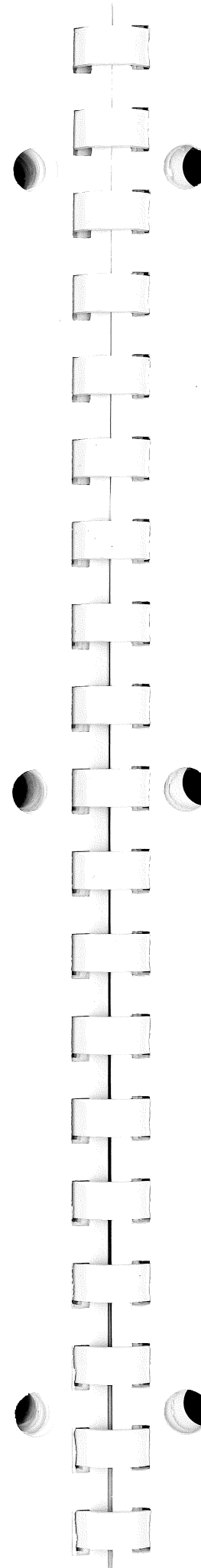


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-36	136-0181-00		1		SKT, P-I, ELEK: TRANSISTOR, 3 CONTACT (ATTACHING PARTS)		
-37	354-0234-00		1		RTNR, XSTR SKT: CHASSIS MT, ACETAL	80009	354-0234-00
-38	214-0539-00		1		RTNR, ELEC RELAY:	02288	30040-2
-39	136-0215-00		1		SKT, PL-IN ELEK: RELAY, 4 POLE, CHASSIS MOUNT (ATTACHING PARTS)	77342	27E126
	210-0586-00		1		NUT, PL, ASSEM WA: 4-40 X 0.25, STL CD PL	83385	211-041800-00
-40	211-0008-00		1		SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-41	343-0007-00		2		CLAMP, LOOP: (ATTACHING PARTS)	95987	5-8-6B
-42	211-0510-00		2		SCREW, MACHINE: 6-32 X 0.375, PNH, STL, CD PL	83385	OBD
-43	210-0863-00		2		WSHR, LOOP CLAMP: FOR 0.50" WIDE CLAMP, STL	95987	C191
	210-0457-00		2		NUT, PL, ASSEM WA: 6-32 X 0.312 INCH, STL	83385	OBD
-44	388-1565-00		4		CIRCUIT BOARD: FRONT LOGIC CONNECTOR		
-45	388-1541-00		4		CIRCUIT BOARD: FRONT SIGNAL CONNECTOR		
-46	200-0237-01	B010100 B020199	1		COVER, FUSE HLDR: BLACK PLASTIC	80009	200-0237-01
	200-0237-03	B020200	1		COVER, FUSE HLDR:	80009	200-0237-03
-47	386-1245-00		2		PL, RTNG, ELEC CO: (2) 36 RIBBON CONTACT (ATTACHING PARTS)	80009	386-1245-00
-48	211-0504-00		6		SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-49	386-1690-00		1		PLATE, CONN MTNG: ALUM (ATTACHING PARTS)	80009	386-1690-00
-50	211-0504-00		4		SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-51	131-0294-04		1		CONNECTOR, RCPT, : FEMALE, 36 CONTACT, 4 KEY (ATTACHING PARTS)	02660	57-41360-04
	211-0062-00		2		SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
	210-0001-00		2		WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
-52	210-0405-00		2		NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-53	131-0324-00		4		CONNECTOR, RCPT, : 24 PIN, FEMALE (ATTACHING PARTS)	71785	222-42-24-060
	211-0062-00		8		SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
	210-0001-00		8		WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
	210-0405-00		8		NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-54	131-0294-03		1		CONNECTOR, RCPT, : 36 CONT, FEMALE (ATTACHING PARTS)	13511	57-41360-03
	211-0062-00		2		SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
	210-0001-00		2		WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
	210-0405-00		2		NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-55	131-0294-05		1		CONNECTOR, RCPT, : FEMALE, 36 CONTACT, 5 KEY (ATTACHING PARTS)	02660	57-41360-05
	211-0062-00		2		SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
	210-0001-00		2		WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
	210-0405-00		2		NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-56	131-0294-06		1		CONNECTOR, RCPT, : 36 PIN, FEMALE (ATTACHING PARTS)	02660	57-41360-06
	211-0062-00		2		SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
	210-0001-00		2		WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
	210-0405-00		2		NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
-57	210-0273-00		2		TERMINAL, LUG: 0.781 INCH LONG (ATTACHING PARTS)	79963	547
-58	212-0008-00		2		SCREW, MACHINE: 8-32 X 0.500 INCH, PNH STL	83385	OBD
	210-0008-00		2		WASHER, LOCK: INTL, 0.172 ID X 0.331" OD, STL	78189	1208-00-00-0541C
-59	210-0458-00		4		NUT, PL, ASSEM WA: 8-32 X 0.344 INCH, STL	78189	511-081800-00
-60	352-0076-00		1		FUSEHOLDER: W/HARDWARE (ATTACHING PARTS)	75915	342012-L
-61	210-0873-00		1		WASHER, NONMETAL: 0.5 ID X 0.688 INCH OD, NPRN	70485	OBD

Replaceable Mechanical Parts—Type 288

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont									
5-94	179-1512-00			1						WIRING, HARNESS: AC	80009	179-1512-00
-95	179-1513-00			1						WIRING, HARNESS: BULKHEAD	80009	179-1513-00
-96	179-1514-00			1						WIRING, HARNESS: COAX	80009	179-1514-00
-97	179-1515-00	B010100	B010101X	1						WIRING, HARNESS: INTERCON	80009	179-1515-00
-98	179-1516-00	B010100	B010101X	1						WIRING, HARNESS: REAR PANEL	80009	179-1516-00
	179-1545-00	XB010102		1						WIRING, HARNESS: REAR PANEL	80009	179-1545-00
-99	179-1518-00			1						WIRING, HARNESS: DELAY LINK	80009	179-1518-00
-100	388-1566-00			4						CIRCUIT BOARD: FRONT LOGIC CONNECTOR	80009	388-1566-00
-101	388-1542-00			4						CIRCUIT BOARD: BACK SIGNAL CONNECTOR	80009	388-1542-00
STANDARD ACCESSORIES												
	334-1528-00			1						MKR SET, IDENT: INTERCONNECTING CABLE	80009	334-1528-00
	351-0086-00			1						SLIDE, DWR, EXT: 22.0 X 3.375, L & R	06666	D3230-22

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.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107 108	PG 501 - Risetime less than 3.5 ns into 50 Ω. PG 501 - 5 V output pulse; 3.5 ns Risetime	107 - Risetime less than 3.0 ns into 50 Ω. 108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107 108 111	PG 502 - 5 V output PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	108 - 10 V output 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114 115 2101	Performance of replacement equipment is the same or better than equipment being replaced.	
PG 506 replaces 106 067-0502-01	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V. PG 506 - Does not have chopped feature.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V. 0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B 191 067-0532-01	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01 067-0650-00	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A 181 184 2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously. 181 - Multiple time-marks 184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs. 2901 - Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.

REV B, JUN 1978



MANUAL CHANGE INFORMATION

PRODUCT GENERAL

CHANGE REFERENCE S23,351

DATE 6-10-76 REV.

CHANGE:

DESCRIPTION

This applies to all instruments with detachable cord.

WARNING

To avoid electrical shock or equipment damage, be sure to replace the cord set only with another of the same polarity.

Power Cord Conductor Identification

Conductor	Color	Alternate Color
Ungrounded (Line)	Brown	Black
Grounded (Neutral)	Blue	White
Grounding (Earthing)	Green-Yellow	Green-Yellow

DESCRIPTION

ILLUSTRATION CORRECTION

Page 8-6, Fig. 8-6

REPLACE: Fig. 8-6 with the illustration shown below:

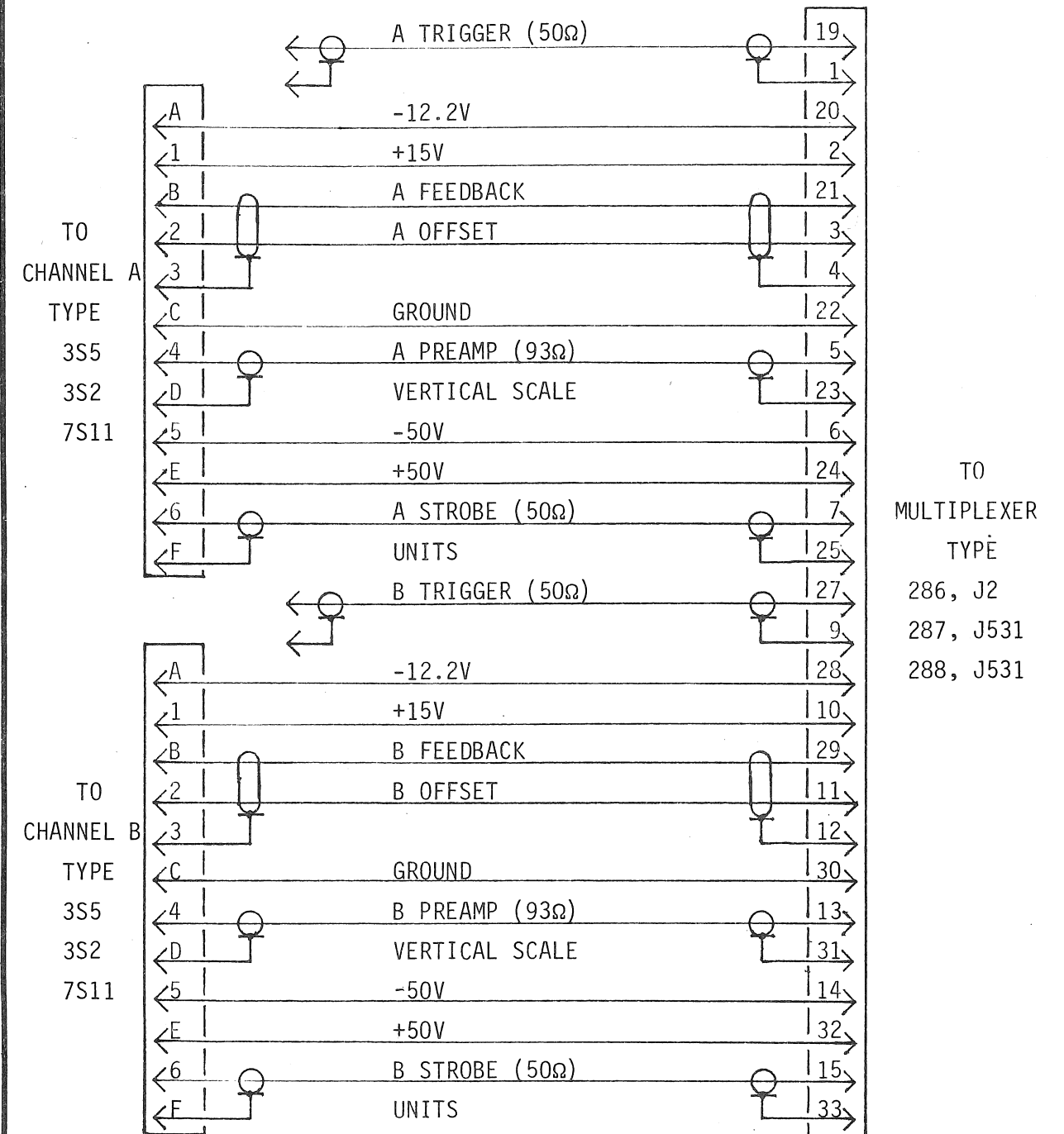


Fig. 8-6. Diagram of cable (Tektronix Part No. 012-0178-00) for connecting Type 3S2, 3S5, or 7S11 to multiplexer.