

Tektronix®

**REMOTE VARIABLE
015-0309-01**

INSTRUCTION MANUAL

EX-100-100-100





**PLEASE CHECK FOR CHANGE INFORMATION
AT THE REAR OF THIS MANUAL.**

**REMOTE VARIABLE
015-0309-01**

INSTRUCTION MANUAL

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


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Product Group 76

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INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag,
or stamped on the chassis. The first number or letter
designates the country of manufacture. The last five digits
of the serial number are assigned sequentially and are
unique to each instrument. Those manufactured in the
United States have six unique digits. The country of
manufacture is identified as follows:

B000000	Tektronix, Inc., Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

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WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

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OPERATORS SAFETY SUMMARY

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

TERMS

In This Manual

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

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

As Marked on Equipment

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

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

SYMBOLS

As Marked on Equipment



DANGER — High voltage.



Protective ground (earth) terminal.



ATTENTION — refer to manual.

Power Source

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

Grounding the Product

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

Danger Arising From Loss of Ground

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

Use the Proper Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

Do Not Operate in Explosive Atmospheres

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

Do Not Remove Covers or Panels

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

SERVICE SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

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

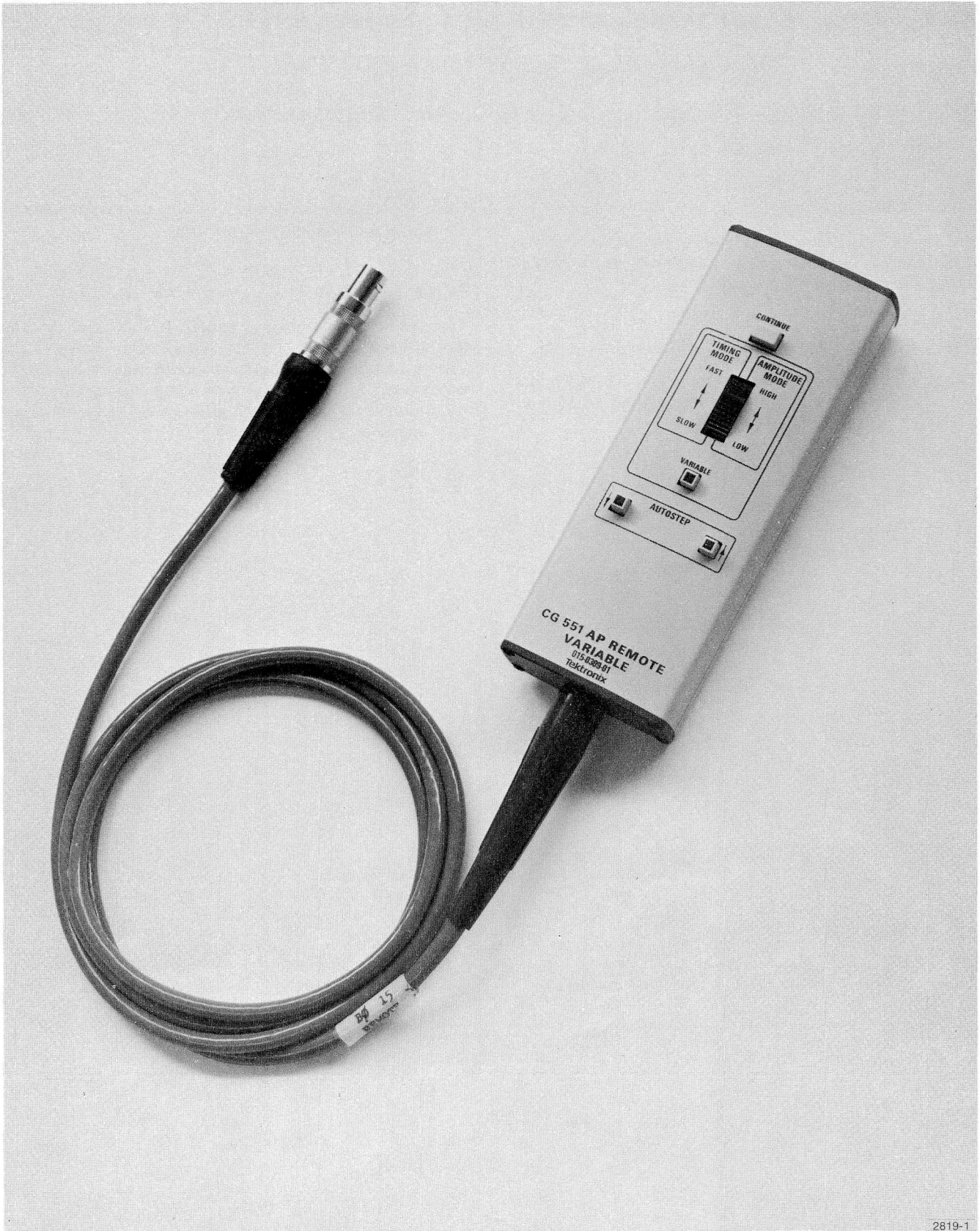
Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

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



2819-1

The CG 551AP Remote Variable (015-0309-01).

SPECIFICATION

NOTE

The references to the CG 551AP in this manual apply equally to the CG 5001. The CG 5001 has a Power Module to plug-in GPIB interface connector. This allows it to be used in all TM 5000 Power Modules. The CG 551AP functional information also applies to the CG 5001.

Introduction

The Remote Variable Head is an accessory to the CG 551AP Programmable Calibration Generator. This accessory permits the operator to remotely operate the following front panel controls:

UNITS/DIV control; VARIABLE-FIXED button; CONTINUE pushbutton and the error variable for the AMPLITUDE and TIMING MODES.

The AUTOSTEP pushbuttons indicated by ↑ or ↓ increment or decrement the UNITS/DIV readout. These buttons light to show the direction that the UNITS/DIV readout will go the next time the CONTINUE pushbutton is pressed.

The VARIABLE-FIXED pushbutton also lights, and is functionally connected in parallel with the VARIABLE-FIXED pushbutton on the CG 551AP.

The CONTINUE pushbutton triggers the CG 551AP continue flag which generates a GPIB Service Request (SRQ). This button also increments or decrements the UNITS/DIV counter (readout), when the CG 551AP is not under program control. The direction is indicated by the last selected AUTOSTEP pushbutton.

The error variable control for the TIMING and AMPLITUDE MODES increments or decrements the error variable counter when the thumbwheel is moved from its inactivated state.

Accessories

This instruction manual is the only standard accessory.

Performance Conditions

The electrical characteristics are valid only if the Remote Variable has been calibrated at an ambient temperature between +20°C and +30°C and is operating at an ambient temperature between 0°C and +50°C, unless otherwise noted.

There are no items listed in the Performance Requirements column of the Electrical Characteristics; however, the Verification Procedure in the Calibration section of this manual verifies the Remote Variable operation with the CG 551AP.

Items listed in the Supplemental Information column are not verified in this manual. They are either explanatory notes or performance characteristics for which no limits are specified.

Table 1-1

ELECTRICAL CHARACTERISTICS

Characteristics	Performance Requirements	Supplemental Information
Power Requirements		
Voltage (V_{cc})		5.0 V \pm 0.25 V dc
Current		125 mA dc maximum
Maximum Clock Rate		60 kHz
Minimum Time to Respond to Interrupt		70 μ s
Maximum Var Frequency		35 Hz
Threshold Voltages		
Clock pulse input		High, 3.5 V minimum Low, 0.8 V maximum
Data input		High, 2.0 V minimum Low, 0.8 V maximum
Data output		High, 2.4 V minimum Low, 0.4 V maximum

Table 1-2
ENVIRONMENTAL

Characteristics	Description	
Temperature	Meets MIL-T-28800B, class 5.	
Operating	0°C to +50°C.	
Non-operating	-55°C to +75°C.	
Humidity	90—95% RH for 5 days to 50° C.	Exceeds MIL-T-28800B, class 5.
Altitude	Exceeds MIL-T-28800B, class 3.	
Operating	4.6 Km (15,000 ft).	
Non-operating	15 Km (50,000 ft).	
Vibration	0.64 mm (0.0252") 10 Hz to 55 Hz, 75 minutes.	Meets or exceeds MIL-T-28800B, class 3.
Shock	50 g's (1/2 sine), 11 ms, 18 shocks.	Meets or exceeds MIL-T-28800B, class 3.
Bench Handling	45° or 4" or equilibrium, whichever occurs first.	Meets MIL-T-28800B, class 3.
EMI Compatibility	Meets MIL-T-28800B, class 3.	
Conducted Emissions	MIL-STD-461A when performed in accordance with MIL-STD-462 with following exception:	
Conducted Susceptibility		
Radiated Emissions	radiated emissions tested to 30 dB above specification from dc to 700 MHz.	
Radiated Susceptibility		
Electrical Discharge	20 kV maximum.	Charge applied to each protruding area of the product under test except the output terminals.
Transportation	Qualified under National Safe Transit Association Preshipment Test Procedures 1A-B-1 and 1A-B-2.	
Vibration	25 mm (1") at 270 rpm for 1 hour.	
Package Drop	10 drops from 91 cm (3 ft).	
Cables		
Flex Life	10,000 cycles at 120° flex with 0.68 kg (1.5 lb) weight.	
Pull Test	15.88 kg (35 lbs) axial pull at 1 minute duration.	

Table 1-3
PHYSICAL CHARACTERISTICS

Characteristics	Description
Finish	Light and dark gray painted metal.
Net Weight	0.23 kg, (0.5 lb).
Overall Dimensions	138 mm (5.43") L x 53.4 mm (2.102") W x 27.8 mm (1.094") H.

OPERATING INSTRUCTIONS

Introduction

The Remote Variable is an accessory designed to operate with the CG 551AP Programmable Calibration Generator. The attached cable contains signal as well as power lines and connects directly to the CG 551AP front panel REMOTE VARIABLE connector. Power for the head is taken from the CG 551AP through this connector.

After turning on the CG 551AP, the Remote Variable pushbutton lights may not conform to the CG 551AP settings. Any change to either the CG 551AP or Remote Variable settings will coordinate the lights. Any changes in the Remote Variable settings will cause an identical change for the CG 551AP settings.

Connecting to CG 551AP

CAUTION

Use care when connecting the Remote Variable plug to the CG 551AP. To avoid pin misalignment and possible connector damage, do not force the plug into the connector.

Carefully align the plug pins with the Remote Variable connector pins and insert the plug into this connector.

This accessory is calibrated and ready to use when received.

Controls

- ① CONTINUE pushbutton—increments or decrements the CG 551AP UNITS/DIV front panel control. The direction is indicated by last selected AUTOSTEP pushbutton when the CG 551AP is not under program control. This switch also triggers the CG 551AP continue flag which generates a Service Request (SRQ) on the general purpose interface bus (GPIB).

NOTE

The CONTINUE pushbutton increment and decrement function is disabled when the CG 551AP-CG 5001 is operated in its remote state (REMS).

- ② TIMING-AMPLITUDE MODE—a spring return thumbwheel adjustment to increment or decrement the CG 551AP error variable.
- ③ VARIABLE-FIXED pushbutton—lights when pressed and is connected functionally in parallel with the VARIABLE-FIXED pushbutton on the CG 551AP.

- ④ AUTOSTEP ↓ and AUTOSTEP ↑ pushbuttons—decrements or increments the CG 551AP UNITS/DIV readout. Press desired button to light, then press again to decrement or increment the CG 551AP UNITS/DIV readout. These buttons light to show the UNITS/DIV counter direction the next time the CONTINUE pushbutton is pressed.

General Operating Instructions

With the Remote Variable Head connected to the CG 551AP OUTPUT connector, press to light the AUTOSTEP ↑ pushbutton. Press this button a second time and observe the CG 551AP UNITS/DIV display readout steps in a positive direction. The AUTOSTEP ↓ pushbutton operation is the same as the AUTOSTEP ↑ button, with exception that the display steps in a negative direction.

NOTE

When the CG 551AP-CG 5001 is operating in its remote state (REMS), any use of the TIMING-AMPLITUDE MODE thumb wheel, VARIABLE-FIXED pushbutton, or AUTO STEP pushbutton will return the CG 551AP-CG 5001 to the LOCAL STATE (LOCS). When the CG 551AP-CG 5001 changes from its "remote" state to the "local" state, operator changes in the CG 551AP-CG 5001 front panel or Remote Variable Head controls can cause an unexpected change in the CG 551AP-CG 5001 operation. This is especially true for the Remote Variable Head CONTINUE pushbutton. When pressed in the "remote" state, this pushbutton satisfies the READ? requirement for the CONTINUE pushbutton. The same pushbutton, when pressed in the "local" state increments or decrements the CG 551AP-CG 5001 UNITS/DIV front panel control and satisfies the READ? requirement.

It is recommended that when using the Remote Variable Head in the "remote" state, that the Remote with Lockout State (RWLS) be the primary operating state. This state can be achieved when the CG 551AP-CG 5001 is in the Remote State (REMS), by sending Local Lockout (LLO,\$11) with Attention (ATN) asserted.

The CONTINUE button, on the Remote Variable, operates as a remote control for the CG 551AP UNITS/DIV switch. When the CONTINUE button is pressed, the UNITS/DIV steps in the direction as selected by one of the AUTOSTEP pushbuttons. This CONTINUE button also sends a Service Request (SRQ) command to a GPIB controller. The AUTOSTEP buttons are unable to generate this command. The Service Request indicates to the controller that the CG 551AP percentage error and

Operating Instructions—Remote Variable 015-0309-(01 & Up)

units/division readout information is available to the controller. Refer to the CG 551AP Programmable Calibration Generator instruction manual for information on programming commands related to the CONTINUE pushbutton.

To activate the TIMING MODE-AMPLITUDE MODE control, press to light the Remote Variable VARIABLE-FIXED pushbutton. The operation of this control is similar to the CG 551AP VARIABLE control and adjusts the CG 551AP output voltage, current, or timing signal. The TIMING MODE-AMPLITUDE MODE thumbwheel, when moved forward or backward, causes the CG 551AP error variable to increase or decrease the percentage error as indicated on the CG 551AP display. The error range is from -9.9% in the SLOW-LOW HIGH-SLOW position to $+9.9\%$ in the FAST-HIGH LOW-FAST position of the thumbwheel control.

Repackaging Information

If shipping this instrument to a Tektronix Service Center for service or repair, attach a tag showing owner (with address) and the name of an individual to contact. Include the complete instrument serial number and a description of the service required.

Save and reuse the package in which the instrument was shipped. If the original packaging is unfit for use or not available, repackaging the instrument as follows:

1. Obtain a corrugated carton having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Use a carton having a test strength of at least 200 pounds.
2. Surround the instrument with protective polyethylene sheeting.
3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.
4. Seal carton with shipping tape or industrial staples.

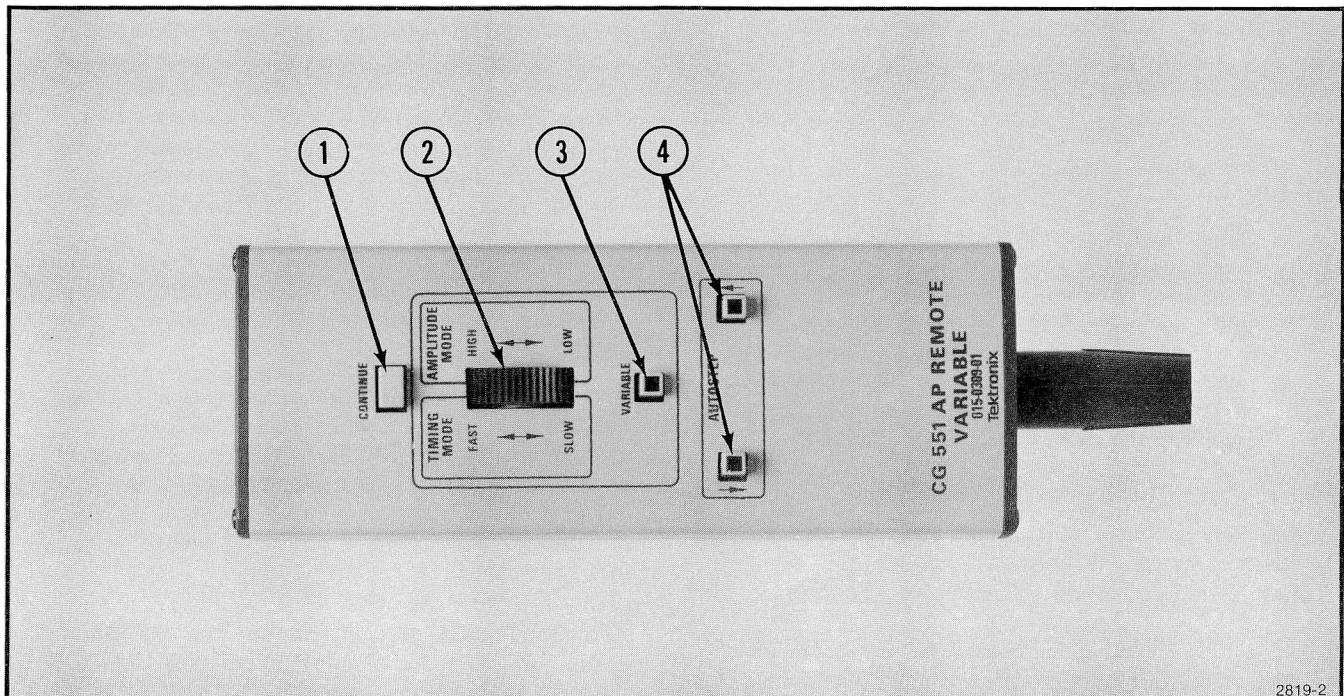
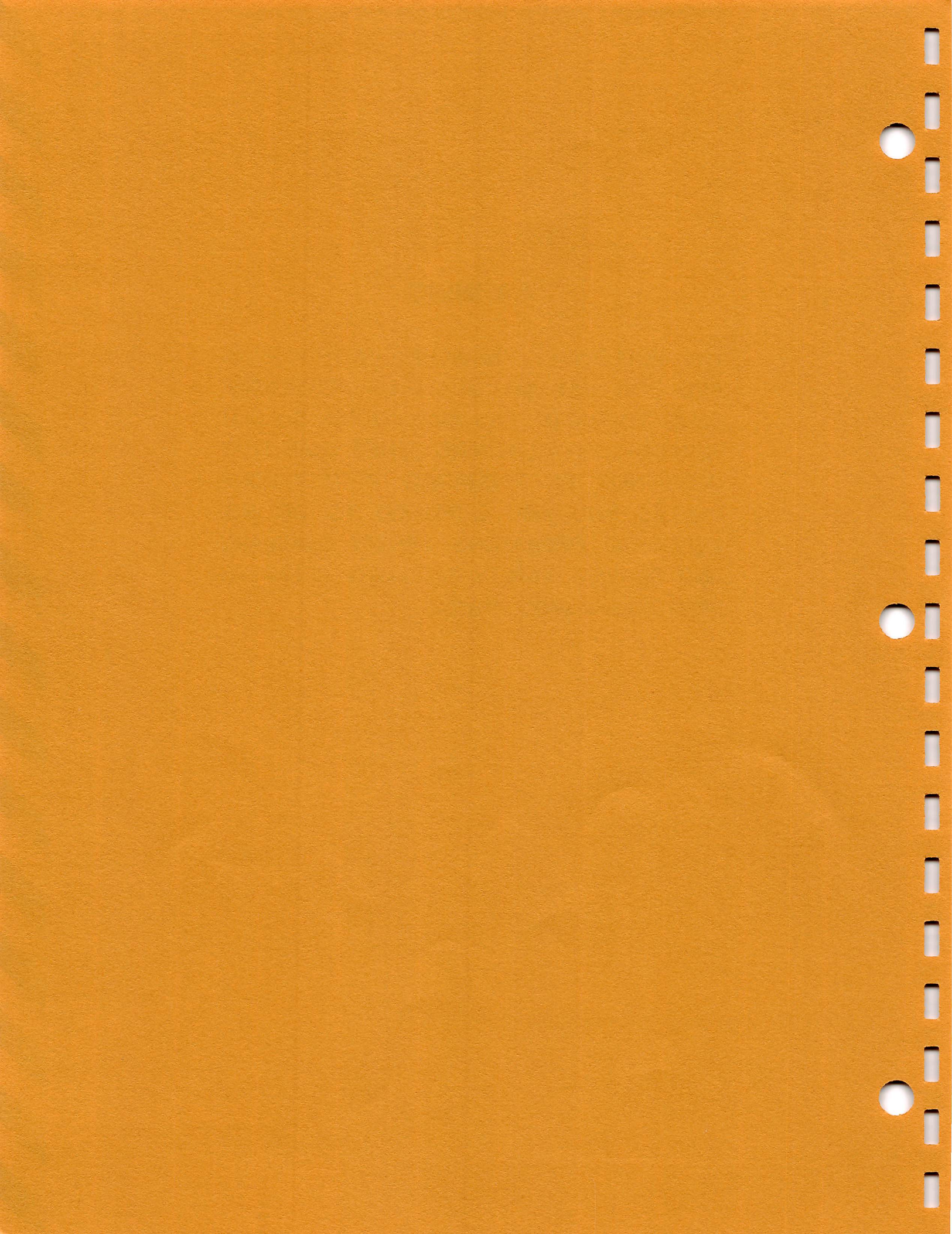


Fig. 2-1. Remote Variable controls.

WARNING

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



THEORY OF OPERATION

Introduction

The power lead from the CG 551AP provides +5 V and ground for the Remote Variable circuitry. The three signal leads provide for data in, data out, interrupt, and clock pulse information.

Timing Mode-Amplitude Mode

The TIMING MODE-AMPLITUDE MODE control is identical in operation to the VARIABLE control on the CG 551AP. This spring-return thumbwheel control, R1214, initiates the error ↑ or error ↓ signals which increment or decrement the percent error variable of the CG 551AP.

With R1214 centered (static state), the Center Adjust control, R1302, centers the input thresholds of comparators U1111C and U1111D. As R1214 is adjusted to either side of center position, the current through Q1001 or Q1003 is changed. This current, which passes through R1003 and CR1002, sets the voltage at the base of Q1005. Q1005 sets the input current for U1111A. This input current determines the oscillator output frequency which alters the percent error on the CG 551AP. U1111A, along with associated components, makes up the current controlled oscillator.

Resistors R1011, R1012, R1013, and the output of U1111A, pin 1, set the comparison level for the voltage on C1011. With the output of U1111A high, capacitor C1011 charges until the voltage across it exceeds the comparison level. The output of U1111A goes to the low state, the comparison level lowers and C1011 discharges until this new comparison level is reached. The output of U1111A then returns to the high state and the cycle repeats.

HIGH-FAST Position. Whether it is in the TIMING or AMPLITUDE mode, the HIGH-FAST position initiates the error ↑ signal. This causes pin 14 of U1111D to go high. Q1111 then turns on if the current controlled oscillator output is low. With Q1111 collector high, Q1301 turns on which sends the error ↑ signal to the shift register, U1411 pin 14. This signal also couples through diode CR1401 causing Q1312 to turn on. The output of Q1312 drives U1411 pin 9 and the base of Q1311. As Q1311 turns on, an interrupt pulse is sent to the CG 551AP via connector J560, pin 1 (see interface waveforms in Fig. 3-1).

The CG 551AP, after receiving the interrupt pulse, accepts the information on pin 3 of J560. This information

outputs from Q1201 (collector) which is driven by the shift register, U1411 pin 3. After receiving the information, the CG 551AP causes a pulse to appear at J560 pin 1, U1411 pin 10, and U1501 pin 8 (see expanded view of clock and data relationship in Fig. 3-2). This shifts the output shift register, U1411, one position. This is repeated seven more times to acquire all of the output information.

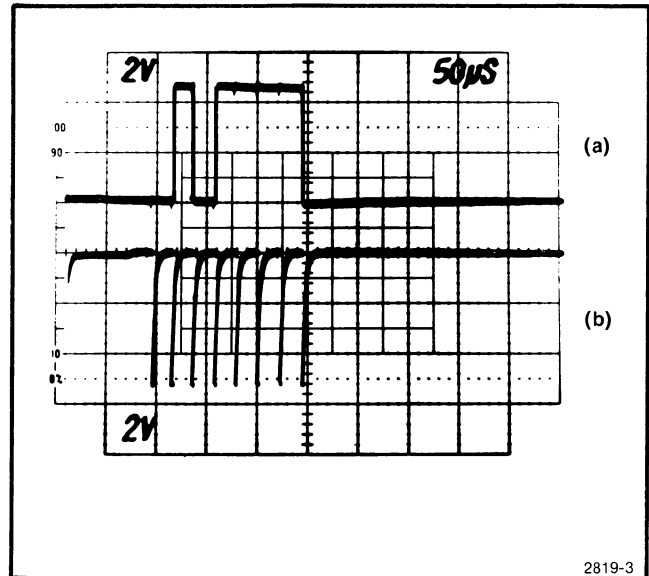


Fig. 3-1. Interface waveforms. (a) Data out. (b) Interrupt and 8 clock pulses.

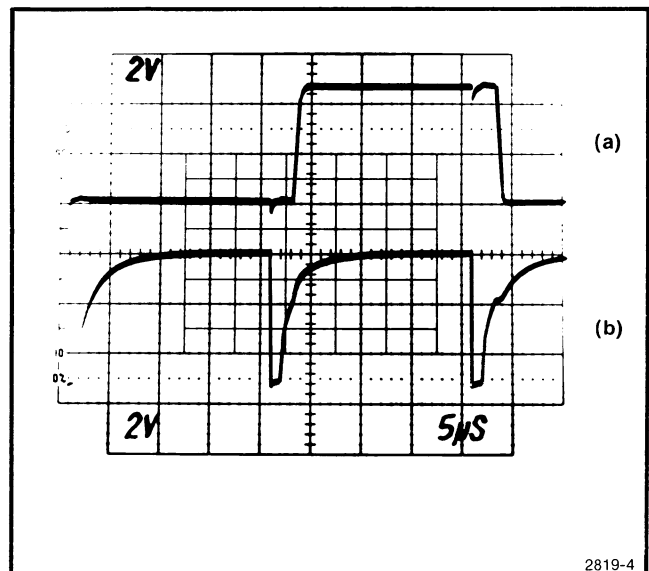


Fig. 3-2. Interface waveforms. (a) Data out (expanded). (b) Clock pulse (expanded).

Theory of Operation—Remote Variable 015-0309-(01 & Up)

The CG 551AP now sends out information (data in) via J560 pin 2 to the Remote Variable using pin 1 of J560 as a clock signal (see interface waveforms in Fig. 3-3). This information reloads shift register U1501, which controls the pushbutton lights.

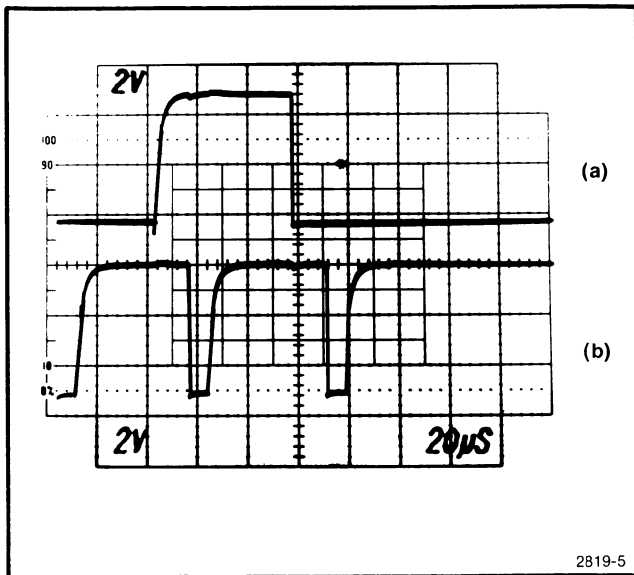


Fig. 3-3. Interface waveforms. (a) Data in. (b) Clock.

LOW-SLOW Position. When in either the TIMING or AMPLITUDE mode, the LOW-SLOW position of R1214 initiates the error ↓ signal causing U1111C pin 8 to go high. With a low from the oscillator output, U1111B pin 7 goes high causing Q1302 to turn on. The error ↓ signal is received at U1411 pin 13 and also turns on Q1312 through diode CR1501. This signal drives U1411 pin 9 and also causes Q1311 to turn on. The interrupt pulse is received by

the CG 551AP and operation continues as previously described (HIGH-FAST Position).

Pushbutton Operation

Any one of four command signals from the Remote Variable can be generated by the CONTINUE, VARIABLE, AUTOSTEP ↑, and AUTOSTEP ↓ pushbuttons.

The main function of the hex debouncer, U1412, is to assure that only one interrupt is generated to the CG 551AP when one of the four pushbuttons is depressed. An internal clock is generated by U1412 in conjunction with capacitor C1512. The output state of U1412 does not change until the input has remained constant for four consecutive clock cycles.

The output signal from U1412 couples through the appropriate diode to feed shift register, U1411. Operation from this point is the same as previously discussed (HIGH-FAST Position).

The pushbutton lights (VARIABLE, AUTOSTEP ↑, and AUTOSTEP ↓) are controlled by the CG 551AP. Information is sent to U1501 pin 1, via J560 pin 2 in conjunction with the clock signal at U1501 pin 8 via J560 pin 1, to light the selected pushbutton.

When the Remote Variable is used with the CG 551AP for GPIB operation, the CONTINUE pushbutton triggers the CG 551AP continue flag which can initiate a GPIB service request (SRQ). Refer to the CG 551AP Instruction manual for further GPIB information.

CALIBRATION

VERIFICATION PROCEDURE

Introduction

This instrument does not have performance requirements; however, the following procedure verifies Remote Variable operation with the CG 551AP.

Refer to the Specification section of this manual for Electrical Characteristics and Supplemental Information.

Test Equipment Required

The test equipment required is a TEKTRONIX CG 551AP Programmable Calibration Generator and a TEKTRONIX modified TM 506 or modified TM 515 Power Module (mod JB).

Carefully connect the Remote Variable plug to the CG 551AP front panel REMOTE VARIABLE connector.

Turn on the CG 551AP.

1. Check VARIABLE Pushbutton

a. Press to light the VARIABLE pushbutton on the Remote Variable.

b. CHECK—that CG 551AP VARIABLE pushbutton and Remote Variable pushbutton lights are both illuminated.

2. Check AUTOSTEP ↓ and AUTOSTEP ↑ Pushbuttons

a. Press to light the Remote Variable AUTOSTEP ↓ pushbutton. Press the button again to decrement.

b. CHECK—that the CG 551AP UNITS/DIV display readout steps in the negative direction.

c. Press to light the AUTOSTEP ↑ pushbutton. Press the button again to increment.

d. CHECK—that the CG 551AP UNITS/DIV display readout steps in the positive direction.

3. Check CONTINUE Pushbutton

a. Depress the Remote Variable CONTINUE pushbutton.

b. CHECK—that the CG 551AP UNITS/DIV display readout steps in the positive direction as previously indicated in step 2d.

4. Check TIMING-AMPLITUDE MODE Thumbwheel

a. Press up on the spring return thumbwheel, let return; press down on the thumbwheel.

b. CHECK—that the direction (up and down) increments and decrements the CG 551AP error variable display readout.

This completes the Verification Procedure.

ADJUSTMENT PROCEDURE

Introduction

Use this Adjustment Procedure to restore the Remote Variable to original factory calibration.

If this instrument has undergone repairs, perform the Adjustment Procedure.

NOTE

Refer to Adjustment Locations, Fig. 8-2, in the pull-out section of this manual for the following procedure.

Test Equipment Required

Use a TEKTRONIX CG 551AP Programmable Calibration Generator and a dc voltmeter, TEKTRONIX DM 501, or equivalent. All test equipment is assumed to be correctly calibrated and operating within specifications.

Preparation

Access to the internal adjustments is achieved with the Remote Variable top cover removed (see Maintenance procedure in this manual).

Make adjustments at an ambient temperature between +20°C and +30°C (+68°F and +86°F).

1. Adjust the mechanical alignment of R1214 with thumbwheel control.

- a. CHECK—that the slot in the shaft for potentiometer R1214 is perpendicular to the circuit

board when the thumbwheel is in the spring-return position (see Fig. 5-1 in the Maintenance procedure section).

- b. To align R1214, loosen the set screws securing the thumbwheel control to the potentiometer shaft. Adjust the shaft so that the slot in the shaft is perpendicular to the board.
- c. Tighten the set screws and proceed with the next step.

2. Adjust R1302, CENTER ADJUST

- a. Connect the Remote Variable cable plug to the CG 551AP REMOTE VARIABLE front panel connector and apply power.
- b. Set the test voltmeter to the 2 V range.
- c. Connect one lead of the voltmeter to test point TP1005 and the other lead to test point TP1004.
- d. CHECK—for a 0 V display reading.
- e. Adjust—R1302 for a 0 V display reading.
- f. Remove the test leads.

This completes the Adjustment Procedure.

MAINTENANCE

Recalibration

To ensure accurate measurements, check the calibration of this instrument after each 1000 hours of operation or every six months if used infrequently. In addition, replacement of components may necessitate recalibration of the affected circuits. Refer to the Adjustment Procedure in the Calibration section.

Disassembly and Reassembly

NOTE

Refer to Fig. 5-1 for the following procedures.

Top Cover Removal and Replacement

Remove the four end screws ① .

Carefully lift the top cover to clear exposed pushbuttons and thumbwheel and remove the cover.

To replace, carefully position the top cover over the exposed pushbuttons and thumbwheel. Check that the thumbwheel does not bind on the cover. Secure cover with the four end screws.

Bottom Cover Removal and Replacement

Remove the two cover screws ② .

Remove the four end screws ③ and lift off bottom cover.

Replace the cover by aligning the circuit board with the cover screw openings and insert screws to secure circuit board to cover.

Replace the four end screws.

Circuit Board Removal and Replacement

After removal of the bottom cover, the printed circuit board can be removed by detaching the connector, J560 ④ from the square pins mounted on the circuit board. Make certain this connector is properly connected when reattaching to the board pins.

Thumbwheel Adjust Assembly Removal and Replacement

To remove the thumbwheel control ⑤ unsolder the TIMING MODE-AMPLITUDE MODE potentiometer (three connections). Remove the four screws securing the two mounting brackets ⑥ and remove the entire assembly from the board.

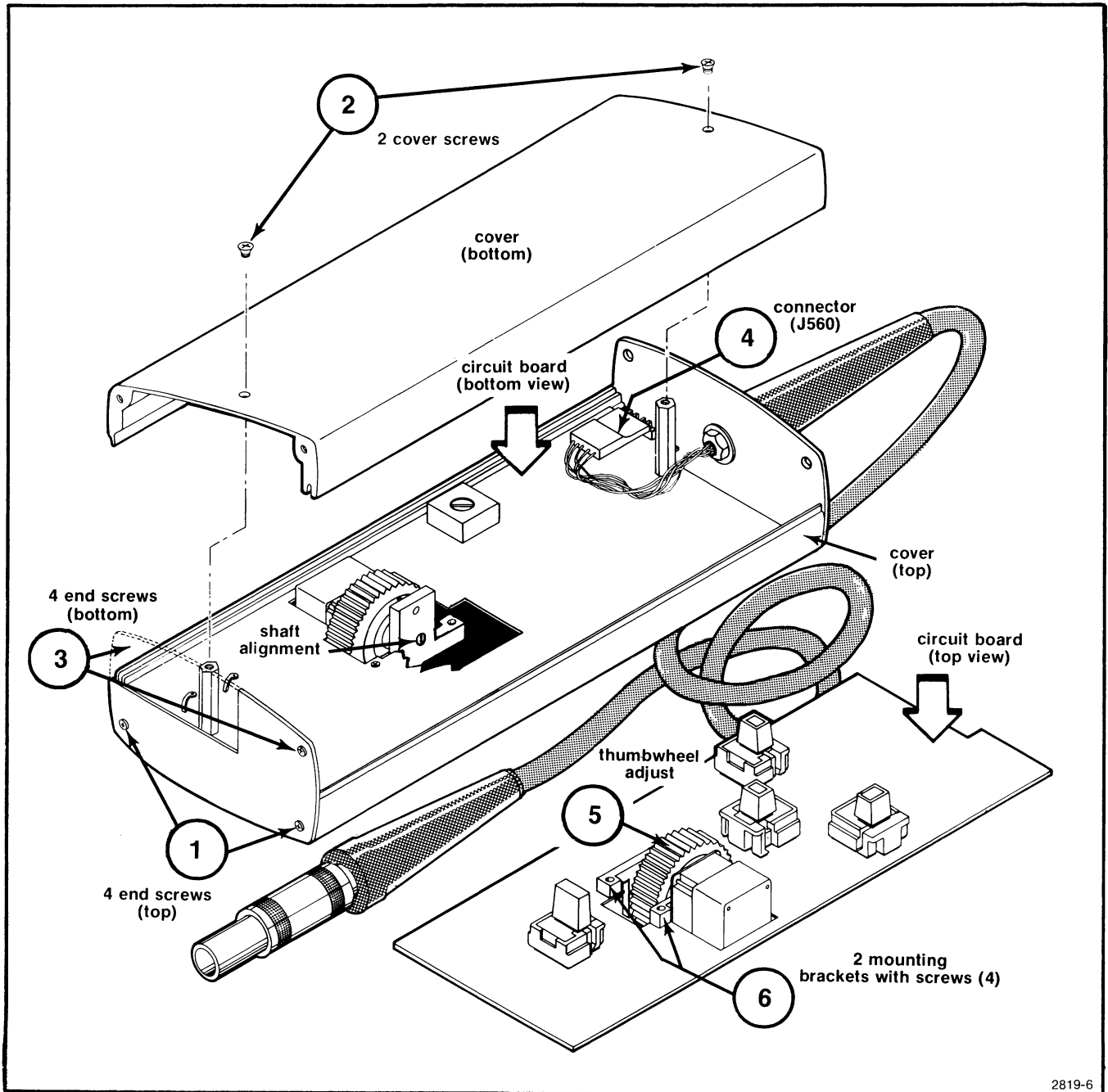
Replacement of this assembly is accomplished by reversing the above steps.

Check that the thumbwheel does not bind on the circuit board.

Thumbwheel Control Assembly Parts Replacement

The following procedure outlines the thumbwheel assembly parts replacement (see Fig. 5-2).

- a. With assembly removed, carefully pull bracket ③ away from the potentiometer shaft.
- b. The exposed Teflon washer ④ and spring ⑤ can be removed. Slide spacer ⑥ off shaft.
- c. Loosen set screws ⑨ , that secure the thumbwheel control ⑦ to the potentiometer shaft, and slide the control off the shaft.
- d. Remove the nut ⑩ and lockwasher ⑪ to detach potentiometer ⑬ from bracket ⑫ .
- e. Replacement of assembly parts is accomplished by reversing the removal procedure. However, make certain that the spring engages the thumbwheel arm ⑧ as well as the bracket arm ② .
- f. Refer to the Adjustment Procedure in the Calibration section of this manual to properly align the potentiometer to the thumbwheel control.



2819-6

Fig. 5-1. Maintenance diagram (exploded view).

Cleaning Instructions

This instrument should be cleaned as often as operating conditions require. Accumulation of dirt on components acts as an insulating blanket and prevents efficient heat dissipation that can cause overheating and component breakdown.

CAUTION

Avoid the use of chemical cleaning agents that might leave a film or damage the plastic material used in this instrument. Use a nonresidue type of cleaner; preferably, isopropyl alcohol or totally denatured ethyl alcohol. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

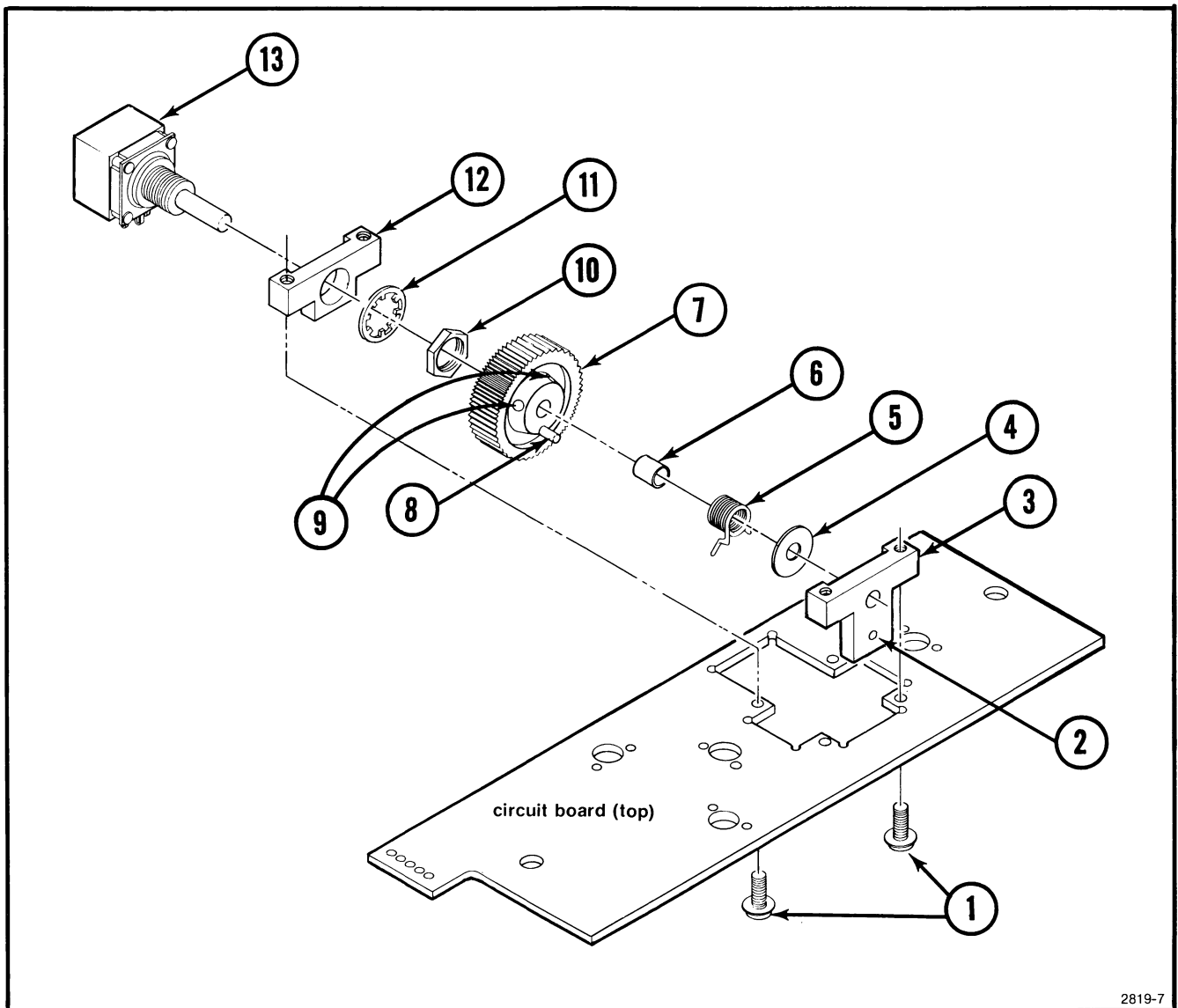


Fig. 5-2. Thumbwheel assembly parts replacement.

Exterior. Loose dust accumulated on the front panel can be removed with a soft cloth or a small brush. Dirt that remains can be removed with a soft cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

Interior. Dust in the interior of the instrument should be occasionally removed, due to its electrical conductivity under high humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry low pressure air; then use a soft brush. If further cleaning is required, use a mild detergent and water solution, flushing well with clean water.

CAUTION

Do not clean the circuit board with water, air, or any solvent unless the pushbutton switches are removed first. Any dirt forced or carried under the switch contacts can cause intermittent operation.

Drying can be accomplished with dry, low pressure air or by placing in an oven at 40°C to 60°C for approximately four hours.

Maintenance—Remote Variable 015-0309-(01 & Up)

After making minor board repairs, cleaning is best accomplished by carefully flaking or chipping the solder flux from the repaired area.

Isopropyl alcohol can be used to clean major repairs to the circuit board; however, flush the board well with clean, isopropyl alcohol. Make certain that resin or dirt is carefully removed from the board.

Obtaining Replacement Parts

Electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained from a local commercial source. Before purchasing or ordering parts from a source other than Tektronix, Inc., check the Replaceable Electrical Parts list for the proper value, rating, tolerance, and description.

Ordering Parts

When ordering replacement parts from Tektronix, Inc., it is important that all of the following information be included to ensure receiving the proper parts.

1. Instrument type (include modification or option numbers).
2. Instrument serial number.
3. A description of the part (if electrical, include the component number).
4. Tektronix part number.

Static-Sensitive Components



Static discharge may damage semiconductor components in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. See Table 5-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only special antistatic suction type or wick type desoldering tools.

Test Equipment

Before using any test equipment to make measurements on static-sensitive components or assemblies, be certain that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

Table 5-1
RELATIVE SUSCEPTIBILITY TO
STATIC DISCHARGE DAMAGE

Semiconductor Classes	Relative Susceptibility Levels ^a
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETs	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

^a Voltage equivalent for levels:

1 = 100 to 500 V 4 = 500 V 7 = 400 to 1000 V (est.)

2 = 200 to 500 V 5 = 400 to 600 V 8 = 900 V

3 = 250 V 6 = 600 to 800 V 9 = 1200 V

(Voltage discharged from a 100 pF capacitor through a resistance of 100 ohms.)

C

C

C

OPTIONS

There are no options available at this time.



REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

LIST OF ASSEMBLIES

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

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

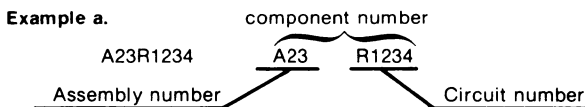
The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

ABBREVIATIONS

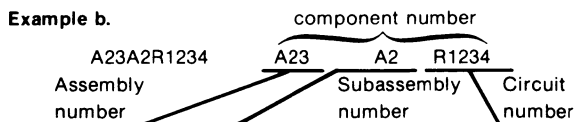
Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

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



Read: Resistor 1234 of Assembly 23



Read: Resistor 1234 of Subassembly 2 of Assembly 23

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

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

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

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

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

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

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

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

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

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

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

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

Indicates actual manufacturers part number.

**Replaceable Electrical Parts—
Remote Variable 015-0309-(01 & Up)**

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC. SEMICONDUCTOR GROUP	P.O. BOX 5012	DALLAS, TX 75222
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
58361	GENERAL INSTRUMENT CORP. OPTO ELECTRONICS DIV.	3400 HILLVIEW AVE	PALO ALTO, CA 94304
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077

**Replaceable Electrical Parts—
Remote Variable 015-0309-(01 & Up)**

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscnt	Name & Description	Mfr Code	Mfr Part Number
A30	670-6093-00		CKT BOARD ASSY:REMOTE VARIABLE	80009	670-6093-00
A30C1011	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAA
A30C1311	281-0785-00		CAP.,FXD,CER DI:68PF,10%,100V	04222	GC101A680K
A30C1501	290-0804-00		CAP.,FXD,ELCTL:10UF,+50-10%,25V	55680	ULA1E100TEA
A30C1511	281-0812-00		CAP.,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A30C1512	281-0773-00		CAP.,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A30CR1002	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30CR1011	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30CR1401	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30CR1501	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30CR1511	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30CR1512	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30CR1513	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30CR1514	152-0141-02		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	01295	1N4152R
A30DS1301	150-1043-00		LT EMITTING DIO:RED,20MA,5V	58361	MV5774C
A30DS1401	150-1043-00		LT EMITTING DIO:RED,20MA,5V	58361	MV5774C
A30DS1411	150-1043-00		LT EMITTING DIO:RED,20MA,5V	58361	MV5774C
A30J560	131-1426-00		TERM SET,PIN:(36) 0.025 SQ RTANG,0.25L	22526	65524-136
A30Q1001	151-0190-05		TRANSISTOR:SILICON,NPN	80009	151-0190-05
A30Q1003	151-0190-05		TRANSISTOR:SILICON,NPN	80009	151-0190-05
A30Q1005	151-0188-03		TRANSISTOR:SILICON,PNP,SEL	80009	151-0188-03
A30Q1111	151-0188-03		TRANSISTOR:SILICON,PNP,SEL	80009	151-0188-03
A30Q1201	151-0190-05		TRANSISTOR:SILICON,NPN	80009	151-0190-05
A30Q1301	151-0190-05		TRANSISTOR:SILICON,NPN	80009	151-0190-05
A30Q1302	151-0190-05		TRANSISTOR:SILICON,NPN	80009	151-0190-05
A30Q1311	151-0190-05		TRANSISTOR:SILICON,NPN	80009	151-0190-05
A30Q1312	151-0188-03		TRANSISTOR:SILICON,PNP,SEL	80009	151-0188-03
A30R1001	315-0911-00		RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
A30R1003	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A30R1006	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1007	315-0361-00		RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
A30R1011	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1012	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1013	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A30R1014	315-0361-00		RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
A30R1015	315-0362-00		RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A30R1101	315-0362-00		RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A30R1102	315-0151-00		RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A30R1103	315-0332-00		RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A30R1105	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A30R1106	315-0105-00		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A30R1107	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1108	315-0105-00		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A30R1111	315-0151-00		RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A30R1112	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1201	315-0361-00		RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
A30R1202	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A30R1203	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A30R1211	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1212	315-0362-00		RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A30R1213	315-0362-00		RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A30R1214	311-1938-00		RES.,VAR,NONWW:PNL,1K OHM,0.5W LINEAR	12697	CM41719
A30R1302	311-1224-00		RES.,VAR,NONWIR:500 OHM,20%,0.50W	32997	3386F-T04-501

**Replaceable Electrical Parts—
Remote Variable 015-0309-(01 & Up)**

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscnt	Name & Description	Mfr Code	Mfr Part Number
A30R1311	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1312	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A30R1313	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A30R1314	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A30R1315	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A30R1401	315-0361-00		RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
A30R1402	315-0361-00		RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
A30R1403	315-0361-00		RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
A30R1404	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A30R1411	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A30R1501	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A30R1502	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A30R1511	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A30S1101	263-0019-04		ACTR ASSY,PB:MOMENTARY	80009	263-0019-04
A30S1301	263-0019-01		ACTR ASSY,PB:MOMENTARY	80009	263-0019-01
A30S1401	263-0019-01		ACTR ASSY,PB:MOMENTARY	80009	263-0019-01
A30S1411	263-0019-01		ACTR ASSY,PB:MOMENTARY	80009	263-0019-01
A30TP1004	214-0579-00		TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A30TP1005	214-0579-00		TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A30U1111	156-0495-01		MICROCIRCUIT,LI:OPNL AMPL,SEL	80009	156-0495-01
A30U1411	156-0576-02		MICROCIRCUIT,DI:8-BIT PRL INP/SER OUT	02735	CD4021BFX
A30U1412	156-0763-02		MICROCKT DI:HEX CONT BOUNCE ELIMINATOR	04713	MC14490BCLD
A30U1501	156-0131-02		MICROCIRCUIT DI:B-BIT PRL-OUT SER SHFT	01295	SN74164(NP3)

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

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

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

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

Abbreviations are based on ANSI Y1.1-1972.

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

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

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

Component Values

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

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

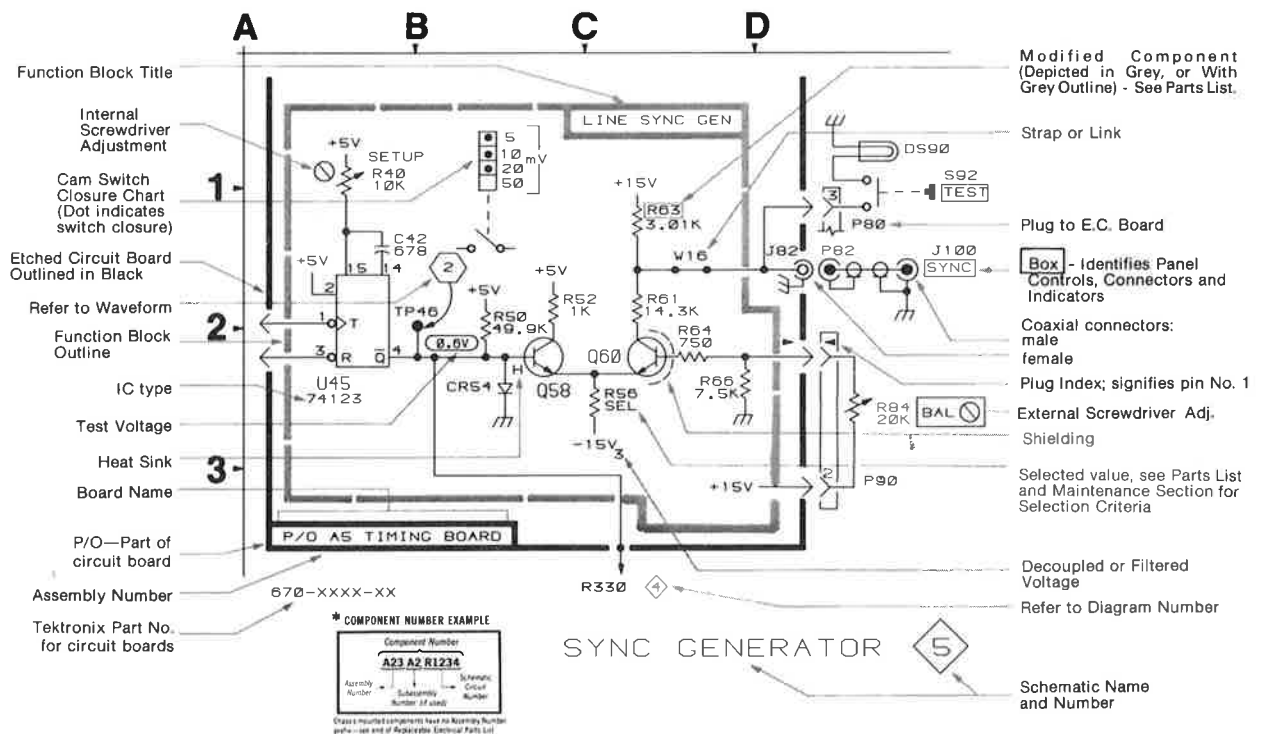
Resistors = Ohms (Ω).

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

Assembly Numbers and Grid Coordinates

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

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



PARTS LOCATION

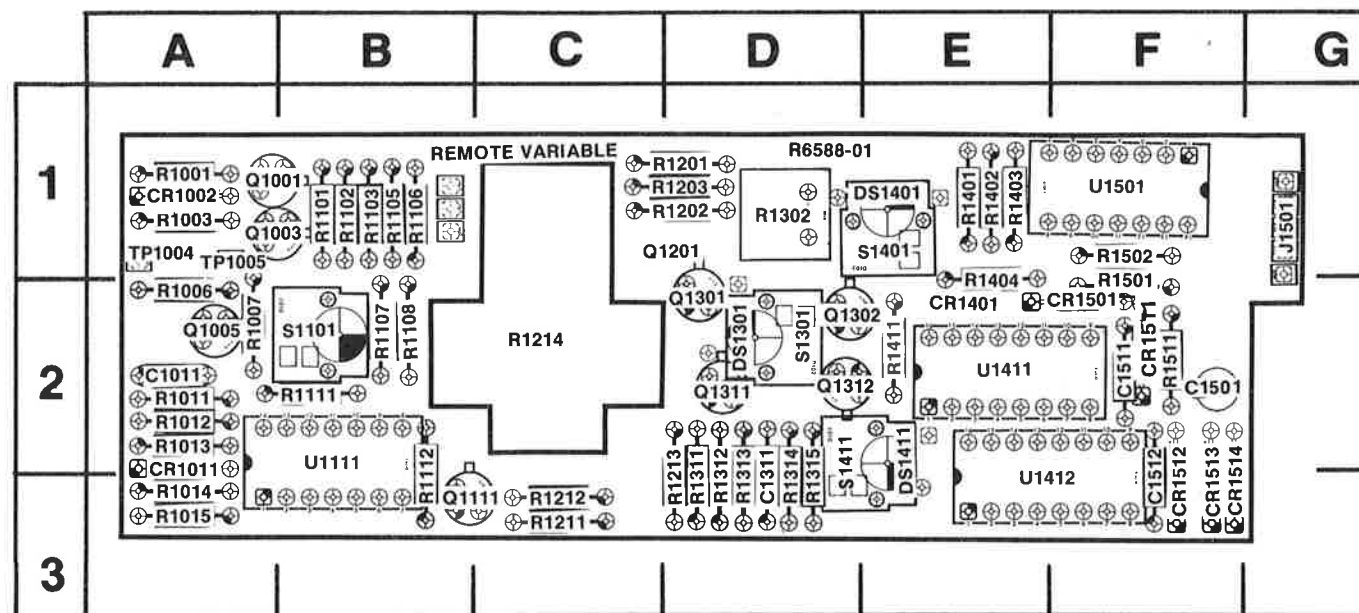
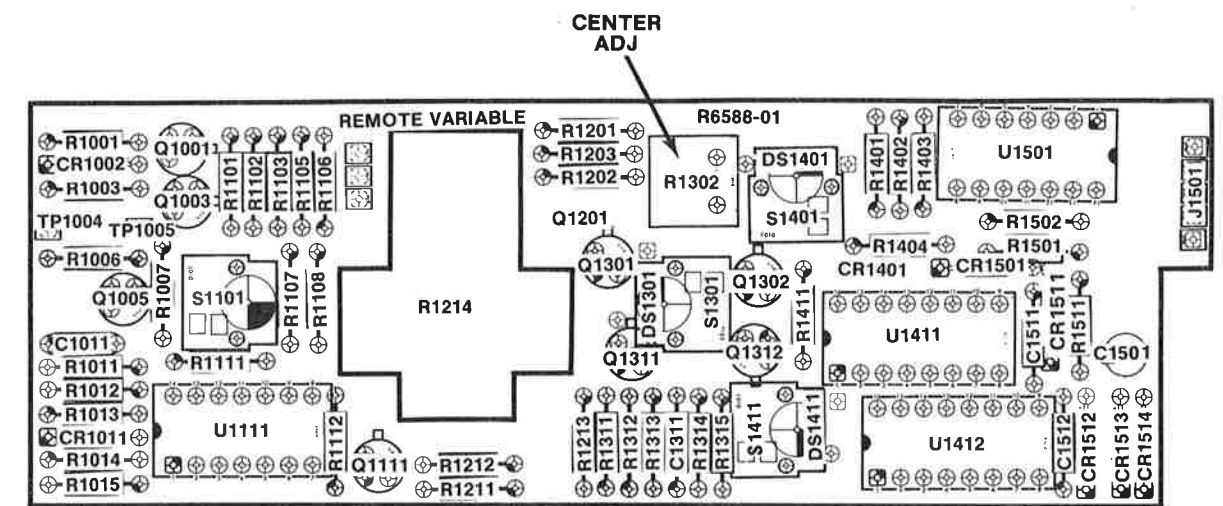


Fig. 8-1. Remote Variable board (A30).

2819-8A

ADJUSTMENT LOCATIONS

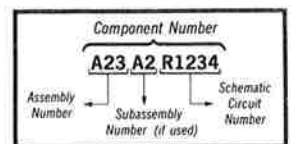


2819-9A

Fig. 8-2. Remote Variable board (A30).

Static Sensitive Devices
See Maintenance Section.

COMPONENT NUMBER EXAMPLE



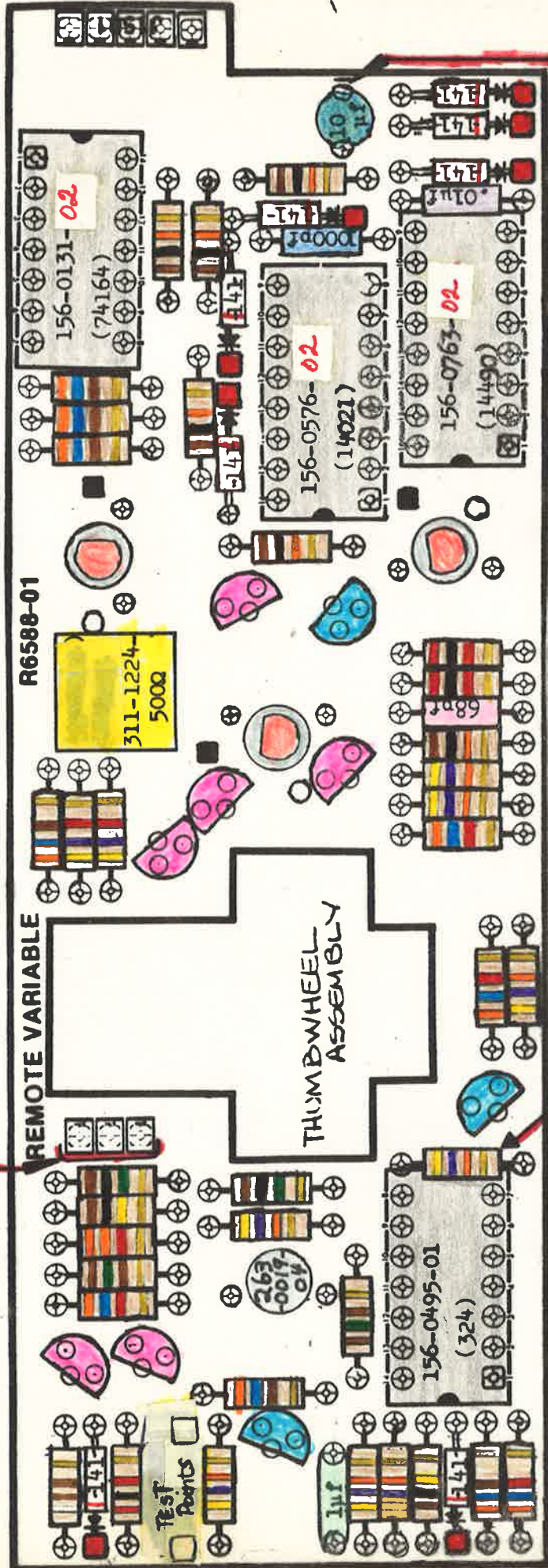
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Technicians!
- Copy -

5-29-80-ks

4-6-88 mjd-w

SOLDER a 1" piece of #22 Bare Wire in each of these holes.



INSTALL THIS RESISTOR AFTER THE IC IS SOLDERED IN.

- (3906)-151-0188-03---(3)---[Blue Box]
- (3904)-151-0190-05---(6)---[Pink Box]
- 281-0773-00---(1)---.01uF---[White Box]
- 281-0785-00---(1)---.68pf---[Pink Box]
- 281-0812-00---(1)-1000pf---[Blue Box]
- 283-0177-00---(1)---.1uF---[Green Box]

290-0804-00---(1)---.10uF---[Blue Box]
INSTALLED AFTER CLEANING
POSITION SO [Blue Box] ARE HERE.

1

2

3

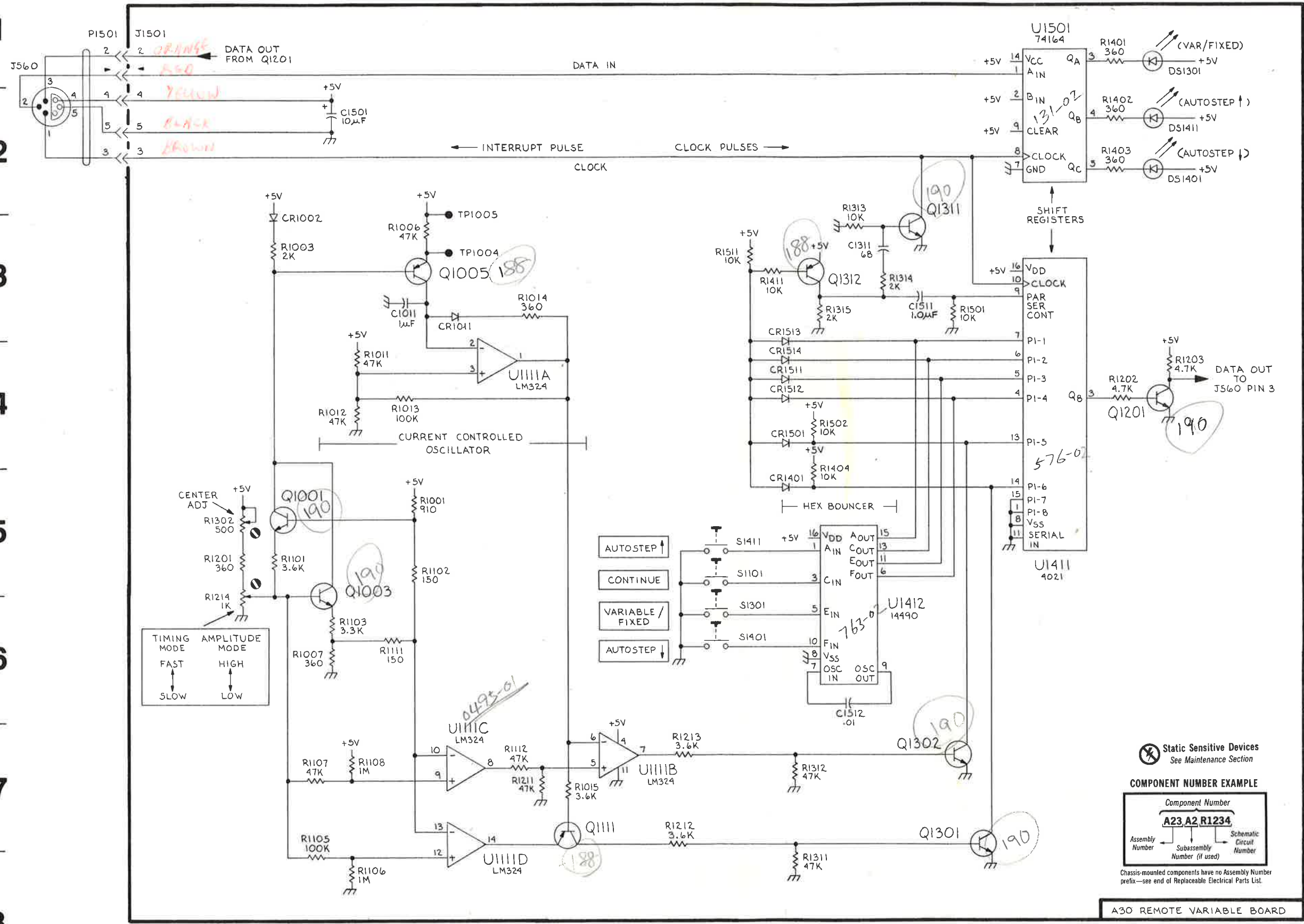
4

5

6

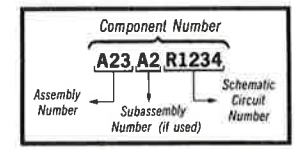
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8



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

A30 REMOTE VARIABLE BOARD

REMOTE VARIABLE HEAD

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

SPECIAL NOTES AND SYMBOLS

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

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

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

```

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

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol - - - * - - - indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

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

ABBREVIATIONS

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

**Replaceable Mechanical Parts—
Remote Variable 015-0309-(01 & Up)**

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

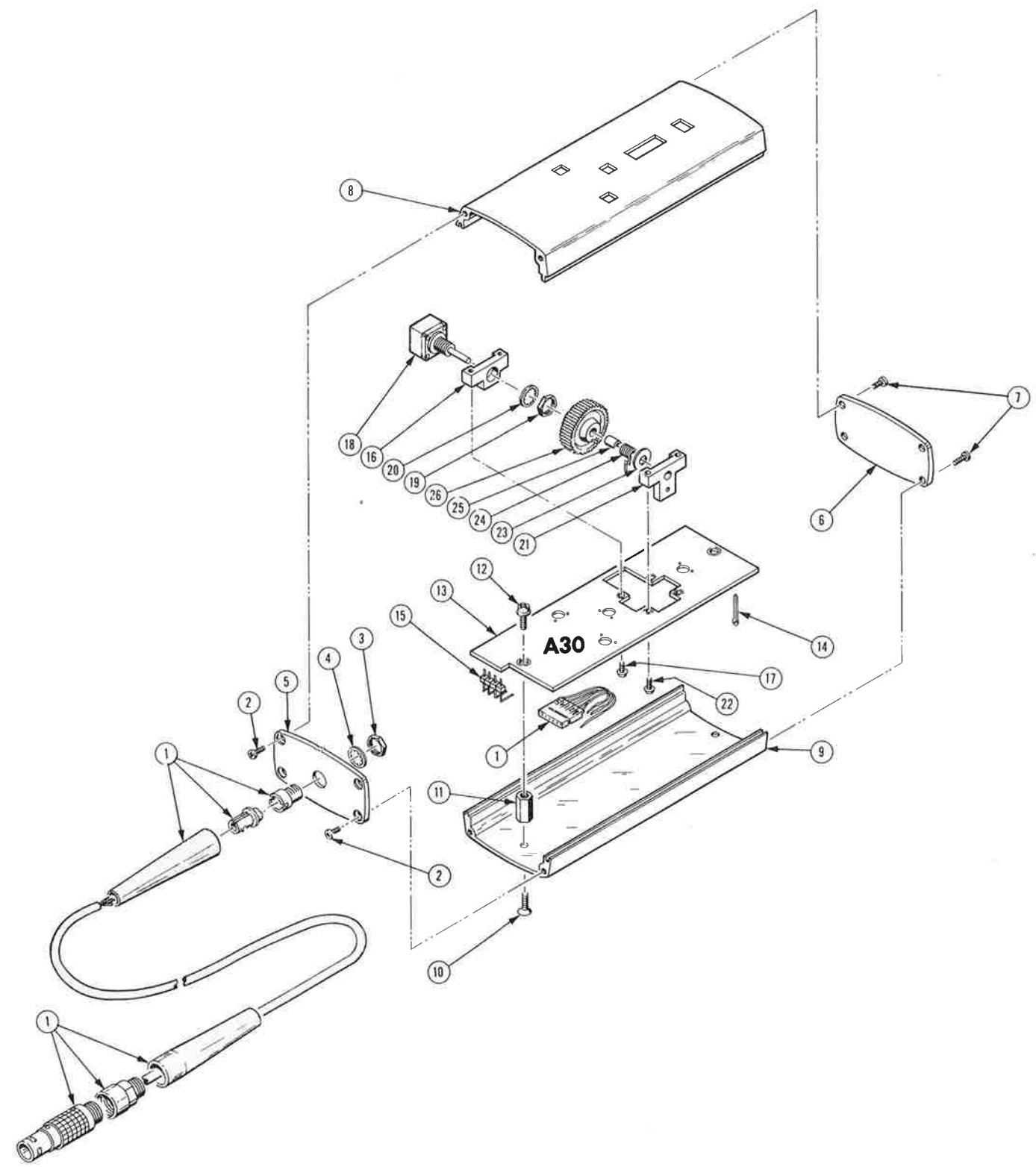
Mfr. Code	Manufacturer	Address	City, State, Zip
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD P O BOX 500	ELGIN, IL 60120 BEAVERTON, OR 97077
80009	TEKTRONIX, INC.		
83309	ELECTRICAL SPECIALITY CO., SUBSIDIARY OF BELDEN CORP.	213 E. HARRIS AVE. SOUTH	SAN FRANCISCO, CA 94080
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

**Replaceable Mechanical Parts—
Remote Variable 015-0309-(01 & Up)**

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	1 2 3 4 5	Name & Description	Mfr	
		Eff	Dscont				Code	Mfr Part Number
1-1	175-2024-00			1		CA ASSY,SP,ELEC:4.28 AWG,60.0 L *****ATTACHING PARTS*****	80009	175-2024-00
-2	211-0118-00			4		SCREW,MACHINE:2-56 X 0.250 INCH,PNH STL *****END ATTACHING PARTS*****	83385	ORD BY DESCR
	-----			-		.CABLE ASSEMBLY INCLUDES:		
-3	210-0583-00			1		.NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-4	210-0046-00			1		.WASHER,LOCK:0.261 ID,INTL,0.018 THK,BRS	78189	1214-05-00-0541C
-5	200-2097-02			1		.COVER,END:REAR,REMODT VARIABLE	80009	200-2097-02
-6	200-2097-01			1		COVER,END:FRONT,REMOTE VARIABLE *****ATTACHING PARTS*****	80009	200-2097-01
-7	211-0118-00			4		SCREW,MACHINE:2-56 X 0.250 INCH,PNH STL *****END ATTACHING PARTS*****	83385	ORD BY DESCR
-8	204-0775-00			1		BODY HALF,RMT V:TOP	80009	204-0775-00
-9	204-0774-00			1		BODY HALF,RMT V:BOTTOM *****ATTACHING PARTS*****	80009	204-0774-00
-10	211-0105-00			2		SCREW,MACHINE:4-40 X 0.188,100 DEG,FLH ST *****END ATTACHING PARTS*****	83385	ORD BY DESCR
-11	129-0420-00			2		POST,ELEC-MECH:0.575 LONG X 0.188 I HEX *****ATTACHING PARTS*****	80009	129-0420-00
-12	211-0116-00			2		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS *****END ATTACHING PARTS*****	83385	ORD BY DESCR
-13	-----			1		CKT BOARD ASSY:REMOTE VARIABLE(SEE A30 REP		
-14	-----			2		.TERM,TEST POINT:(SEE A30TP1004 & 1005 REP		
-15	-----			1		.CONTACT SET,ELE:(SEE A30J560 REPL)		
-16	391-0151-00			1		.BLOCK,VAR RES: *****ATTACHING PARTS*****	80009	391-0151-00
-17	211-0180-00			2		.SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS *****END ATTACHING PARTS*****	83385	ORD BY DESCR
-18	-----			1		.RES.,VARIABLE:(SEE A30R1214 REPL) *****ATTACHING PARTS*****		
-19	210-0583-00			1		.NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-20	210-0046-00			1		.WASHER,LOCK:0.261 ID,INTL,0.018 THK,BRS *****END ATTACHING PARTS*****	78189	1214-05-00-0541C
-21	391-0150-00			2		.BLOCK,GUIDE:SHAFT *****ATTACHING PARTS*****	80009	391-0150-00
-22	211-0180-00			2		.SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS *****END ATTACHING PARTS*****	83385	ORD BY DESCR
-23	210-1011-00			1		.WASHER,NONMETAL:0.13 ID X 0.375 " OD,PLST	83309	ORD BY DESCR
-24	214-2565-00			1		.SPR,HLCL,TRSN:0.175 ID X 0.18 L,0.215 OD	80009	214-2565-00
-25	358-0465-00			1		.SPACER,SLEEVE:0.13 ID X 0.18 L,SST,0.155	80009	358-0465-00
-26	366-1734-00			1		.KNOB:GY,0.127 ID X 0.97 OD X 0.2	80009	366-1734-00



FIG. 1 EXPLODED



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Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
	070-2819-00			1						MANUAL,TECH:INSTRUCTION 015-0309-01	80009	070-2819-00

MANUAL CHANGE INFORMATION

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

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

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



