

TEKTRONIX®

1405

**TV SIDEBAND
ADAPTER**

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Serial Number _____



WARRANTY

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

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

Specifications and price change privileges reserved.

Copyright © 1976 by Tektronix, Inc., Beaverton, Oregon. Printed in the United States of America. All rights reserved. Contents of this publication may not be reproduced in any form without permission of Tektronix, Inc.

U.S.A. and foreign Tektronix products covered by U.S. and foreign patents and/or patents pending.

TEKTRONIX is a registered trademark of Tektronix, Inc.

TABLE OF CONTENTS

SECTION 1. GENERAL INFORMATION	Page
1.1 DESCRIPTION	1-1
1.2 ELECTRICAL SPECIFICATIONS	1-1
1.3 ENVIRONMENTAL SPECIFICATIONS	1-3
1.4 STANDARD AND OPTIONAL ACCESSORIES	1-3
SECTION 2. OPERATION	
2.1 INTRODUCTION	2-1
2.2 PERFORMANCE CHECK	2-1
2.2.1 Equipment Required	2-1
2.2.2 Procedure	2-1
2.3 FRONT-PANEL CONTROLS AND CONNECTORS	2-3
2.4 REAR PANEL CONNECTORS	2-4
2.5 GENERAL OPERATING INFORMATION	2-5
2.5.1 Initial Connections	2-5
2.5.2 Initial Set-Up for TV Transmitter	2-5
2.6 APPLICATIONS	2-6
2.6.1 General Sideband Analysis	2-6
2.6.2 In-Service Sideband Analysis Using Low-Level Technique	2-7
2.6.3 In-Service Sideband Analysis Using the Vertical Interval	2-9
2.6.4 Swept Differential Gain Measurements on the Television Transmitter	2-10
2.6.5 Aural Modulation Monitor Calibration	2-11
SECTION 3. SERVICE INFORMATION	
3.1 INTRODUCTION	3-1
3.2 CIRCUIT DESCRIPTION	3-1
3.2.1 Local Oscillator	3-1
3.2.2 Mixer	3-1
3.2.3 CW Amplifier Chain	3-1
3.2.4 Variable Gain Amplifier	3-2
3.2.5 Diode CW Gate	3-2
3.2.6 Post-Gate Amplifier	3-2
3.2.7 Output CW Amplifier	3-2
3.2.8 Detector and AGC	3-3
3.2.9 Sync Rate Generator	3-3
3.2.10 External Blanking Input	3-4
3.2.11 Sync and Blanking Gates	3-4
3.2.12 Sine ² Low-Pass Filter	3-4
3.2.13 Sync and Blanking Amplifiers	3-5
3.2.14 APL Uncal	3-5
3.2.15 Amplitude Switch and 75 ohm Composite Video Output	3-5
3.2.16 Marker Oscillators	3-6
3.2.17 Marker Mixer and Amplifiers	3-7
3.2.18 Aural Amplifier	3-8
3.2.19 Power Supplies	3-9

SECTION 3. SERVICE INFORMATION (cont)

	Page
3.3 CALIBRATION	3-9
3.3.1 Introduction	3-9
3.3.2 History Information	3-9
3.3.3 Preliminary Notes	3-10
3.3.4 Equipment Required	3-10
3.3.5 Procedure	3-10
3.4 MAINTENANCE NOTES	3-15
3.4.1 Changing Marker Crystals	3-15
3.4.2 Changing Pilot Light	3-15
3.4.3 Changing Nominal Line Voltage	3-15

SECTION 4. OPTIONS

4.1 OPTION 1	4-1
4.1.1 Description	4-1
4.1.2 Specifications	4-1
4.1.3 Marker Crystal Installation	4-1
4.1.4 Operation	4-1

SECTION 5. ELECTRICAL PARTS LIST**SECTION 6. DIAGRAMS****SECTION 7. MECHANICAL PARTS LIST****CHANGE INFORMATION**

List of Illustrations

	Page
Figure 1-1. 1405 TV Sideband Adapter. (frontispiece)	1-0
Figure 2-1. 1405 Front and rear panel.	2-2
Figure 2-2. Basic interconnections for general operation.	2-4
Figure 2-3. Typical station layout showing test points.	2-5
Figure 2-4. Sideband analyzer response at baseband.	2-6
Figure 2-5. Transmitter response at 2 MHz/Div and 10 dB/Div.	2-7
Figure 2-6. Transmitter response at 2 dB/Div.	2-7
Figure 2-7. Insertion "T" for in-service low level testing.	2-8
Figure 2-8. In-service low level sideband response.	2-8
Figure 2-9. Low level sideband response using 3 kHz resolution bandwidth.	2-8
Figure 2-10. Low level sideband response at 2 dB/Div.	2-9
Figure 2-11. Sideband analyzer connections for VITS insertion.	2-9
Figure 2-12. Waveform monitor display of VITS interval including sideband envelope.	2-10
Figure 2-13. Sideband response using VITS insertion.	2-10
Figure 2-14. Transmitter variations with 10 and 90 IRE test sweeps.	2-10
Figure 2-15. Transmitter differential gain display for 20% amplitude 0 and 100 IRE test sweeps.	2-11
Figure 2-16. Bessel null technique of determining 100% modulation.	2-11
Figure 3-1. CW amplifier chain (simplified diagram).	3-1
Figure 3-2. Variable gain amplifier (simplified diagram).	3-2
Figure 3-3. Diode cw gate (simplified diagram).	3-2
Figure 3-4. Post-gate cw amplifier (simplified diagram).	3-2
Figure 3-5. Output cw amplifier (simplified diagram).	3-2
Figure 3-6. Detector and agc (simplified diagram).	3-3
Figure 3-7. External blanking input (simplified diagram).	3-4
Figure 3-8. Sync and blanking gates (simplified diagram).	3-5
Figure 3-9. Sine ² low-pass filter.	3-5
Figure 3-10. APL, sync and blanking amplifier (simplified diagram).	3-6
Figure 3-11. APL uncal circuitry (simplified diagram).	3-6
Figure 3-12. AMPLITUDE switch and 75 Ω composite video output (simplified diagram).	3-7
Figure 3-13. Typical marker oscillator (simplified diagram).	3-7
Figure 3-14. Marker amplifier and detector (partial diagram).	3-8
Figure 3-15. Aural amplifier (simplified diagram).	3-8
Figure 3-16. Power supply (simplified diagram).	3-9
Figure 3-17. Approximate current foldback characteristics.	3-9
Figure 3-18. Pulse generator adjustment for Step 6b.	3-11
Figure 3-19. Pulse generator setup for Step 6d.	3-11
Figure 3-20. R185 adjustment.	3-13
Figure 3-21. Test setup for Step 17.	3-14

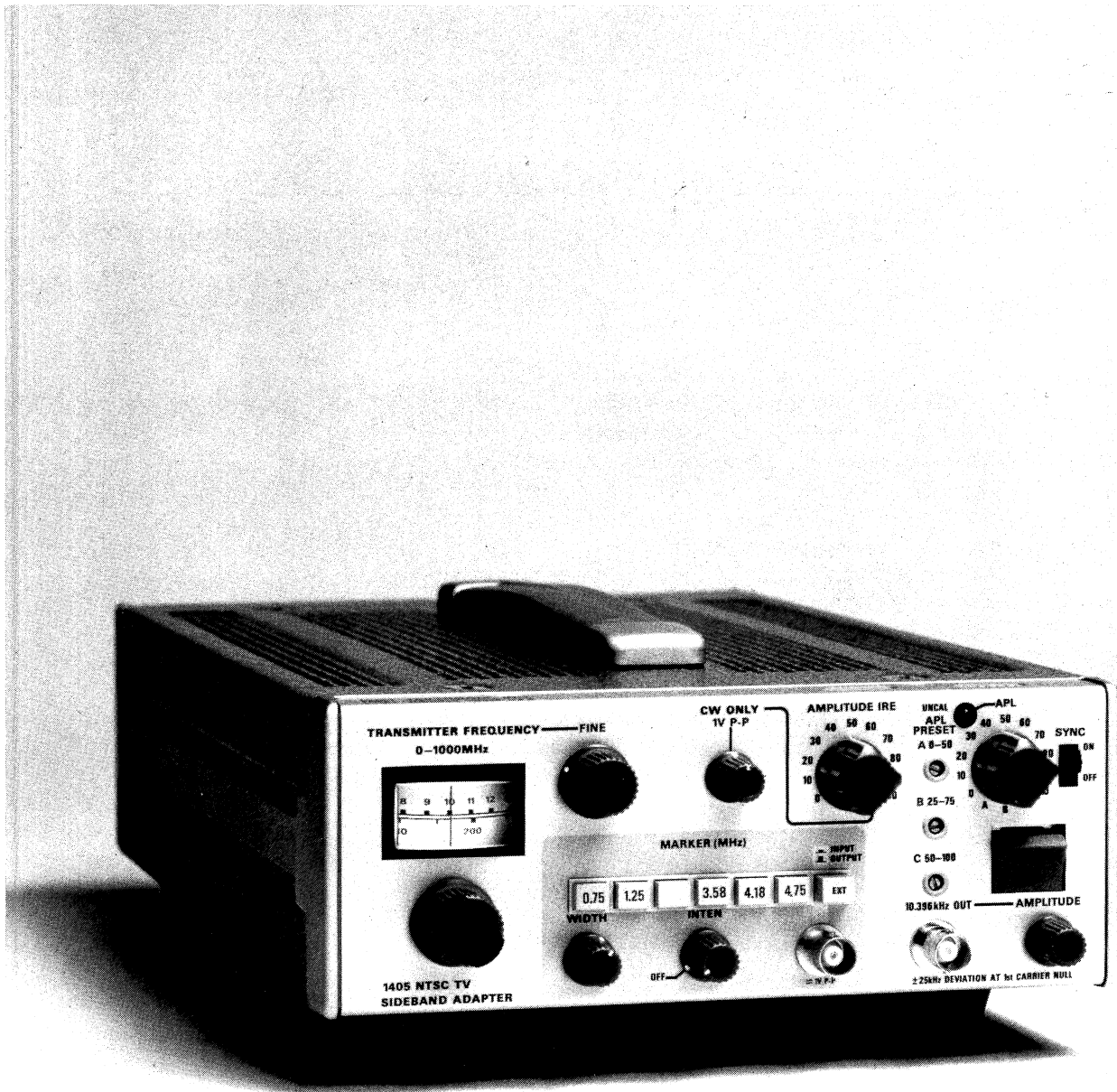


Fig. 1-1. 1405 TV Sideband Adapter.

1405 NTSC TELEVISION SIDEBAND ADAPTER

GENERAL INFORMATION

1.1 DESCRIPTION

The 1405 NTSC Television Sideband Adapter is an accessory instrument which is used with a spectrum analyzer, such as the 7L12 or 7L13, to analyze the video output of a television transmitter. The 1405 generates a composite video signal, the "picture" portion of which is a constant-amplitude sinusoidal signal that sweeps continuously and periodically between 0 and 15 MHz. This signal is applied as modulation to a television transmitter. The transmitter output is displayed on the spectrum analyzer, and appears as the transmitter's response curve. The 1405/spectrum analyzer combination will display the frequency response characteristics of RF and IF circuits for transmitters with carrier frequencies up to 1 GHz. Video circuits (zero frequency offset) can also be analyzed.

The swept portion of the 1405 output signal is produced by mixing the 1405 local oscillator with the 7L12 or 7L13 first local oscillator. The first local oscillator produces a sweeping signal whose frequency limit depends upon the input frequency (tuned to the transmitter frequency), and the FREQ SPAN/DIV setting of the spectrum analyzer. Sync and blanking signals are combined with the sweep to form the composite output signal. The internal sync signal can be switched off for sinusoidal sweep only, or when external blanking is used. External blanking allows either full-field or single-line operation, a feature useful for in-service testing.

The output amplitude of the cw portion of the composite video signal can be varied from 0 to 100 IRE in 10-IRE steps. The average picture level (APL) can also be varied from 0 to 100 in 10-IRE steps. Three adjustable, preset APLs are provided, and can be selected for rapid checks. If a combination of cw amplitude and APL exceeds tv transmitter modulation limits, internal logic will clamp the APL to 50 IRE and light an UNCAL indicator as a caution.

Five intensity marker frequencies related to tv transmission standards are provided; a sixth marker oscillator is available for a user-provided crystal. The intensity and width of the displayed markers are adjustable.

A television transmitter's aural fm deviation can be checked with the 1405, using the 10.396 kHz signal output. This signal, applied to a transmitter's aural input at the amplitude that produces the first carrier null, corresponds to ± 25 kHz of frequency deviation, or 100% modulation.

1.2 ELECTRICAL SPECIFICATIONS

The following electrical specifications apply to the 1405 and the 1405/7L12 or 7L13 combination. They are applicable over the environmental specification limits for the 1405 and 7000-Series mainframes.

Transmitter Frequency (Frequency Offset)

Range: Will tune and provide a swept video output for a 7L12 or 7L13 center frequency range of 0 to 1 GHz.

FREQUENCY Dial Accuracy: When properly tuned to transmitter frequency, dial reading is within 20 MHz.

Fine Tuning Range: From ± 0.5 MHz to ± 1.25 MHz, depending upon transmitter frequency setting.

Tuned Frequency Drift: Less than 1 MHz per hour after a 30-minute warmup.

Local Oscillator Input

Requires +5 dBm to +10 dBm for a constant output level. The frequency is 2095 MHz to 3095 MHz. (This level and frequency is provided by the 1st LO OUTPUT on the 7L12 above SN B160000 or with LO Output Mod, or the 7L13.)

Output Signal Level

Amplitude (sync off): 100 IRE equals 0.714 V P-P when terminated in 75 Ω .

Output Impedance: 75 Ω $\pm 1\%$ at 100 IRE and $\pm 2\%$ from 0 to 90 IRE.

General Information—1405

Output Signal Level (cont)

Step Variable: 0 to 100 IRE in 10-IRE steps.

Accuracy (at 200 kHz): ± 1 IRE at 100 IRE; ± 2 IRE from 10 IRE to 90 IRE.

Amplitude at 0 IRE setting (relative to 100 IRE): 0.1 MHz to 5 MHz, greater than 40 dB down; 5 MHz to 10 MHz, greater than 33 dB down; 10 MHz to 15 MHz, greater than 30 dB down.

CW Output Amplitude: No change in relative level between cw and line rate blanking. Single-line cw amplitude within 0.2 dB of the cw level.

CW Only: 0.6 V to 1.3 V P-P when terminated in 75 Ω . Reference line on variable at about 1 V P-P.

Output Level During Blanking: 0 V ± 0.01 V at 0 IRE; 0 V ± 0.04 V at 100 IRE from 0 to 1 MHz; 0 V ± 0.02 V at 100 IRE above 1 MHz.

CW Output Harmonics: 2nd harmonic content dependent upon spectrum analyzer 1st LO OUTPUT. 3rd harmonic content down 40 dB from 0.1 MHz to 5 MHz; down 35 dB from 5 MHz to 10 MHz.

Video Monitor

Same as Output Signal Level within 5%.

Flatness

1405: Within ± 0.1 dB from 100 kHz to 10 MHz; within ± 0.2 dB from 10 MHz to 15 MHz; and within ± 0.4 dB from 50 kHz to 20 MHz.

1405 plus 7L12 or 7L13: TRANSMITTER FREQUENCY greater than 20 MHz: Within ± 0.2 dB from 100 kHz to 10 MHz, increasing to ± 0.3 dB at 15 MHz. Within ± 0.5 dB from 50 kHz to 20 MHz.

TRANSMITTER FREQUENCY 0 to 20 MHz: Within ± 0.5 dB from 100 kHz to 15 MHz.

System Span

7L12, equal to or greater than 200 kHz per division.
7L13, equal to or greater than 100 kHz per division.

Video Frequency Range

15-0-15 MHz, with 1405 TRANSMITTER FREQUENCY controls properly set.

Average Picture Level (APL)

Variable: 0 to 100 IRE in 10-IRE steps.

Accuracy: ± 2 IRE.

Three preset levels: PRESET A, 0 to 50 IRE; PRESET B, 25 IRE to 75 IRE; PRESET C, 50 IRE to 100 IRE.

Horizontal Sync and Blanking Duration

Within NTSC limits (no vertical interval is provided). Transition time is 0.24 μ s $\pm 10\%$, from 10% to 90% points.

External Blanking Modes

- A. 0 V turns cw on, greater than -5 V turns cw off. DC coupled (e.g., composite blanking).
- B. TTL pulse from $> +2.5$ V to 0 V turns cw on (e.g., 1480 line strobe). Minimum pulse length, 50 μ s.

Markers and Z-Axis Output

Marker Frequencies, NTSC version: 0.75 MHz, 1.25 MHz, 3.58 MHz (color subcarrier), 4.18 MHz and 4.75 MHz.

Accuracy: $\pm 0.01\%$ of frequency selected (crystal controlled). Additional marker oscillator accepts user-supplied crystals.¹

External Marker Input: Accepts 0.2 MHz to 10 MHz, 1 V P-P nominal.

Internal Marker Output: Marker crystal frequencies, nominal output level 0.75 V P-P or greater.

¹Crystal Requirements: Maximum frequency 10 MHz, Series resonant, R_s less than 1000 Ω , Q greater than 5000, case, HC-6/U or HC-25/U.

Z-Axis Output Amplitude: Up to about +10 V and -3 V into 500 Ω . Minus voltage intensifies trace to provide markers (variable with INTEN control); dark zone identifies middle of marker. About +10 V (fixed) blanks trace during blanking interval.

Aural Output

Output Frequency: 10.396 kHz, $\pm 0.01\%$ (crystal controlled).

CW Output Amplitude: Variable up to at least +12 dBm into 600 Ω (about 10 V P-P). Harmonics down 45 dB or more.

1.3 ENVIRONMENTAL SPECIFICATIONS

Operating Temperature Range: 0°C to +50°C.
Non-operating Temperature Range: -40°C to +75°C.
Operating Altitude Range: to 15,000 feet.
Non-operating Altitude Range: to 50,000 feet.

1.4 STANDARD AND OPTIONAL ACCESSORIES

Refer to Section 7, Accessories page for accessories.

Consult General Catalog for other accessories, such as cables, attenuators, and adaptors, that are available.

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
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

OPERATION

2.1 INTRODUCTION

The Performance Check can be used: (1) to check the operating status of the 1405; (2) as an incoming inspection procedure; (3) to familiarize the user with the basic operation of the 1405.

The Controls and Connectors section gives a detailed description of the effect of each control and the use of each connector. It is also intended to aid in discovering alternate or additional ways to use the 1405.

Since the 1405 is designed to be used with a TEKTRONIX 7L12 or 7L13 Spectrum Analyzer Plug-In installed in a 7000-Series Oscilloscope mainframe, the General Operating Information and Applications sections assume their presence, and that the user is familiar with their operation.

2.2 PERFORMANCE CHECK

The following procedure can be used to perform an operational check or incoming inspection. It does not test the 1405 to specifications.

2.2.1 Equipment Required

7L12 or 7L13 Spectrum Analyzer in mainframe. Test oscilloscope (to check aural output amplitude and frequency only). Appropriate cables as indicated (1405 standard accessories).

2.2.2 Procedure

1. Connect the cable with SMA connectors between the spectrum analyzer 1st LO and the 1405 LO IN. Connect a cable with BNC connectors between the 1405 VIDEO OUT and the spectrum analyzer RF IN. Connect a second cable with BNC connectors between the 1405 Z-AXIS OUT and the spectrum analyzer mainframe EXT Z-AXIS IN. Turn instruments on and allow them to warm up.

2. Set the spectrum analyzer controls as follows:

FREQ	0
REFERENCE LEVEL	0 dB
LOG 10 dB/DIV	Pushed in
MODE	P-P AUTO
SOURCE	FREE RUN
TIME/DIV	2 ms/DIV
FREQ SPAN/DIV	5 MHz
RESOLUTION	300 kHz

3. Set up the 1405 controls as follows:

TRANSMITTER	
FREQUENCY	0
AMPLITUDE	100
APL	0
SYNC	OFF
MARKER INTEN	OFF

4. Adjust the spectrum analyzer controls as necessary to position the zero spike to the left edge of the display. Adjust the 1405 frequency controls as necessary to produce maximum upward deflection of the display, then switch the spectrum analyzer RESOLUTION control to 30 kHz and repeat the above adjustments. The flat portion of the display depicts the pass band of the 1405.

5. Turn all markers on (push in), set the MARKER INTEN and WIDTH controls to midrange, and set the spectrum analyzer SPAN/DIV control to 0.5 MHz. It may be necessary to readjust the frequency controls slightly. Intensified markers will be displayed; it may also be necessary to adjust the MARKER INTEN, WIDTH, and oscilloscope INTENSITY controls.

6. Turn the MARKER INTEN control to OFF, reset the FREQ SPAN/DIV control to 5 MHz and the RESOLUTION control to 300 kHz, set the TIME/DIV control to 0.2 ms/DIV, and the SOURCE control to INT. Set the SYNC control to ON; the display should be similar to that in step 4, with the addition of negative-going spikes (sync pulses).

7. Connect a cable from the 10.396 kHz OUT to the test oscilloscope vertical input. With the aural AMPLITUDE control set fully clockwise, the test oscilloscope should display a sine wave of about 10 V P-P amplitude and about 10.4 kHz frequency (with the TIME/DIV control at 0.1 ms/DIV, ten cycles in about 9.6 divisions).

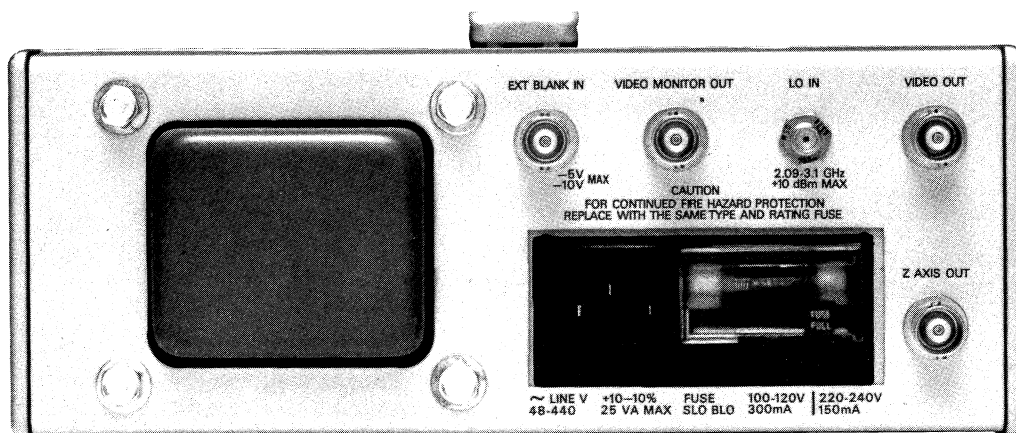
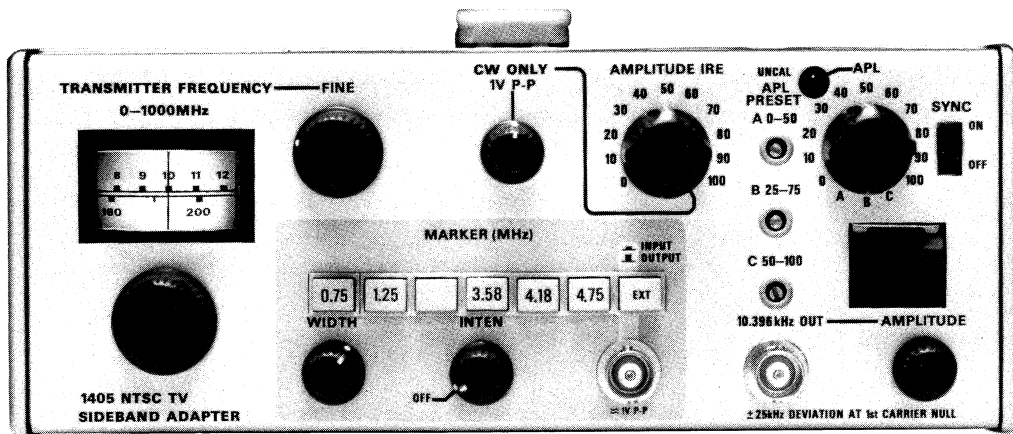


Fig. 2-1. 1405 front and rear panel.

2.3 FRONT-PANEL CONTROLS AND CONNECTORS

TRANSMITTER FREQUENCY

Positions a dial scale marked in 20 MHz increments (0 to 1000) and tv channels from 2 to 83, and tunes the 1405 local oscillator to offset the spectrum analyzer first local oscillator frequency. The correct setting occurs when the 1405 and spectrum analyzer are both tuned to the transmitter frequency. At this setting, the 1405 local oscillator frequency equals the 7L12 or 7L13 first local oscillator center frequency.

FINE (tuning)

Tunes the local oscillator over a range of 1 MHz or more.

AMPLITUDE

Sets the cw amplitude of the 1405 output signal, from 0 to 100 IRE units, in steps of 10 IRE, or to a VARIABLE position.

CW ONLY

Varies the cw between about 0.6 V and 1.3 V, when the AMPLITUDE is in the CW ONLY position. A front-panel index mark shows the nominal 1 V position. The sync and APL are disabled; SYNC ON or external blanking will gate the cw as in normal operation (although the sync will not be present).

APL

Sets the average picture level (APL) from 0 to 100 IRE in steps of 10 IRE.

APL PRESET A, B, C

Three adjustable ranges for setting APL to a preset level: A can be preset from 0 to 50 IRE; B can be preset from 25 to 75 IRE; C can be preset from 50 to 100 IRE.

APL UNCAL

Warns operator when combinations of amplitude and APL exceed transmitter modulation limits (limits are 120 IRE and -40 IRE). The pedestal latches at about 50 IRE when the indicator is lighted.

@

SYNC ON/OFF

Disables internal horizontal sync rate generator, allowing continuous cw signal when set to OFF. With sync OFF, cw and pedestal (APL) may be externally blanked or strobed on.

MARKERS

Selects frequency markers (which appear as intensified portions of the sweep) as follows: 0.75 MHz, 1.25 MHz, 3.58 (3.579545) MHz, 4.18 MHz, 4.75 MHz, user-supplied crystal frequency, external marker input or internal marker output (see below).

WIDTH: Controls width (in frequency) of marker pulses.

INTEN: Controls intensity of markers pulses. In the detent position, the marker oscillators and mixer are switched off.

INPUT/OUTPUT: When the pushbutton is pushed in, the BNC connector can be used for adding an external marker signal. External markers should be between 0.2 MHz and 10 MHz, at a nominal level of 1 V peak to peak.

When the pushbutton is in the out position (push to release), the internal marker oscillator signals are available at the BNC connector, at a nominal level of 0.75 V peak to peak.

10.396 kHz OUT

Signal output for carrier null method of fm deviation measurement.

10.396 kHz AMPLITUDE

Variable control for output amplitude.

POWER

Turns the ac power to the instrument on and off. Green button lights to indicate when power is applied.

Operation—1405

2.4 REAR PANEL CONNECTORS

LO IN (local oscillator input)

Three millimeter (SMA) input which must be connected to the 7L12 or 7L13 1st LO.

VIDEO OUT

The composite video output of the instrument. Source impedance is 75 Ω.

EXT BLANK IN

Input for external blanking signal.

Z AXIS OUT

Signal to 7000-Series Z-axis input.

VIDEO MONITOR

Composite video output for the oscilloscope 1 MΩ input.

Rear panel also includes the ac power connector and provisions for universal ac voltage selection. Consult the Electrical Parts List for correct fuse value.

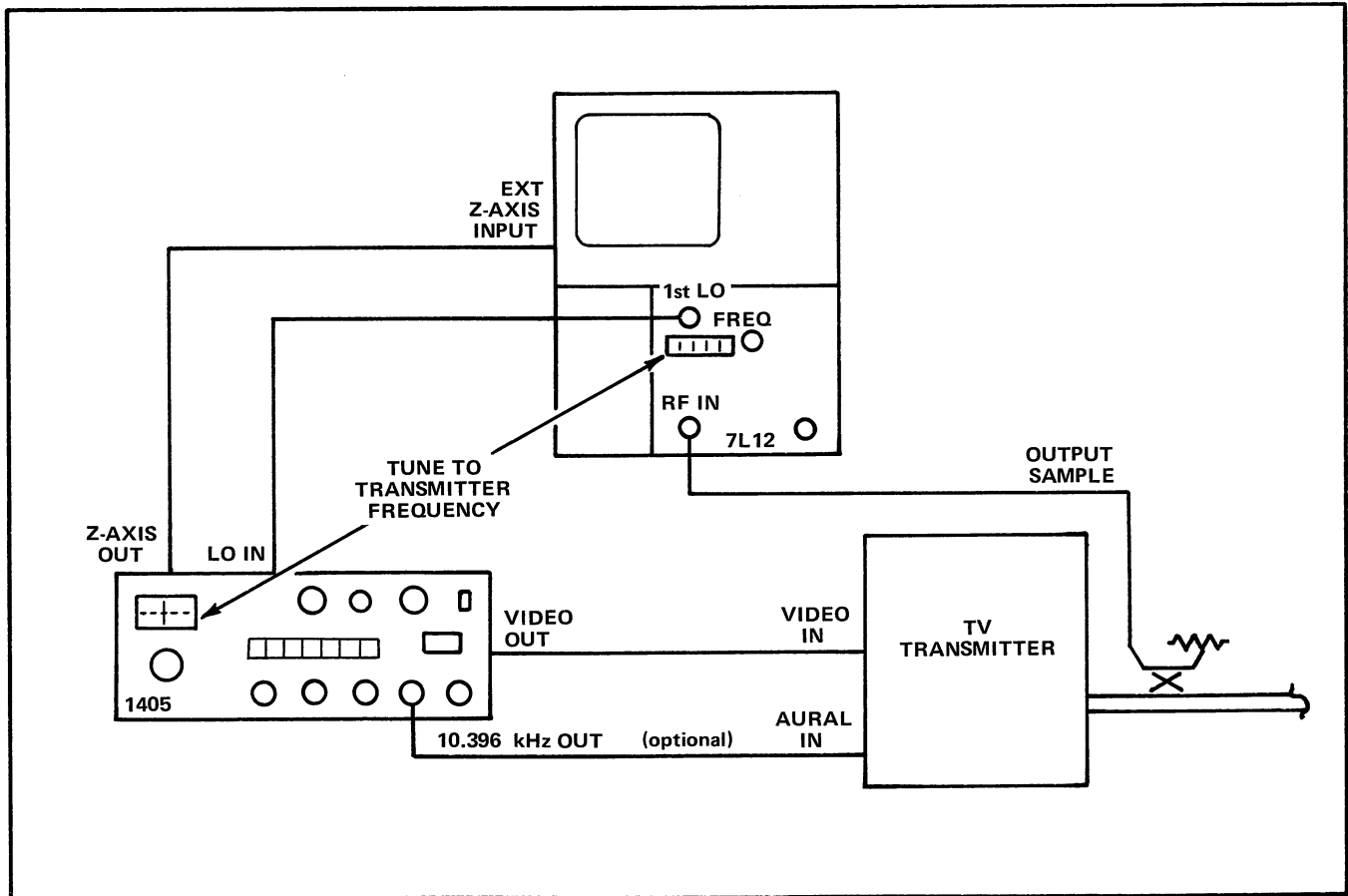


Fig. 2-2. Basic interconnections for general operation.

2.5 GENERAL OPERATING INFORMATION

2.5.1 Initial Connections

The basic interconnections required for general operation are shown in Fig. 2-2, and are described below.

a. If desired, secure the 1405 to the top of the oscilloscope mainframe, using the accessory hold-down strap provided (Tektronix Part No. 346-0144-00).

b. Connect the spectrum analyzer 1st LO to the 1405 LO IN, using the cable provided (Tektronix Part No. 012-0649-00).

c. Connect the 1405 Z-AXIS OUT to the oscilloscope mainframe EXT Z-AXIS IN, using the cable provided (Tektronix Part No. 012-0057-01).

d. Connect the 1405 VIDEO OUT to the video input of the tv transmitter or circuit under test, using the cable provided (Tektronix Part No. 012-0057-01) or any other convenient cable.

e. Connect a sample of the output of the tv transmitter or circuit under test to the RF IN of the spectrum analyzer, using an appropriate cable and coupler to avoid exceeding the maximum input power level of +30 dBm.



Use care to keep the power level into the spectrum analyzer low; an off-screen signal can damage the spectrum analyzer. External attenuators should be used if the internal attenuator will not reduce the signal sufficiently.

f. If you desire to check the transmitter's aural circuitry, connect the 1405 10.396 kHz OUT (NTSC) to the transmitter's aural input. Check that the AMPLITUDE control is initially set fully counterclockwise.

2.5.2 Initial Set-Up for TV Transmitter

The following control settings assume the set-up described above was accomplished, and that the circuit under test is a tv transmitter. For other types of circuits, refer to Applications, Section 2.6.

Oscilloscope Mainframe
(as necessary to obtain display.)

Spectrum Analyzer

MODE	NORM
SOURCE	FREE RUN
FREQUENCY	To transmitter output frequency
TIME/DIV	1 ms or slower
FREQ SPAN/DIV	2 MHz
REFERENCE LEVEL	As appropriate for incoming signal

1405

TRANSMITTER FREQUENCY	To transmitter output frequency; same as spectrum analyzer.
AMPLITUDE and APL	As appropriate to produce desired signal. Ascertain that the APL UN-CAL indicator is off.
SYNC	Set to ON to add blanking and internally-generated sync pulses; set to OFF for cw output or when external blanking is used.
MARKERS	Turn INTEN fully ccw to OFF position.
POWER	ON

The above set-up, possibly with minor adjustments, should result in a display of the output of the tv transmitter when modulated by the 1405. The display should appear similar to Fig. 2-4.

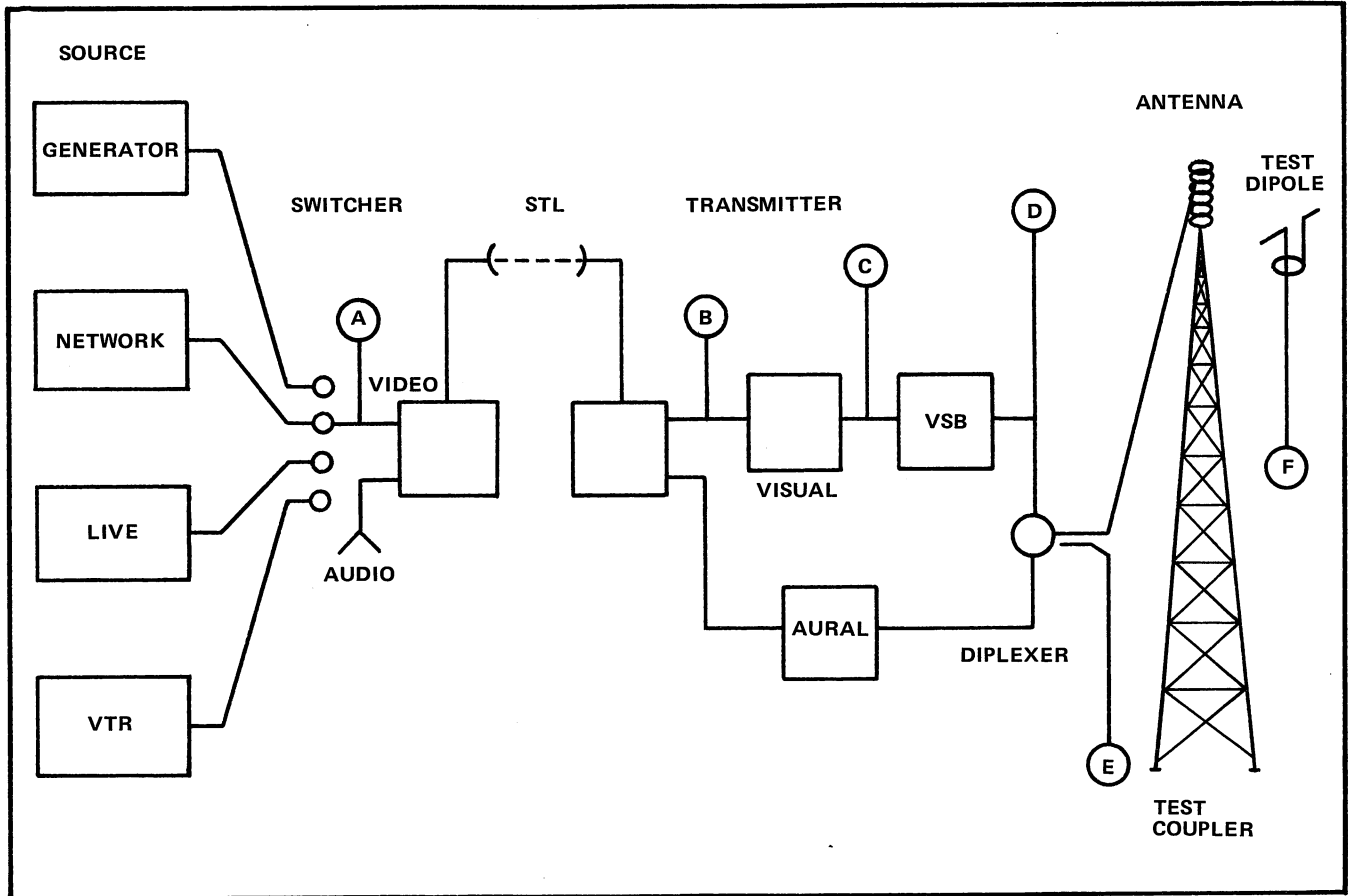


Fig. 2-3. Typical station layout showing test points.

2.6 APPLICATIONS

2.6.1 General Sideband Analysis

Many possibilities exist for performing sideband analysis. For transmitter tuning, refer to Fig. 2-3, set up the 1405 (see procedure below), and connect it directly to the transmitter input (B). Connect the input of the spectrum analyzer to the output of the vestigial sideband filter (D). Other intermediate points can also be observed, such as the transmitter IF, the transmitter output before the vestigial sideband filter (C), after the diplexer (E), or off-the-air using a dipole (F).

Many parameters can change significantly when the aural and visual transmitters are combined in the diplexer. Tests should be performed both at a test point after the diplexer, and off-the-air to verify the condition of the signals as actually received by the customer.

Once the transmitter has been correctly set up, you may wish to move the sideband analyzer system to the studio (A) so that, by using a test antenna, the entire loop including the microwave link and transmitting antenna can be verified.

Procedure

1. Calibrate the 7L12 or 7L13 Spectrum Analyzer as described in its instruction manual.

2. Connect the 1405 Sideband Analyzer to the 7L12 or 7L13. Temporarily connect a BNC to BNC jumper from the output of the 1405 to the input of the spectrum analyzer.

3. Tune both units to zero and verify that the 1405 is producing a flat response curve from 0 MHz to at least 15 MHz (refer to Fig. 2-4).

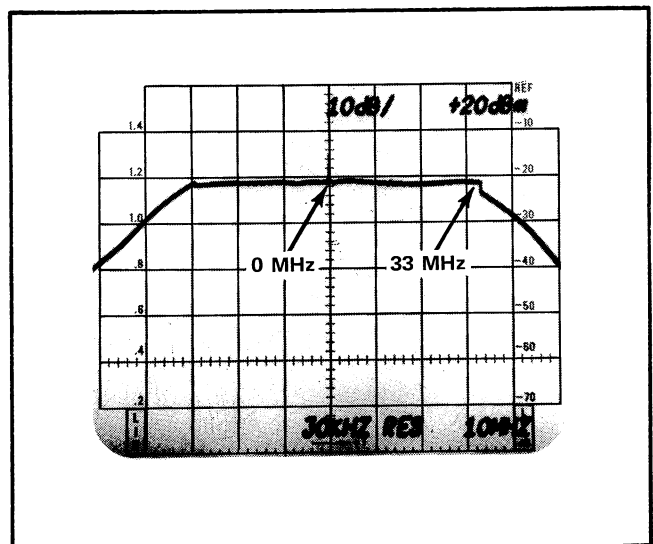


Fig. 2-4. Sideband analyzer response at baseband.

4. Make sure that the internal SYNC on the 1405 is switched ON, and connect the 1405 VIDEO OUT to the transmitter input (B). Generally this can be accomplished through the video patch panel. See note for special cases and international standards.

NOTE

For transmitters where the supplied sync rate will not work, or for transmitters that must see vertical or full NTSC sync, the 1405 Sideband Analyzer cw signal can be added to a test signal generator as described in Section 2.6.3 and shown in Fig. 2-11. In this mode the 1405 internal sync is switched off. Although not necessary, blanking can be supplied to the 1405 to interrupt the swept signal during the sync interval. When the 1405 signal is added to composite sync as shown in Fig. 2-11, the transmitter input gain control may have to be increased to make up combining losses of 50%.

5. Connect the spectrum analyzer to an rf test point after the vestigial sideband filter.

CAUTION

Use care to keep the power level into the spectrum analyzer low; an off-screen signal can damage the spectrum analyzer. External attenuators should be used if the internal attenuator will not reduce the signal sufficiently.

6. With the spectrum analyzer in the 10 dB/DIV mode and its FREQ SPAN/DIV control set to 5 MHz/DIV, adjust the FREQ control until the station carrier is centered on the screen.

7. With the spectrum analyzer RESOLUTION control set to 0.3 MHz, adjust the 1405 TRANSMITTER FREQUENCY control until the display floor on the spectrum analyzer suddenly rises to indicate the response shape of the tv transmitter. Then reduce the SPAN/DIV control on the spectrum analyzer to 2 or 1 MHz/DIV, reduce RESOLUTION control to 30 kHz, and adjust the 1405 FINE control for maximum rise on the display. A properly adjusted transmitter will appear similar to Fig. 2-5.

8. Set the spectrum analyzer mode to 2 dB/DIV and verify the display flatness from -0.75 MHz to +4.2 MHz. The display should be similar to Fig. 2-6. Intensity markers can be used by connecting a cable from the Z-AXIS OUT of the 1405 to the Z-AXIS IN of the spectrum analyzer mainframe.

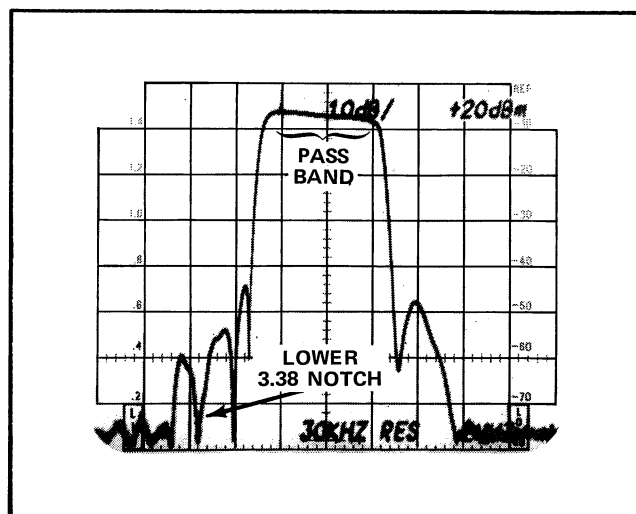


Fig. 2-5. Transmitter response at 2 MHz/Div and 10 dB/Div.

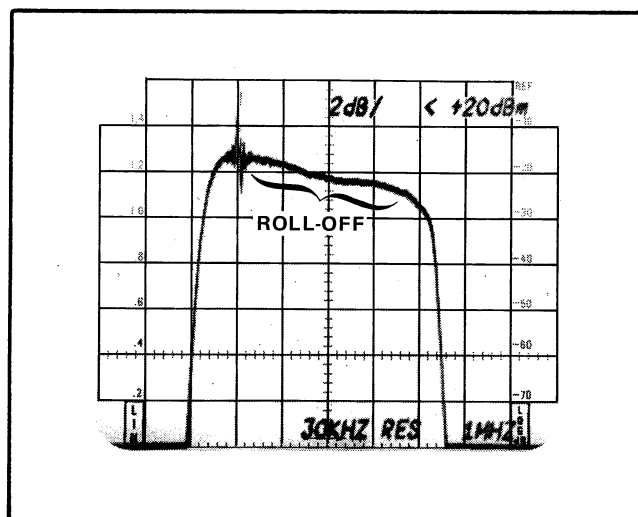


Fig. 2-6. Transmitter response at 2 dB/Div (note response rolloff of about 2 dB).

2.6.2 In-Service Sideband Analysis Using Low-Level Technique

The low level sweep is attractive because of its simplicity and real time adjustment capabilities. The sweeping signal is combined directly with the tv picture signal using a resistive combiner so that the sweeping signal is down 30 to 40 dB (or more) below the picture information. Because of the low signal level and repetition rates, interference from in-service testing by this technique is only perceptible to the trained observer. The average customer will not detect the sweeping signals superimposed on the tv signal.

Operation—1405

The intentional addition of the swept signal to the picture information might be interpreted as illegal [FCC Rules and Regulations, Vol. III, §73.682(a21)] especially since no information is permitted on sync information. However, part a16 of the same section states that carrier-to-noise and other effects can be up to 5%. This is equivalent to 8 IRE units. We recommend that the sweeping signal be inserted with 2 or 3 IRE units, well within the tolerance of this rule.

This in-service technique can be used from the studio, to verify not only the transmitter, but also the studio-transmitter link, processors, and antenna performance.

Procedure

1. Prepare a test point where the swept signal can be inserted. This can be a simple T as shown in Fig. 2-7 (supplied with the 1405). Make sure that the internal sync on the 1405 is switched OFF, APL is set to 0, and the AMPL control is set to 10 IRE. Amplitude settings between 10 and 20 (equivalent to 1 and 2 IRE through the insertion T) will give the most satisfactory results with minimum picture impairment.

2. Connect the spectrum analyzer to an rf test point and carefully tune in the picture carrier at 10 dB/DIV, 1 or 2 MHz/DIV and 30 kHz resolution.

3. Connect the 1405 to the test point, and while watching an off-air color monitor to ensure that there is no interference, tune the TRANSMITTER FREQUENCY control until the baseline raises. It should be possible to use the FINE control to tune for maximum upward deflection of the display.

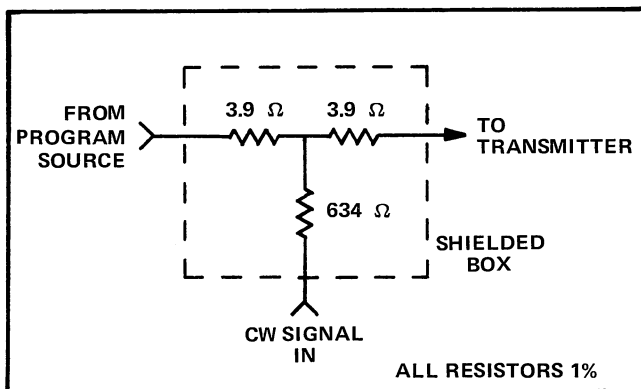


Fig. 2-7. Insertion "T" for in-service low level testing.

4. By using the video filters on the spectrum analyzer it should be possible to obtain a display similar to Fig. 2-8.

5. Approximately 10 dB more range and finer resolution can be obtained with 3 kHz resolution (see Fig. 2-9). The fine tuning control will be more critical and tend to drift unless both instruments are completely warmed up.

6. The 2 dB/DIV mode can also be used to check the flatness (see Fig. 2-10).

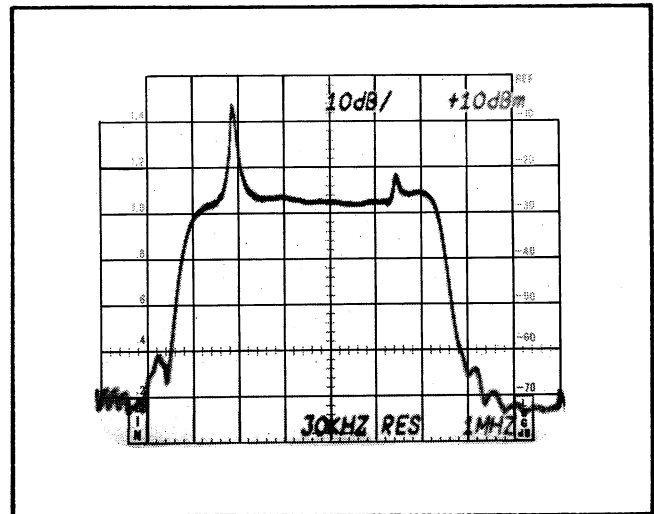


Fig. 2-8. In-service low level sideband response.

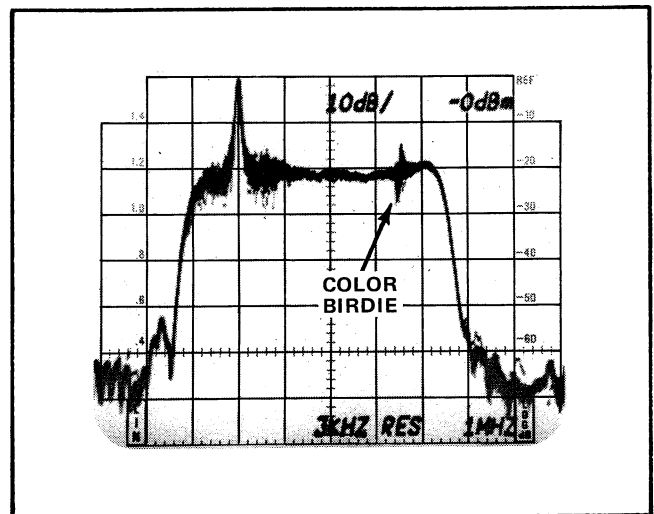


Fig. 2-9. Low level sideband response using 3 kHz resolution bandwidth.

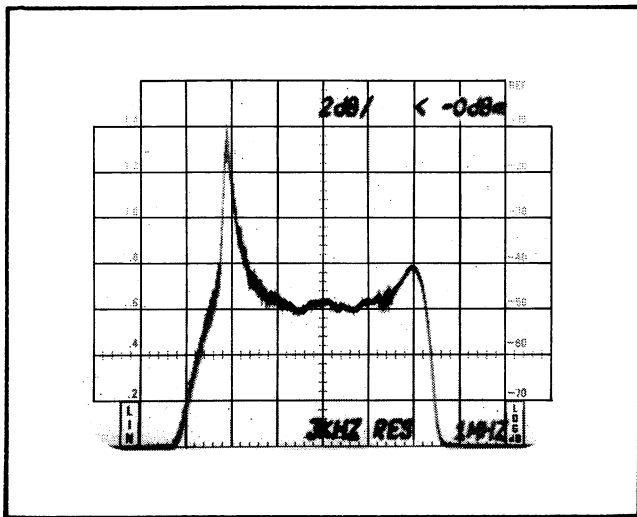


Fig. 2-10. Low level sideband response at 2 dB/Div.

2.6.3 In-Service Sideband Analysis Using the Vertical Interval

This technique inserts the swept signal on one line in the vertical interval. It has the advantage that it can be used continuously with no picture interference and with very fine resolution and accuracy; however, a storage oscilloscope is required to recover the swept display. Also, the display is not real time; up to thirty seconds is required after an adjustment to visually verify the result.

A number of lines in the VITS area can be used for the sweeping signal [FCC Rules and Regulations, Vol. III §73.682(a16)]. Line 18, field 2 is sometimes available, and line 20, both fields is also often empty.

The theory of this technique should be understood before attempting to use the procedure. Different VITS insertion devices can be used other than those shown in the procedure, provided that the same keying can be accomplished.

The spectrum analyzer will receive all the normal picture information; however, the z-axis (intensity) is only turned on during the single line sweep.

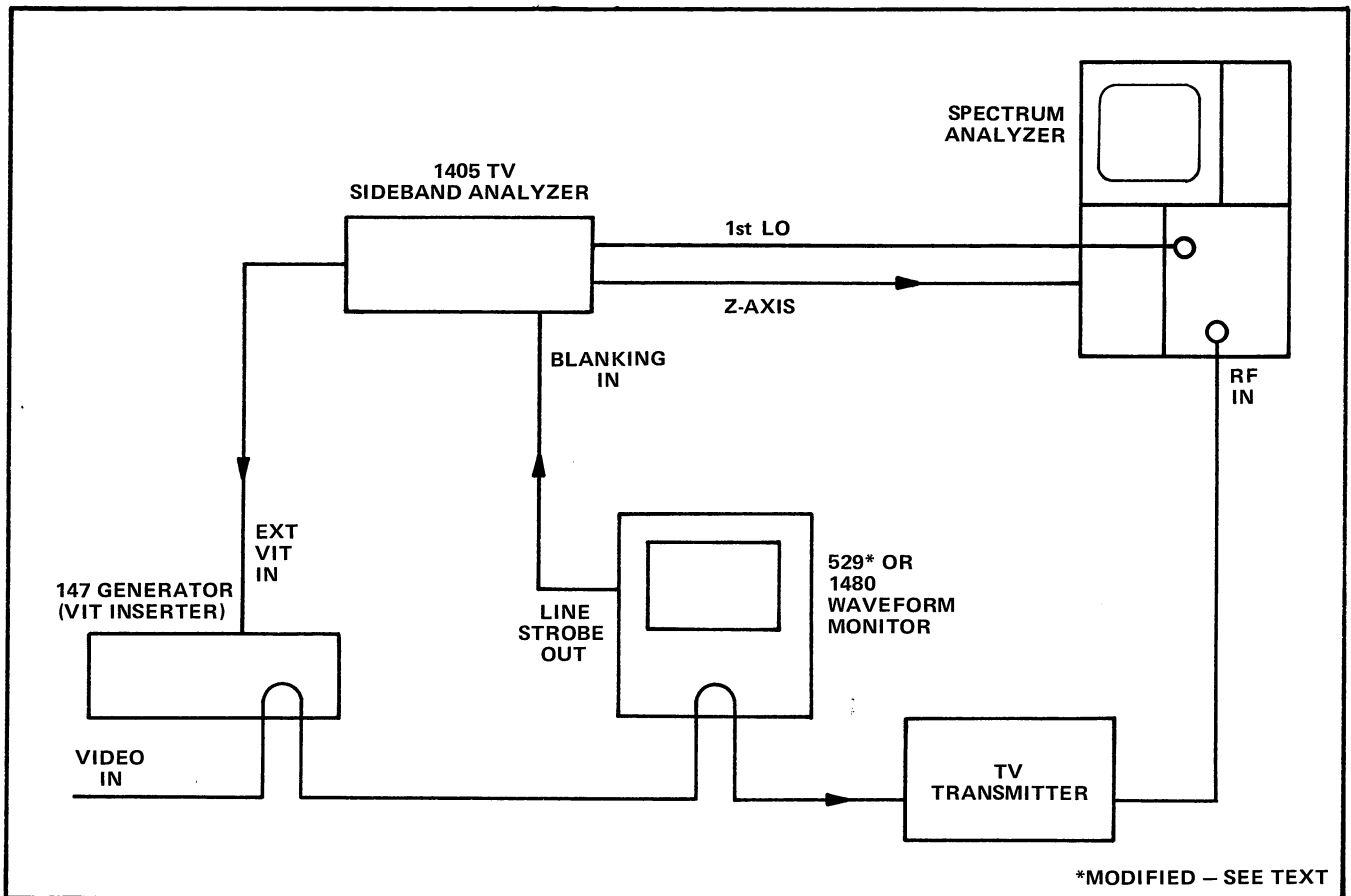


Fig. 2-11. Sideband analyzer connections for VITS insertion.

Operation—1405

Procedure

1. Set up the equipment as shown in Fig. 2-11. Good results can be obtained without the 1480 Waveform Monitor if the intensity on the spectrum analyzer is carefully set. A 529 Waveform Monitor can be substituted for the 1480, using the video output. However, the 529 must be modified by disconnecting one end of R198.

2. Verify with the 1480 (or another waveform monitor) that the sweep signal is inserted on the correct line, and the APL and AMPLITUDE controls work correctly (see Fig. 2-12).

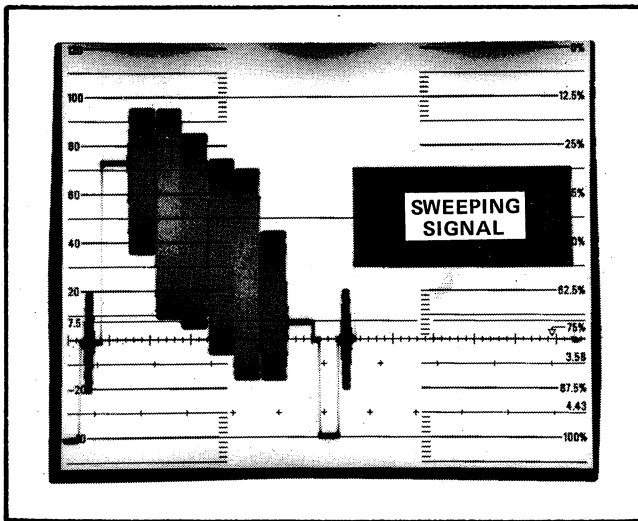


Fig. 2-12. Waveform monitor display of VITS interval including sideband envelope.

3. The spectrum analyzer should be tuned to the picture carrier with 1 MHz/DIV, 300 kHz resolution, and 10 dB/DIV.

4. Using the storage mode on the spectrum analyzer and a slow sweep speed (approximately 0.5 s/DIV), carefully tune the 1405 for maximum upward deflection of the response curve (see Fig. 2-13).

5. This procedure can be used at the studio location, by using a suitable antenna to receive the rf for the spectrum analyzer. On long studio-transmitter links some delay will occur, and can be compensated for with the FINE tuning control on the 1405. The intensity markers work normally with this technique.

2.6.4 Swept Differential Gain Measurements on the Television Transmitter

A variety of methods exist at baseband for making differential gain measurements. However, the following technique uses the rf swept signal of the sideband analyzer. This makes it possible to check gain changes with frequency across the passband of the transmitter.

The tv transmitter, being a very high powered am transmitter, often tends to exhibit an inferior differential gain characteristic. A "linearizer" function is generally included to correct most of the gain effects; however, effects related to frequency remain. The procedure which follows shows a typical transmitter characteristic with (Fig. 2-14) and without (Fig. 2-15) the "linearizer" function. Although most of the gain slewing with input APL is controlled, the effects relative to frequency remain.

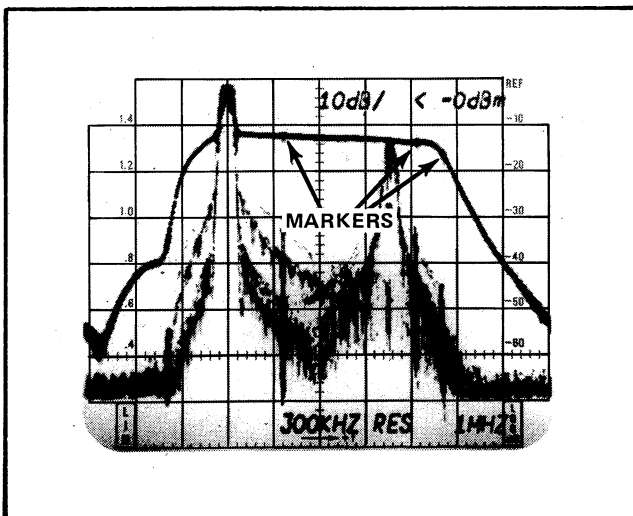


Fig. 2-13. Sideband response using VITS insertion.

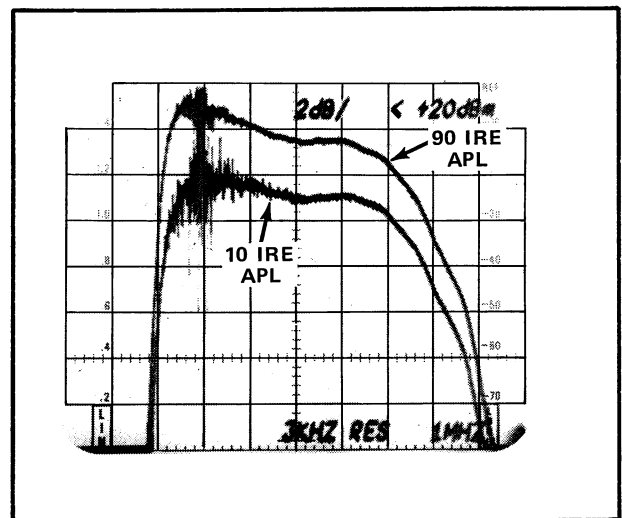


Fig. 2-14. Transmitter variations with 10 and 90 IRE test sweeps.

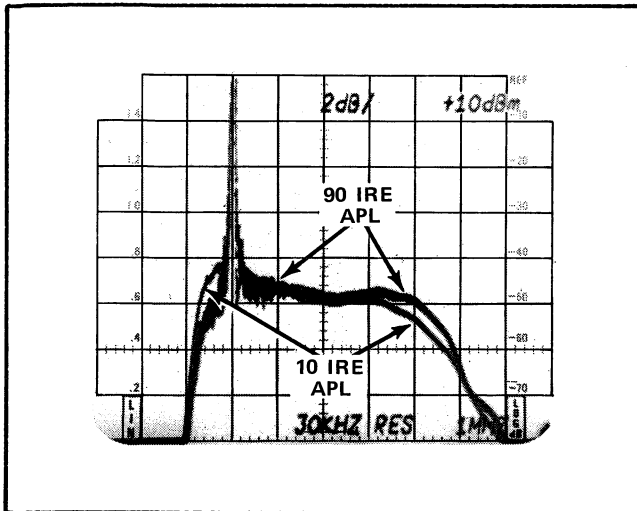


Fig. 2-15. Transmitter differential gain display for 20% amplitude 0 and 100 IRE test sweeps.

Procedure

1. Set up the sideband analyzer and spectrum analyzer for normal out-of-service testing (see Section 2.6.1).

2. With all processing defeated and the transmitter "linearizer" OFF, sweep the transmitter using a 20 IRE AMPLITUDE signal with an APL of 10 and 90 IRE. A display similar to Fig. 2-14 will be typical. You may wish to do a series of sweeps from 10 to 90 IRE to determine how the transmitter responds at intermediate levels.

3. With the "linearizer" or other processing equipment on, repeat the sweep tests for levels of 10 and 90 IRE. The display in Fig. 2-15 is typical. Note the response changes with APL.

2.6.5 Aural Modulation Monitor Calibration

NOTE

This section applies to NTSC instruments only. For 1405 Option 1, refer to Options and Modifications, Section 4.

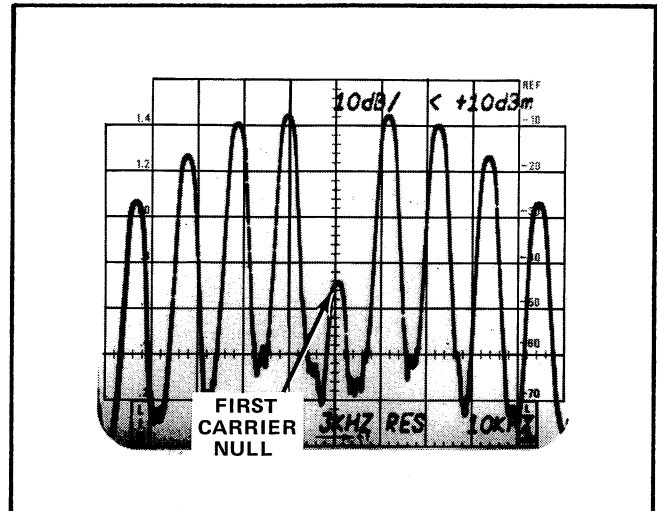


Fig. 2-16. Bessel null technique of determining 100% modulation.

The 1405/spectrum analyzer system provides a very accurate method of calibrating the aural modulation monitor, using the Bessel Null technique. With this technique, a specific frequency (10.396 kHz for 25 kHz deviation) will cause a distinctive and undisputable carrier null at 100% modulation (see Fig. 2-16).

Procedure

1. Connect the spectrum analyzer to sample the output of the aural transmitter, and connect the 10.396 kHz OUT from the 1405 to the input of the aural transmitter.

2. Advance the 10.396 kHz AMPLITUDE control until the first carrier null occurs (see Fig. 2-16). At the first carrier null, the transmitter is being modulated 100% and the fm frequency deviation is 25 kHz.

3. Adjust the modulation monitor to indicate 100% modulation.



WARNING

THE REMAINING SECTIONS OF THIS MANUAL CONTAIN SERVICING INSTRUCTIONS. THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRICAL SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CALLED OUT IN THE OPERATING INSTRUCTIONS UNLESS QUALIFIED TO DO SO.

SERVICE INFORMATION

WARNING

The service information in the remainder of this manual is intended for use by qualified personnel only. To avoid electrical hazards, DO NOT perform any servicing unless you are qualified to do so.

3.1 INTRODUCTION

This section includes circuit description, calibration procedures, and other maintenance information which requires access to the inside of the instrument. Therefore, refer all service to qualified personnel.

3.2 CIRCUIT DESCRIPTION

3.2.1 Local Oscillator

The local oscillator frequency is tuned mechanically and electrically. The TRANSMITTER FREQUENCY control mechanically tunes the frequency range from 2.09 GHz to 3.1 GHz by means of a plunger in a resonant cavity. The FINE control varies the tuning voltage from +5 V to +15 V to fine tune the oscillator at least 1 MHz but less than 2.5 MHz, depending upon the mechanical setting. The oscillator output drives the mixer.

3.2.2 Mixer

The 1st LO output from the 7L12 or 7L13 is at a level of +5 dBm to +10 dBm and has a swept frequency that is dependent upon the spectrum analyzer center frequency and FREQ SPAN/DIV. This output is connected to the 1405, where it is fed through a fixed 20-dB attenuator to the mixer. The mixer output is a difference frequency between 0.1 MHz and 20 MHz at a level of -23 dBm to -17 dBm.

3.2.3 CW Amplifier Chain

Three cascaded amplifiers, with a diode gate following the first amplifier (see Fig. 3-1), are used to increase the signal level from the mixer to at least 2.86 V P-P into 200 ohms. These circuits are described in greater detail in the following paragraphs. The overall response of the amplifiers is flat (within about 2 dB) over the usable range of 0.1 MHz to 20 MHz. Detector diodes at the output generate an automatic gain control (AGC) signal which controls the gain of the first amplifier. The gain of the AGC circuit is sufficient to hold the peak-to-peak output level constant (within ± 0.1 dB) for changes in mixer output levels. The diode gate provides at least 40 dB attenuation for the cw when it is shut off.

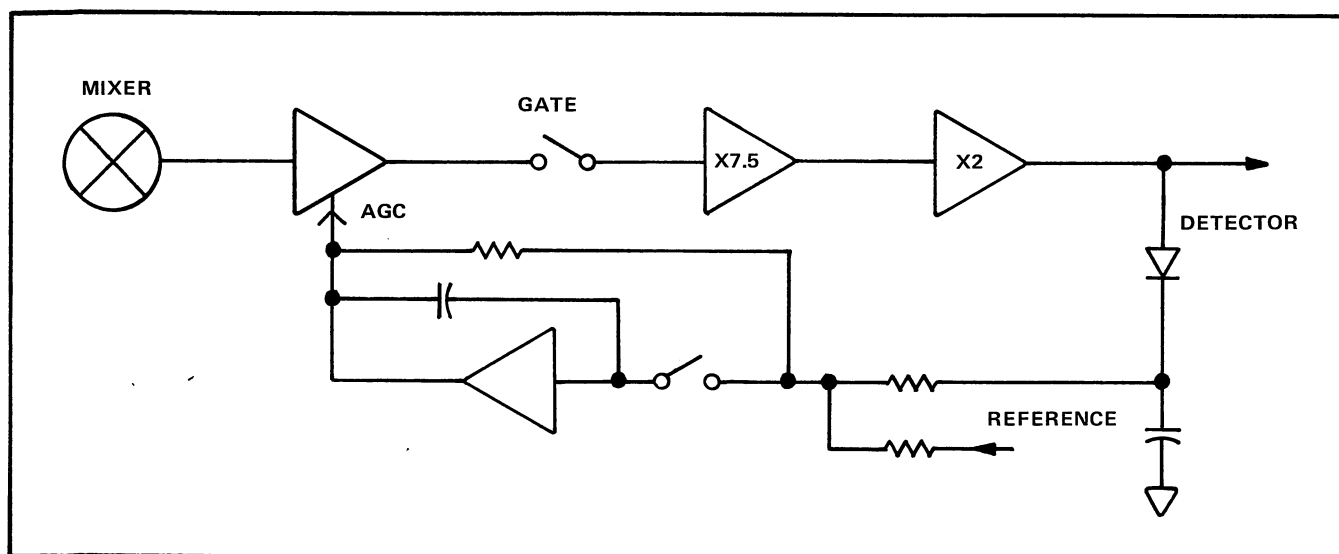


Fig. 3-1. CW amplifier chain (simplified diagram).

Service Information—1405

3.2.4 Variable Gain Amplifier

The variable gain amplifier (see Fig. 3-2) consists of Q118, Q115, and Q120. Feedback current through R130, R132, and Q130 sets the amplifier gain at two to twelve times, depending upon the AGC voltage fed to Q130. The variable gain amplifier has an output level of about 0.2 V P-P to drive the diode cw gate through R128, and the marker mixer through R126.

3.2.5 Diode CW Gate

The diode cw gate (see Fig. 3-3) uses balanced input and output transformers to reduce the gate signal at the output. CR170 and CR176 conduct to pass cw through the gate. When the cw is cut off, CR172 and CR174 conduct to help attenuate the leakage signal through the off-diode capacitance. Diode conduction is balanced by R170 and R175 to allow nearly complete gate rejection at the output. The gate current of 3 mA (from R182 and R185) passes

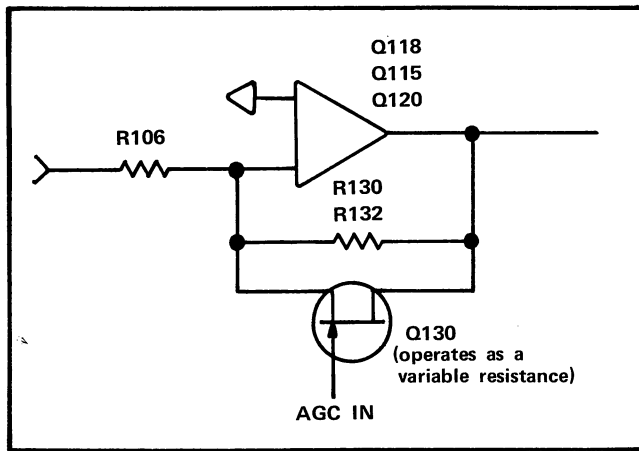


Fig. 3-2. Variable gain amplifier (simplified diagram).

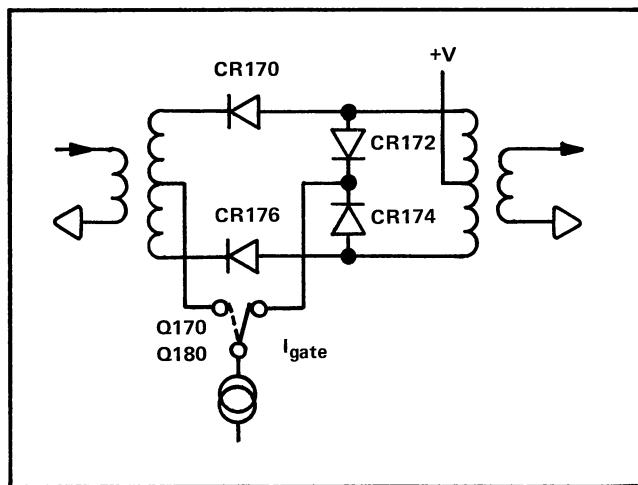


Fig. 3-3. Diode cw gate (simplified diagram).

through either Q170 or Q180, as determined by the level of the Blanking In Line. The Blanking In Level is about +4 V when the gate is conducting and 0 V when the gate is not conducting. The magnetizing inductance of the transformers, combined with the source impedance of R128 and C128, sets the low-frequency operating limit of the gate.

3.2.6 Post-Gate Amplifier

Two differentially-connected transistor pairs (Q190, Q195, and Q200, Q205; see Fig. 3-4) are connected for an in-phase gain with feedback about 7.5. Variable resistor R195 compensates for overall gain variations in the cw amplifier chain due to component tolerances.

3.2.7 Output CW Amplifier

The output amplifier (see Fig. 3-5) consists of a differential input amplifier (Q210, Q215) and a complementary emitter follower output amplifier (Q235, Q245). Gain is about 2.1 with feedback. The output stage is biased with a low quiescent current (about 5 mA to 10 mA), yet is capable of high peak-to-peak output current with very low source impedance. Low source impedance

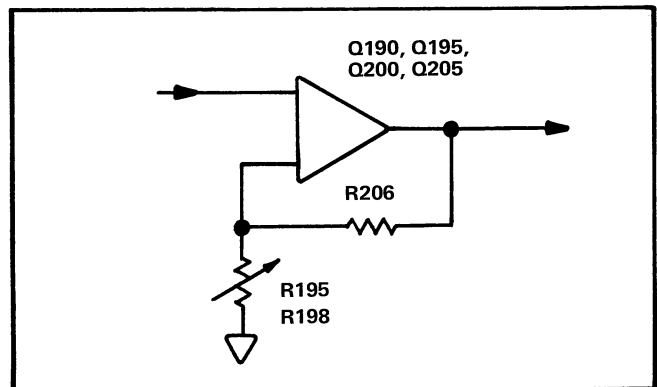


Fig. 3-4. Post-gate cw amplifier (simplified diagram).

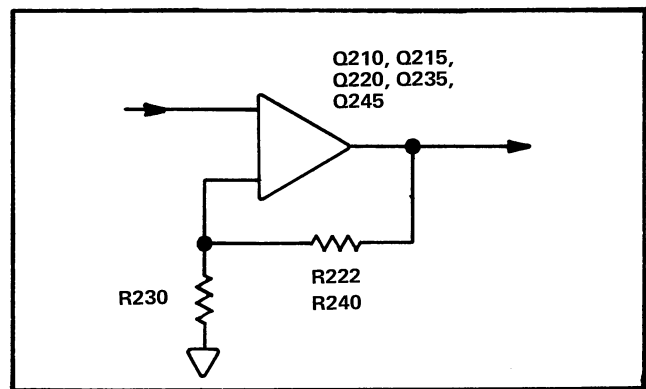


Fig. 3-5. Output cw amplifier (simplified diagram).

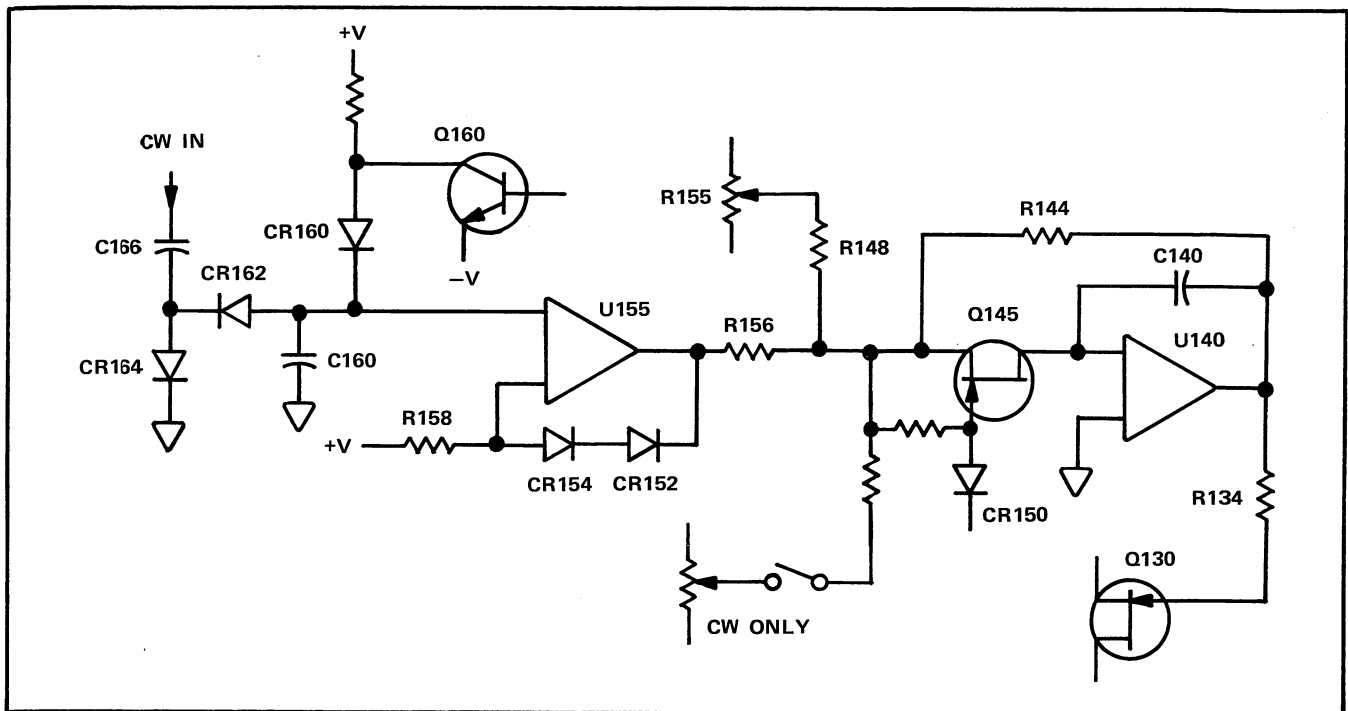


Fig. 3-6. Detector and agc (simplified diagram).

is needed for proper operation of the attenuator, and to prevent sync and blanking signals from disturbing the detected cw voltage.

3.2.8 Detector and AGC

Refer to Fig. 3-6. Connected to the output of the cw amplifier are peak-to-peak detector diodes CR162 and CR164, which are forward biased by a low current from R168 through disconnect diode CR160. Voltage follower U155, with compensating diodes CR152 and CR154, delivers current to R156 that is proportional to the peak-to-peak cw output voltage. U140, operating with a current summing node, provides the agc loop gain; C140 stabilizes the loop. This stage also has voltage excursion clamps (CR140 and Q140, not shown) to hold the output in the active gain control range of FET Q130. The current from R156 is summed with two variable currents to control the output cw amplitude. One variable source is the internal amplitude adjustments R155 and R148. The other (active in the CW ONLY position) is the current through R140 from the CW ONLY control, which varies the cw output level through a range centered at 1 V P-P.

When cw blanking is required and cw is present, capacitors C160 and C140 are charged. Since the cw can be turned off for intervals up to 40 ms, the voltage must be stored for at least this length of time. The voltage across

C160 is stored when CR160 stops conducting, which happens when Q160 conducts. R185 sets the current through Q160 so that CR160 is just cut off. The voltage of C140 can be held by amplifier U140 if all input currents are turned off. This is done by FET Q145, which switches to high resistance when CR150 conducts. R160 matches the blanking level to the voltage required to turn Q145 off.

3.2.9 Sync Rate Generator

U500 is a 555 Timer IC operated as a free-running oscillator. It is turned off when pin 4 is grounded by the SYNC switch. Nominal blanking time ($10.8 \mu\text{s}$) is set by R500. R505 adjusts the rate ($63.5 \mu\text{s}$ for NTSC) by biasing the fm input at pin 5 of the timer.

Q510 turns off during the blank interval and allows an exponential ramp to be generated by R516 and C518. U520, a dual voltage comparator, has a high output when the ramp is between the dc levels applied to pin 9 and pin 3. This generates a $4.7 \mu\text{s}$ sync pulse, $1.55 \mu\text{s}$ after the start of the blank interval. A superfluous pulse, generated when Q510 returns to the on state, is logically excluded by U525B. U525A inverts the blanking pulse to provide proper operation of U525B. The pulse is inverted again by U525C to provide a negative pulse for the following circuits. Sync and blanking are connected to the APL and sync gate. Blanking also connects to external blanking circuitry.

3.2.10 External Blanking Input

When the SYNC switch is OFF, there are three possible modes of operation:

First mode: If no external blanking signal is applied, cw output is obtained. This is accomplished by turning Q535 on through R534, which causes CR534 and CR536 to conduct (see Fig. 3-7). This current passes through L540 to the cw gate line. A positive 4 V on this line allows cw on the output.

Second mode: For negative signals Q545 operates as a unity-gain amplifier. When the input is more negative than -5 V, CR534 and CR536 stop conducting. This causes the cw gate line to go to 0 V, which turns off the cw.

Third mode: Positive TTL-derived pulses are applied through disconnect diode CR538 to U525D, which is a NAND gate operated as an inverter. Positive input greater than +2.5 V causes CR532 to conduct, resulting in 0 V on the cw gate line. Conversely, a 0 V input results in a positive level on the gate line.

These external blanking signals, combined with signals from the internal sync generator (from CR525), connect to the blanking input of the APL gate, and pass through a low-pass filter L540, R548. This delays the cw turn-on and turn-off to match the delay in the sine² low-pass filter of the

sync and blanking circuits. CR540 passes the same cw gate signal to the z-axis amplifier to blank the crt beam when the cw is off.

3.2.11 Sync and Blanking Gates

Refer to Fig. 3-8.

The sync gate (Q310, Q315) and the blanking gate (Q320, Q325) combine appropriate currents at the common collector junction of Q315 and Q325. The combined signals then go to the sine² low-pass filter. The sync current value is fixed by R314 and the bias voltage at the base of Q315. When the blanking line is high, the current gated on is set by the APL switch (2 to 10 volt range) through R339, U320A (voltage follower), R328 and U320B (unity gain amplifier). CR324 compensates the emitter-base voltage of Q325. R325 sets the APL-to-sync amplitude ratio. (When APL is 100 IRE, sync is 40 IRE negative.)

3.2.12 Sine² Low-Pass Filter

The combined sync and blanking pulses are routed through a sine² low-pass filter (see Fig. 3-9) to shape the pulses by slowing the fast gate transitions, so the 10%-90% risetime is 0.235 μ s. L402 and L404 are adjusted for

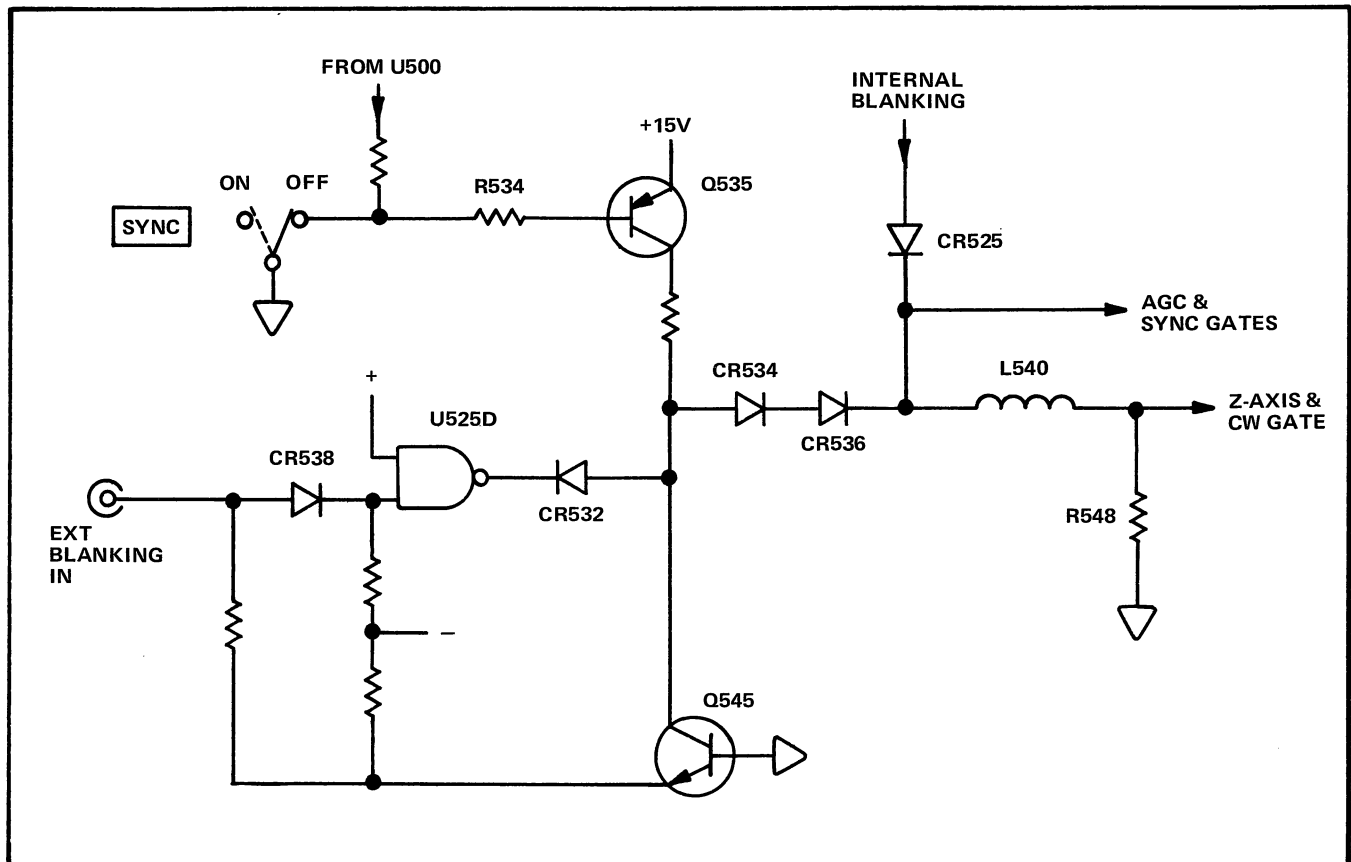


Fig. 3-7. External blanking input (simplified diagram).

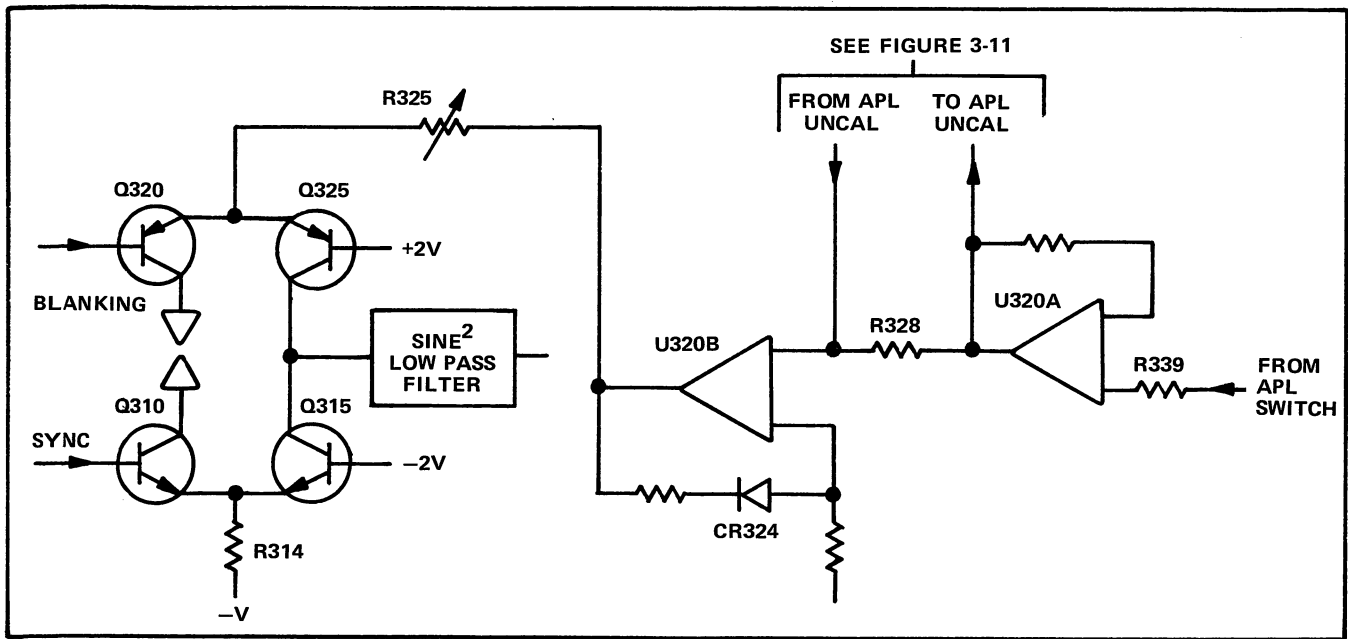


Fig. 3-8. Sync and blanking gates (simplified diagram).

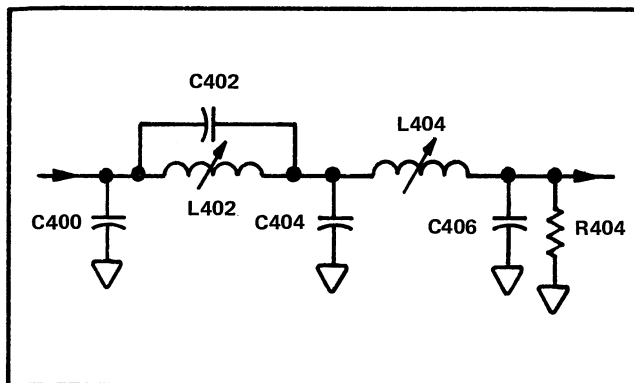


Fig. 3-9. Sine² low-pass filter.

minimum overshoot and ringing on the sync and blanking waveform. This filter is terminated by R404. R400 offsets the dc voltage to allow setting the blanking level at the output to 0 V.

3.2.13 Sync and Blanking Amplifiers

Two amplifiers, each with a nominal gain of two, follow the low-pass filter (see Fig. 3-10). The first amplifier (Q400, Q410, Q420, Q425) has a variable gain set by the feedback resistor R420, to allow absolute calibration of the combined sync and blanking waveform (140 IRE = 1 V P-P). The output amplifier (Q430, Q440, Q445, Q460, and Q465) is identical to the cw output amplifier and provides a low source impedance. However, this amplifier has a source

impedance equivalent to a small inductor (about 55 nH). An all-pass network, consisting of R470, R474, and C474, provides a true 50-ohm source for R472.

3.2.14 APL Uncal

This circuitry prevents combinations of cw amplitude and APL from exceeding 125 IRE or -40 IRE (see Fig. 3-11). The APL voltage from U320A is connected to an absolute value amplifier (CR360, CR362, and U330B). The output voltage is proportional to |APL-40 IRE|, with symmetry set by R365. This signal passes through R376 to the voltage summing input of U330A. The threshold level from R380 is combined with information from the AMPLITUDE switch and amplified by U330A. When the output of U330A is positive CR388 stops conducting, which causes Q380 to turn on the APL UNCAL lamp. This also turns off CR394 to allow FET Q390 to conduct, which holds the input to U320B at approximately 50 IRE.

3.2.15 Amplitude Switch and 75 ohm Composite Video Output

The source impedance for the composite video output is 75 ohms, and consists of two 150 ohm sources in parallel (see Fig. 3-12). One source is the sync and blanking signal impedance. The other is the AMPLITUDE switch, which is configured to provide a constant 150 ohm source while attenuating the cw signal in steps of 10 IRE. When the CW ONLY position is selected, the sync and blanking amplifier is disconnected, and a 75 ohm resistor is connected from the cw output amplifier to the output line.

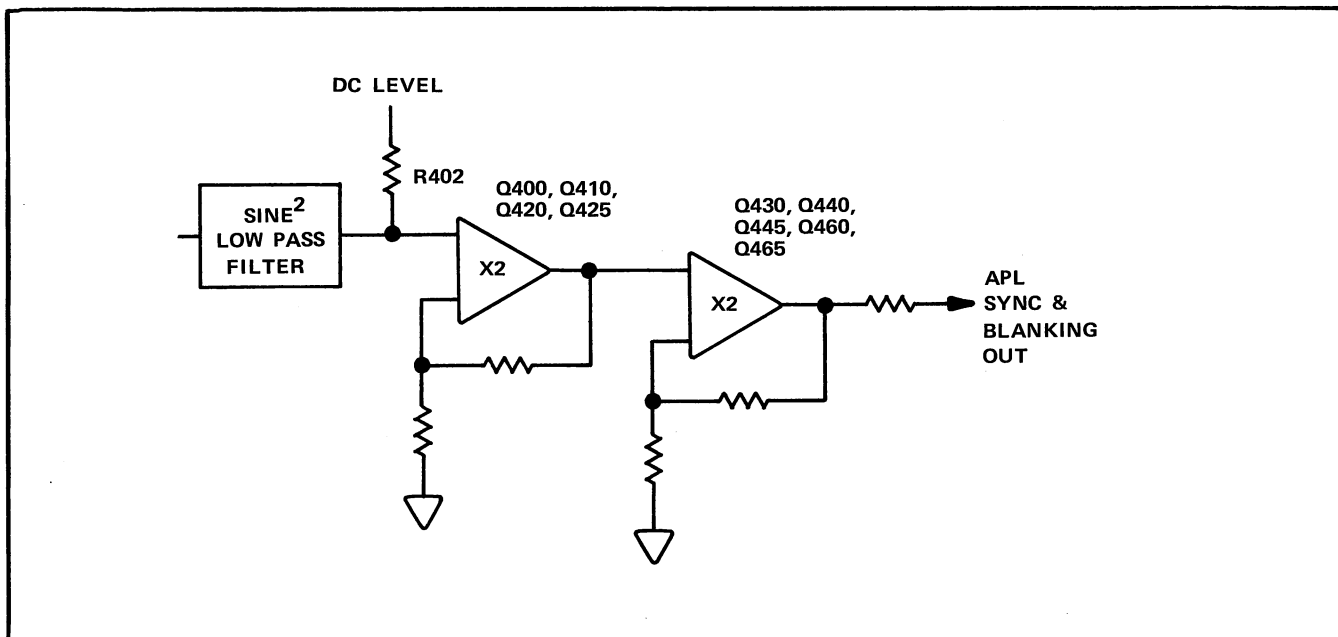


Fig. 3-10. APL, sync and blanking amplifier (simplified diagram).

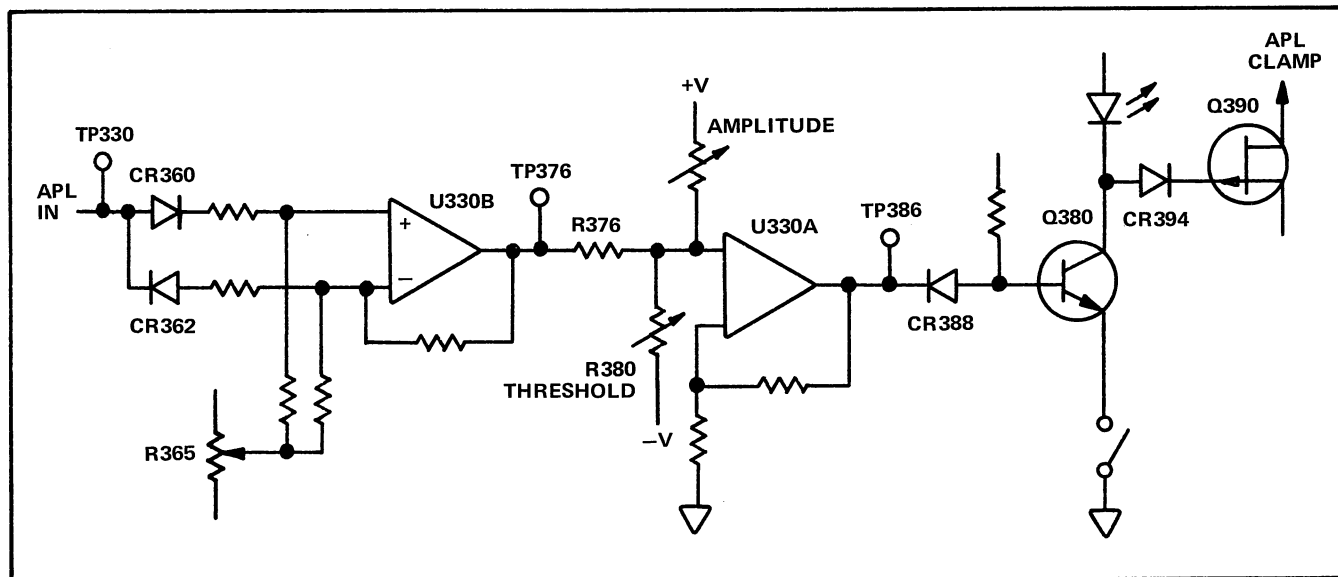


Fig. 3-11. APL uncal circuitry (simplified diagram).

An emitter follower pair (Q305, Q300) receives the signal from the 75 ohm composite video line and provides enough current to drive cable and oscilloscope input capacitance which may be connected to the VIDEO MONITOR output connector.

3.2.16 Marker Oscillators

Five crystal controlled oscillators provide frequencies appropriate to tv transmission standards. A sixth oscillator is available to receive a user provided crystal. The

oscillators and mixer are enabled only when the INTEN control is rotated out of its detent position. Selection of one or more push-on push-off switches then turns on the corresponding oscillator(s).

When the INPUT/OUTPUT pushbutton is in the in position, external marker signals can be fed into the marker mixer. When the pushbutton is in the out position, the internal markers, if switched on, are available at the connector, through buffer amplifier Q660.

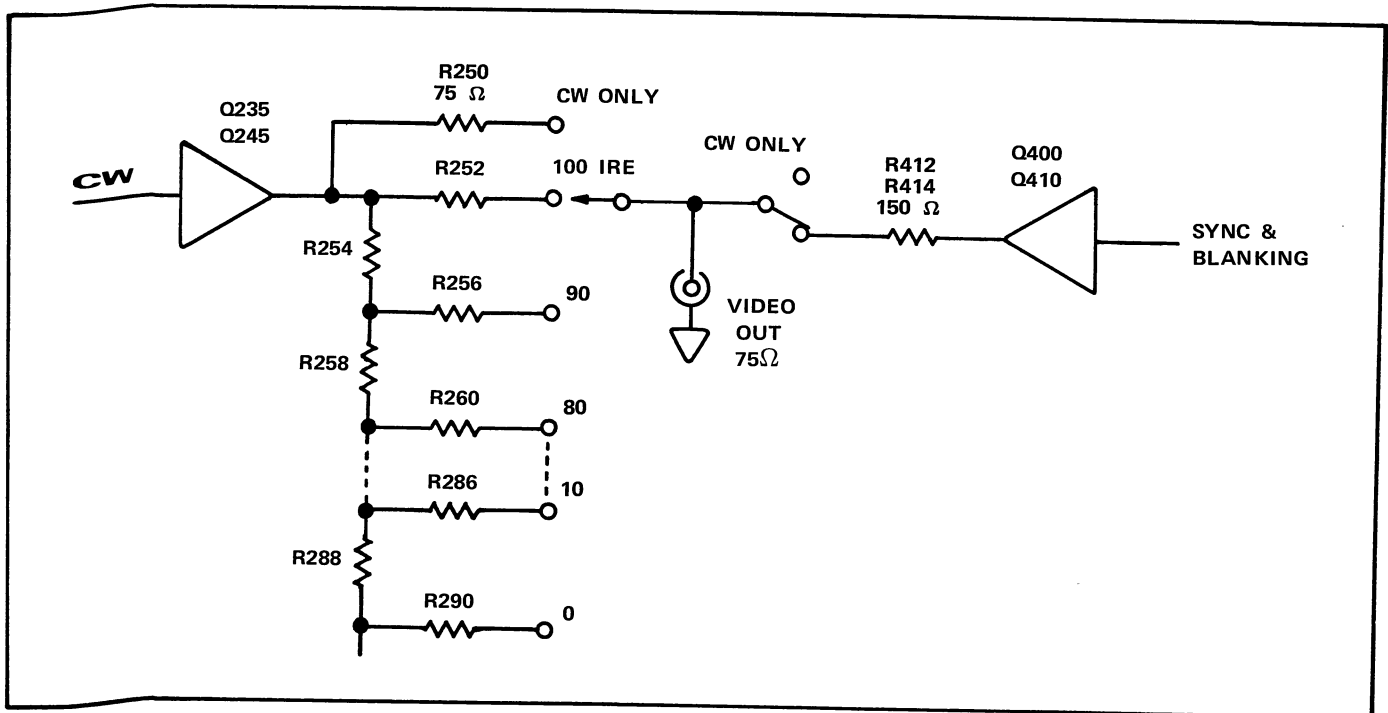


Fig. 3-12. AMPLITUDE switch and 75 Ω composite video output (simplified diagram).

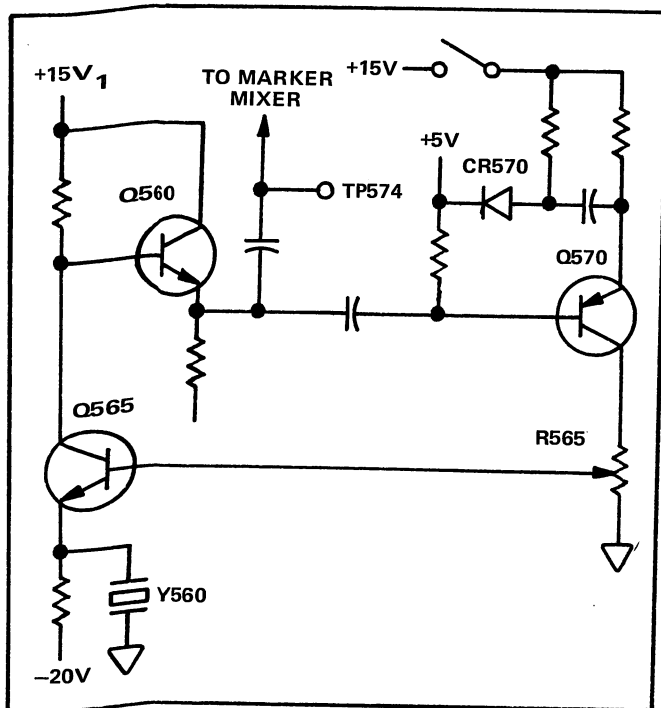


Fig. 3-13. Typical marker oscillator (simplified diagram).

The oscillator circuit is designed to allow a loop gain greater than one for the series resonant frequency of the crystal (see Fig. 3-13). Q565 and Q570 are common-

emitter amplifiers. For a given series resonant resistance of the crystal (maximum 2 kilohms), the wiper of R565 can be advanced from the ground end to a point where the small signal loop gain exceeds unity. Emitter follower Q560 keeps the loop gain high and provides a driving voltage of at least 1 V P-P at TP574. When the oscillatory signal exceeds about 0.1 V P-P, Q570 and CR570 become current limiters to hold a constant operating amplitude. Loop gain is advanced slightly past unity level until about 1 V P-P is obtained at TP574.

3.2.17 Marker Mixer and Amplifiers

Signals from one or more oscillators and from the external marker input connector are combined at the 600-ohm input port of an active mixer (pin 11 of U690; see Fig. 3-14). The 50-ohm local oscillator input (pin 5 of U690) is driven by the cw variable gain amplifier through R690. U700 is a bandpass amplifier with a differential input, a gain of ten, and a single-ended output. A variable low-pass network controlled by the WIDTH control follows, then an ac-coupled amplifier with a gain of five. The output of this stage has a maximum peak-to-peak amplitude of about 3 V. This signal is rectified by CR720 and filtered by C726. When the detected voltage, buffered by Q720, exceeds about -0.6 V, current from R730 is switched to the INTENSITY control through CR732. This current causes a negative voltage, dependent on the wiper position of the INTENSITY control, to appear at the positive input terminal of operational amplifier U740 which is connected for 100X gain. The Z-axis blanking is summed at the negative input through Q540. The output of U740 is set at

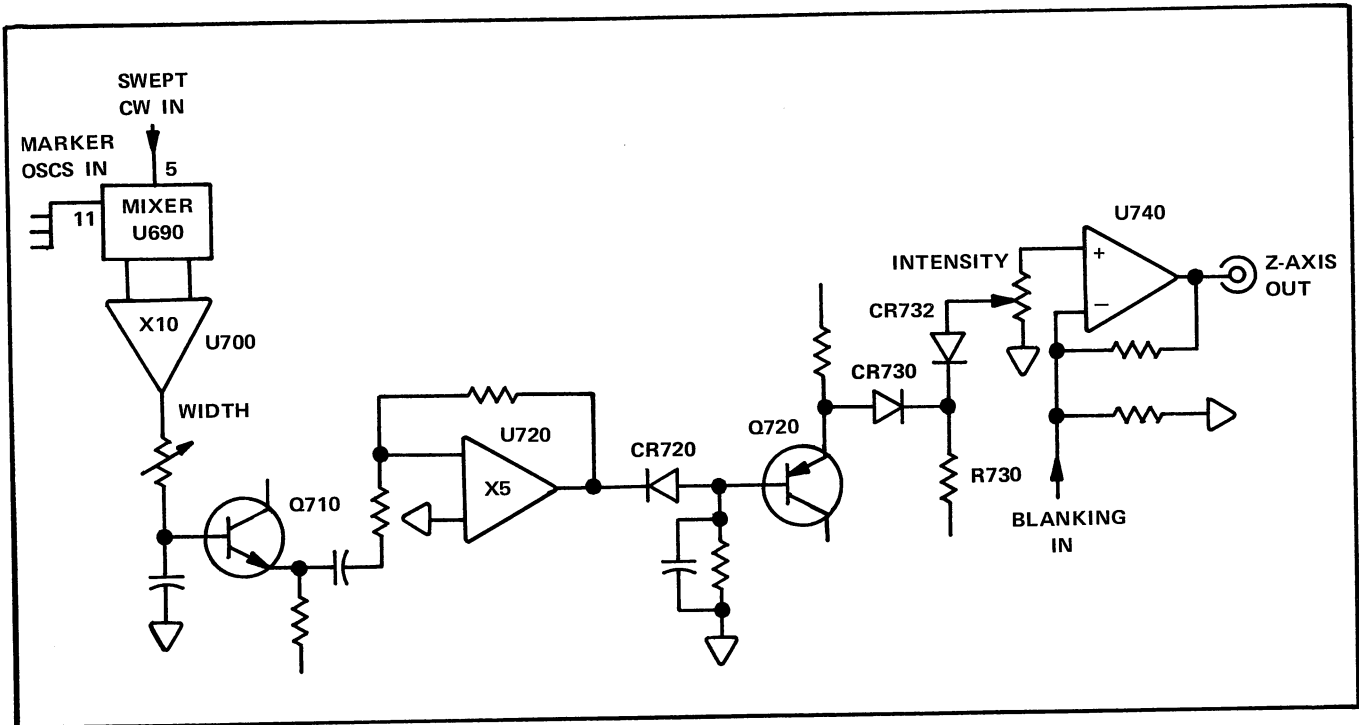


Fig. 3-14. Marker amplifier and detector (partial diagram).

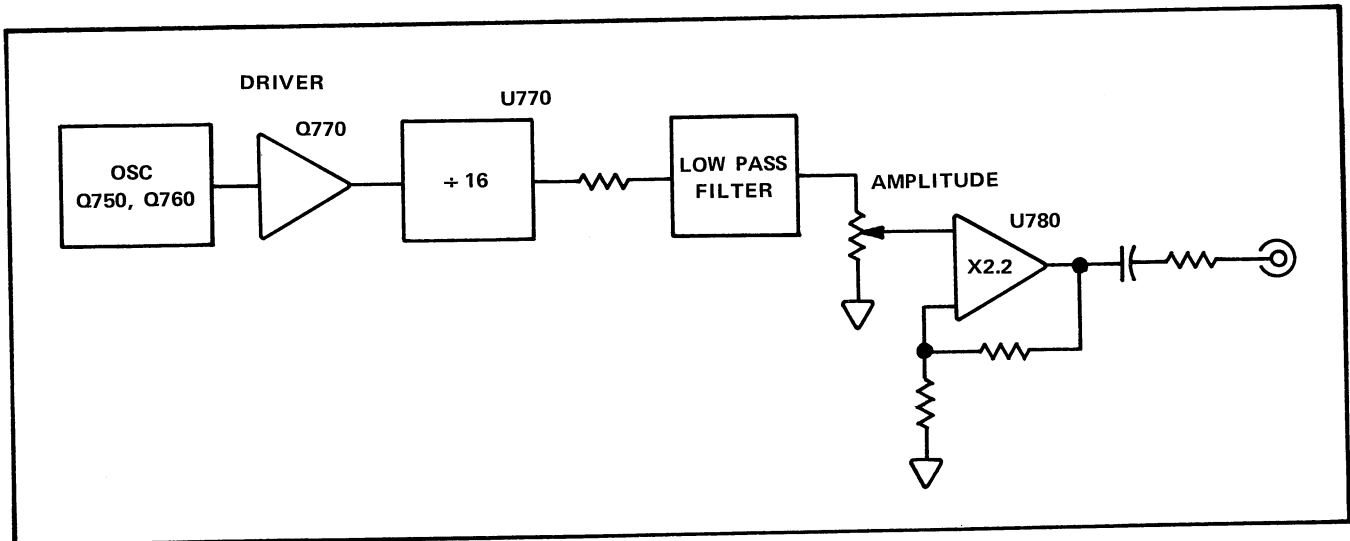


Fig. 3-15. Aural amplifier (simplified diagram).

0 V (no marker or blanking signal input) by R735, and connects to the Z-axis output through R740 and R746. When current through R740 exceeds ± 0.6 mA, one of the emitter followers (Q740 or Q745) turns on to drive the 500-ohm load that is common to 7000-Series Z-axis inputs.

3.2.18 Aural Amplifier

The crystal controlled oscillator circuit consisting of Q750 and Q760 (see Fig. 3-15) is very similar to the marker oscillator circuits, except that the emitter follower has

been deleted. R795 sets the loop gain so the voltage level at TP756 is 1 V P-P. At this level, Q760 and CR762 are current limiting, and a square wave is generated in the collector load of Q760. Q770 amplifies the signal through R756 to provide about 13 V P-P of drive signal at pin 15 of U770. U770 divides the pulse frequency by 128 to provide an output of 10.396 kHz at about 12 V P-P. This squarewave output has an odd harmonic content; which is reduced by a low-pass filter consisting of C774, C776, C778, and L776. The resulting fundamental is about 6 V P-P in amplitude and is applied through the AMPLITUDE control (S35) to amplifier U780. U780, with its emitter

followers Q780 and Q785, has a gain of about 2.2. The output is ac coupled through C786 and protected from shorts by R786. This output can provide at least +12 dBm of signal into a 600 ohm load.

3.2.19 Power Supplies

Filtered dc is provided by two full-wave rectifiers CR920 and CR922 and filter capacitors C924 and C926. The line transformer may be connected to operate on 100, 120, 220, or 240 V ac at 48 to 440 Hz.

The -20 V reference supply has input amplifier U820 configured in such a way as to bias its reference zener VR826 with the regulated output (see Fig. 3-16). R845 accommodates the zener tolerance to allow setting -20 V at TP848. The ic amplifier U820 is also provided with regulated voltage through R840. The output level of U820 is shifted in level by Q830 to drive the input of a pair of emitter followers Q840, Q950.

Current through Q950 is sensed by transistor Q835 across R846. Maximum load current is about 250 mA when the output is -20 V, but short circuit current is limited to about 60 mA due to the drop across R838. This is referred to as current foldback, and is shown graphically in Fig. 3-17.

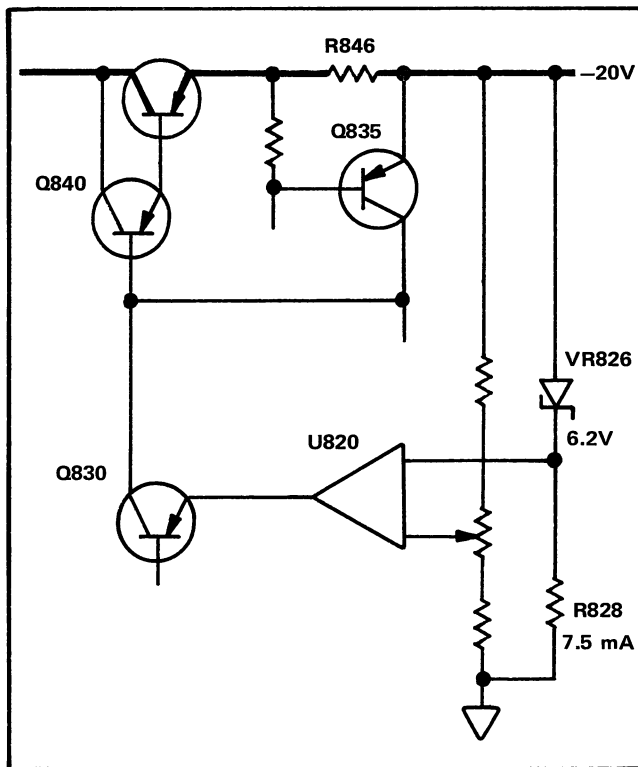


Fig. 3-16. Power supply (simplified diagram).

The instrument power is obtained from a -20 V supply and a +15 V supply. The +15 V regulator is similar to the -20 V regulator circuit except for the voltage reference diode. The +15 V instead receives reference voltage from R822 which causes the amplifier to generate a balancing current through R814.

3.3 CALIBRATION

3.3.1 Introduction

This section provides adjustment and check information that will calibrate the instrument to specifications. The procedure is written so parts or all of the procedure can be used to recalibrate an instrument. After calibration, the circuit or instrument should meet the requirements of the applicable Performance Check steps in Section 2.

Recalibration is usually necessary only after a component has been replaced or the instrument has been operating for a number of hours. We advise checking the performance and recalibrate only those circuits that do not meet specifications. Turn to the desired step within this procedure and prepare the instrument for calibration by referring to the preceding setup and control instructions, then adjust or calibrate as directed. Verify performance after recalibration.

3.3.2 History Information

The instrument and manual are periodically evaluated and updated. If modifications require changes in the calibration procedure, history information applicable to earlier instruments is included, either as a deviation within a step, or, as a subpart to a step.

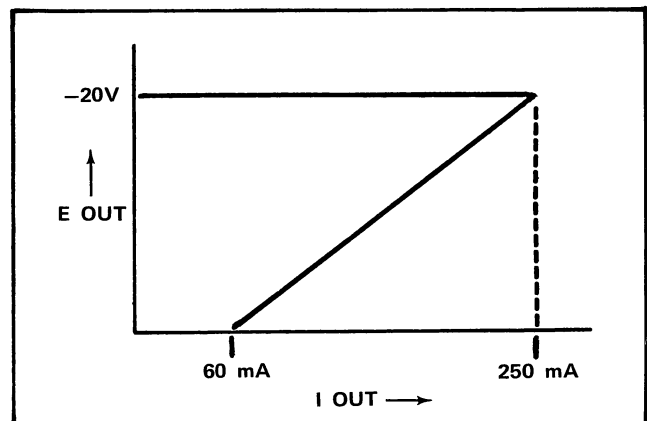


Fig. 3-17. Approximate current foldback characteristics.

Service Information—1405

3.3.3 Preliminary Notes

1. Prior to calibration, the instrument should be cleaned and all front panel controls checked for smooth operation and proper indexing.
2. Turn the power ON and allow at least thirty minutes for the instrument to stabilize.
3. Remove the top and bottom covers by turning the four fasteners on each 1/4 turn counterclockwise.
4. Calibration should be performed within an ambient temperature of +20°C to +30°C.
5. Note that the adjustment and test point locations are on a pull-out page at the end of section 6. Also included are brief notes intended to aid the experienced calibrator.
6. All measurements are assumed to be referenced to ground. Note that there is a convenient ground test point on each circuit board, as indicated on the adjustment and test point locations page.
7. Where a probe is used with the test oscilloscope, its attenuation factor is included in the sensitivity mentioned.

3.3.4 Equipment Required

TYPE	MINIMUM USE REQUIREMENT
Multimeter	Measure +15 V and -20 V DC with accuracy better than ± 0.1 V.
Variable line voltage transformer	Adjust power line voltage -10%.
Test oscilloscope	$\pm 3\%$ amplitude and time base.
Pulse Generator	± 5 V pulses with adjustable width, period and offset.
Spectrum analyzer in mainframe	7L12 or 7L13.
Offset Oscillator	Nominal 100 MHz; 1.5 V into 50 Ω .
Mixer	At least dc-500 MHz at I port.
600 Ω terminator	Tektronix Part No. 011-0092-00.

3.3.5 Procedure

See adjustment and test point locations (bottom).

1. Adjust -20 V Power Supply

- a. Turn the 1405 on and connect a multimeter between the -20 V supply (TP848) and ground.
- b. Adjust R845 if necessary for $-20 \text{ V} \pm 0.1 \text{ V}$.

2. Check +15 V Power Supply

With the multimeter, check for $+15 \text{ V} \pm 0.4 \text{ V}$ between TP815 and ground. If necessary, R845 can be adjusted slightly, within the tolerance of the -20 V supply, to bring the +15 V supply into tolerance.

3. Check Power Supply Regulation at Low Line Voltage

- a. Connect a probe from the test oscilloscope to TP848. AC-couple the test oscilloscope input, set its vertical sensitivity to about 50 mV/DIV and its sweep speed to about 5 ms/DIV.
- b. Slowly reduce the 1405 line voltage with the line voltage transformer, and note the point at which the power supply starts to go out of regulation (should be more than 10% below nominal line voltage).
- c. Return the 1405 line voltage to its nominal value.

d. Move the test oscilloscope probe to TP815, and repeat the preceding procedure.

4. Adjust Sync Generator

- a. Connect the test oscilloscope probe to TP546. Set oscilloscope vertical sensitivity to 1 V/DIV, sweep speed to 2 $\mu\text{s}/\text{DIV}$, and trigger to internal, minus slope. Set the 1405 SYNC switch to ON.
- b. Adjust R500 for a blanking time of $10.8 \mu\text{s} \pm 0.6 \mu\text{s}$ (NTSC instruments), measured at 50% points at the waveform. (For 1405 Option 1, adjust R500 for $12.05 \mu\text{s} \pm 0.25 \mu\text{s}$.)
- c. Change the test oscilloscope sweep speed to 10 $\mu\text{s}/\text{Div}$, and adjust R505 for a waveform period of $63.5 \mu\text{s} \pm 1.5 \mu\text{s}$ for NTSC instruments ($64.0 \mu\text{s} \pm 1.5 \mu\text{s}$ for 1405 Option 1).

5. Check Sync Pulse

a. Connect the 1405 rear panel VIDEO OUTPUT to the input of the test oscilloscope. Set the vertical sensitivity to 20 mV/DIV and internally trigger on the negative-going slope. Set the TIME/DIV switch to 0.5 μ s/DIV. Set the 1405 APL switch to 100.

b. Check for a "front porch" delay from blanking start to sync start of 1.27 μ s to 2.54 μ s for NTSC instruments (1.55 μ s \pm 0.25 μ s for 1405 Option 1).

c. Change sweep speed to 1 μ s/DIV and check for a sync duration of 4.19 μ s to 5.7 μ s for NTSC instruments (4.7 μ s \pm 0.2 μ s for 1405 Option 1).

d. Turn the SYNC switch off and check at TP546 for a dc level of greater than +3.5 V.

6. Check External Blanking

a. With test oscilloscope still connected to TP546 and the 1405 SYNC switch OFF, connect a pulse generator to the rear panel EXT BLANK IN connector.

b. Adjust the pulse generator for a -5 V pulse approximately 10 μ s wide, with a period of approximately 65 μ s (refer to Fig. 3-18).

c. Check at TP546 for a similar pulse (but shifted in level to between about 3.66 V and -0.1 V).

d. Readjust the pulse generator to output at -2.5 V pulse with +2.5 V offset, approximately 50 μ s wide, with a period of approximately 40 ms (refer to Fig. 3-19).

e. Check for an inverted pulse at TP546.

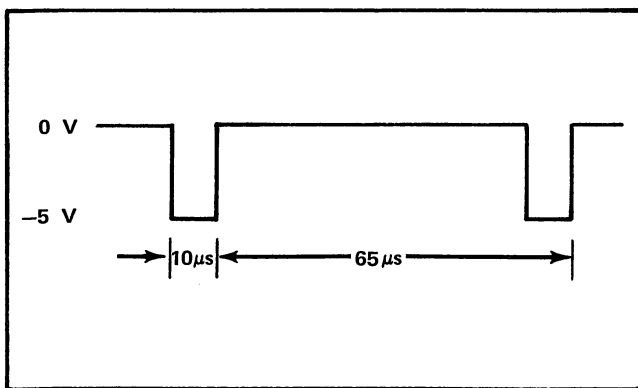


Fig. 3-18. Pulse generator adjustment for Step 6b.

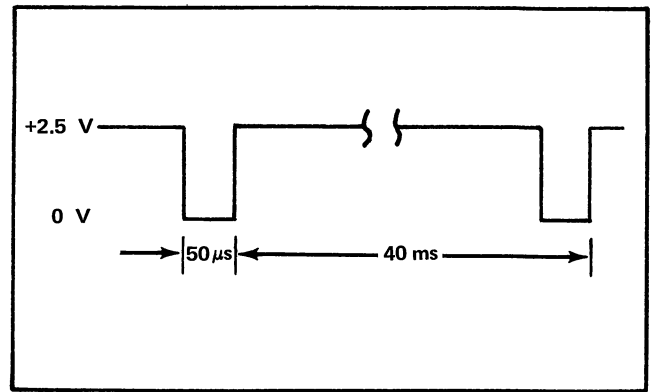


Fig. 3-19 Pulse generator setup for Step 6d.

7. Adjust Line Strobe Operation

a. With the pulse generator still connected as in the previous step, connect a cable between the VIDEO OUT connector and the test oscilloscope input. Set the AMPLITUDE control to 100.

b. Adjust R160 for a stable amplitude cw burst on the test oscilloscope, of about the same amplitude as when the SYNC is switched on momentarily. R160 is located on the bottom circuit board.

8. Adjust Z-Axis Output Amplifier

a. Switch the SYNC and marker INTENSITY controls to OFF, and connect the test oscilloscope to the Z-AXIS OUT connector on the 1405 rear panel. Adjust the test oscilloscope for a free-running trace with a vertical sensitivity of about 50 mV/DIV.

b. Adjust R735 for 0 V \pm 0.2 V on the Z-AXIS OUTPUT connector.

c. Reduce the test oscilloscope vertical sensitivity to about 2 V/DIV, switch the 1405 SYNC switch ON, and check for a 9 V pulse that is about 10.8 μ s wide.

d. Set the height of the display to 6 divisions with the test oscilloscope variable control.

e. Load the Z-Axis OUTPUT signal with a 600 Ω BNC terminator, and check that the display on the test oscilloscope drops to about five divisions.

f. Reset the variable control to its calibrated position, and disconnect the terminator and cable between the 1405 and test oscilloscope.

Service Information—1405

9. Check Marker Width

NOTE

If this step can be performed satisfactorily, Step 10 can be omitted. Step 10 is necessary only if radical misadjustment or difficulty is encountered.

a. Push all MARKER buttons in, set the WIDTH and INTEN controls to midrange, and adjust the spectrum analyzer FREQ SPAN/DIV and FREQ controls as necessary to display the markers across the screen.

b. Readjust the 1405 INTEN and WIDTH controls and the oscilloscope INTENSITY controls as necessary to display the widest possible distinct markers, and check that the markers are of equal width. If necessary, the individual oscillators can be adjusted slightly to equalize the marker width (refer to Step 10.)

10. Adjust Marker Oscillators

Refer to NOTE, Step 9.

a. Set the marker INTENSITY controls to midrange and connect the probe from the test oscilloscope to TP574. Set the test oscilloscope vertical sensitivity to 0.2 V/DIV, ac-coupled.

b. Turn on the first marker oscillator only, and adjust R565 for 1 V \pm 0.1 V P-P. Turn off the marker oscillator.

c. In the same manner, move the test oscilloscope probe to the following test point (as indicated in TABLE 3-1), turn on the next marker only, and adjust for 1 V P-P.

TABLE 3-1

Marker Frequency (NTSC)	Test Point	Adjust
0.75	TP574	R565
1.25	TP594	R585
	TP614	R605 Only if a crystal has been installed in Y600 socket (one may be borrowed from another oscillator for checking the circuit).
3.58	TP634	R625
4.18	TP654	R645
4.75	TP684	R675

d. Equal oscillator amplitude will result in slightly unequal widths with all markers on. Markers wider than average can be reduced slightly in amplitude.

11. Aural Oscillator

a. Connect the test oscilloscope input probe to TP752 and adjust R745 for a 1 V \pm 0.1 V P-P signal.

b. Connect a cable from the 10.396 kHz OUT connector to the test oscilloscope input, set the 10.396 kHz AMPLITUDE control to maximum, and adjust the oscilloscope vertical sensitivity to 2 V/DIV. The display should be about six divisions.

c. Adjust L776 for maximum output. Optionally, if a low frequency spectrum analyzer is available, connect it to the output and adjust L776 for minimum third harmonic content.

d. Load the 10.396 kHz output with a 600 Ω terminator, and check for at least 8.75 V P-P (+12 dBm) maximum output.

Refer to adjustment and test point locations (top) while performing Steps 12 through 15.

12. Adjust CW Amplifier

a. Connect the spectrum analyzer 1st LO to the 1405 LO IN and adjust the spectrum analyzer for a free-running sweep. Set the SPAN/Div control to 0.2 MHz.

b. Set the 1405 AMPLITUDE control to any position other than CW ONLY, and switch the SYNC switch to OFF. Connect the test oscilloscope probe to TP130 and adjust the TRANSMITTER FREQUENCY dial to produce the maximum stable signal at TP130 (amplitude approximately 0.22 V P-P).

c. Adjust R195 for 0.22 V P-P at TP130.

d. Move the test oscilloscope probe to TP166 and adjust R155 for 2.86 V P-P.

NOTE

R155 sets the overall accuracy of the output at 100 IRE. If equipment is available with sufficient accuracy, perform the following:

Terminate the VIDEO OUT with 75 Ω \pm 0.1%, then adjust R155 for an output voltage of 0.714 V P-P \pm 1%.

e. Disconnect the test oscilloscope probe, and disconnect the 1st LO from the 1405. Set the SYNC switch to ON and the AMPLITUDE control to CW ONLY. Connect a cable from the test oscilloscope vertical input to the VIDEO OUT connector, and trigger the test oscilloscope externally from the Z-AXIS OUT connector.

f. Adjust R170 and R175 for minimum aberration on the VIDEO OUT waveform (these adjustments interact; repeat several times). These adjustments are very critical and vary somewhat with temperature. Best results are obtained if the covers are installed for 15 minutes or more before making the final adjustment.

g. Connect the oscilloscope probe to TP160 and note the effect of adjusting R185. The pulse transition is from about -2 V to -3.6 V. Set R185 so that the negative-going transition time is between the fastest, and the start of the rise. This produces a negative-going transition time of about 5 μ s (refer to Fig. 3-20).

13. Adjust APL

a. Adjust uncal symmetry: connect the test oscilloscope probe to TP376. Set the APL switch to 60, then switch to 20 and adjust R365 for the same dc level. Repeat to reduce interaction.

b. Set uncal threshold: set the APL switch to 100 and the AMPLITUDE switch to 50. Connect the test oscilloscope probe to TP386 and adjust R380 for 0.15 to 0.2 V. Note that the APL UNCAL indicator is on.

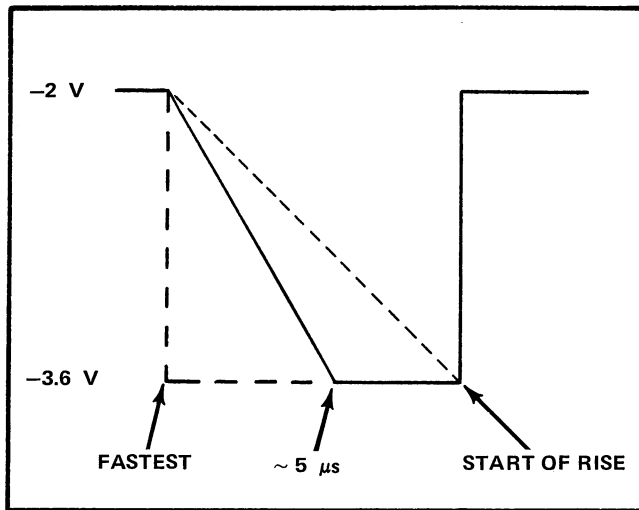


Fig. 3-20. R185 adjustment.

c. Note that the UNCAL indicator comes on with the combinations of AMPLITUDE and APL switch settings shown below:

APL	AMPLITUDE					
	100	90	80	70	60	50
100	X	X	X	X	X	X
90	X	X	X	X		
80	X	X				
70						
60						
50						
40						
30						
20						
10						
0	X	X				

d. Connect the test oscilloscope probe to TP320 and check that the top waveform level is about 0.35 V when the APL UNCAL indicator comes on.

14. Check APL Switch Settings

a. Switch the AMPLITUDE control to 0 and the APL switch to 80. With the SYNC ON and the test oscilloscope probe still connected to TP320, adjust the test oscilloscope vertical gain for eight divisions of display **above** the blank level. Each division, therefore, corresponds to 10 IRE.

b. Check the APL switch settings from 80 to 0 by noting that each step reduces the level one major division on the test oscilloscope.

c. Return the APL switch to 80 and reposition the top of the waveform 2 divisions below the top of the screen.

d. Switch the APL switch to 90 and 100, checking that the display advances one major division each time.

15. Adjust Sync and Blanking Gates and Amplifiers

a. Set the SYNC switch to ON, the APL switch to 100, and the AMPLITUDE control to 0.

b. Connect test oscilloscope probe to TP400, and adjust L402 and L404 for minimum overshoot and ringing on the sync pulse and blanking waveform.

c. Check the sync pulse for a 10-90% risetime of about 0.23 μ s.

Service Information—1405

d. Connect the test oscilloscope probe to TP430 and check for the same waveform, with an amplitude of about 2 V P-P.

e. Connect the test oscilloscope probe to TP470 and check for the same waveform, with an amplitude of about 4 V P-P.

f. With the probe still connected to TP470:

Adjust R420 for 1.15 V of sync amplitude;
Reduce APL to 50 and adjust R400 for 0 V at the end of the blanking pulse;

Return APL to 100 and adjust R325 for 4 V P-P amplitude (this corresponds to 1 V P-P at the VIDEO OUT connector when it is terminated by 75 Ω).

16. Check Video Outputs

a. Set the AMPLITUDE control to 100, the APL switch to 50, and the SYNC switch to ON. Connect a cable from the VIDEO OUT connector to the test oscilloscope, and check for a waveform of 2 V P-P (open circuited).

b. Move the cable to the VIDEO MONITOR OUT connector, and check for a similar signal.

17. Check Oscillator Tuning Frequency and Flatness

a. Connect the test set-up as shown in Fig. 3-21, with the instrument controls set as follows:

Offset Oscillator

Output Frequency	1.5 V P-P (into 50 Ω) between about 90 MHz and 100 MHz
------------------	---

Spectrum Analyzer

Frequency	Tuned to offset oscillator frequency
TIME/DIV	2 ms/DIV
Triggering	free run
REFERENCE LEVEL	-20 dBm
Display	LOG 10 dB/DIV
FREQ SPAN/DIV	10 MHz/DIV

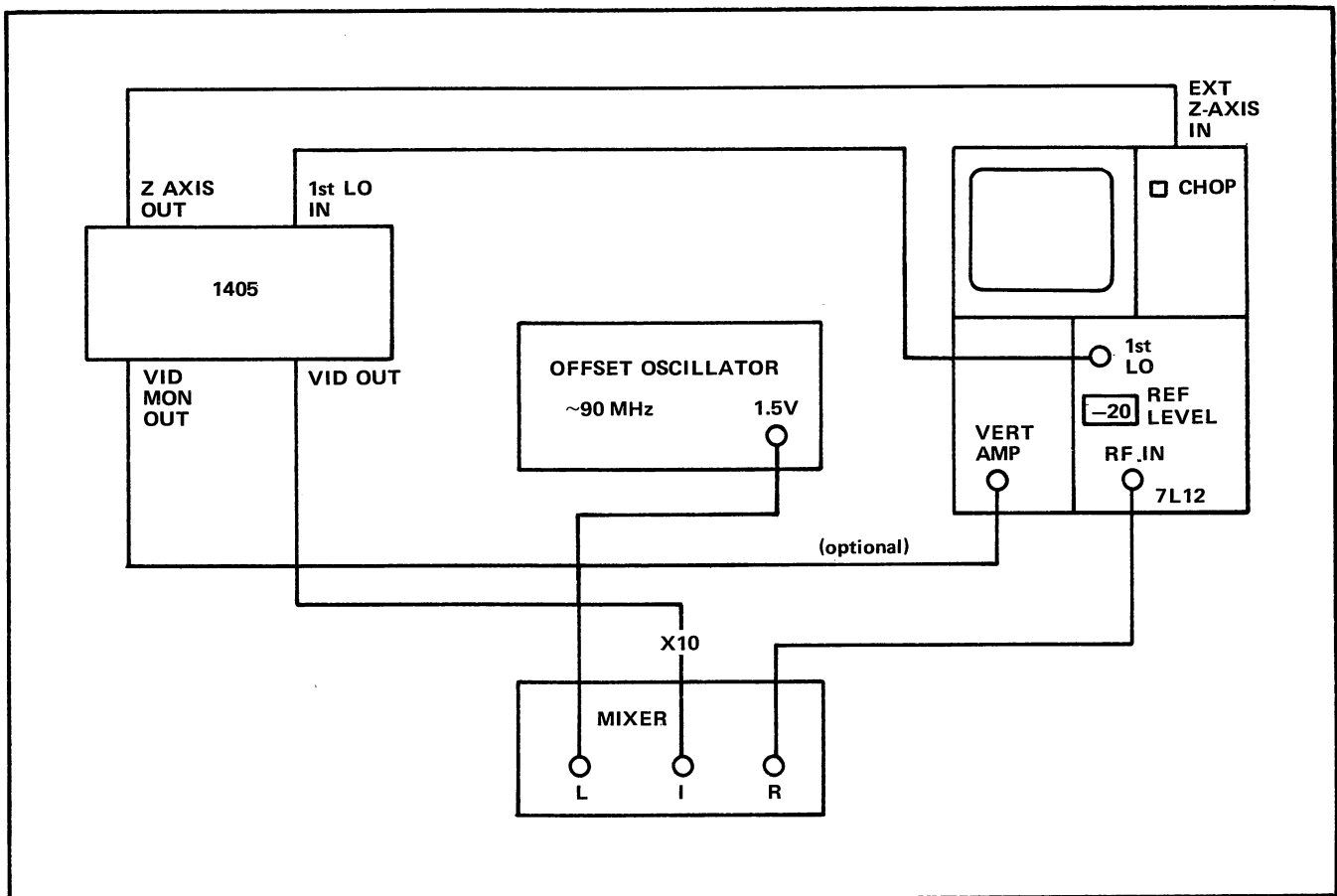


Fig. 3-21. Test setup for Step 17.

1405

TRANSMITTER FREQUENCY	Tuned to offset oscillator (and spectrum analyzer) frequency
AMPLITUDE	100 IRE
SYNC	OFF
MARKER INTEN	OFF

b. Adjust the 1405 FINE frequency control for maximum signal, then readjust the spectrum analyzer as necessary and check for display flatness within ± 0.2 dB from 0.1 MHz to 10 MHz.

c. Check to see that the 1405 TRANSMITTER FREQUENCY dial reading is within 20 MHz of the offset oscillator frequency (note that the accuracy of the frequency reading must be known in order to perform this step).

3.4 MAINTENANCE NOTES

3.4.1 Changing Marker Crystals

If a marker crystal is changed, check the oscillator by turning it off and back on. Some crystals may restart at the third harmonic; this is corrected by the selective addition of a 10 pF capacitor from the collector of the crystal drive transistor to ground. Refer to the schematic and parts list and install (or remove) the capacitor as necessary. Pads are provided on the etched circuit board for installation of the capacitors.

3.4.2 Changing Pilot Light

WARNING

Disconnect the power cord from the instrument before performing the following procedure.

To gain access to the pilot light, remove the green rocker button on the ON/OFF switch. This is accomplished by carefully prying out at the top and bottom of the button with two small, flat-bladed screwdrivers. Use care not to damage the button or the front panel. After the button is removed, the bulb can be removed in a similar way, working it back and forth until it pops out of its mounting clip. The new bulb can be installed by simply pressing it into the socket; 1/4 to 1/2 turn will ensure proper seating. Set the switch to the ON position and connect power momentarily to check that the clip holds the bulb securely and that the bulb lights, then replace the green rocker button.

3.4.3 Changing Nominal Line Voltage

The power transformer is connected for the proper nominal line voltage by jumper runs on the plug-in etched circuit board located just below the fuse. To change the instrument for a different nominal supply voltage, insert any appropriate small tool into the hole in the board, pull out the board, and reinsert it with the desired nominal voltage in the readable position. Be sure the correct fuse is installed. See Electrical Parts List for correct fuse values.

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
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

OPTIONS

4.1 OPTION 1

4.1.1 Description

The 1405 Option 1 is used with PAL television systems. Features and operation are the same as the NTSC instrument except that the sync rate, blanking time, marker frequencies, and aural oscillator frequency are different as required by the PAL system (see Specifications, Section 4.1.2).

The 1405 Option 1 differs mechanically from the 1405 in that the front panel reflects the changes noted below, and the dial tape does not include the US television channel numbers.

NOTE

Option 1 instruments are connected for a nominal power line voltage of 240 V. Refer to Section 3.4.3 to change the nominal line voltage.

4.1.2 Specifications

Except as noted below, all specifications for the 1405 also apply to the Option 1.

Horizontal Sync and Blanking Duration

Blanking Time: $12.05 \mu\text{s} \pm 0.25 \mu\text{s}$, internally adjustable

Sync Rate: $64 \mu\text{s} \pm 1.5 \mu\text{s}$, internally adjustable.

Sync Pulse Length: $4.7 \mu\text{s} \pm 0.2 \mu\text{s}$.

Front Porch: $1.55 \mu\text{s} \pm 0.25 \mu\text{s}$.

Markers and Z-Axis Output

Marker Frequencies: 0.75 MHz, 1.25 MHz, 1.75 MHz, 2.25 MHz, 4.43 MHz, 5.0 MHz, 5.5 MHz, 5.75 MHz, 6.25 MHz. Some crystals are installed and all may be relocated as explained in Marker Crystal Installation, Section 4.1.3, below.

Aural Output

Output Frequency: $9.058 \text{ kHz} \pm 0.01\%$ (crystal controlled). See Operation, Section 4.1.4.

4.1.3 Marker Crystal Installation

Because of the various international standards, the 1405 Option 1 is shipped with the marker crystals installed as indicated in Table 4-1. The remaining crystals are shipped with the unit. Any combination of crystals may be installed; Table 4-1 lists those desirable for the different systems.

To install or change the crystals, remove the bottom cover (refer to Service Information, section 3) and plug the crystals in the sockets indicated in Table 4-1. Crystal circuit numbers are printed on the circuit board. Change the pushbutton caps as appropriate by pulling them straight out, and pushing on the new caps.

TABLE 4-1

Marker Crystals (Frequencies in MHz)

	Installed when shipped	Frequencies Used in			Installed in this unit (write in)
		System B	System G	System I	
Y560	0.75	0.75	0.75	1.25	
Y580	1.25	1.25	2.25	1.75	
Y600	2.25				
Y620	4.43	4.43	4.43	4.43	
Y640	5.0	5.0	5.0	5.5	
Y670	5.75	5.75	5.75	6.25	

4.1.4 Operation

Aural Modulation Monitor Calibration—The basic technique is the same as described in the manual EXCEPT that the output frequency is **9.058 kHz**, and the level should be adjusted for the **second** carrier null, for frequency modulation limits of $\pm 50 \text{ kHz}$.



REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

ITEM NAME

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

ABBREVIATIONS

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

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P. O. BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
01807	PETERSEN RADIO CO., INC.	2800 WEST BROADWAY	COUNCIL BLUFFS, IA 51501
04713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
05245	CORCOM INC.	2635 N KILDARE AVENUE	CHICAGO, IL 60639
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172
11237	CTS KEENE, INC.		PASO ROBLES, CA 93446
13571	ELECTRONIC RESEARCH CO.	P. O. BOX 913	SHAWNEE MISSION, KS 66201
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR PRODUCTS GROUP	P.O. BOX 600, 600 W. JOHN ST.	HICKSVILLE, NY 11802
15818	TELEDYNE SEMICONDUCTOR	1300 TERRA BELLA AVE.	MOUNTAIN VIEW, CA 94043
18203	ENGELMANN MICROWAVE CO.	SKYLINE DRIVE	MONTVILLE, NJ 07045
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SAN YSIDRO WAY	SANTA CLARA, CA 95051
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
32436	SYSCON INTERNATIONAL, INC.	205 SYCAMORE ST.	SOUTH BEND, IN 46622
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
34371	HARRIS SEMICONDUCTOR, DIV. OF HARRIS CORPORATION	P. O. BOX 883	MELBOURNE, FL 32901
50522	MONSANTO CO., ELECTRONIC SPECIAL PRODUCTS	3400 HILLVIEW AVENUE	PALO ALTO, CA 94304
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW- EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
71744	CHICAGO MINIATURE LAMP WORKS	4433 RAVENSWOOD AVE.	CHICAGO, IL 60640
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75378	CTS KNIGHTS, INC.	222 REIMANN AVE.	SANDWICH, IL 60548
79727	C-W INDUSTRIES	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97005
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
82104	STANDARD GRIGSBY CO., DIV. OF SUN CHEMICAL CORP.	920 RATHBONE AVE.	AURORA, IL 60507
84411	TRW ELECTRONIC COMPONENTS, TRW CAPACITORS	112 W. FIRST ST.	OGALLALA, NB 69153
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY CO., INC.	3029 E. WASHINGTON ST.	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601
93790	CORNELL-DUBLIER, ELECTRONICS DIVISION FEDERAL PACIFIC ELECTRIC CORP.	1605 RODNEY FRENCH BLVD.	NEW BEDFORD, MA 02741

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont			
A30	119-0792-00			OSCILLATOR, RF: 2.09-3.1GHZ	18203	CC-A01-A84
A35	119-0796-00			ATTENUATOR: 20DB, 2-3.1GHZ	18203	CC-A01-A84
A40	119-0816-00			MIXER UNIT, RF: DOUBLE BALANCE, 2-3GHZ INPUT	80009	119-0816-00
A100	670-4422-00			CKT BOARD ASSY: COMPOSITE VIDEO	80009	670-4422-00
A500	670-4424-00			CKT BOARD ASSY: MARKERS AND Z AXIS	80009	670-4424-00
A920	670-4425-00			CKT BOARD ASSY: FILTERED D.C.	80009	670-4425-00
C100	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C102	290-0536-00			CAP., FXD, ELCTLT: 10UF, 20%, 25V	90201	TDC106M025FL
C103	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C106	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C107	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C110	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C114	281-0504-00			CAP., FXD, CER DI: 10PF, +/-1PF, 500V	72982	301-055COG0100F
C120	281-0504-00			CAP., FXD, CER DI: 10PF, +/-1PF, 500V	72982	301-055COG0100F
C124	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N058 E103M
C128	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C130	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C132	281-0579-00			CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050COG0210J
C134	281-0592-00			CAP., FXD, CER DI: 4.7PF, +/-0.5PF, 500V	72982	301-023COH0479D
C138	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C140	283-0249-00			CAP., FXD, CER DI: 0.068UF, 10%, 50V	72982	8131N075 C 683K
C142	281-0504-00			CAP., FXD, CER DI: 10PF, +/-1PF, 500V	72982	301-055COG0100F
C156	281-0513-00			CAP., FXD, CER DI: 27PF, +/-5.4PF, 500V	72982	301-000P2G0270M
C160	283-0041-00			CAP., FXD, CER DI: 0.0033UF, 5%, 500V	72982	841-541B332J
C164	283-0041-00			CAP., FXD, CER DI: 0.0033UF, 5%, 500V	72982	841-541B332J
C174	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N058 E103M
C194	283-0067-00			CAP., FXD, CER DI: 0.001UF, 10%, 200V	72982	835-515B102K
C196	281-0579-00			CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050COG0210J
C206	281-0627-00			CAP., FXD, CER DI: 1PF, +/-0.25PF, 500V	72982	301-000COK0109C
C208	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N058 E103M
C210	281-0504-00			CAP., FXD, CER DI: 10PF, +/-1PF, 500V	72982	301-055COG0100F
C212	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C216	283-0059-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	72982	8141N037Z5U0105Z
C222	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C224	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N058 E103M
C228	281-0579-00			CAP., FXD, CER DI: 21PF, 5%, 500V	72982	301-050COG0210J
C236	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C238	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C240	281-0503-00			CAP., FXD, CER DI: 8PF, +/-0.5PF, 500V	72982	301-000COH0809D
C244	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N058 E103M
C248	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C298	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C338	283-0024-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 30V	72982	814N039-E-104Z
C400	283-0659-00			CAP., FXD, MICA D: 1160PF, 2%, 500V	00853	D195C1161G0
C402	283-0630-00			CAP., FXD, MICA D: 110PF, 1%, 100V	00853	D151E111F0
C404	283-0660-00			CAP., FXD, MICA D: 510PF, 2%, 500V	00853	D155F511G0
C406	283-0672-00			CAP., FXD, MICA D: 200PF, 1%, 500V	00853	D155F201F0
C412	283-0672-00			CAP., FXD, MICA D: 200PF, 1%, 500V	00853	D155F201F0
C422	281-0577-00			CAP., FXD, CER DI: 14PF, 5%, 500V	72982	301-050COG0140J
C424	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N058 E103M
C428	281-0564-00			CAP., FXD, CER DI: 24PF, 5%, 500V	72982	301-000COG0240J
C436	281-0658-00			CAP., FXD, CER DI: 6.2PF, +/-0.25PF, 500V	72982	301-000COH0629C

Replaceable Electrical Parts—1405

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C444	281-0503-00		CAP.,FXD,CER DI:8PF,+/-0.5PF,500V	72982	301-000COH0809D
C456	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C458	281-0562-00		CAP.,FXD,CER DI:39PF,10%,500V	72982	301-000U2J0390K
C460	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C462	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C468	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C474	281-0564-00		CAP.,FXD,CER DI:24PF,5%,500V	72982	301-000COG0240J
C504	283-0593-00		CAP.,FXD,MICA D:0.01UF,1%,100V	00853	D301F103F0
C506	283-0059-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C508	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C512	281-0500-00		CAP.,FXD,CER DI:2.2PF,+/-0.5PF,500V	72982	301-000C0J0229D
C518	283-0696-00		CAP.,FXD,MICA DI:2300PF,1%,500V	93790	CD19ED232F03
C564	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C566	283-0080-00		CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C572	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C574	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C584	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C586	283-0080-00		CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C592	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C594	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C604	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C606	283-0080-00		CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C612	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C614	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C623	281-0579-00		CAP.,FXD,CER DI:21PF,5%,500V	72982	301-050COG0210J
C624	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C626	283-0080-00		CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C632	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C634	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C644	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C646	283-0080-00		CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C652	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C654	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C660	283-0081-00		CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C674	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C676	283-0080-00		CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C682	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C684	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C686	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C690	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C692	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C694	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C696	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C698	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C700	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C702	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C708	281-0562-00		CAP.,FXD,CER DI:39PF,10%,500V	72982	301-000U2J0390K
C712	283-0041-00		CAP.,FXD,CER DI:0.0033UF,5%,500V	72982	841-541B332J
C714	283-0010-00		CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C726	283-0010-00		CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C738	281-0500-00		CAP.,FXD,CER DI:2.2PF,+/-0.5PF,500V	72982	301-000C0J0229D
C742	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C748	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C752	283-0204-00		CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M

Ckt No.	Tektronix	Serial/Model No.		Name & Description	Mfr	
	Part No.	Eff	Dscont		Code	Mfr Part Number
C756	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C760	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C766	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C772	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C774	285-0683-00			CAP.,FXD,PLSTC:0.022UF,5%,100V	56289	410P22351
C776	285-0651-01			CAP.,FXD,MICA DI:1700PF,5%,100V	84411	TEK-44-17251
C778	285-0683-00			CAP.,FXD,PLSTC:0.022UF,5%,100V	56289	410P22351
C780	281-0519-00			CAP.,FXD,CER DI:47PF,+/-4.7PF,500V	72982	308-000C0G0470K
C782	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C784	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C786	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C800	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C810	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C812	281-0519-00			CAP.,FXD,CER DI:47PF,+/-4.7PF,500V	72982	308-000C0G0470K
C814	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C816	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C820	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C822	281-0516-00			CAP.,FXD,CER DI:39PF,+/-3.9PF,500V	72982	301-000U2J0390K
C826	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C830	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C834	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C840	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058 E103M
C848	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C880	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C882	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C884	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C890	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C892	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C894	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	814N039-E-104Z
C898	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C924	290-0585-00			CAP.,FXD,ELCTLT:350UF,+75-10%,75V	90201	20-36095
C926	290-0585-00			CAP.,FXD,ELCTLT:350UF,+75-10%,75V	90201	20-36095
CR140	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR150	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR152	152-0322-00			SEMICONV DEVICE:SILICON,15V,HOT CARRIER	28480	5082-2672
CR154	152-0322-00			SEMICONV DEVICE:SILICON,15V,HOT CARRIER	28480	5082-2672
CR160	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR162	152-0322-00			SEMICONV DEVICE:SILICON,15V,HOT CARRIER	28480	5082-2672
CR164	152-0322-00			SEMICONV DEVICE:SILICON,15V,HOT CARRIER	28480	5082-2672
CR170	152-0153-00			SEMICONV DEVICE:SILICON,15V,50MA	07263	FD7003
CR172	152-0153-00			SEMICONV DEVICE:SILICON,15V,50MA	07263	FD7003
CR174	152-0153-00			SEMICONV DEVICE:SILICON,15V,50MA	07263	FD7003
CR176	152-0153-00			SEMICONV DEVICE:SILICON,15V,50MA	07263	FD7003
CR232	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR242	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR324	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR360	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR362	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR386	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR388	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR394	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR452	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152

Replaceable Electrical Parts—1405

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
CR456	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR514	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR525	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR532	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR534	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR536	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR538	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR540	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR570	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR590	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR610	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR630	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR650	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR680	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR720	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR730	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR732	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR762	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR920	152-0585-00			SEMICON D DEVICE: SILICON, BRIDGE, 75V, 75MA	14936	W02M
CR922	152-0585-00			SEMICON D DEVICE: SILICON, BRIDGE, 75V, 75MA	14936	W02M
DS50	150-0181-00			LAMP, INCAND: 0.08A, 14V	71744	CM8362
DS80	150-1014-00			LAMP, LED: RED, 50MA	50522	MU5054-1
F910	159-0029-00			FUSE, CARTRIDGE: 0.3A, 3AG, 100-120V, SLO-BLOW	71400	MDL3/10
F910	159-0054-00			FUSE, CARTRIDGE: 0.15A, 3AG, 220-240V, SLO-BLOW	71400	MDL 15/100
L100	108-0597-00			COIL, RF: TOROIDAL, 425UH	80009	108-0597-00
L402	114-0233-00			COIL, RF: 8.5 TO 15.5UF	80009	114-0233-00
L404	114-0257-00			COIL, RF: 6-11UF	80009	114-0257-00
L540	108-0214-00			COIL, RF: 400UF	80009	108-0214-00
L776	114-0176-00			COIL, RF: 10-40MH, SHIELDED	32436	5E-003-2
Q115	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q118	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q120	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q130	151-1006-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	15818	U1491
Q140	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q145	151-1004-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1004-00
Q160	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q170	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q180	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q190	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q195	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q200	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q205	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q210	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q215	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q220	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q235	151-0160-00			TRANSISTOR: SILICON, NPN	80009	151-0160-00
Q240	151-0285-00			TRANSISTOR: SILICON, PNP	80009	151-0285-00
Q300	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q305	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q310	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q315	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q320	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906
Q325	151-0188-00			TRANSISTOR: SILICON, PNP	01295	2N3906

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr	
					Code	Mfr Part Number
Q380	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q390	151-1045-00			TRANSISTOR:SILICON,JFE,P-CHANNEL	80009	151-1045-00
Q400	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q410	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q420	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q425	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q430	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q440	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q445	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q460	151-0160-00			TRANSISTOR:SILICON,NPN	80009	151-0160-00
Q465	151-0285-00			TRANSISTOR:SILICON,PNP	80009	151-0285-00
Q510	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q535	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q540	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q545	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q560	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q565	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q570	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q580	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q585	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q590	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q600	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q605	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q610	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q620	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q625	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q630	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q640	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q645	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q650	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q660	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q670	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q675	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q680	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q710	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q720	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q740	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q745	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q750	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q760	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q770	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q780	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q785	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q800	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q805	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q810	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q830	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q835	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q840	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q950	151-0324-00			TRANSISTOR:SILICON,PNP	80009	151-0324-00
Q955	151-0323-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE521	80009	151-0323-00
R5	311-1044-00			RES.,VAR, NONWIR:50K OHM,20%,0.50W	01121	W-7542A

Replaceable Electrical Parts—1405

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R10	311-1044-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	01121	W-7542A
R15	311-1044-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	01121	W-7542A
R20	311-1729-00		RES.,VAR, WW:10K OHM,5%,2W	32997	3540S-561-103
R35	311-1424-00		RES.,VAR, NONWIR:10K OHM,10%,0.75W	11237	VA305-6P1026
R50	311-0771-00		RES.,VAR, NONWIR:1K OHM,20%,0.50W	71590	BA162-005
R55	311-0608-00		RES.,VAR, NONWIR:2K OHM,10%,0.75W	01121	W8156
R90	311-0580-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	11237	300SF-41695
R100	315-0620-00		RES.,FXD, CMPSN:62 OHM,5%,0.25W	01121	CB6205
R102	315-0472-00		RES.,FXD, CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R103	315-0220-00		RES.,FXD, CMPSN:22 OHM,5%,0.25W	01121	CB2205
R104	315-0133-00		RES.,FXD, CMPSN:13K OHM,5%,0.25W	01121	CB1335
R106	315-0201-00		RES.,FXD, CMPSN:200 OHM,5%,0.25W	01121	CB2015
R107	315-0220-00		RES.,FXD, CMPSN:22 OHM,5%,0.25W	01121	CB2205
R108	315-0680-00		RES.,FXD, CMPSN:68 OHM,5%,0.25W	01121	CB6805
R110	315-0102-00		RES.,FXD, CMPSN:1K OHM,5%,0.25W	01121	CB1025
R112	315-0102-00		RES.,FXD, CMPSN:1K OHM,5%,0.25W	01121	CB1025
R114	315-0391-00		RES.,FXD, CMPSN:390 OHM,5%,0.25W	01121	CB3915
R116	315-0510-00		RES.,FXD, CMPSN:51 OHM,5%,0.25W	01121	CB5105
R118	315-0102-00		RES.,FXD, CMPSN:1K OHM,5%,0.25W	01121	CB1025
R120	315-0510-00		RES.,FXD, CMPSN:51 OHM,5%,0.25W	01121	CB5105
R122	315-0103-00		RES.,FXD, CMPSN:10K OHM,5%,0.25W	01121	CB1035
R124	315-0512-00		RES.,FXD, CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R126	315-0510-00		RES.,FXD, CMPSN:51 OHM,5%,0.25W	01121	CB5105
R128	315-0330-00		RES.,FXD, CMPSN:33 OHM,5%,0.25W	01121	CB3305
R130	315-0122-00		RES.,FXD, CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R132	315-0122-00		RES.,FXD, CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R134	315-0104-00		RES.,FXD, CMPSN:100K OHM,5%,0.25W	01121	CB1045
R136	315-0302-00		RES.,FXD, CMPSN:3K OHM,5%,0.25W	01121	CB3025
R138	315-0102-00		RES.,FXD, CMPSN:1K OHM,5%,0.25W	01121	CB1025
R140	321-0331-00		RES.,FXD, FILM:27.4K OHM,1%,0.125W	91637	MFF1816G27401F
R142	315-0102-00		RES.,FXD, CMPSN:1K OHM,5%,0.25W	01121	CB1025
R144	315-0394-00		RES.,FXD, CMPSN:390K OHM,5%,0.25W	01121	CB3945
R146	315-0202-00		RES.,FXD, CMPSN:2K OHM,5%,0.25W	01121	CB2025
R148	321-0296-00		RES.,FXD, FILM:11.8K OHM,1%,0.125W	91637	MFF1816G11801F
R150	315-0113-00		RES.,FXD, CMPSN:11K OHM,5%,0.25W	01121	CB1135
R152	315-0104-00		RES.,FXD, CMPSN:100K OHM,5%,0.25W	01121	CB1045
R154	315-0622-00		RES.,FXD, CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R155	311-1562-00		RES.,VAR, NONWIR:2K OHM,20%,0.50W	73138	91A-20000M
R156	321-0231-00		RES.,FXD, FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
R158	315-0105-00		RES.,FXD, CMPSN:1M OHM,5%,0.25W	01121	CB1055
R160	311-1560-00		RES.,VAR, NONWIR:5K OHM,5%,0.50W	73138	91A-50000M
R162	315-0333-00		RES.,FXD, CMPSN:33K OHM,5%,0.25W	01121	CB3335
R164	315-0333-00		RES.,FXD, CMPSN:33K OHM,5%,0.25W	01121	CB3335
R166	315-0123-00		RES.,FXD, CMPSN:12K OHM,5%,0.25W	01121	CB1235
R168	315-0105-00		RES.,FXD, CMPSN:1M OHM,5%,0.25W	01121	CB1055
R170	311-1594-00		RES.,VAR, NONWIR:10 OHM,20%,0.50W	73138	91A-R10
R172	315-0161-00		RES.,FXD, CMPSN:160 OHM,5%,0.25W	01121	CB1615
R174	315-0162-00		RES.,FXD, CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R175	311-1594-00		RES.,VAR, NONWIR:10 OHM,20%,0.50W	73138	91A-R10
R180	315-0161-00		RES.,FXD, CMPSN:160 OHM,5%,0.25W	01121	CB1615
R182	315-0472-00		RES.,FXD, CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R184	315-0133-00		RES.,FXD, CMPSN:13K OHM,5%,0.25W	01121	CB1335
R185	311-1562-00		RES.,VAR, NONWIR:2K OHM,20%,0.50W	73138	91A-20000M

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number	
		Eff	Dscont				
R186	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525	
R190	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525	
R192	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R194	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R195	311-1567-00			RES.,VAR,NONWIR:100 OHM,20%,0.50W	73138	91A-100ROM	
R196	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215	
R198	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515	
R199	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925	
R200	315-0911-00			RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115	
R202	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005	
R204	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005	
R206	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325	
R208	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025	
R210	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215	
R212	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925	
R214	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005	
R216	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515	
R218	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R220	301-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.50W	01121	EB7515	
R222	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315	
R224	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R226	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815	
R228	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315	
R230	321-0124-00			RES.,FXD,FILM:191 OHM,1%,0.125W	91637	MFF1816G191ROF	
R232	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525	
R234	315-0300-00			RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005	
R236	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525	
R238	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005	
R239	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5	
R240	321-0128-00			RES.,FXD,FILM:210 OHM,1%,0.125W	91637	MFF1816G210ROF	
R242	315-0110-00			RES.,FXD,CMPSN:11 OHM,5%,0.25W	01121	CB1105	
R243	315-0300-00			RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005	
R244	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005	
R246	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035	
R248	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5	
R250	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F	
R252	321-0114-07			RES.,FXD,FILM:150 OHM,0.1%,0.125W	91637	MFF1816C150R0B	
R254	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R256	321-0095-00			RES.,FXD,FILM:95.3 OHM,1%,0.125W	91637	MFF1816G95R30F	
R258	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R260	321-0071-00			RES.,FXD,FILM:53.6 OHM,1%,0.125W	91637	MFF1816G53R60F	
R262	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R264	321-0038-00			RES.,FXD,FILM:24.3 OHM,1%,0.125W	91637	MFF1816G24R30F	
R266	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R268	307-0114-00			RES.,FXD,CMPSN:6.2 OHM,5%,0.25W	01121	CB62G5	
R270	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R272	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R274	307-0114-00			RES.,FXD,CMPSN:6.2 OHM,5%,0.25W	01121	CB62G5	
R276	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R278	321-0038-00			RES.,FXD,FILM:24.3 OHM,1%,0.125W	91637	MFF1816G24R30F	
R280	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	
R282	321-0071-00			RES.,FXD,FILM:53.6 OHM,1%,0.125W	91637	MFF1816G53R60F	
R284	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D	

Replaceable Electrical Parts—1405

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R286	321-0095-00			RES.,FXD,FILM:95.3 OHM,1%,0.125W	91637	MFF1816G95R30F
R288	321-0704-00			RES.,FXD,FILM:60 OHM,0.25%,0.125W	91637	MFF1816G60R00D
R290	321-0114-00			RES.,FXD,FILM:150 OHM,1%,0.125W	91637	MFF1816G150R0F
R292	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R294	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R296	315-0304-00			RES.,FXD,CMPSN:300K OHM,5%,0.25W	01121	CB3045
R298	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R300	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R302	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R304	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R310	315-0112-00			RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125
R312	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R314	321-0279-00			RES.,FXD,FILM:7.87K OHM,1%,0.125W	91637	MFF1816G78700F
R316	321-0285-00			RES.,FXD,FILM:9.09K OHM,1%,0.125W	91637	MFF1816G90900F
R318	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R320	321-0173-00			RES.,FXD,FILM:619 OHM,1%,0.125W	91637	MFF1816G619R0F
R322	321-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.125W	91637	MFF1816G13300F
R324	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R325	311-1565-00			RES.,VAR,NONWIR:250 OHM,20%,0.50W	73138	91A-250R0M
R326	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
R328	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R330	321-0211-00			RES.,FXD,FILM:1.54K OHM,1%,0.125W	91637	MFF1816G15400F
R332	321-0187-00			RES.,FXD,FILM:866 OHM,1%,0.125W	91637	MFF1816G866R0F
R334	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887R0F
R336	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887R0F
R337	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R338	321-0187-00			RES.,FXD,FILM:866 OHM,1%,0.125W	91637	MFF1816G866R0F
R339	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R340	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R342	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R344	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R346	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R348	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R350	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R352	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R354	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R356	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R358	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R360	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R362	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R364	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R365	311-1563-00			RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R366	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R370	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R372	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R374	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R376	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R378	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R380	311-1559-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	73138	91A-10001M
R382	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R384	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R386	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R388	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035

Replaceable Electrical Parts—1405

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R390	315-0332-00		RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R392	315-0562-00		RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R394	315-0205-00		RES.,FXD,CMPSN:2M OHM,5%,0.25W	01121	CB2055
R396	315-0132-00		RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
R398	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R400	311-1556-00		RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91A-50001M
R402	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R404	321-0108-00		RES.,FXD,FILM:130 OHM,1%,0.125W	91637	MFF1816G130R0F
R406	315-0510-00		RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R408	315-0622-00		RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R410	315-0431-00		RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R412	315-0511-00		RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R414	315-0181-00		RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R416	315-0510-00		RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R418	321-0143-00		RES.,FXD,FILM:301 OHM,1%,0.125W	91637	MFF1816G301R0F
R420	311-1566-00		RES.,VAR,NONWIR:200 OHM,20%,0.50W	73138	91A-200R0M
R421	315-0911-00		RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
R422	321-0155-00		RES.,FXD,FILM:402 OHM,1%,0.125W	91637	MFF1816G402R0F
R424	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R426	315-0680-00		RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
R428	315-0221-00		RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R430	315-0332-00		RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R432	301-0112-00		RES.,FXD,CMPSN:1.1K OHM,5%,0.50W	01121	EB1125
R434	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R436	315-0681-00		RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R438	315-0392-00		RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R440	315-0752-00		RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R442	321-0124-00		RES.,FXD,FILM:191 OHM,1%,0.125W	91637	MFF1816G191R0F
R444	315-0110-00		RES.,FXD,CMPSN:11 OHM,5%,0.25W	01121	CB1105
R446	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R448	315-0681-00		RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R450	315-0752-00		RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R452	315-0300-00		RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
R454	321-0128-00		RES.,FXD,FILM:210 OHM,1%,0.125W	91637	MFF1816G210R0F
R456	315-0300-00		RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
R458	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R460	315-0100-00		RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R462	307-0106-00		RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
R464	307-0106-00		RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
R466	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R468	315-0100-00		RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R470	321-0068-00		RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
R472	321-0636-00		RES.,FXD,FILM:100 OHM,0.5%,0.125W	91637	MFF1816D100R0D
R474	321-0068-00		RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
R490	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R492	315-0122-00		RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R494	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R498	315-0470-00		RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R500	311-1564-00		RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500R0M
R502	321-0266-00		RES.,FXD,FILM:5.76K OHM,1%,0.125W	91637	MFF1816G57600F
R504	321-0207-00		RES.,FXD,FILM:1.4K OHM,1%,0.125W	91637	MFF1816G14000F
R505	311-1562-00		RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91A-20000M
R506	315-0273-00		RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735

Replaceable Electrical Parts—1405

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R508	321-0260-00		RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
R510	321-0285-00		RES.,FXD,FILM:9.09K OHM,1%,0.125W	91637	MFF1816G90900F
R512	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R514	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R516	321-0263-00		RES.,FXD,FILM:5.36K OHM,1%,0.125W	91637	MFF1816G53600F
R518	321-0239-00		RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
R520	321-0204-00		RES.,FXD,FILM:1.3K OHM,1%,0.125W	91637	MFF1816G13000F
R522	321-0176-00		RES.,FXD,FILM:665 OHM,1%,0.125W	91637	MFF1816G665R0F
R524	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R526	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R534	315-0683-00		RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R536	315-0392-00		RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R540	315-0184-00		RES.,FXD,CMPSN:180K OHM,5%,0.25W	01121	CB1845
R542	315-0393-00		RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R544	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R546	315-0152-00		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R548	315-0302-00		RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R550	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R560	315-0222-00		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R562	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R564	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R565	311-1563-00		RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R566	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R568	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R570	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R572	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R574	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R576	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R580	315-0222-00		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R582	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R584	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R585	311-1563-00		RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R586	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R588	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R590	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R592	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R594	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R596	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R600	315-0222-00		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R602	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R604	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R605	311-1563-00		RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R606	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R608	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R610	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R612	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R614	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R616	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R620	315-0222-00		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R622	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R624	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R625	311-1563-00		RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R626	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435

Replaceable Electrical Parts—1405

Ckt No.	Tektronix	Serial/Model No.		Name & Description	Mfr	
	Part No.	Eff	Dscont		Code	Mfr Part Number
R628	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R630	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R632	315-0201-00			RES., FXD, CMPSN:200 OHM, 5%, 0.25W	01121	CB2015
R634	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R636	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R640	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R642	315-0682-00			RES., FXD, CMPSN:6.8K OHM, 5%, 0.25W	01121	CB6825
R644	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R645	311-1563-00			RES., VAR, NONWIR:1K OHM, 20%, 0.50W	73138	91A-10000M
R646	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R648	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R650	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R652	315-0201-00			RES., FXD, CMPSN:200 OHM, 5%, 0.25W	01121	CB2015
R654	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R656	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R660	315-0272-00			RES., FXD, CMPSN:2.7K OHM, 5%, 0.25W	01121	CB2725
R670	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R672	315-0682-00			RES., FXD, CMPSN:6.8K OHM, 5%, 0.25W	01121	CB6825
R674	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R675	311-1563-00			RES., VAR, NONWIR:1K OHM, 20%, 0.50W	73138	91A-10000M
R676	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R678	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R680	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R682	315-0201-00			RES., FXD, CMPSN:200 OHM, 5%, 0.25W	01121	CB2015
R684	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R686	315-0182-00			RES., FXD, CMPSN:1.8K OHM, 5%, 0.25W	01121	CB1825
R688	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R690	315-0471-00			RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R692	315-0301-00			RES., FXD, CMPSN:300 OHM, 5%, 0.25W	01121	CB3015
R700	315-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.25W	01121	CB2025
R702	315-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.25W	01121	CB2025
R706	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R710	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R711	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R712	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R714	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R718	315-0472-00			RES., FXD, CMPSN:4.7K OHM, 5%, 0.25W	01121	CB4725
R720	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R724	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R726	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R728	315-0472-00			RES., FXD, CMPSN:4.7K OHM, 5%, 0.25W	01121	CB4725
R730	315-0624-00			RES., FXD, CMPSN:620K OHM, 5%, 0.25W	01121	CB6245
R732	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R734	315-0104-00			RES., FXD, CMPSN:100K OHM, 5%, 0.25W	01121	CB1045
R735	311-1559-00			RES., VAR, NONWIR:10K OHM, 20%, 0.50W	73138	91A-10001M
R736	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R738	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R739	315-0104-00			RES., FXD, CMPSN:100K OHM, 5%, 0.25W	01121	CB1045
R740	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R742	315-0220-00			RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R744	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R745	311-1563-00			RES., VAR, NONWIR:1K OHM, 20%, 0.50W	73138	91A-10000M
R746	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015

Replaceable Electrical Parts—1405

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R748	315-0201-00		RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R749	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R750	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R752	315-0332-00		RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R754	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R756	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R758	315-0394-00		RES.,FXD,CMPSN:390K OHM,5%,0.25W	01121	CB3945
R760	315-0393-00		RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R762	315-0393-00		RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R764	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R768	315-0242-00		RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R770	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R772	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R774	315-0162-00		RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R778	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R780	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R782	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R784	315-0621-00		RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R786	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R788	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R789	315-0562-00		RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R800	315-0153-00		RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R802	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R804	315-0122-00		RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R806	315-0622-00		RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R808	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R810	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R812	308-0574-00		RES.,FXD,WW:10 OHM,5%,2W	91637	RS2B162K10R00J
R814	321-0277-00		RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R816	307-0103-00		RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R818	301-0470-00		RES.,FXD,CMPSN:47 OHM,5%,0.50W	01121	EB4705
R820	315-0432-00		RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R821	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R822	321-0289-00		RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R824	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R826	315-0821-00		RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R828	321-0218-00		RES.,FXD,FILM:1.82K OHM,1%,0.125W	91637	MFF1816G18200F
R830	315-0432-00		RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R832	315-0432-00		RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R834	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R836	315-0153-00		RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R838	315-0182-00		RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
R840	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R842	321-0234-00		RES.,FXD,FILM:2.67K OHM,1%,0.125W	91637	MFF1816G26700F
R844	321-0199-00		RES.,FXD,FILM:1.15K OHM,1%,0.125W	91637	MFF1816G11500F
R845	311-1566-00		RES.,VAR,NONWIR:200 OHM,20%,0.50W	73138	91A-200ROM
R846	308-0574-00		RES.,FXD,WW:10 OHM,5%,2W	91637	RS2B162K10R00J
R848	307-0103-00		RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R880	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R882	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R884	315-0220-00		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R886	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R888	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R890	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R892	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R894	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R896	301-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.50W	01121	EB3315
R898	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
S50	311-0771-00			RES.,VAR,NONWIR:1K OHM,20%,0.50W	71590	BA162-005
S260	263-1148-00			ACTR ASSY,CAM S:AMPLITUDE	80009	263-1148-00
S350	263-1147-00			ACTR ASSY,CAM S:AVERAGE PICTURE LEVEL	80009	263-1147-00
S560	260-1836-00			SWITCH,PUSH:7 BUTTON,2 POLE,PP,10MM	82104	0BD
SW80	260-0816-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF-126-0012A
SW910	260-1837-00			SWITCH,ROCKER:DPDT,5A,120VAC	09353	5201-06
SW915	119-0802-00			SELECTOR,LINE V:100,120,220,240V,W/FUHLR	05245	F2112
T170	120-1057-00			TRANSFORMER,RF:TOROID,2 WINDINGS	80009	120-1057-00
T180	120-1057-00			TRANSFORMER,RF:TOROID,2 WINDINGS	80009	120-1057-00
T920	120-1058-00			XFMR,PWR,SDM:	80009	120-1058-00
U140	156-0512-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308N
U155	156-0512-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308N
U320	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U330	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U500	156-0402-00			MICROCIRCUIT,DI:TIMER	18324	NE555V
U520	156-0570-00			MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
U525	156-0180-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74S00N
U690	156-0517-00			MICROCIRCUIT,DI:DOUBLE BAL MIXER	01295	SN76514N
U700	156-0132-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	34371	HA2-911-5
U720	156-0132-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	34371	HA2-911-5
U740	156-0511-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE531V
U770	156-0523-00			MICROCIRCUIT,DI:7-STAGE BINARY COUNTER	04713	MC14024P
U780	156-0511-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE531V
U810	156-0105-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM301AN
U820	156-0105-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM301AN
VR232	152-0461-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N821
VR456	152-0461-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N821
VR522	152-0279-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	07910	CD332305
VR826	152-0317-00			SEMICONV DEVICE:ZENER,0.25W,6.2V,5%	81483	1N3497
VR896	152-0279-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	07910	CD332305
Y560	158-0111-00			XTAL UNIT,QTZ:0.75MHZ,0.01%	01807	Z-9
Y580	158-0114-00			XTAL UNIT,QTZ:1.25MHZ,0.01%	75378	51553-6C
Y600 ¹	158-0119-00			XTAL UNIT,QTZ:2.25MHZ,0.01%	75378	
Y620	158-0069-00			XTAL UNIT,QTZ:3.579545 MHZ,+/-0.0035%	75378	TX-005-B
Y620 ¹	158-0075-00			XTAL UNIT,QTZ:4.433618 MHZ,0.0035%	80009	158-0075-00
Y640	158-0113-00			XTAL UNIT,QTZ:4.18MHZ,0.01%	75378	51453-6C
Y640 ¹	158-0019-00			XTAL UNIT,QTZ:5.00MHZ,0.01%	13571	ER-1177
Y670	158-0112-00			XTAL UNIT,QTZ:4.7MHZ,0.01%	75378	S1335-6C
Y670 ¹	158-0123-00			XTAL UNIT,QTZ:5.75MHZ,0.01%	75378	
Y900	158-0110-00			XTAL UNIT,QTZ:166.33KHZ,0.01%	75378	H17
Y900 ¹	158-0121-00			XTAL UNIT,QTZ:1.1594MHZ,0.01%	75378	
	158-0118-00 ²			XTAL,UNIT,QTZ:5.50MHZ,0.01%	75378	
	158-0120-00 ²			XTAL,UNIT,QTZ:1.75MHZ,0.01%	75378	
	158-0122-00 ²			XTAL,UNIT,QTZ:6.25MHZ,0.01%	75378	

¹Option 1 only.

²Spare crystal units shipped with Option 1 instruments.

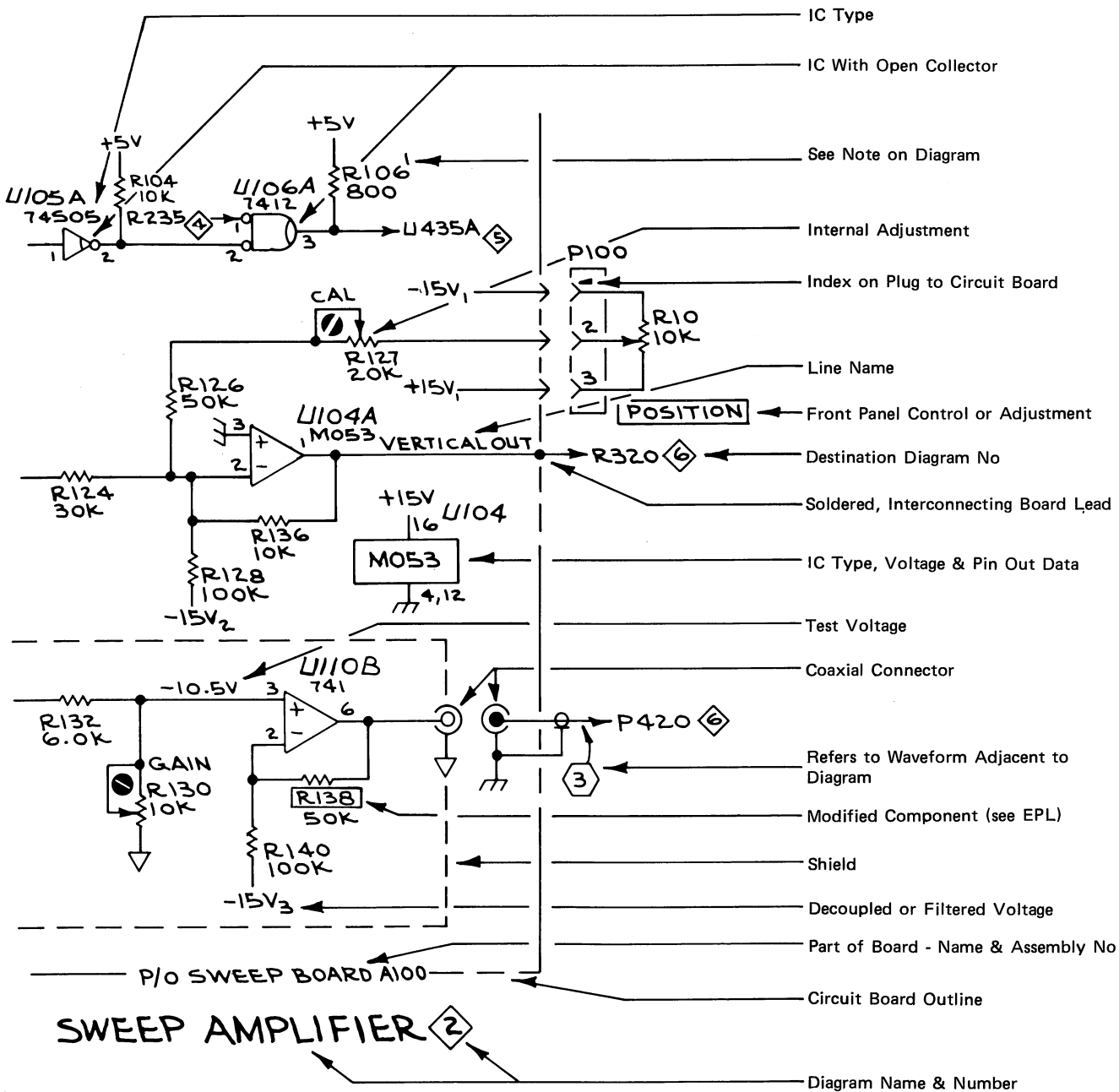


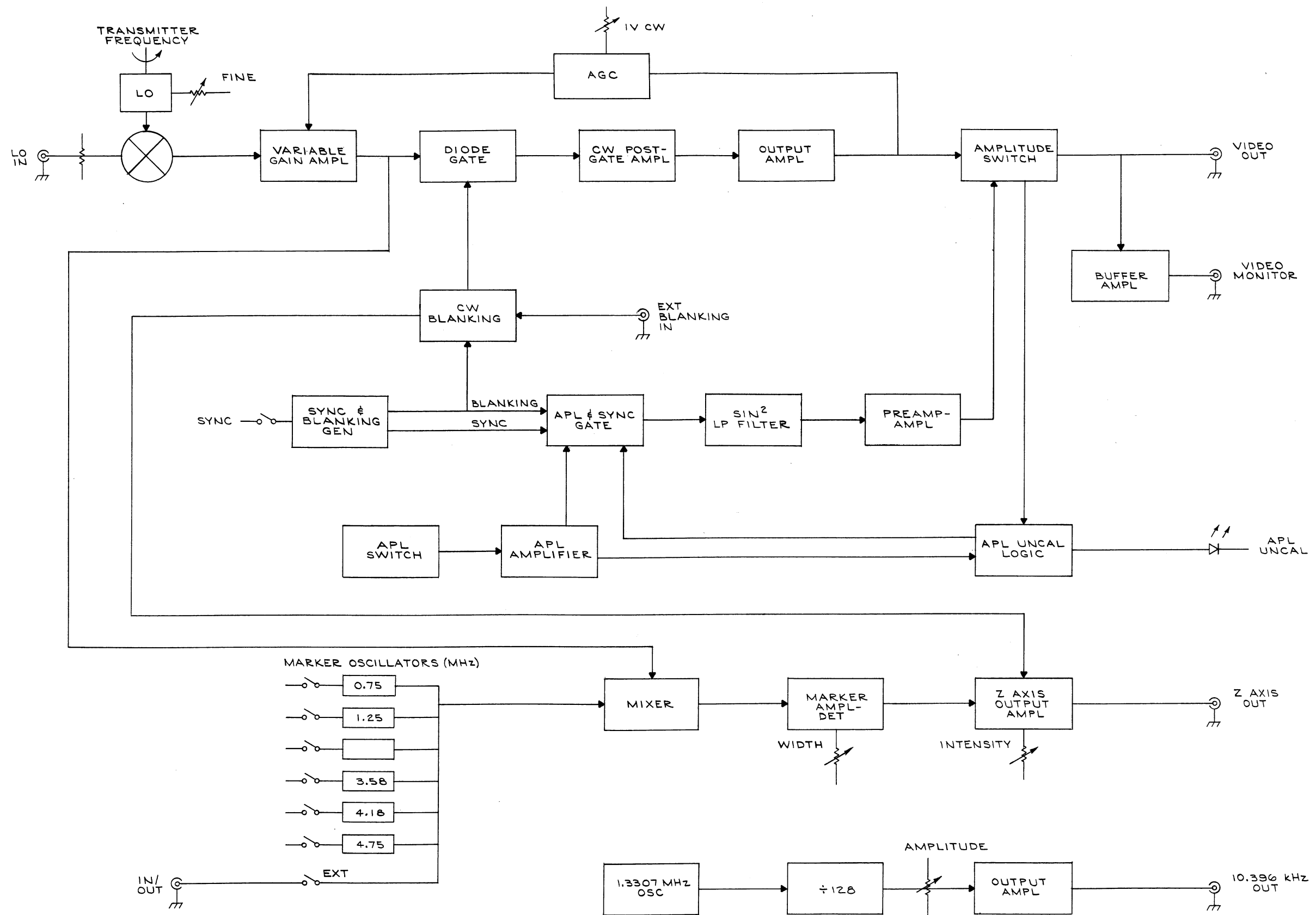
DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

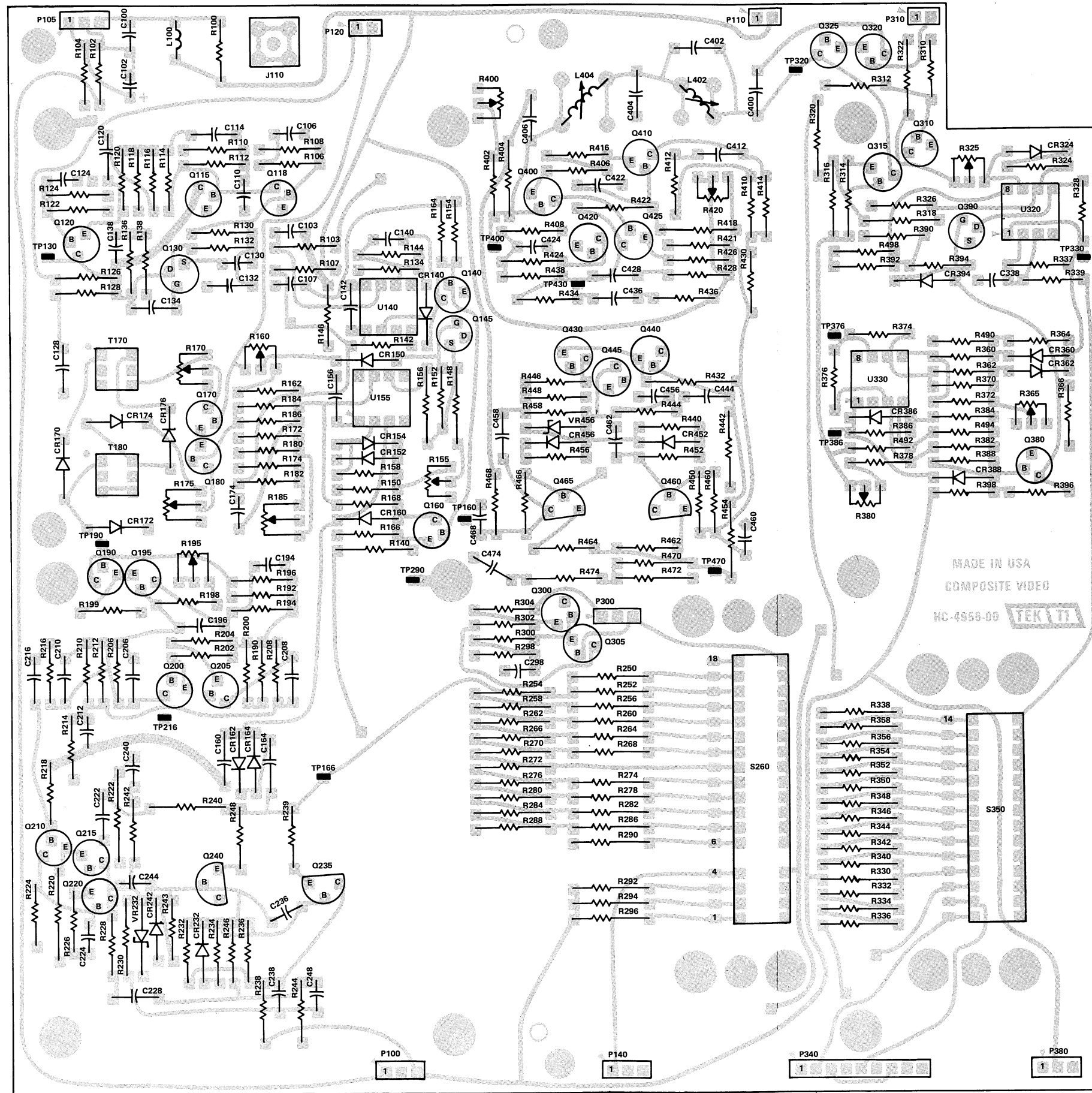
Graphic symbols for electrical and logic symbols, used on the diagrams, are based on ANSI Y32.2, 1970, and ANSI Y32.14, 1973, "American National Standards Institute." Logic symbols depict the logic function of the device in positive logic. Copies of these standards can be obtained from the Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, N.Y., 11017. Exceptions and additions are shown on this sample diagram. These conform or are based on the manufacturers data sheet and industry trends.

Resistor values are in ohms, unless noted otherwise, and the Ω symbol is omitted. Capacitor values ≥ 1 (e.g. 10) are in picofarads (pF) and values < 1 (e.g. 0.01) are in microfarads unless otherwise noted.

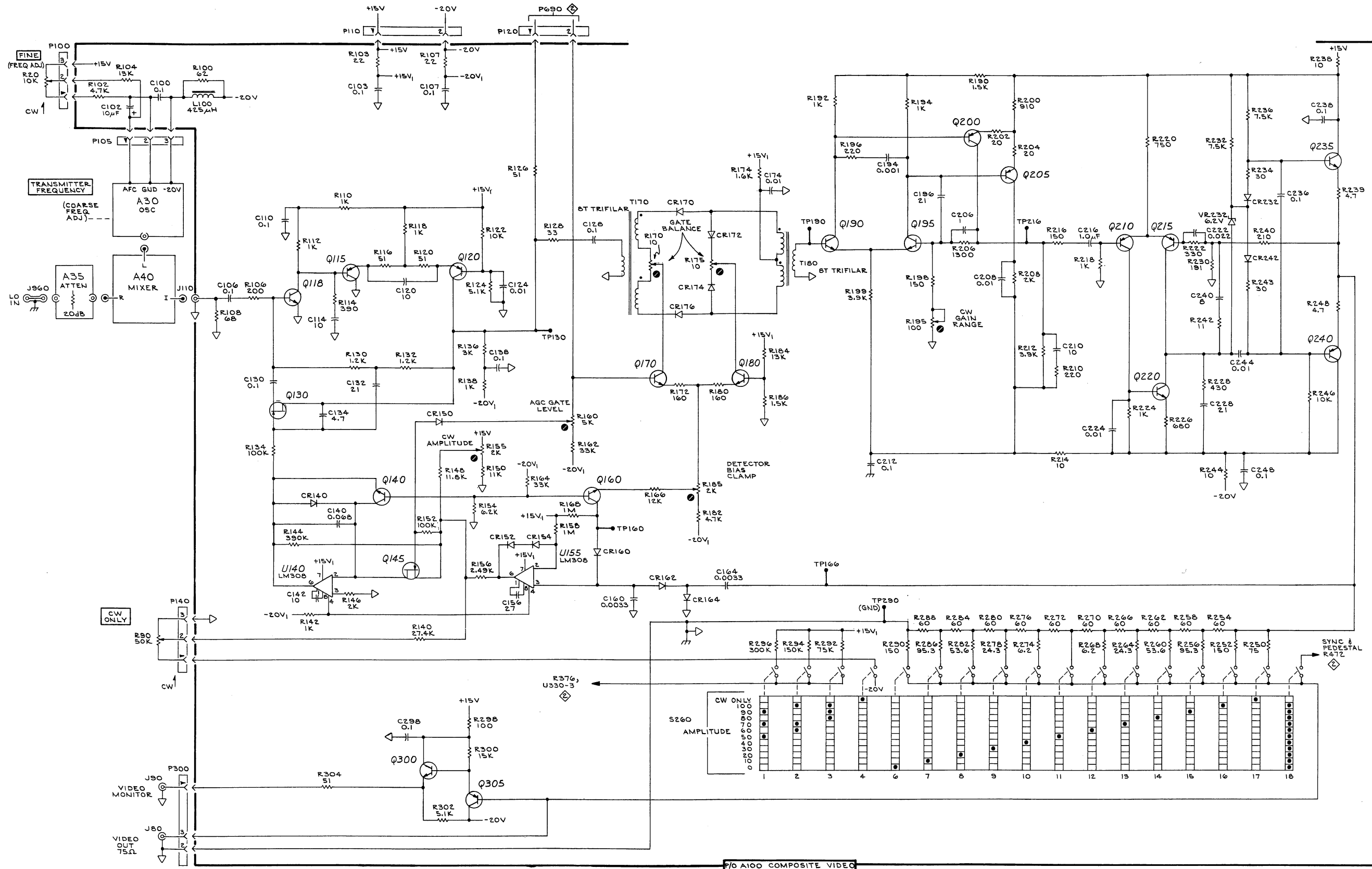


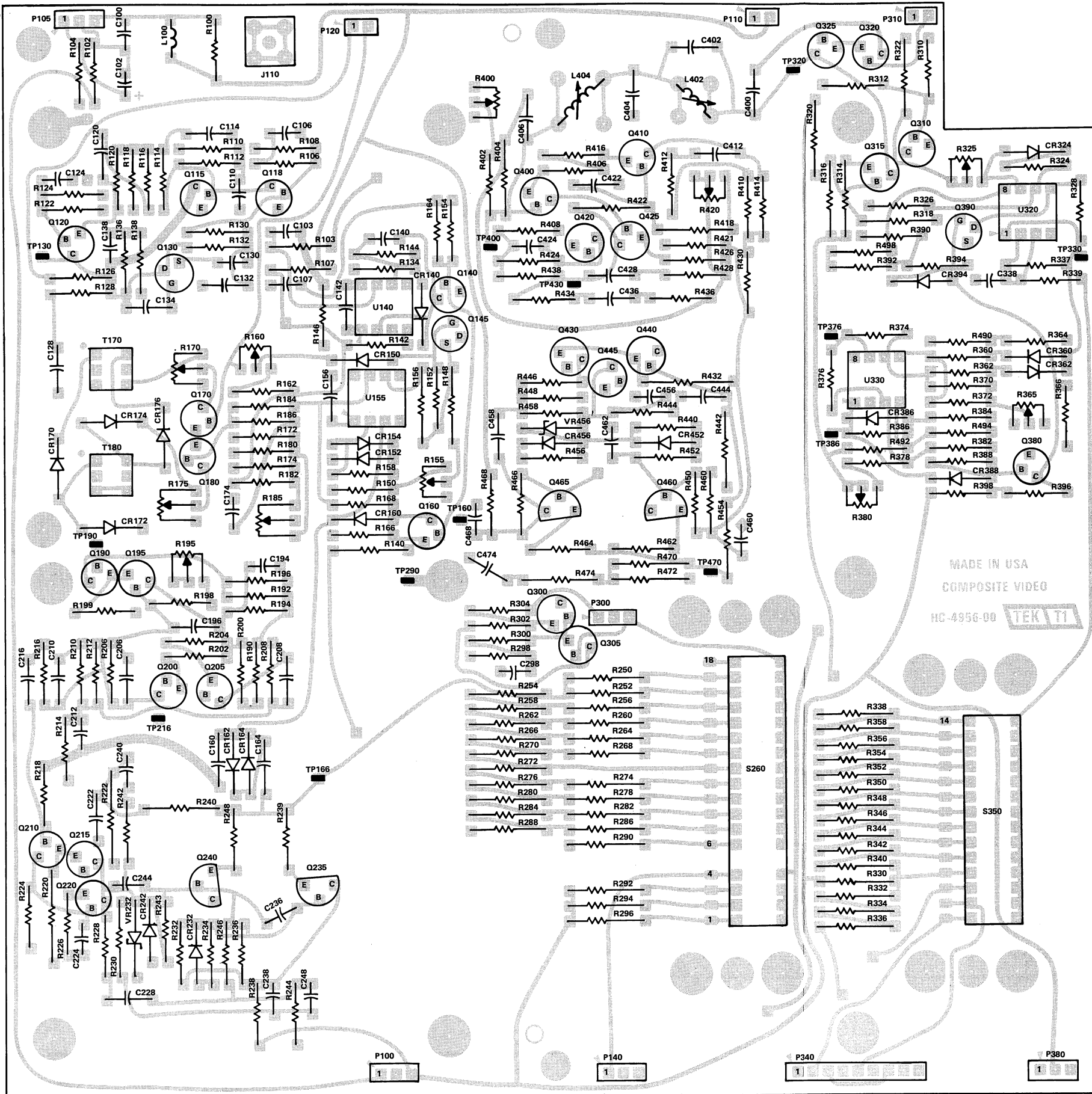


BLOCK DIAGRAM

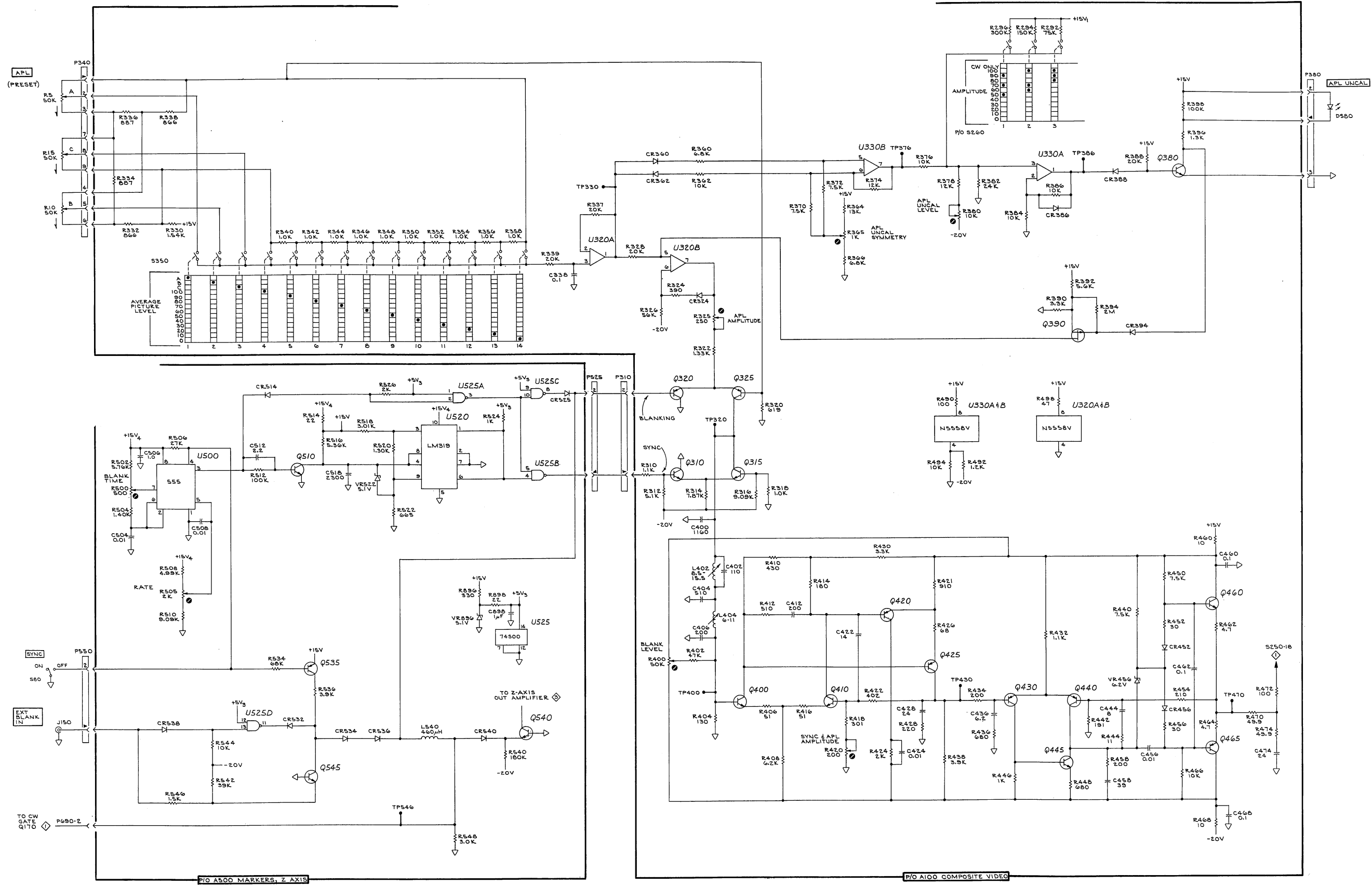


A100 Composite Video

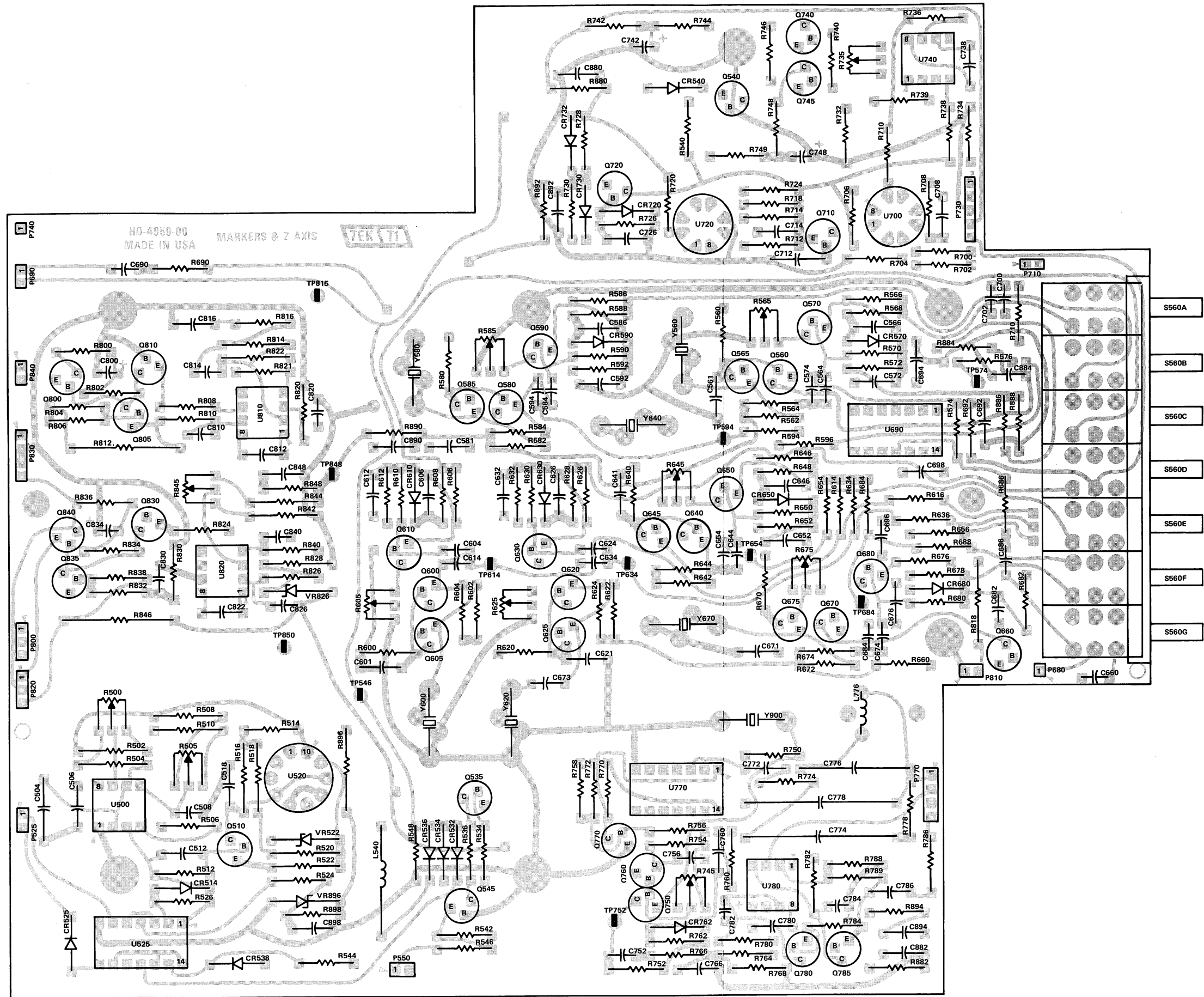




MADE IN USA
 COMPOSITE VIDEO
 HC-4956-00 TEK T1

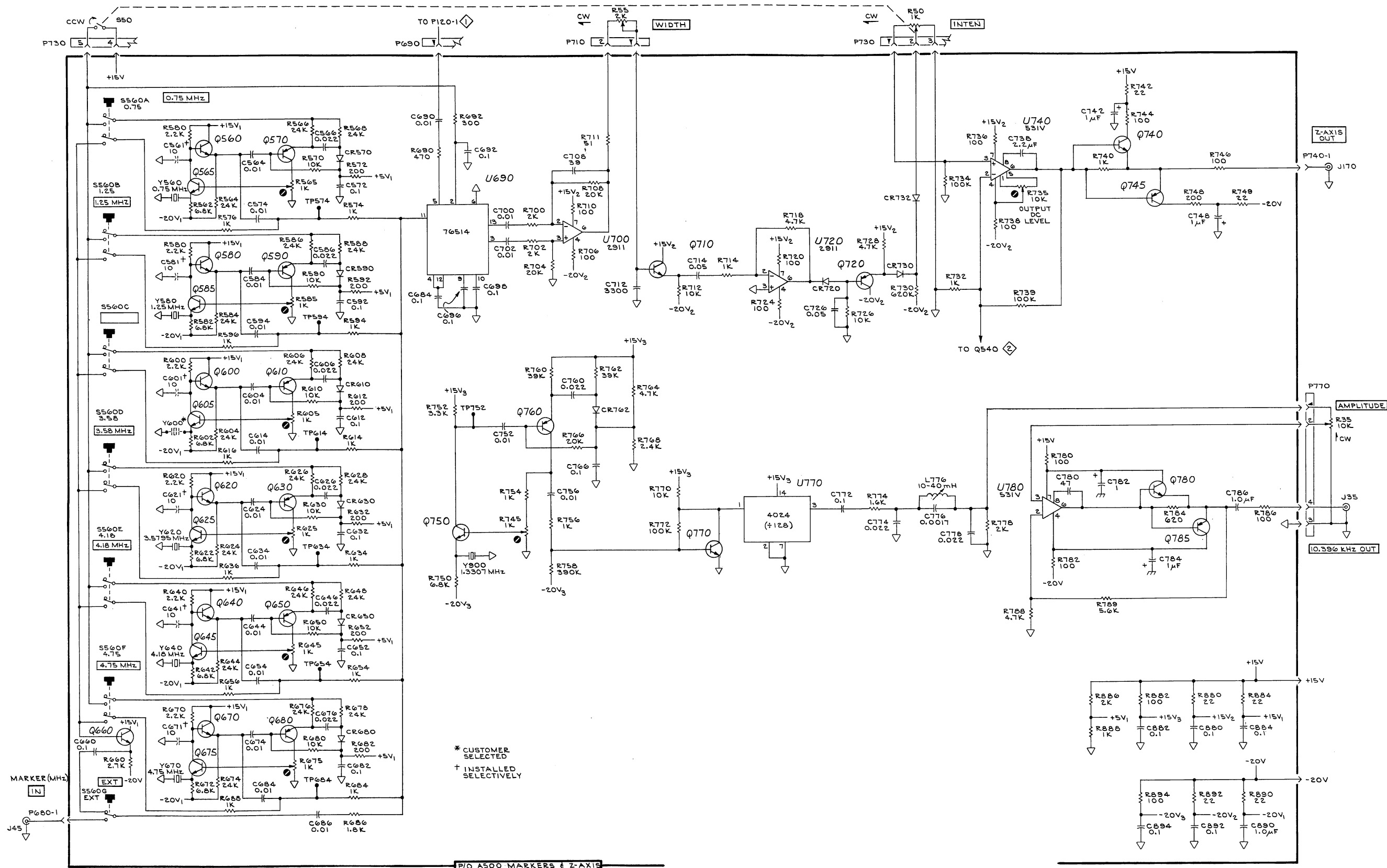


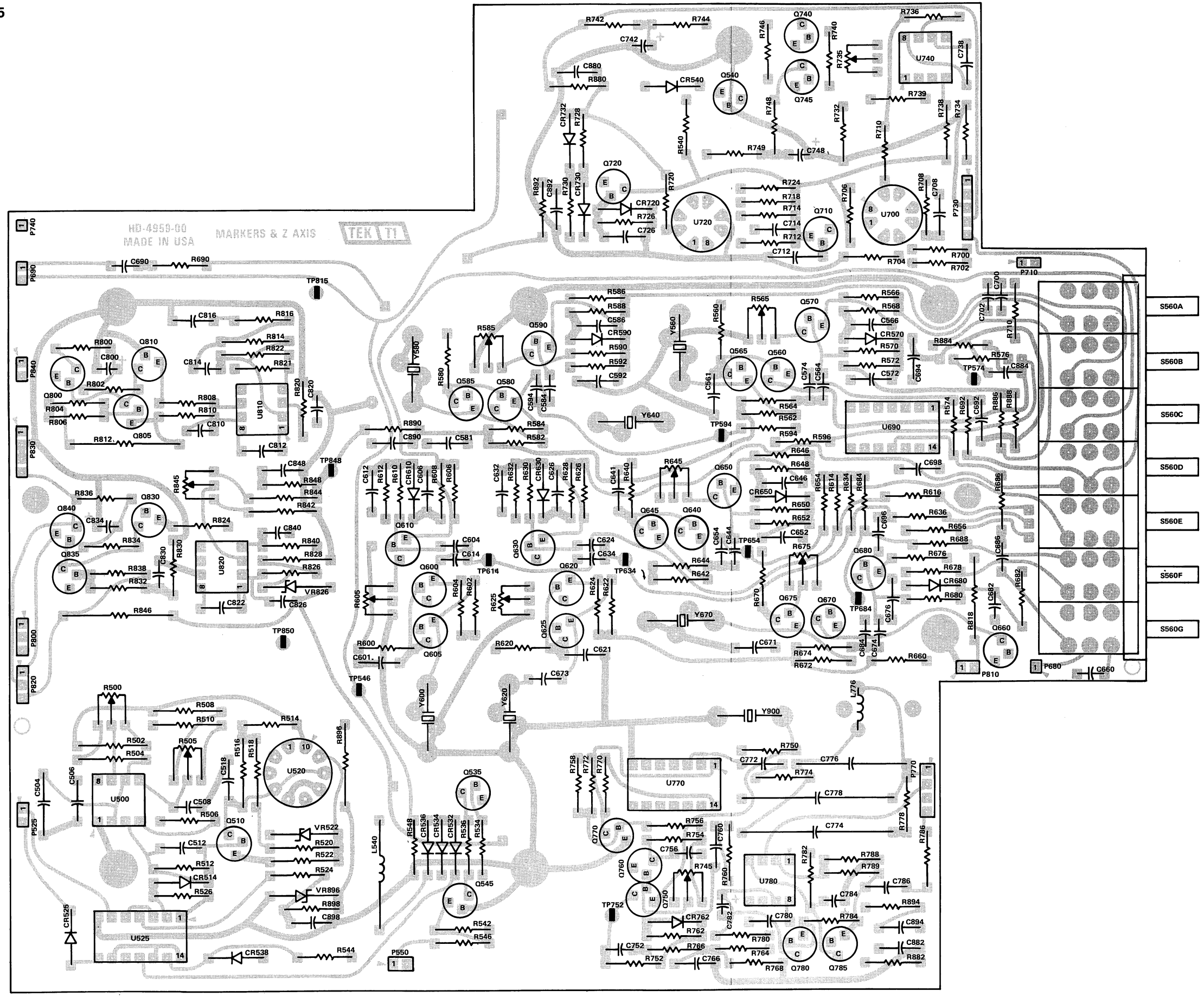
COMPONENT LOCATION FOR DIAGRAM 3



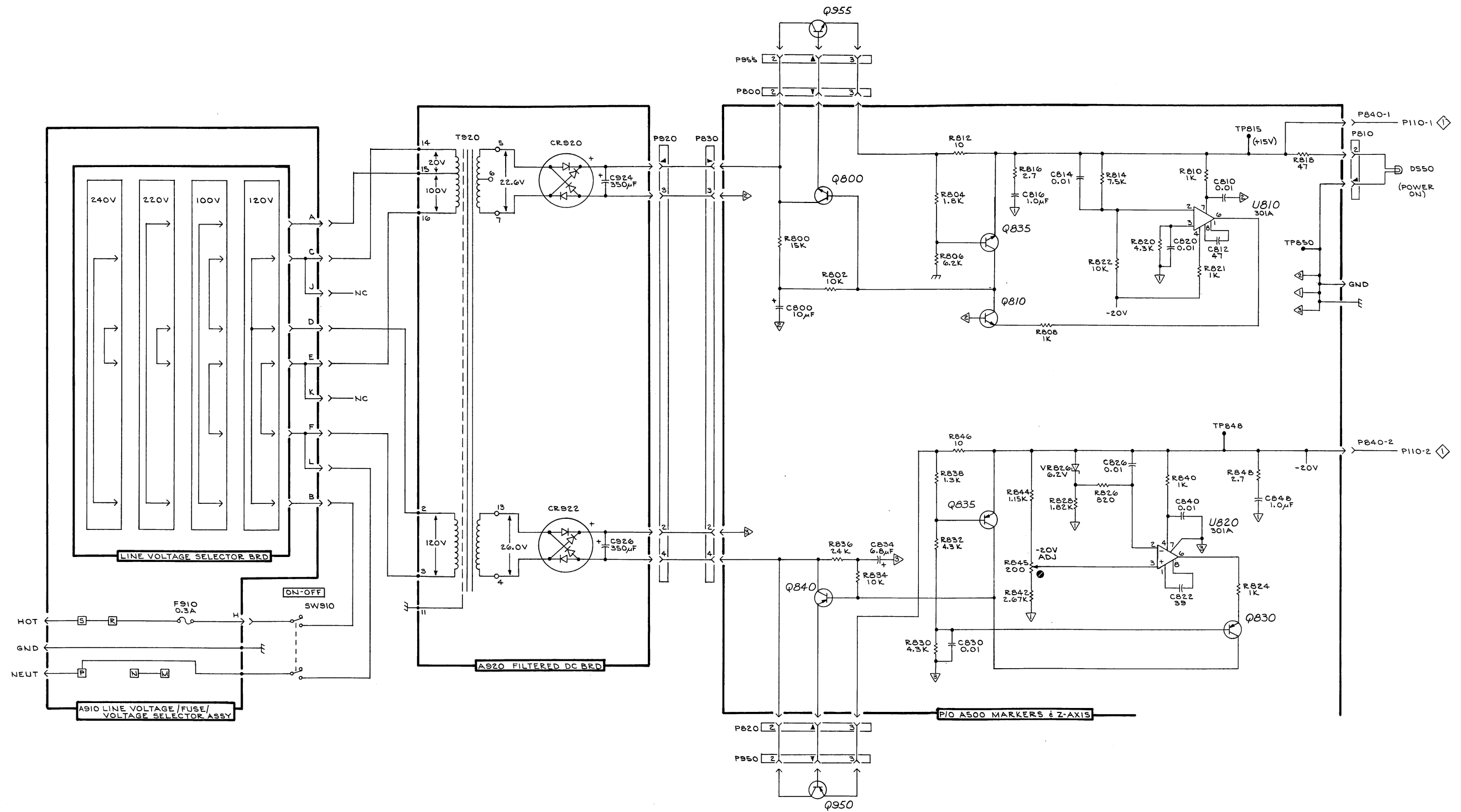
- S560A
- S560B
- S560C
- S560D
- S560E
- S560F
- S560G

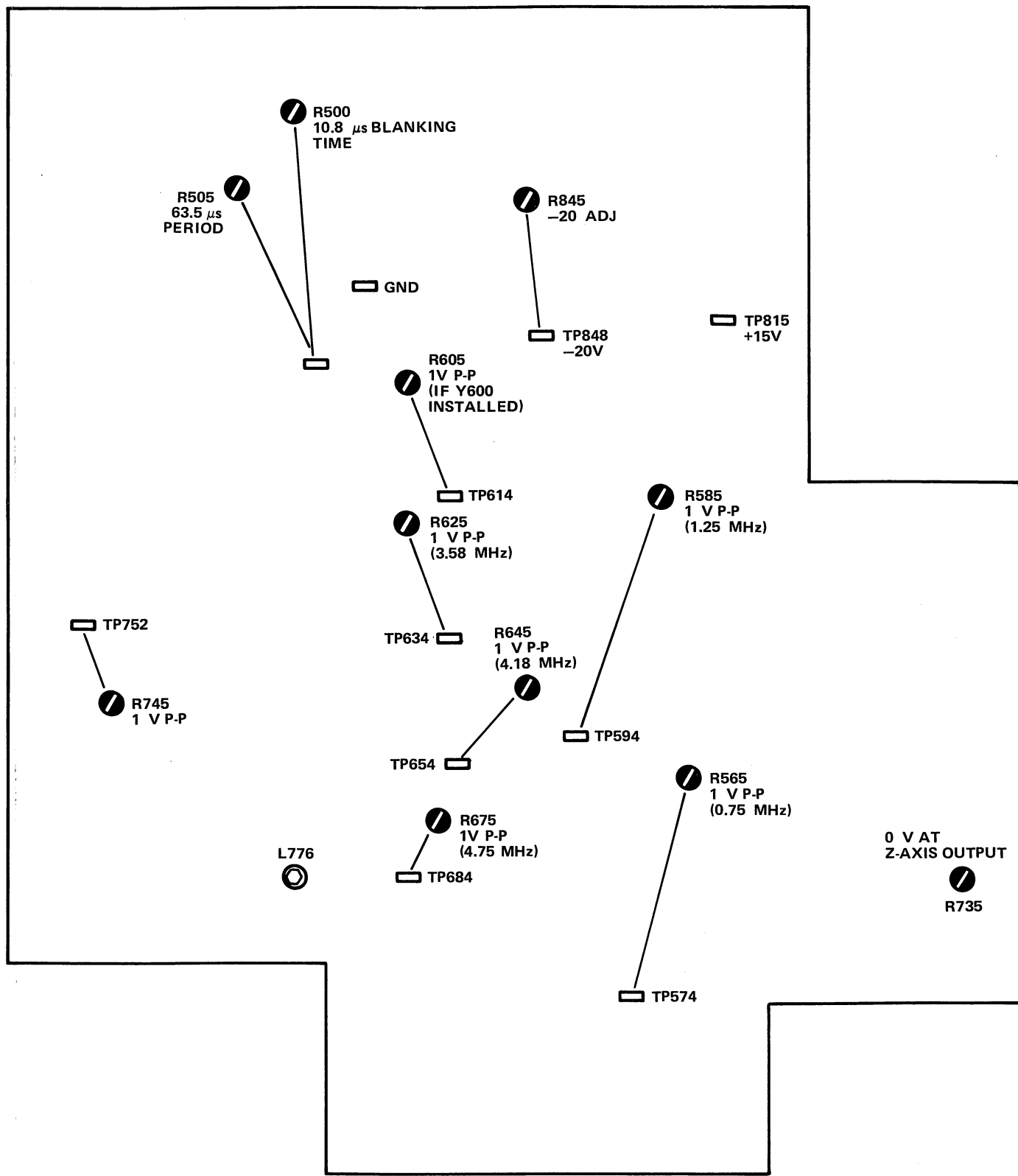
A500 Markers & Z-Axis



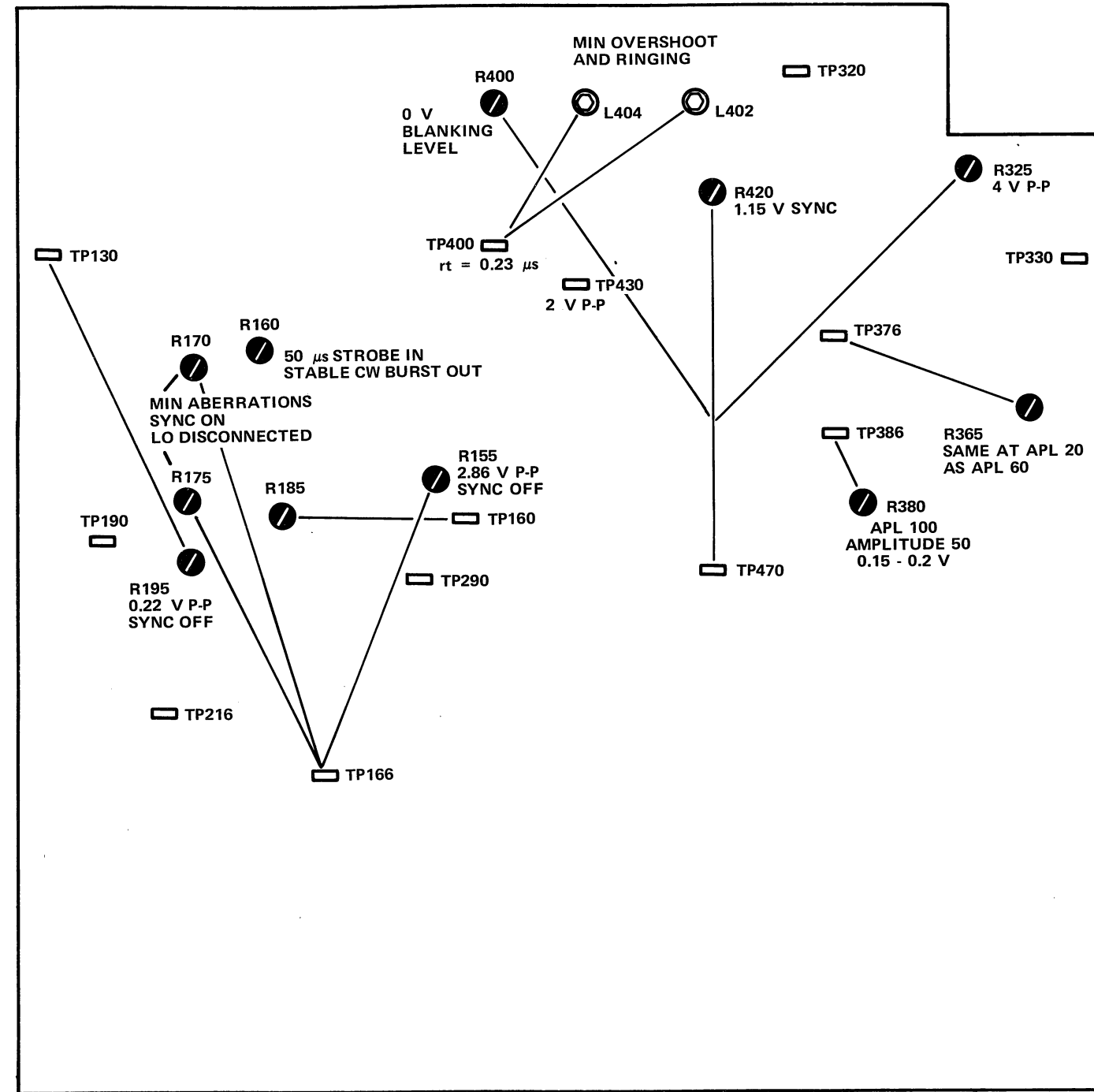


A500 Markers & Z-Axis





1405 Adjustment and test point locations (bottom).



1405 Adjustment and test point locations (top).

ADJUSTMENT & TEST POINT LOCATIONS

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

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
C0779	AMP, INC.	P. O. BOX 3608	HARRISBURG, PA 17105
C1295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
C4713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
C5820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
C6982	MOORE, HOWARD J., CO.	105 E. 16TH ST.	NEW YORK, NY 10003
C8261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12136	PHILADELPHIA HANDLE CO., INC.	1643 HADDON AVE.	CAMDEN, NJ 08103
12327	FREEWAY CORP.	9301 ALLEN DR.	CLEVELAND, OH 44125
13257	AMERACE LTD.	10 ESNA PARK DR.	MARKHAM, ONTARIO, CANADA
16179	OMNI SPECTRA, INC.	24600 HALLWOOD CT.	FARMINGTON, MI 48024
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23499	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	455 N. QUINCE ST.	ESCONDIDO, CA 92025
24618	TRANSCON MFG. CO.	2655 PERTH ST.	DALLAS, TX 75220
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
26805	AMERICON, AMERICON MICROWAVE INDUSTRIES, INC.	87 RUMFORD AVE.	WALTHAM, MA 02154
70276	ALLEN MFG. CO.	P. O. DRAWER 570	HARTFORD, CT 06101
71041	BOSTON GEAR, DIVISION ROCKWELL INTL.	14 HAYWARD STREET	QUINCY, MA 02171
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
77250	PHEOLL MANUFACTURING CO., DIVISION OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97005
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83309	ELECTRICAL SPECIALITY CO., SUBSIDIARY OF BELDEN CORP.	213 E. HARRIS AVE.	SOUTH SAN FRANCISCO, CA 9408
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-1	390-0153-00			1						COVER,SCOPE:TOP	80009	390-0153-00
-2	344-0208-01			2						. CLIP,DECORATIVE:	80009	344-0208-01
-3	367-0037-00			1						. HANDLE,LUGGAGE:	12136	OBD
										(ATTACHING PARTS)		
-4	213-0155-00			2						. SCREW,MACHINE:10-32 X 0.40 INCH LONG,STL	77250	OBD
										- - - - *		
-5	386-0226-00			4						. PL,LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-6	386-0227-00			4						. PL,LATCH INDEX:	80009	386-0227-00
-7	214-0604-00			4						. WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-8	214-0603-01			4						. PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-9	348-0068-01			4						FOOT,CABINET:	80009	348-0068-01
										(ATTACHING PARTS FOR EACH)		
-10	210-0458-00			1						NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
-11	212-0023-00			1						SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
-12	210-0008-00			1						WASHER,LOCK:INTL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-0541C
										- - - - *		
-13	390-0154-01			1						COVER,SCOPE:BOTTOM	80009	390-0154-01
-14	386-0226-00			4						. PL,LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-15	386-0227-00			4						. PL,LATCH INDEX:	80009	386-0227-00
-16	214-0604-00			4						. WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-17	214-0603-01			4						. PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-18	366-0402-00			1						KNOB:GRAY	80009	366-0402-00
	213-0153-00			2						. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-19	358-0298-00			1						BSHG,MACH THD:	80009	358-0298-00
-20	210-0978-00			1						WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
-21	366-0494-04			1						KNOB:GRAY	80009	366-0494-04
	213-0153-00			1						. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-22	366-1189-00			2						KNOB:GRAY	80009	366-1189-00
										. EACH KNOB INCLUDES:		
	213-0153-00			1						. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-23	366-1023-01			1						KNOB:GRAY	80009	366-1023-01
	213-0246-00			1						. SETSCREW:5-40 X 0.093 INCH,HEX SOC STL	71159	OBD
-24	366-1190-00			2						KNOB:GRAY	80009	366-1190-00
										. EACH KNOB INCLUDES:		
	213-0153-00			2						. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-25	131-0955-00			2						CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
										(ATTACHING PARTS FOR EACH)		
-26	220-0495-00			1						NUT,PLAIN,HEX:0.375-32 X 0.438 INCH BRS	73743	OBD
										- - - - *		
-27	210-0255-00			1						TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
-28	366-1039-00			1						KNOB:GRAY	80009	366-1039-00
	213-0153-00			1						. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-29	426-0681-00			7						FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-30	358-0301-00			3						BUSHING,SLEEVE:FOR 0.185 DIA HOLE,GRAY	80009	358-0301-00
-31	-----			1						RESISTOR,VAR:(SEE R20 EPL)		
										(ATTACHING PARTS)		
-32	220-0495-00			1						NUT,PLAIN,HEX:0.375-32 X 0.438 INCH BRS	73743	OBD
-33	210-0978-00			1						WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
-34	210-0051-00			1						WASHER,LOCK:INTL,0.425" ID X 0.615 OD,STL	78189	1220-08-00-0541C
										- - - - *		
-35	333-2167-00			1						PANEL,FRONT:	80009	333-2167-00
	333-2167-01			1						PANEL,FRONT:OPTION 1 ONLY	80009	333-2167-01
-36	386-0115-01			1						WINDOW,DIAL:	80009	386-0115-01
										(ATTACHING PARTS)		
-37	213-0138-00			2						SCR,TPG,THD FOR:4-40 X 0.188 INCH,PNH STL	83385	OBD
										- - - - *		
-38	-----			1						RESISTOR,VAR:(SEE R90 EPL)		
-39	-----			1						RESISTOR,VAR:(SEE R55 EPL)		
										(ATTACHING PARTS)		
-40	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-41	210-0046-00			3						WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
										- - - - *		

Replaceable Mechanical Parts—1405

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-42	-----		1		RESISTOR,VAR:(SEE R50,S50 EPL) (ATTACHING PARTS)		
-43	210-0583-00		1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-44	210-0046-00		3		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
-45	-----		3		RESISTOR,VAR:(SEE R5,R10,R15 EPL)		
-46	-----		1		LAMP,LED:RED,50MA(SEE DS80 EPL)		
-47	-----		1		SWITCH,ROCKER:DPDT,5A,120V(SEE SW910 EPL)		
-48	-----		1		SWITCH,SLIDE:DPDT,0.5A,125V(SEE SW80 EPL) (ATTACHING PARTS)		
-49	213-0138-00		2		SCR,TPG,THD FOR:4-40 X 0.188 INCH,PNH STL	83385	OBD
-50	210-0994-00		4		WASHER,FLAT:0.125 ID X 0.25" OD,STL	83385	OBD
-51	-----		1		RESISTOR,VAR:(SEE R35 EPL) (ATTACHING PARTS)		
-52	210-0583-00		1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-53	210-0046-00		2		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
-54	386-3565-00		1		SUBPANEL,FRONT: (ATTACHING PARTS)	80009	386-3565-00
-55	211-0538-00		4		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-56	331-0418-00		1		DIAL ASSY,TAPE:	80009	331-0418-00
	331-0419-00		1		. DIAL,SCALE:	80009	331-0419-00
	331-0419-01		1		. DIAL,SCALE:OPTION 1 ONLY	80009	331-0491-01
-57	214-0520-01		1		. SPROCKET WHEEL:35MM,8 TOOTH,0.47 INCH DIA	80009	214-0520-01
-58	213-0075-00		2		. . SETSCREW:4-40 X 0.094 INCH,HEX SOC STL	70276	OBD
-59	384-0635-00		1		. EXTENSION SHAFT:1.188 L X 0.125 INCH OD	80009	384-0635-00
-60	210-0992-00		1		. WASHER,NONMETAL:0.265 INCH IDX 0.437" OD	80009	210-0992-00
-61	210-1011-00		1		. WASHER,NONMETAL:0.13 ID X 0.375 " OD,PLSTC	83309	OBD
-62	214-0522-00		1		. GEAR,BEVEL:	71041	G460-Y
-63	384-0636-01		2		. ROD,IDLER,STAND:	80009	384-0636-01
-64	214-0521-01		2		. ROLLER,IDLER,TA:	80009	214-0521-01
-65	380-0076-01		1		. HOUSING,DIAL:	80009	380-0076-01
-66	214-0564-00		1		. . PIN,HOLLOW:	13257	59-028-125-025D
-67	214-0535-00		1		GEAR,BEVEL:	80009	214-0535-00
-68	213-0140-00		2		. SETSCREW:2-56 X 0.94 INCH,HEX SOC STL	70276	OBD
-69	384-1135-00		1		EXTENSION SHAFT:5.25 INCH LONG X 0.125 OD	80009	384-1135-00
-70	376-0008-00		1		CPLG,SHAFT,RIGI:	80009	376-0008-00
-71	213-0005-00		2		. SETSCREW:8-32 X 1.25 INCH,HEX SOC STL	74445	OBD
-72	376-0032-00		1		CPLG,SHAFT,RIGI:	80009	376-0032-00
-73	213-0075-00		2		. SETSCREW:4-40 X 0.094 INCH,HEX SOC STL	70276	OBD
-74	210-0839-00		1		WSHR,SPR TNSN:0.25 ID X 0.438 OD	78189	3539-14-01-0511
-75	210-0992-00		1		WASHER,NONMETAL:0.265 INCH IDX 0.437" OD	80009	210-0992-00
-76	210-0905-00		1		WASHER,FLAT:0.256 ID X 0.438 INCH OD,BRS	83385	OBD
-77	-----		1		MIXER UNIT,RF:DBL BAL,2-3 GHZ INPUT(SEE A40 EPL) (ATTACHING PARTS)		
-78	211-0097-00		2		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-79	343-0088-00		2		CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
	672-0579-00		1		CKT BOARD ASSY:COMPOSITE VIDEO,W/CAM SW (ATTACHING PARTS)	80009	672-0579-00
-80	211-0116-00		9		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
	-----		-		. CKT BOARD ASSEMBLY INCLUDES:		
	263-1148-00		1		. ACTR ASSY,CAM S:AMPLITUDE (ATTACHING PARTS)	80009	263-1148-00
-81	211-0244-00		4		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
-82	200-1219-00		1		. . COVER,CAM SW: (ATTACHING PARTS)	80009	200-1219-00
-83	211-0022-00		2		. . SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-84	210-0001-00		2		. . WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C

Replaceable Mechanical Parts—1405

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-85	407-0714-00		1	.	.	.			BRACKET,CAM SW:	80009	407-0714-00
-86	214-1126-02		1	.	.	.			SPRING,FLAT:RED COLORED	80009	214-1126-02
-87	214-1127-00		1	.	.	.			ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-88	401-0058-00		1	.	.	.			BEARING,CAM SW:FRONT	80009	401-0058-00
									(ATTACHING PARTS)		
-89	354-0219-00		1	.	.	.			RING,RETAINING:FOR 0.25 INCH SHAFT	79136	5103-25-MD-R
									- - - * - - -		
-90	105-0725-00		1	.	.	.			ACTUATOR,CAM SW:AMPLITUDE	80009	105-0725-00
-91	210-0405-00		1	.	.	.			NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-92	210-0406-00		2	.	.	.			NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-93	401-0061-00		1	.	.	.			BEARING,CAM SW:REAR	80009	401-0061-00
	263-1147-00		1	.	.	.			ACTR ASSY,CAM S:AVERAGE PICTURE LEVEL	80009	263-1147-00
									(ATTACHING PARTS)		
-94	211-0244-00		4	.	.	.			SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
									- - - * - - -		
-95	200-1983-00		1	.	.	.			COVER,CAM SW:	80009	200-1983-00
									(ATTACHING PARTS)		
-96	211-0022-00		2	.	.	.			SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-97	210-0001-00		2	.	.	.			WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
									- - - * - - -		
-98	407-0714-00		1	.	.	.			BRACKET,CAM SW:	80009	407-0714-00
-99	214-1126-02		1	.	.	.			SPRING,FLAT:RED COLORED	80009	214-1126-02
-100	214-1127-00		1	.	.	.			ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-101	401-0058-00		1	.	.	.			BEARING,CAM SW:FRONT	80009	401-0058-00
									(ATTACHING PARTS)		
-102	354-0219-00		1	.	.	.			RING,RETAINING:FOR 0.25 INCH SHAFT	79136	5103-25-MD-R
									- - - * - - -		
-103	105-0726-00		1	.	.	.			ACTUATOR,CAM SW:AVERAGE PICTURE LEVEL	80009	105-0726-00
-104	210-0405-00		1	.	.	.			NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-105	210-0406-00		2	.	.	.			NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-106	401-0061-00		1	.	.	.			BEARING,CAM SW:REAR	80009	401-0061-00
-107	-----		1	.	.	.			CKT BOARD ASSY:COMPOSITE VIDEO(SEE A100 EPL)		
-108	131-0604-00		31	.	.	.			CONTACT,ELEC:0.025 SQ X 0.365 INCH LONG	80009	131-0604-00
-109	131-0608-00		30	.	.	.			CONTACT,ELEC:0.365 INCH LONG	22526	47357
-110	214-1292-00		4	.	.	.			HEAT SINK,ELEC:TRANSISTOR	05820	205-AB
-111	136-0252-04		105	.	.	.			CONTACT,ELEC:0.188 INCH LONG	22526	75060
-112	131-0663-00		1	.	.	.			CONNECTOR,RCPT:	26805	2062-0000
-113	136-0514-00		4	.	.	.			SOCKET,PLUG-IN:MICROCIRCUIT,8 CONTACT	82647	C930802
-114	214-0579-00		13	.	.	.			TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-115	366-1557-54		1	.	.	.			PUSH BUTTON:GRAY,0.75	80009	366-1557-54
-116	366-1557-53		1	.	.	.			PUSH BUTTON:GRAY,1.25	80009	366-1557-53
-117	366-1257-00		1	.	.	.			PUSH BUTTON:GRAY PLASTIC	80009	366-1257-00
-118	366-1557-52		1	.	.	.			PUSH BUTTON:GRAY,3.58	80009	366-1557-52
-119	366-1557-51		1	.	.	.			PUSH BUTTON:GRAY,4.18	80009	366-1557-51
-120	366-1557-50		1	.	.	.			PUSH BUTTON:GRAY,4.75	80009	366-1557-50
-121	366-1489-43		1	.	.	.			PUSH BUTTON:GRAY	80009	366-1489-43
	366-1557-61 ¹		1	.	.	.			PUSH BUTTON:GRAY,1.75	80009	366-1557-61
	366-1557-62 ¹		1	.	.	.			PUSH BUTTON:GRAY,2.25	80009	366-1557-62
	366-1557-63 ¹		1	.	.	.			PUSH BUTTON:GRAY,4.43	80009	366-1557-63
	366-1557-64 ¹		1	.	.	.			PUSH BUTTON:GRAY,5.00	80009	366-1557-64
	366-1557-65 ¹		1	.	.	.			PUSH BUTTON:GRAY,5.50	80009	366-1557-65
	366-1557-66 ¹		1	.	.	.			PUSH BUTTON:GRAY,5.75	80009	366-1557-66
	366-1557-67 ¹		1	.	.	.			PUSH BUTTON:GRAY,6.25	80009	366-1557-67
-122	-----		1	.	.	.			CKT BOARD ASSY:MARKERS AND Z AXIS(SEE A500 EPL)		
									(ATTACHING PARTS)		
-123	211-0116-00		7	.	.	.			SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
									- - - * - - -		
-124	131-0608-00		33	.	.	.			CONTACT,ELEC:0.365 INCH LONG	22526	47357
-125	136-0269-02		3	.	.	.			SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C931402
-126	-----		1	.	.	.			SWITCH,PUSH:7 BTN,2 POLE,10MM(SEE S560 EPL)		
-127	361-0542-00		6	.	.	.			SPACER,SWITCH:PLASTIC	71590	J-64281
-128	136-0252-04		149	.	.	.			CONTACT,ELEC:0.188 INCH LONG	22526	75060

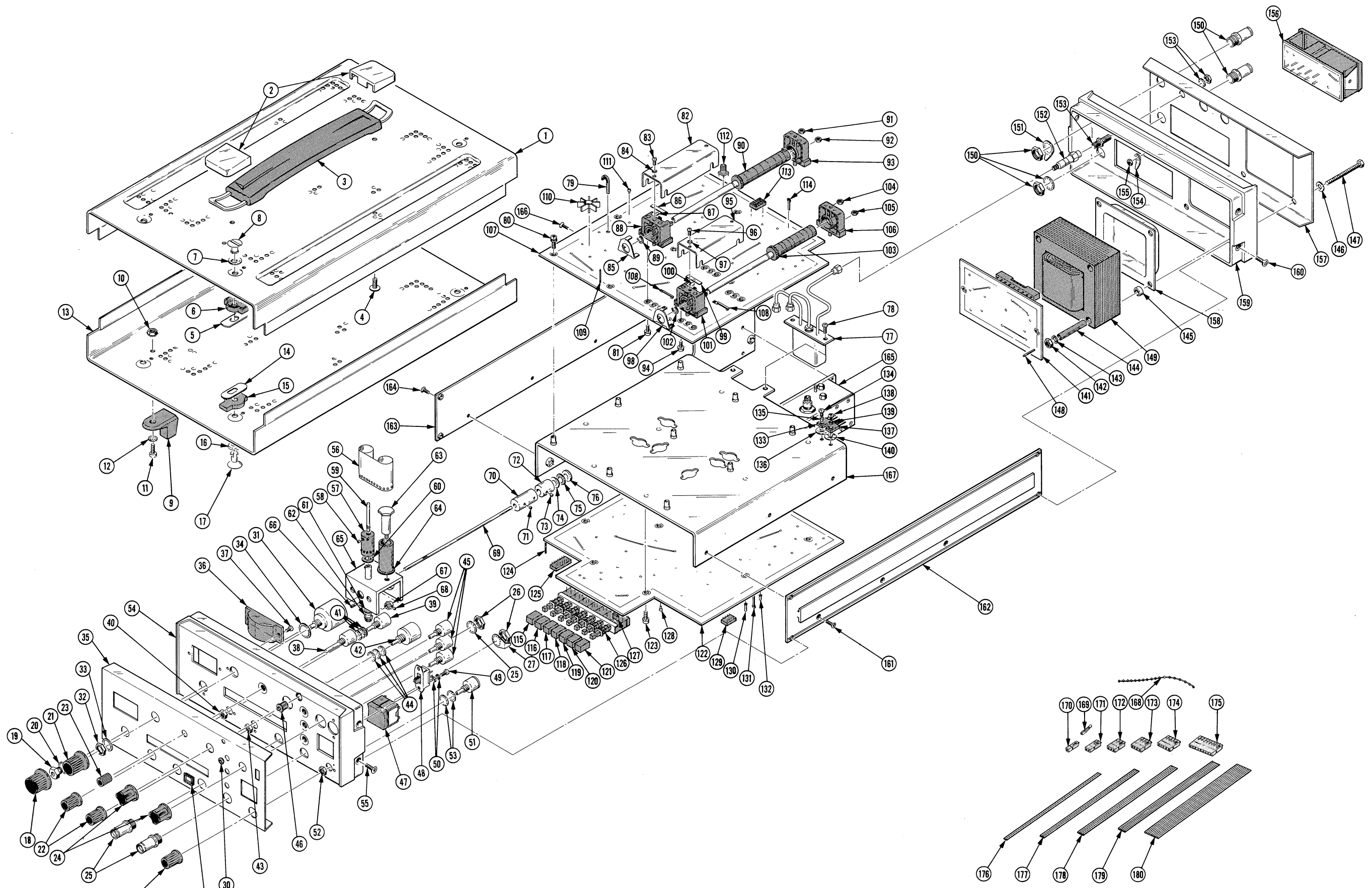
¹Option 1 only.

Replaceable Mechanical Parts—1405

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-129	136-0514-00		5	.					SOCKET, PLUG-IN: MICROCIRCUIT, 8 CONTACT	82647	C930802
-130	136-0234-00		14	.					CONTACT, ELEC: 0.088 OD X 0.247 INCH L	00779	380598-1
-131	214-0579-00		11	.					TERM., TEST PT: 0.40 INCH LONG	80009	214-0579-00
-132	136-0254-00		12	.					CONTACT, ELEC: 0.088 OD X 0.145 INCH LONG	00779	1-331892-5
-133	-----		1						TRANSISTOR: SILICON, NPN (SEE Q955 EPL) (ATTACHING PARTS)		
-134	211-0008-00		1						SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-135	210-1122-00		1						WASHER, LOCK: 0.228 ID X 0.375 INCH OD, STL	78189	4704-04-02
-136	342-0209-00		1						INSULATOR, PLATE: - - - * - - -	04713	OBD
-137	-----		1						TRANSISTOR: SILICON, PNP (SEE Q950 EPL) (ATTACHING PARTS)		
-138	211-0008-00		1						SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-139	210-1122-00		1						WASHER, LOCK: 0.228 ID X 0.375 INCH OD, STL	78189	4704-04-02
-140	342-0209-00		1						INSULATOR, PLATE: - - - * - - -	04713	OBD
-141	-----		1						CKT BOARD ASSY: FILTERED DC (SEE A920 EPL) (ATTACHING PARTS)		
-142	220-0410-00		4						NUT, EXTENDED WA: 10-32 X 0.375 INCH, STL	83385	OBD
-143	210-0812-00		4						WASHER, NONMETAL: #10, FIBER	06982	OBD
-144	166-0432-00		4						INSUL SLVG, ELEC: BOLT INSULATING	80009	166-0432-00
-145	166-0093-00		4						SPACER, SLEEVE: 0.196 ID X 0.188" LONG, AL	80009	166-0093-00
-146	210-0805-00		4						WASHER, FLAT: 0.204 ID X 0.438 INCH OD, STL	12327	OBD
-147	212-0516-00		4						SCREW, MACHINE: 10-32 X 2 INCH, HEX HD STL - - - * - - -	77250	OBD
-148	131-0608-00		4	.					CONTACT, ELEC: 0.365 INCH LONG	22526	47357
-149	-----		1	.					XFMR, PWR, SDN: (SEE T920 EPL)		
-150	131-0955-00		4						CONNECTOR, RCPT, : BNC, FEMALE, W/HARDWARE	24931	28JR200-1
-151	210-0255-00		2						TERMINAL, LUG: 0.391" ID INT TOOTH	80009	210-0255-00
-152	-----		1						ATTENUATOR ASSY: 20 DB, 2-3.1 GHZ (SEE A35 EPL)		
-153	131-0850-00		1						CONNECTOR, RCPT:	16179	209-8579
-154	210-0201-00		1						TERMINAL, LUG: SE #4 (ATTACHING PARTS)	78189	2104-04-00-2520N
-155	210-0551-00		1						NUT, PLAIN, HEX: 4-40 X 0.25 INCH, STL - - - * - - -	83385	OBD
-156	-----		1						SEL, LINE V: 100, 120, 220, 240V (SEE SW915 EPL)		
-157	333-2168-00		1						PANEL, REAR:	80009	333-2168-00
-158	200-1544-01		1						COVER, XFMR: 3 L X 2.5 W X 0.65 INCH H	80009	200-1544-01
-159	386-3566-00		1						SUBPANEL, REAR: (ATTACHING PARTS)	80009	386-3566-00
-160	211-0538-00		4						SCREW, MACHINE: 6-32 X 0.312" 100 DEG, FLH STL - - - * - - -	83385	OBD
-161	426-1318-00		1						FRAME SECT, CAB: RIGHT (ATTACHING PARTS)	80009	426-1318-00
-162	211-0038-00		3						SCREW, MACHINE: 4-40 X 0.312" 100 DEG, FLH STL - - - * - - -	83385	OBD
-163	426-1317-00		1						FRAME SECT, CAB: LEFT (ATTACHING PARTS)	80009	426-1317-00
-164	211-0038-00		3						SCREW, MACHINE: 4-40 X 0.312" 100 DEG, FLH STL - - - * - - -	83385	OBD
-165	-----		1						OSCILLATOR, RF: 2.09-3.1 GHZ (SEE A30 EPL) (ATTACHING PARTS)		
-166	211-0101-00		4						SCREW, MACHINE: 4-40 X 0.25" 100 DEG, FLH STL - - - * - - -	83385	OBD
-167	441-1331-00		1						CHAS, ELEC EQUIP: ANALYZE	80009	441-1331-00
-168	006-0531-00		1						STRAP, TIE DN, EL: 5 INCH LONG	24618	700-3688
-169	131-0707-00		71						CONTACT, ELEC: 0.48" L, 22-26 AWG WIRE	22526	47439
-170	352-0171-00		2						CONN BODY, PL, EL: 1 WIRE BLACK	80009	352-0171-00
	352-0171-01		1						CONN BODY, PL, EL: 1 WIRE BROWN	80009	352-0171-01
	352-0171-02		1						CONN BODY, PL, EL: 1 WIRE RED	80009	352-0171-02
-171	352-0169-00		4						CONN BODY, PL, EL: 2 WIRE BLACK	80009	352-0169-00
	352-0169-02		2						CONN BODY, PL, EL: 2 WIRE RED	80009	352-0169-00
	352-0169-05		1						CONN BODY, PL, EL: 2 WIRE, GREEN	80009	352-0169-05

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Qty						Name & Description	Mfr Code	Mfr Part Number
					1	2	3	4	5			
1-	352-0169-06			1						CONN BODY,PL,EL:2	WIRE BLUE	80009 352-0169-06
-172	352-0161-00			3						CONN BODY,PL,EL:3	WIRE BLACK	80009 352-0161-00
	352-0161-03			1						CONN BODY,PL,EL:3	WIRE ORANGE	80009 352-0161-03
	352-0161-04			1						CONN BODY,PL,EL:3	WIRE YELLOW	80009 352-0161-04
	352-0161-05			3						CONN BODY,PL,EL:3	WIRE GREEN	80009 352-0161-05
	352-0161-08			1						CONN BODY,PL,EL:3	WIRE GRAY	80009 352-0161-08
-173	352-0162-05			3						CONN BODY,PL,EL:4	WIRE GREEN	80009 352-0162-05
-174	352-0163-07			1						CONN BODY,PL,EL:5	WIRE VIOLET	80009 352-0163-07
-175	352-0167-04			1						CONN BODY,PL,EL:9	WIRE YELLOW	80009 352-0167-04
-176	175-0825-00			FT						WIRE,ELECTRICAL:2	WIRE RIBBON	08261 TEK-175-0825-00
-177	175-0826-00			FT						WIRE,ELECTRICAL:3	WIRE RIBBON	08261 TEK-175-0826-00
-178	175-0827-00			FT						WIRE,ELECTRICAL:4	WIRE RIBBON	08261 TEK-175-0827-00
-179	175-0828-00			FT						WIRE,ELECTRICAL:5	WIRE RIBBON	23499 TEK-175-0828-00
-180	175-0832-00			FT						WIRE,ELECTRICAL:9	WIRE RIBBON	23499 TEK-175-0832-00





a

1405 TV SIDEBAND ADAPTER

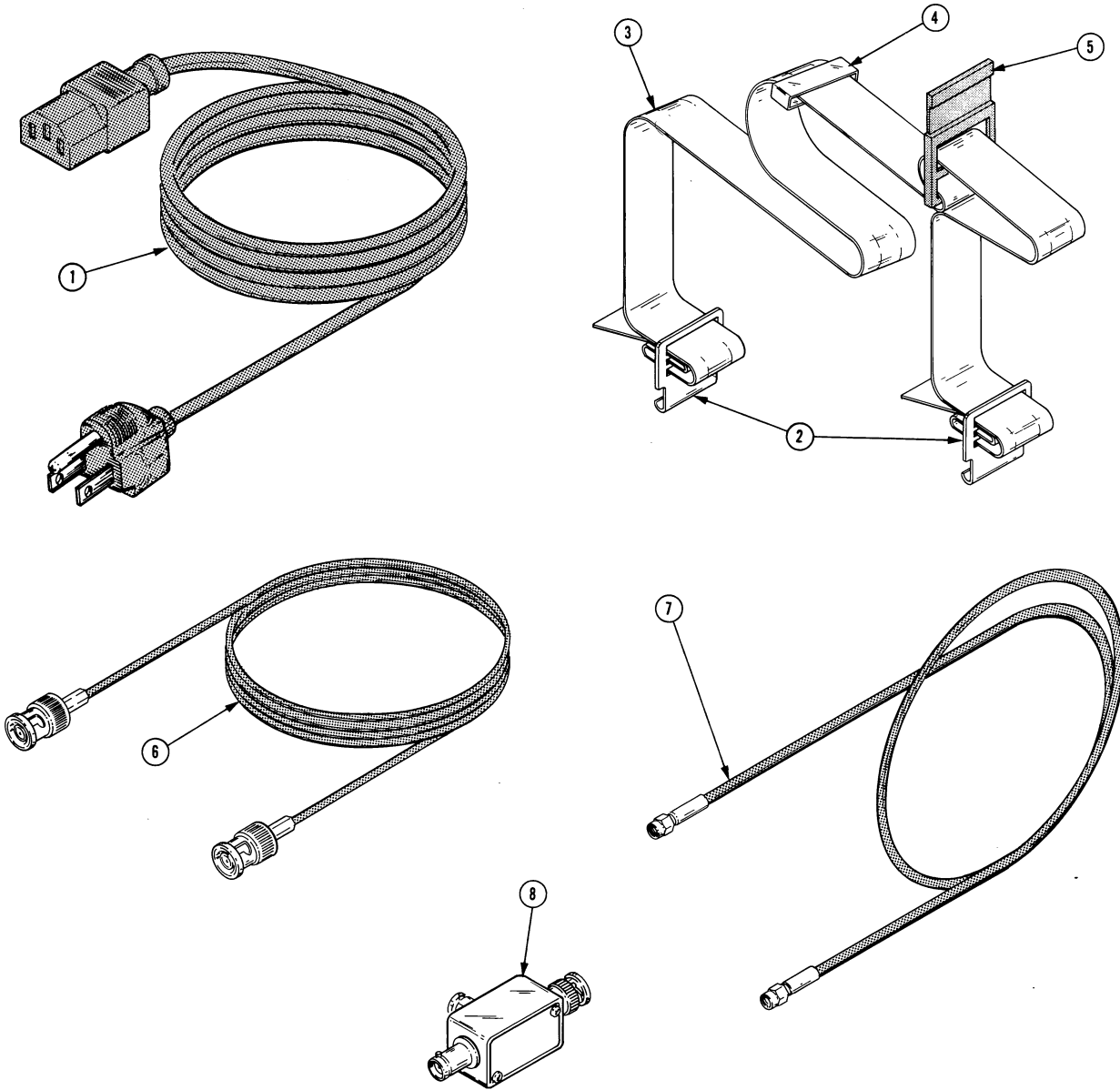


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
------------------	--------------------	----------------------	------------	-----	---	---	---	---	---	--------------------	----------	-----------------

ACCESSORIES

-1	161-0066-00			1						CABLE ASSY,PWR:3 WIRE,98 INCH LONG	80009	161-0066-00
	346-0144-00			1						STRAP ASSY:1.5" WIDE X 72.0" LONG	80009	346-0144-00
-2	214-2475-00			2						. HOOK,STRAP:	80009	214-2475-00
-3	252-0611-00			1						. PLASTIC WEBBING:	80009	252-0611-00
-4	352-0128-00			1						. HOLDER,LOAD BDR:0.480 X 0.930 INCH	80009	352-0128-00
-5	214-0945-02			1						. BINDER,LOAD:	80009	214-0945-02
-6	012-0057-01			2						CABLE ASSY,RF:50 OHM COAX W/BNC	80009	012-0057-01
-7	012-0649-00			1						CABLE ASSY,RF:50 OHM COAX,28.5 INCH LONG	80009	012-0649-00
-8	011-0128-00			1						ADAPTER,CONN:75 OHM INSERTION TEE	80009	011-0128-00
	070-2078-00			1						MANUAL,TECH:INSTRUCTION	80009	070-2078-00