



# product modification

Scan by Zenith

040-0245-00  
M5853, M5812  
M3593, M3678

Type See Below

## BLANK PLUG-IN

For the following TEKTRONIX® Type Oscilloscopes:

Types - 129, 506, 560, 561, 561A, 561B, 561S,  
564, 564B, 565, 567, 568 and their production-  
modified and rack-mounted versions ----- All Serial Numbers

Modification Kit, PN 040-0245-00, provides the necessary skeleton parts and information to construct a special plug-in unit for the above instruments.

With the information provided, it is possible to construct a plug-in unit for use in either a specific 560 Series Oscilloscope or in several (or all) of these instruments. The special plug-in may be made to operate in conjunction with a standard TEKTRONIX Type Plug-in Unit (except sampling) or with a second special plug-in.

PARTS INCLUDED IN MODIFICATION KIT:

Quantity	Part Number	Description
1 ea	131-0149-00	Connector, chassis mtg, 24-contact, male
5 ea	210-0004-00	Lockwasher, int #4
5 ea	210-0406-00	Nut, hex, 4-40 x 3/16
2 ea	211-0008-00	Screw, 4-40 x 1/4 PHS, Phillips
1 ea	211-0012-00	Screw, 4-40 x 3/8 PHS, Phillips
3 ea	211-0507-00	Screw, 6-32 x 5/16 PHS, Phillips
3 ea	211-0538-00	Screw, 6-32 x 5/16 FHS, Phil-slot 100°
4 ea	212-0008-00	Screw, 8-32 x 1/2 PHS, Posidriv
4 ea	212-0043-00	Screw, 8-32 x 1/2 FHS, Phil-slot 100°
1 ea	214-0052-00	Fastener
1 ea	333-0656-00	Panel, front, blank
1 ea	351-0037-00	Guide, plug-in, nylon
1 ea	366-0109-00	Knob, plug-in, securing, aluminum, 9/16
4 ea	384-0615-00	Rod, frame spacing, chrome, 12-1/4
1 ea	387-0408-00	Sub-panel, blank
1 ea	387-0647-00	Plate, rear, 3-31/32 x 5-31/32
1 ea	441-0375-00	Chassis, blank

GENERAL INFORMATION

The text and fold-out chart are intended as a guide only, listing the voltages, waveforms and currents supplied by each instrument at the plug-in connectors, as well as the voltages and waveforms which the plug-in should supply. Some of the figures are approximate. It is recommended that all information pertaining to a given instrument be examined before a designed plug-in is used in that instrument.

Each of the instruments listed has two plug-in receptacles, the left-hand receptacle wired for the Vertical plug-in and the right-hand receptacle for the Horizontal (except Type 565). For most of the plug-in connector pins, the available or required voltage is the same on both right and left-hand connectors. However, where connectors differ, the pin number listed in these instructions is followed by an L 'H' (horizontal) or 'V' (vertical).

The Type 565 dual-beam instruments have two identical plug-in receptacles, one for each Vertical. The horizontal deflection systems are built-in. For these instruments, the information given for the left-hand receptacle applies also to the right-hand receptacle.

For the Types 561B, 564B and 568, disregard references to power supply shunts. These instruments will supply from zero to maximum current without shunts.

## Indicates change since last publication.

## GENERAL INFORMATION (cont)

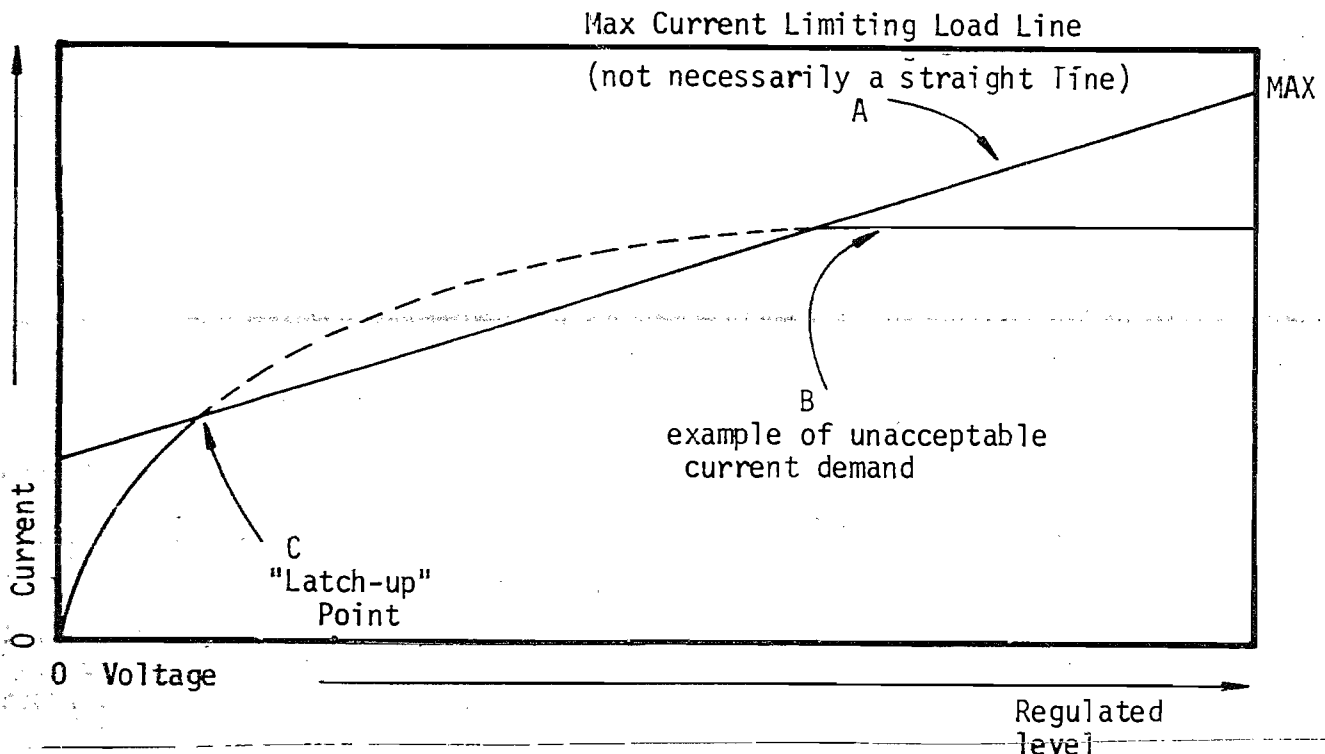
Refer to the 561A power supply considerations for the Type 129 power supply and the Types 506 and 561S oscilloscopes.

Information provided here is sufficient to construct plug-ins for operating the Type 567 and 568 as conventional oscilloscopes only. Extra circuitry is required to use the digital readout facility.

The limit of how much power can be dissipated in one plug-in unit is based primarily upon the ambient temperature and amount of ventilation supplied. Vacuum tubes should not be operated with envelope temperatures above 150°C when the ambient temperature is at 15°C, or above 175°C when the ambient temperature is at 50°C.

Based upon the preceding information, the designed plug-in should not dissipate more than 40 watts DC, or 52 watts AC and DC, regardless of the amount of power a given instrument could supply.

The power supplies in the Types 561B and 564B are protected by current-limiting. Furthermore, they are designed so that during turn-on the current delivered increases as the voltage increases (see graph, line A). If the designed plug-in happens to provide a constant current load to the power supply (see graph, line B), it may "latch up" the power supply (see graph, point C) during instrument turn-on by demanding more current than the supply can deliver at a particular voltage. This condition can be overcome by interrupting or delaying the plug-in load until the power supplies can come up to voltage.



## EXPLANATION OF CHART:

'X' indicates line pertains to instrument. Blank space indicates line does not pertain to instrument.

'NC' indicates No Connection at this pin.

'NA' indicates Not Applicable.

Rack-mounted versions are the same as those listed except where otherwise noted.

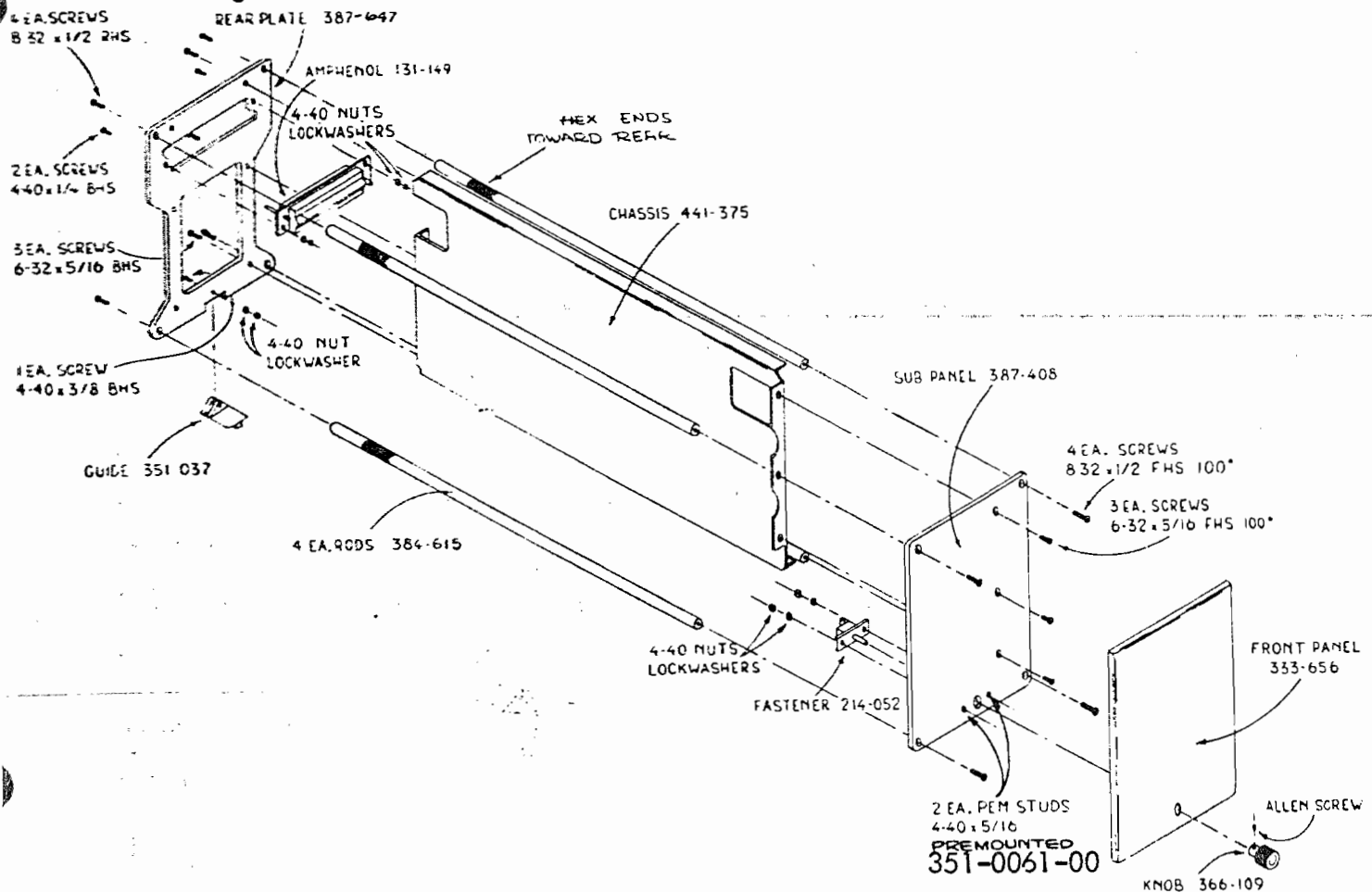
'V' indicates that information is for Vertical Plug-in Connector.

'H' indicates that information is for Horizontal Plug-in Connector.

## ASSEMBLY INSTRUCTIONS

- ( ) 1. Assemble the plug-in unit as shown in the drawing, except for the front panel.
- ( ) 2. Check to see that the plug-in is square, then tighten securely the screws which fasten the four rods to the rear plate and front sub-panel.
- ( ) 3. Install the front panel. If possible, use mounting nuts on switches, potentiometers, etc., to fasten the front panel.

**IMPORTANT:** The nylon guide (PN 351-0037-00) shown in drawing may be mounted in two ways. If plug-in requirements exceed capabilities of Type 560 Oscilloscope, mount guide so it extends from rear of plug-in, preventing use in that instrument. Otherwise, mount as indicated in drawing.



## EXPLANATION

## PIN NO.

**1-2 FILAMENT POWER**  
 There is a separate floating 6.3V AC transformer winding for each plug-in. One side may be grounded if necessary. The winding should not be elevated above 600V DC.

NOTE: If a considerable amount of current (max current/plug-in shown on chart) is to be drawn from 6.3V AC Supply, be sure to read paragraph on temperature-power limitations.

ON ALL INSTRUMENTS EXCEPT TYPE 565, PINS 3 AND 4 ARE CROSS-CONNECTED (3H to 4V, and 4H to 3V).

- 3V ALTERNATE-TRACE SYNC PULSE**  
 When a Tektronix Time-Base Generator is used in the adjacent plug-in receptacle (or the instrument is a Type 565), a 10 to 15 volt positive pulse, with an approximate risetime of 0.7 to 1.0 $\mu$ s is available at this pin. This pulse occurs at the end of the sweep.
- 4V ALTERNATE-TRACE SYNC PULSE RETURN (shield braid)**
- 4H ALTERNATE-TRACE SYNC PULSE (EXCEPT TYPE 565)**  
 If the designed plug-in unit is to be used in conjunction with a standard Tektronix multi-trace plug-in unit, a 10 volt positive pulse (risetime of about 0.7 $\mu$ s) applied to this pin serves as a switching pulse for the alternate mode. This pulse should occur at the end of the sweep.
- 3H ALTERNATE-TRACE SYNC PULSE RETURN (sheld braid) (except Type 565)**
- 5 -12.2V DC GROUND RETURN**  
 To properly route high ground currents, the ground side of the -12.2V supply should be returned to this pin.
- 6 SHUNT TERMINAL, +300V**  
 If more than 25 mA is needed from the 300V Supply, a shunt resistor should be added between pins 6 and 10. Maximum shunt of 2k is obtained when pins 6 and 10 are shorted together.  
 Use the graph on page 9 for selecting the shunt resistor.  
 The Type 560 differs from the other types in that shunts can not be used to extend the current range of the power supply. Types 561B, 564B, and 568 do not require a shunt for full current capability.
- 7-8 NO CONNECTIONS**  
 For the instruments listed on following page, 117V AC at line frequency is available at pins 7 and 8 with the power switch on. USE OF 117V AC IS NOT RECOMMENDED; the 6.3V AC at pins 1 and 2 should be used instead (with an appropriate power transformer).  
 If 117V AC facility is used, the following limitations must be observed:  
 No power line isolation is provided.  
 Instrument line fuse must be increased in value by the amount of the increased load. The original fuse should be replaced when special plug-in is removed.

## EXPLANATION

## 7-8 NO CONNECTIONS (cont)

Instrument operated on a 230V line limited to 120 mA at 117V maximum unbalanced current (total for both plug-ins). If instrument has a fan, max load may be increased to 240 mA, provided that 117V source is connected to opposite half of primary from the fan connection. If more current is required a shunt resistor may be placed across the unloaded half of the primary. In no case should the transformer primary unbalance be greater than 120 mA (including fan current) with special plug-in installed or removed. Operation with excessive unbalance may damage the power transformer and reduce power supply regulation capability.

Type	Serial Number	Normal Line fuse for 117V	Max Current Each Plug-in for 117V	Line Fuse Absolute Max value
560	all	2.0A	4.0A	10.0A
561A, RM561A (fan)	101-19539	3.0A	4.0A	10.0A
564, RM564 (fan)	101-11047	3.0A	4.0A	10.0A
565 (fan), RM565 (fan)	101-2856	6.25A	2.0A	10.0A
567 (fan), RM567 (fan)	101-3049	4.0A	3.0A	10.0A
568 (fan), RM568 (fan)	B010100-B069999			10.0A

## 9 GROUND

This is the ground return for all the power supplies (except the -12.2V supply-see pin 5) and signals.

10 +300V DC SUPPLY (560 ONLY)  
0 to 25 mA is available per plug-in.

## +300V DC SUPPLY (561B, 564B 568)

0 to 75 mA available per plug-in.

## +300V DC SUPPLY (ALL OTHER TYPES)

0 to 30 mA is available per plug-in without a shunt. 30 to 75 mA is available with a suitable shunt connected between pins 6 and 10 (see 6).

## EXPLANATION (cont)

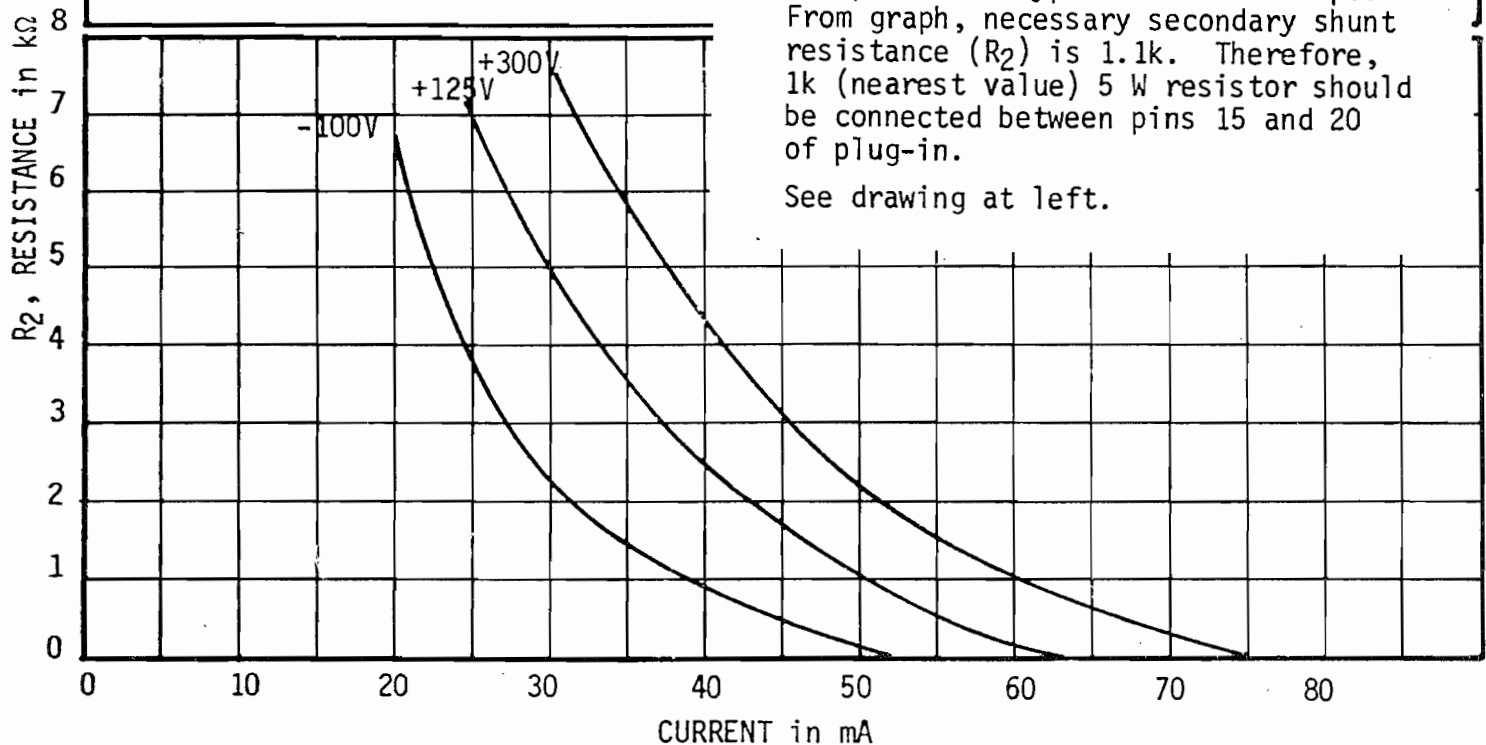
GRAPH FOR DETERMINING SIZE OF  
SECONDARY SHUNT RESISTORS

Do NOT use for Types 560, 561B,  
564B or 568 Oscilloscopes

Select nearest value of 5 W resistor

EXAMPLE: 50mA at +125V DC is required  
for plug-in to be used in right-hand  
receptacle of Type 561 Oscilloscope.  
From graph, necessary secondary shunt  
resistance ( $R_2$ ) is 1.1k. Therefore,  
1k (nearest value) 5 W resistor should  
be connected between pins 15 and 20  
of plug-in.

See drawing at left.



## PIN NO.

ON ALL INSTRUMENTS, PINS 11 AND 12 ARE CROSS-C CONNECTED, V TO H  
(11H to 12V, and 12H to 11V).

## 11V, 12V INTERNAL TRIGGER SIGNAL, OUTGOING

For internally triggering a standard Tektronix Time-Base plug-in in the  
H plug-in receptacle (or for a Type 565), a signal proportional to the  
vertical deflection of the CRT should be applied at this pin.

The signal at pin 11V (with respect to 12V) should be about 3.75V per  
displayed division. The DC level should be 0V when the trace is at  
graticule center.

12V is Shield Braid.

## EXPLANATION (cont)

## PIN NO.

## 11H,12H INTERNAL TRIGGER SIGNAL, INCOMING

When a standard Tektronix Vertical plug-in is used in the V plug-in receptacle, a signal amplitude, as described in 11V, is available at pin 12H, with respect to 11H. (Shield Braid)

## 13H,14H CRT BLANKING

Type	Serial Number
560	A11
561	A11
RM561	101 to 429

The CRT utilizes deflection blanking. For the above instruments access is provided to both of the blanking deflection plates. For normal, unblanked operation both 13H and 14H should be at the same potential, nominally +125V. For blanking, the potential difference between pins 13H and 14H should be 75V. For compatibility with all instruments pin 13H should be either +50V or +200V for blanking. (in all other 560-series instruments access is provided to only one blanking deflection plate; the other is tied to the +125V supply.)

## 13H CRT BLANKING

The CRT utilizes deflection blanking. For normal, unblanked operation pin 13H should be at +125V (power supply). For blanking, pin 13H should be at either +200V or +50V.

## 14H CRT INTENSIFY

For normal operation pin 14H should be at -12V (power supply). For intensifying a portion of the trace, pin 14H should be at 0V (ground). (Trace intensification is used by Tektronix 3B1, 3B3 and 3B5 Delaying Sweep Generators for locating the delayed sweep.)

15 +125V DC SUPPLY (560 ONLY)  
0 to 25 mA is available per plug-in.

## +125V DC SUPPLY (561B, 564B, 568)

0 to 75 mA available per plug-in.

## +125V DC SUPPLY (ALL OTHER TYPES)

0 to 25 mA is available per plug-in without a shunt. 25 to 75 mA is available with a suitable shunt connected between pins 15 and 10 (see 20).

16 -12V DC SUPPLY (560 ONLY)  
0 to 350 mA is available per plug-in.

## -12.2V DC SUPPLY (ALL OTHER TYPES)

750 mA is available per plug-in. A minimum load of 150 mA per plug-in is recommended, if the supply is used at all. (Except Types 565, 561B, 564B and 568.)

## 17,21 CRT DEFLECTION PLATES

## 17V LOWER VERTICAL DEFLECTION PLATE

## 21V UPPER VERTICAL DEFLECTION PLATE



## EXPLANATION (cont)

17H LEFT HORIZONTAL DEFLECTION PLATE

21H RIGHT HORIZONTAL DEFLECTION PLATE

Average DC level (with respect to ground): 180V  $\pm$ 10%  
(trace centered, horizontally or vertically)

Capacitance: 16pF

Deflection Factor:

(Deflection factors in V/cm refer to the potential difference between pins 17 and 21. It is recommended that the deflection plates be driven with a push-pull signal in order to maintain the average DC level at 180V.)

## CRT DEFLECTION PLATE SENSITIVITIES IN V/CM

Tube Type	Instrument Type	Vertical (17V, 21V)	Horizontal (17H, 21H)
T5030	560, 561	21.9 - 24.5	17.8 - 19.6
T5031	561S	21.7 $\pm$ 23.9	17.5 $\pm$ 19.3
T5032	561A, 567, 568	18.5 - 20.5	17.5 - 19.25
T5033	506	11.1 - 12.3	19.4 - 21.4
T5610	561A	18.55 - 20.3	17.5 - 19.25
T5611	561B, 567, 568	18.5 - 20.5	17.5 - 19.5
T5640	564	18.5 - 20.5	17.5 - 19.25
T5641	564B	18.5 - 20.5	17.5 - 19.5
T5650	565	17.6 - 19.4	Not Applicable

18-19 INTERCONNECTING PINS (EXCEPT 560, 561's below SN 580 NOT MODIFIED, AND 565).

These pins are used in the sampling, spectrum analyzer, and four-trace plug-in units. A coaxial cable is used; The center conductor connects 18H to 18V; The shield connects 19H to 19V.

20 SHUNT TERMINAL, + 125V

If more than 25 mA is required from the +125V supply, then a shunt resistor should be added between pins 15 and 20.

25 mA to 65 mA, use graph on page 9.

65 mA to 75 mA, use a wire strap.

Type 560 differs from the other types in that shunts can't be used to extend the current range of the power supply. Types 561B, 564B, and 568 do not require a shunt for full current capability.

21 DEFLECTION PLATES

See 17 for characteristics.

## EXPLANATION (cont)

## PIN NO.

- 22 SHUNT TERMINAL, -100V  
 If more than 20 mA is needed from the -100V supply, a shunt resistor should be added between pin 22 and ground. A maximum shunt of 2k is obtained when pin 22 is shorted to ground.  
 Use the graph on page 8 for selecting the shunt resistor.  
 The Type 560 differs from the other types in that shunts can not be used to extend the current range of the power supply. Types 561B, 564B, and 568 do not require a shunt for full current capability.
- 22H PROVIDES +125V THROUGH A 4.5k RESISTOR (6k in early instruments) (561B, 564B AND 568 ONLY) for use with Type 3B5.
- 23 -100V DC SUPPLY (560 ONLY)  
 20 to 50 mA is available per plug-in. A minimum load of 20 mA insures power supply regulation.  
 -100V DC SUPPLY (561B, 564B, 568)  
 0 to 65 mA is available per plug-in  
 -100V DC SUPPLY (ALL OTHER TYPES)  
 0 to 10 mA is available w/o a shunt, up to 65 mA.
- 24V CRT CATHODE (EXCEPT 560 where no connection is made to this pin)  
 Capacitively coupled to the CRT cathode for blanking or intensifying relatively short segments of the trace. If not used, connect to ground.
- AMPLITUDE REQUIREMENTS  
 A positive-going pulse will blank the trace; a negative-going pulse will intensify it. A slow or high-repetition-rate trace of normal viewing intensity (approximately 5 $\mu$ A beam current) will be completely blanked by a positive pulse of 10 to 15V; at maximum intensity, 45-60V may be required for complete blanking, although apparently complete blanking may be obtained with considerably lower amplitudes. A negative-going pulse for intensification should not exceed approximately 30V amplitude, or severe defocusing and deflection aberrations may result.

## EXPLANATION (cont)

## PIN NO.

## TIME-CONSTANT

Nominal coupling time-constants for various instruments are shown below. Because the dynamic impedance of the CRT cathode is part of the effective time-constant, the nominal values hold only near or below beam cutoff, and will be reduced to approximately half the indicated value at high intensity.

Instrument Type	SN Range	Nominal Time
561, RM561	A11	55 $\mu$ s
*561A	5001-12112	67.5 $\mu$ s
	12113- up	135 $\mu$ s
561B, R561B	A11	135 $\mu$ s
*RM561A	5001- 8739	67.5 $\mu$ s
	8740- up	135 $\mu$ s
*564	101- 2979	67.5 $\mu$ s
	2980- up	135 $\mu$ s
*RM564	A11	185 $\mu$ s
564B, R564B	A11	135 $\mu$ s
565, RM565	A11	22 $\mu$ s
567	101- 248	55 $\mu$ s
	249- up	67.5 $\mu$ s
RM567	102- up	67.5 $\mu$ s
568, R568	A11	135 $\mu$ s

\*Rear panel switch must be set for "Dual Trace" or "Chopped Blanking".

DF:ljs