4633A

CONTINUOUS RECORDER

INSTRUCTION MANUAL

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WARNING

The remaining portion of this Table of Contents lists servicing instructions that expose personnel to hazardous voltages. These instructions are for qualified service personnel only.

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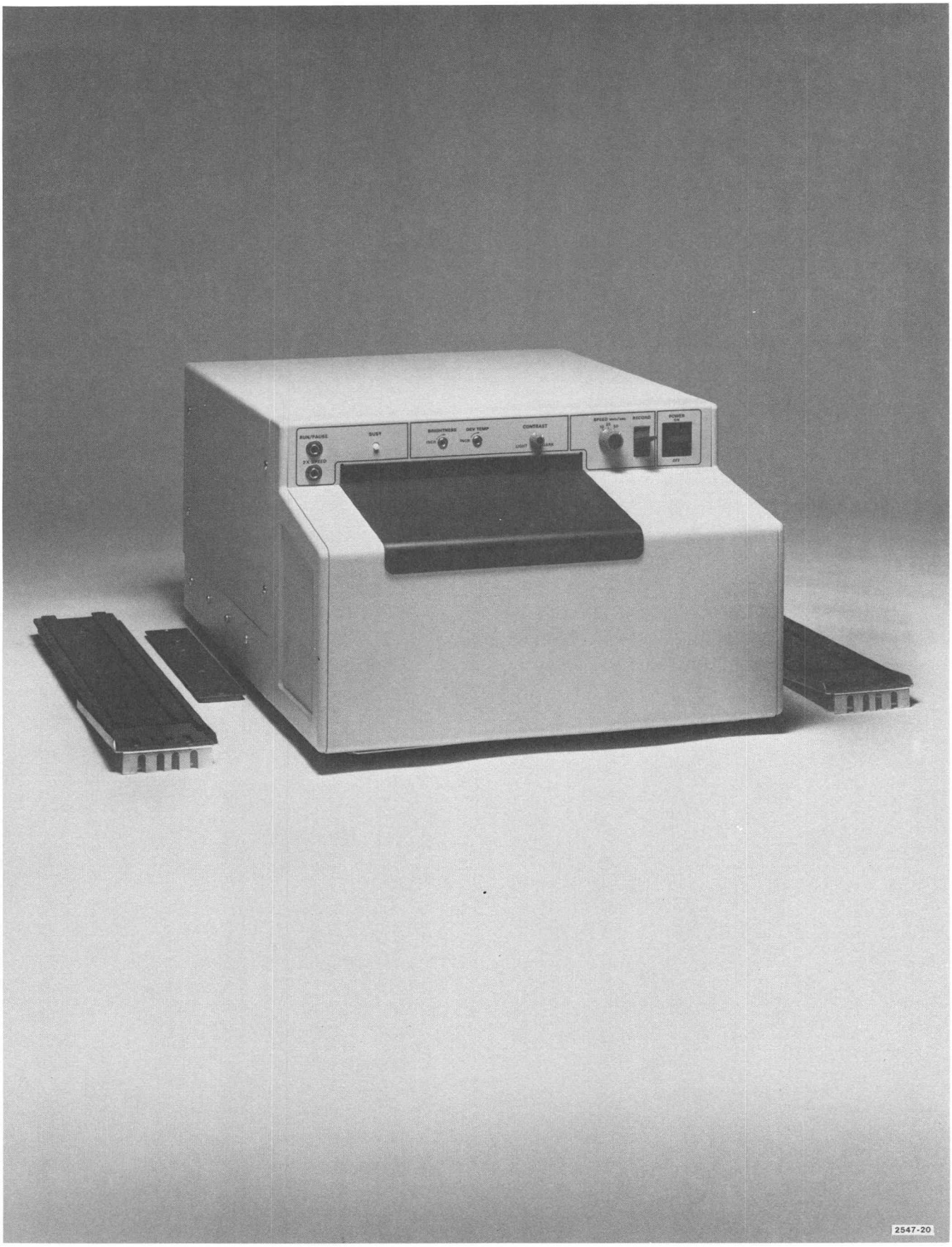


Figure 1-1. 4633A Continuous Recorder.

Section 1

GENERAL DESCRIPTION AND OPERATION

GENERAL DESCRIPTION

The Continuous Recorder (Figure 1-1) makes permanent, high-contrast copies of line scan images from external equipment such as M-mode medical diagnostic ultrasound systems. (The M-mode display system uses a signal echo technique by which the range and velocity of motion of structures within the human body can be determined.) A record is produced when the control panel RECORD lever switch is pressed, when an external switch is plugged into the front panel Run/Pause jack and is actuated, or when a remote start/stop command is applied through the rear-panel connector.

The electrical signals representing the image are processed by the Recorder's electronic circuitry, producing a line on the face of an internal crt. As the paper moves past the crt, successive sections of paper are exposed to successive lines of image. This creates a latent image on the paper. The Continuous Recorder heat-develops the exposed paper in its internal processor and ejects the paper through an opening in the front panel. Slide out track assemblies for rach mounting are included with the instrument. Optium 30 deletes the rack mount hardware.

Safety Considerations

CAUTION

The instrument is intended to be operated from a single-phase power source which has one of its current-carrying conductors (the "Grounded" or "Neutral" conductor) at ground (earth) potential. Operation from other sources where both current-carrying conductors are live with respect to ground is not recommended, as only the Ungrounded (Line) conductor has over-current (fuse) protection within the instrument.

Recording Medium

The Continuous Recorder uses Tektronix High Performance Dry Silver paper (7772). This paper comes in a cylindrical cannister; replacement cannisters may be purchased from Tektronix, Inc. (see Accessories list).

Dry Silver Paper is virtually dust-free and, since it is also dry, requires only normal room ventilation. However, it is always good practice to operate any process involving chemicals in a ventilated or air-conditioned room.

The shelf life of the unexposed rolls of paper is twelve months, provided the paper is stored at low room temperature in its protective wrapper. The paper is heat sensitive. When the storage temperature is 50° C at 50% relative humidity, the paper life is reduced to approximately 30 days.

No special precautions need be taken with the finished recordings. However, temperatures at or higher than 55° C (130° F) will tend to darken the background of the processed paper.

OPERATION

Using the Continuous Recorder

Before using the Continuous Recorder, first connect it to the external equipment whose line scan signals it is to record. (See installation instructions in Installation Section.) Then turn the unit on and allow it to warm up for at least **twenty minutes**. This ensures that the unit's heat-actuated processor has time to come up to its operating temperature.

Once the Continuous Recorder is warmed up, press the RECORD lever switch on the control panel to make a recording. This switch may function in three different ways, depending upon which of three modes has been selected during installation.

1. If "Push-Push-Continuous" mode has been selected, start a recording by pressing the RECORD lever switch; terminate the recording by pressing it again.

2. If "Push-Release-Continuous" mode has been selected, start a recording by pressing the RECORD lever switch and HOLDING IT DOWN. To end the recording, release the switch.

3. If "Page" mode has been selected, press the RECORD lever switch to make a recording. The Continuous Recorder will then make a single-page recording, 190 or 270 mm (7.5 or 10.6 in) long (see the Strappable Options discussion in the Installation section).

In addition, the recording unit is capable of many variations while using the customer-supplied switches in the RUN/PAUSE and 2XSPEED jacks or rear panel Remote Start/Stop BNC connector. Note that Run/Pause mode functions properly only in the Push-Push Continuous mode of operation.

1. Inserting a plug for a remote switch into the RUN/PAUSE jack on the front panel engages the Run/Pause mode of operation. Closing the switch initiates a recording. The switch must remain closed to continue recording. Opening the switch causes the crt to blank and causes the paper to travel at idle speed, after a delay which allows the exposed copy to be properly heat developed. Reclosing the switch starts the recording process again at the selected paper speed. To end the recording, press the RECORD level switch on the front panel of the unit.
2. The paper speed can be doubled by a remote switch plugged into the 2XSPEED jack on the front panel. Closing the switch causes the paper to travel at double the selected paper speed. When used in conjunction with a RUN/PAUSE switch, closing either switch initiates a recording and opening both switches causes the paper to travel at idle speed as in case one above. Reclosing the 2XSPEED switch starts the recording process again at double the selected paper speed. To end the recording press the RECORD lever switch on the front panel of the unit.
3. A switch or signal applied to the REMOTE START/STOP connector can initiate or terminate a copy in place of the front panel RECORD switch.

Loading the Paper Cannister

WARNING

Turn POWER switch off.
Remove plugs from 2XSpeed and Run/Pause jacks. Be sure to keep plugs and cords away from the front of the instrument.

To load the paper cannister, refer to Figure 1-2 for nomenclature identification, and follow this procedure:

1. Open the front cover.
2. Push handles (A) down and pull out cassette assembly.
3. Remove expended paper cannister (B).

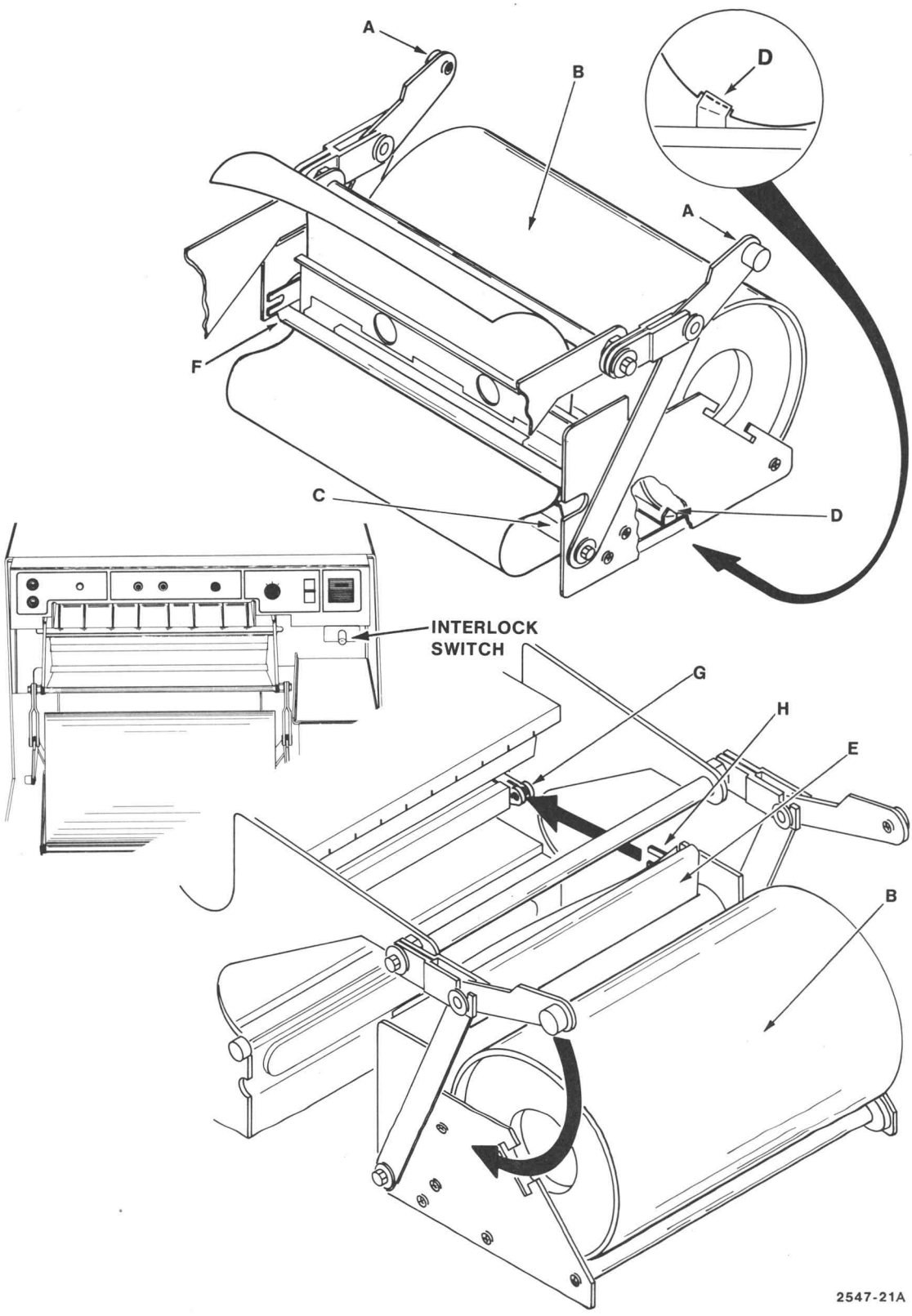


Figure 1-2. General Paper Loading Illustration.

4. Tear off metallic light seal tape from new paper cannister. Pull out approximately 12 inches of paper.

5. Insert paper under metal roller (C) with the glossy side down.

6. Holding tension on the paper, place paper cannister into frame. Rotate paper cannister to engage locator (D) into paper exit slot on cannister.

7. Pull paper guide (E) forward against stop. Thread paper up through knife assembly (F) and out top of paper guide. Pull excess paper tight over front of unit.

WARNING

Do not insert fingers into the opening at the bottom of the knife assembly. The sharp, paper-cutting edges are located there.

8. Push cassette assembly in until it stops. BE SURE THAT PIN (G) IS ENGAGED BY THE FORK (H).

9. Lift both handles (A) and lock firmly in place.

10. Turn power switch on. Pull interlock switch forward (white knob just below the power switch). The recorder is now on with the front cover open.

11. Make a short recording while gently pulling the paper toward front of the unit.

12. Remove the excess paper that has been cut off. Close the front cover.

The Control Panel

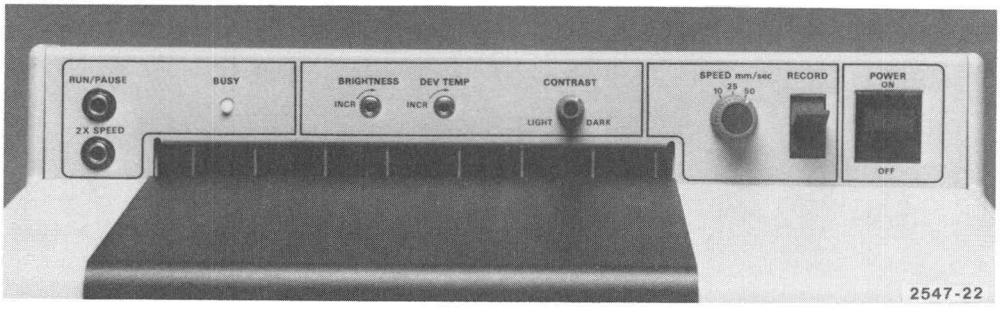


Figure 1-3. Control Panel.

POWER

The POWER switch is a rocker-type switch which applies power to the electronic circuits, drive motor, fan, and paper processor. Included in the switch is a lamp which lights when power is applied.

PAPER SPEED

The PAPER SPEED control allows the user to select a paper speed of 10, 25, or 50 mm/sec.

CONTRAST

The CONTRAST control is used to adjust the degree of contrast between light and dark portions of the image.

BRIGHTNESS

The BRIGHTNESS control is a screwdriver adjustment to set paper background density (gray level).

RECORD

The RECORD switch is a lever switch which initiates and terminates a recording. (See preceding "General Description and Operation" procedure.)

BUSY

The Busy lamp is an indicator. When the recorder is not making a record, the lamp is out. The lamp is on steady when the recorder is recording in a mode that will not terminate by itself. The lamp starts flashing when the Recorder receives an end of record signal. It continues flashing until the Recorder cuts the paper and passes it out the front panel; then the lamp goes out.

DEV TEMP

The DEV TEMP control is a screwdriver adjustment to set the temperature of the Recorder's internal thermal processor. This adjustment compensates for variation in developing speeds caused by photographic emulsion differences from one roll of paper to another.

RUN/PAUSE

The RUN/PAUSE jack is for an external switch. Closing the switch initiates a recording. If the switch is opened during a recording, the paper speed reduces to the idle speed. Re-closing the switch will cause the paper to travel at the selected speed again.

2XSPEED

The 2XSPEED jack is for an external switch. Closing the switch causes the paper to travel at twice the speed selected on the control panel. When used in conjunction with a RUN/PAUSE switch, closing either switch initiates a recording, and opening both switches causes the paper to travel at idle speed.

CORRECTING COPY PROBLEMS

Causes of Poor Copies

Recordings which are too light or too dark can be caused by incorrect adjustment of the CONTRAST control, incorrect temperature adjustment, or paper which has aged or become insensitive. (The paper should be used before the date stamped on the paper cannister.)

To correct for recordings which are too light or too dark, first check the position of the front-panel CONTRAST control. If darker copies are desired, rotate the control clockwise in 30-degree increments, running a recording after each adjustment, until the desired darkness is reached. If lighter recordings are desired, rotate the CONTRAST control counterclockwise in a similar manner.

If this does not solve the problem, compare the Indication column in Table 1-1 with the recording to determine the specific problem, then follow the directions given in the Correction column.

Table 1-1
DARKNESS PROBLEMS CAUSED BY TEMPERATURE AND/OR PAPER

Problem	Indication	Correction
Temperature Setting Too High	White portions of the display appear as gray, and gray portions appear as black.	Refer to information given under "Processor Temperature Adjustment".
Temperature Setting Too Low	Gray portions of the display appear as white, and black portions appear as gray.	Refer to information given under "Processor Temperature Adjustment".
Over-age or insensitive paper[1]	White portions of the display appear as gray, and black portions appear as a darker gray.	Replace the paper cannister.

[1] **Paper stored for too long a time or at too high a temperature will lose its sensitivity. Refer to "Paper Storage" in this section.**

Processor Temperature Adjustment

The DEV TEMP control (screwdriver adjustment on the control panel) is used to adjust the processor developing temperature to compensate for possible variations in the photographic emulsion from one roll of paper to another. Turning the control clockwise increases the processor temperature, darkening the copy; turning it counterclockwise decreases the temperature, causing lighter copies.

Make adjustments in small increments. After each adjustment, wait at least one minute for the processor to reach its new temperature; then make a copy to see if the new DEV TEMP setting is satisfactory.

CAUSE AND CORRECTION OF PAPER JAMS

Since paper jams can occur as a result of incorrect paper loading, be sure the instructions under "Loading the Paper Cannister" earlier in this section are carefully followed. If the paper is correctly loaded, check that the power cord is plugged in and that the POWER switch is turned on. If, under these conditions, no copy is delivered when the RECORD lever switch is pressed, proceed to flow chart (Figure 1-4).

Refer to Section 4 for Processor removal, installation, disassembly, and assembly.

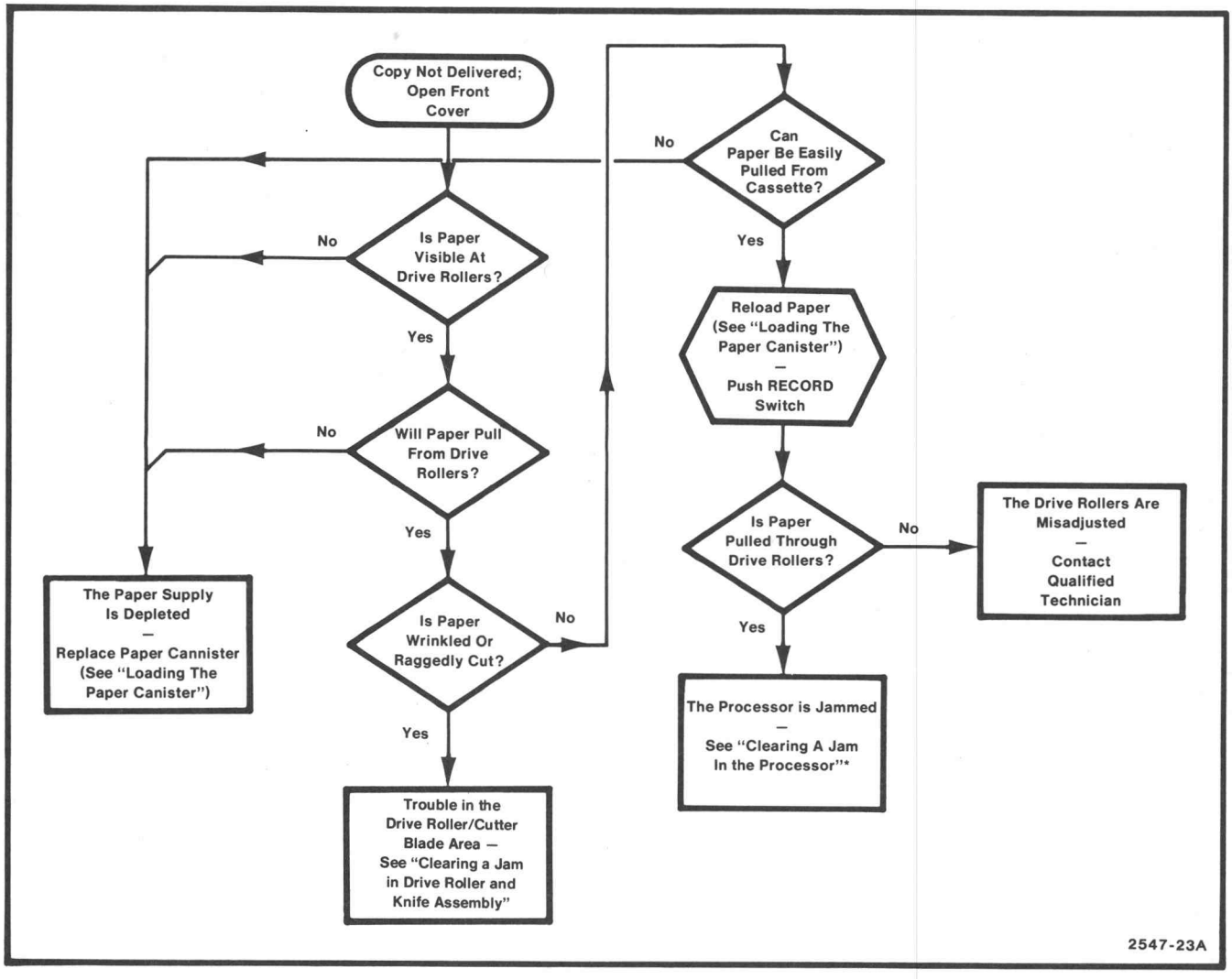


Figure 1-4. Troubleshooting Flow Chart.

Clearing a Jam in the Drive Roller/Knife Assembly

1. Push the POWER switch OFF and open the instrument front cover.

WARNING

(A) Before attempting to clear a paper jam, be sure to remove or secure anything which might come in accidental contact with the drive rollers or chains (i.e., jewelry, necktie, long hair, shirt-tail, etc.)

(B) Do not insert fingers into the opening at the bottom of the knife assembly. The sharp paper-cutting edges are located there.

(C) The processor becomes very hot when the Continuous Recorder is in operation. When working around the processor, use caution to contact only the jammed paper.

2. Push the cassette handles down, then pull them out in an upward arc.

3. Remove the wrinkled and jammed paper from within the knife assembly. Scraps of paper which cannot be readily removed may be reached with tweezers. After the paper jam is cleared, reload the paper, using the procedures given under "Loading the Paper Cannister".

4. Remove the wrinkled paper and paper fragments from the rear paper guide area. If necessary, remove the guide.

5. Push the POWER switch ON and depress the interlock button for a few seconds to clear any paper which may be trapped within the processor. Close the cover and push the RECORD lever switch. If copies run through freely, the paper jam is corrected; unplug the Continuous Recorder and proceed to step 6. If paper is still trapped within the processor, contact a qualified service technician.

6. Be sure the rear paper guide is back in place and install the attaching screws. Close the front cover, replace the top cover, plug in the Continuous Recorder, and push the POWER switch ON. Push the RECORD lever switch twice; the first recording will be dark due to exposure to light.

CLEANING THE INSTRUMENT

The instrument exterior can be dusted using a dry soft cloth. A small brush may be helpful for dusting crevices such as around controls.

For additional exterior cleaning, first disconnect the instrument from the power mains, and then use a soft cloth lightly dampened in a mild detergent solution. Be sure all excess solution is thoroughly wrung from the cloth prior to wiping the instrument. Do not allow excess cleaning agent to drip into the instrument.

WARNING

To avoid possible electrical shock, be sure to disconnect the instrument from the power mains before cleaning the case, and be sure not to let any water or soap solution drip down into the inside of the instrument.

PLANNED MAINTENANCE

After Each Roll of Paper

Each time the paper is changed the operator should remove any dust or paper chaff visible in the area of the rollers and cutter blades and wipe the face of the crt with a damp cloth to keep the Continuous Recorder running properly.

After Each Four Rolls

After each four rolls of paper, the unit should be cleaned more thoroughly to remove accumulations of the sublimate. A small vacuum cleaner is recommended for chaff, dust, etc.

WARNING

Do not clean the interior of this instrument with compressed air, as this may cause dirt to be blown into the eyes.

Any hardened buildup of the paper sublimate should be removed using a soft cloth dampened in a mild detergent solution. The cloth should be well wrung out. Nylon scouring pads may be used, but gently. Look for buildup of paper sublimate in these areas especially: (a) the exit guide at the rear of the processor, (b) the conveyor, (c) the paper guides that bolt into the top of the rotary knife blade (on the cassette holder assembly), and (d) the rear lip of the paper tray (under the top cover).

CAUTION

Using alcohol-based or petroleum-based solvents may damage the drive rollers and the processor belt.

After Each Ten, Twenty, and 200 Rolls

After each ten rolls of paper, a qualified service technician should perform additional maintenance. A planned maintenance schedule in the Servicing section lists steps to be taken after each ten, twenty, and 200 rolls of paper.

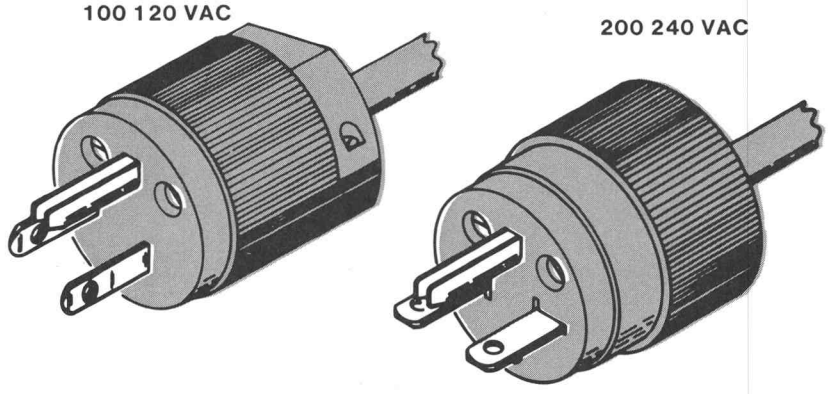
Section 2

SPECIFICATIONS

GENERAL SPECIFICATIONS

Safety Considerations

The instrument is provided with an attached three-wire power cord with a three-terminal, hospital grade, polarized plug for connection to the power source. The Grounding (Earthing) terminal of the plug is connected directly to the instrument frame as recommended by national and international safety codes (Figure 2-1).



POWER CORD CONDUCTOR IDENTIFICATION

CONDUCTOR	COLOR	ALTERNATE COLOR
UNGROUNDED (LINE)	BROWN	BLACK
GROUNDED (NEUTRAL)	BLUE	WHITE
GROUNDED (EARTHING)	GREEN-YELLOW	GREEN-YELLOW

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Figure 2-1. Hospital Grade Connector.

CAUTION

The instrument is intended to be operated from a single-phase power source which has one of its current-carrying conductors (the "Grounded" or "Neutral" conductor) at ground (earth) potential. Operation from other sources where both current-carrying conductors are live with respect to ground (such as phase-to-phase on a multi-phase system) is not recommended, as only the Ungrounded (Line) conductor has over-current (fuse) protection within the instrument.

During processing, the Dry Silver paper gives off a sublimate which condenses on the cooler surfaces of the Continuous Recorder. Toxicologic tests conducted by 3M Company indicate that this substance is not toxic.

The Continuous Recorder should be operated in a normally ventilated room. Some persons may experience an allergic reaction from inhaling the sublimate at concentrations that could be reached in an unventilated room.

Power Requirements

Table 2-1 lists the Continuous Recorder's power requirements.

Table 2-1

POWER REQUIREMENTS

Line Voltage Range (Factory Wired Options)	100 V ac ±10% 115 V ac ±10% 120 V ac ±10% 200 V ac ±10% 220 V ac ±10% 230 V ac ±10% 240 V ac ±10%
Line Frequency	48-62 Hz
Power Consumption Maximum Typical	 600 W 360 W

Heat Dissipation Specifications

Table 2-2 lists the Continuous Recorder's Heat Dissipation Specifications.

Table 2-2

HEAT DISSIPATION SPECIFICATIONS

Heat Dissipation average[1]	955 BTU/HR
Heat Dissipation maximum	1910 BTU/HR

[1]**Based on average power consumption for rackmount application (280 watts).**

Environmental Limitations

Table 2-3 lists the Continuous Recorder's environmental limitations.

Table 2-3

ENVIRONMENTAL LIMITATIONS

Temperature	
Operation	0 to +35° C (32 to 95° F).
Non-Powered (without paper)	−15 to +55° C (+5 to +131° F).
Paper storage	5° C (40° F) recommended
Altitude	
Operation	To 4,500 m (15,000 ft). Maximum allowable ambient temperature decreased by 1° C/305 m (1.8° F/1,000 ft) from 1,500 m to 4,500 m (5,000 ft to 15,000 ft).
Non-Powered	To 15,000 m (50,000 ft).
Humidity	40%—95% relative humidity non-condensing.

Fuses

The Continuous Recorder has fuse protection at five points within it. These fuses are listed in Table 2-4.

Table 2-4

FUSES

	110 Volt Range	230 Volt Range
On the rear panel:		
Line fuse (F1001)	7 A fast-blow	4 A fast-blow
Electronic unit fuse (F1002)	1.6 A slow-blow	1 A slow-blow
On the Main board:		
+400 V supply (F431)	0.06 A fast-blow	0.06 A fast-blow
+20 V supply (F425)	0.7 A slow-blow	0.7 A slow-blow
On the Control board:		
Motor fuse (F301)	3.2 A slow-blow	3.2 A slow-blow

Fail-Safe Features

In addition to its fuses, the Continuous Recorder includes a number of features to protect it from certain types of equipment or signal failures.

Motor Shut Down

Should a jam occur which loads the motor beyond a pre-set current limit, the Motor Control circuit will turn off both the motor and the processor heating element.

Processor Heater Thermal Cut-Off

The processor temperature is regulated by means of feedback from a thermal sensor mounted on the processor. However, should this regulating mechanism fail and the processor temperature increase to about 174° C (345° F), a temperature-operated switch will turn off the processor heating element.

Crt Protective Blanking

The crt protective blanking circuit monitors the deflection yoke current. When the deflection is less than 10 cm the crt drive is cut off. This protective blanking occurs only when the video and sweep card is in ultrasound mode.

Recording Method

Table 2-5 summarizes the more important specifications relating to the Continuous Recorder's method of operation.

Table 2-5

RECORDING METHOD

Recording medium	Tektronix High Performance Dry Silver Paper 7772.
Recording technique	Line-scan with fiber-optic crt.
Developing technique	Heating the paper in an internal processor.
Paper speed (after the first 400mm or 16 in of paper)	10mm/sec ± 10% 25mm/sec ± 8% 50mm/sec ±6% Stability within a 15 meter record; ± 3% at selected speeds, ± 4% at 2X speeds.
Copy modes	There are three modes of operation. The mode selected is wired on the Timing board by a strap connection. Page mode: Press the RECORD lever switch (or provide a ground closure or TTL low to the REMOTE START/STOP connector) to record a single 190 or 270 mm (7.5 or 10.6 in.) page. Push-Push-Continuous mode: Press the RECORD lever switch once (or provide a ground closure or TTL low to the REMOTE START/STOP connector). Press to start a recording, and press again to end the recording. Push-Release-Continuous mode: Depress the RECORD lever switch (or provide a ground closure or TTL low to the REMOTE START/STOP connector) to start a recording; release the RECORD switch (remove the ground or TTL low) to end the recording.
RUN/PAUSE	Run/Pause: A jack provided for an external switch. Closing the switch will initiate a recording. If the switch is opened during a recording, the crt blanks, and the paper speed reduces to idle speed. Re-closing the switch starts the recording process again at the selected paper speed.
2XSPEED	2XSpeed: A jack provided for an external switch. Closing the switch will cause the paper to travel at twice the selected paper speed. When used with a RUN/PAUSE switch, closing either switch initiates a recording, and opening both switches causes the paper to travel at idle speed.

Control Panel

Table 2-6 lists the controls on the control panel. A more complete description of their use can be found in the General Description and Operation section under "Operation".

Table 2-6

CONTROL PANEL

POWER switch	Applies power to the Continuous Recorder.
PAPER SPEED switch	Selects 10, 25, or 50 mm/sec paper speed.
2XSPEED jack	A jack provided for an external switch. When the switch is closed, the selected paper speed is doubled.
RUN/PAUSE jack	A jack provided for an external switch. When the switch is closed, a recording is started.
CONTRAST control	Adjusts the gain of the amplifier driving the crt.
RECORD switch	Initiates and terminates the recording operation.
BUSY lamp	Lights to indicate that a recording is being made.
DEV TEMP control	Screwdriver adjustment to set processor temperature to compensate for actual developing speed of paper.
BRIGHTNESS control	Screwdriver adjustment to set paper background density (gray level).

Rear Panel

Table 2-7 lists the connectors and controls on the rear panel. A more complete description of the various connectors may be found later in this section, under "Interfacing to Other Equipment".

Table 2-7

REAR PANEL

REMOTE START/STOP	Allows external equipment to start or end a recording without the use of the RECORD pushbutton.
X INPUT	Horizontal deflection input from external equipment.
BLANKING	Blanking input from external equipment.
Z INPUT	Video input from external equipment.
FOCUS	Screwsriver adjustment to set crt focus.

Power Supplies

Table 2-8 lists the various supply voltages provided by the Continuous Recorder to its internal electronic circuitry.

Table 2-8

POWER SUPPLIES

+400 V	Unregulated.
+180 V	+171 to +189 volts Regulated, <150 mV ripple.
+110 V	+104.5 to +115.5 volts Regulated, <100 mV ripple. Shuts down to about +25 V when no recording is being made.
+30 V	Unregulated.
+22 V	+21.5 to +23.0 volts Regulated, <100 mV ripple.
+15 V	+14.85 to +15.15 volts Regulated, <50 mV ripple.
+5 V	+4.8 to +5.2 volts Regulated, <50 mV ripple.
−15 V	−14.55 to −15.45 volts Regulated, <50 mV ripple.
−20 V	Unregulated.

Dimensions and Weight

Table 2-9 lists the Continuous Recorder's weight and physical dimensions.

Table 2-9

DIMENSIONS AND WEIGHT

Weight	Approximately 30 kg (67 lbs)
Dimensions	
Length	65.38 cm (25.74 in)
Width	44.83 cm (16.75 in)
Height	26.63 cm (10.468 in)

INTERFACING TO OTHER EQUIPMENT

On the rear panel of the Continuous Recorder are four BNC connectors for interfacing the unit to other equipment. These are the REMOTE START/STOP, X INPUT, BLANKING, and Z INPUT connectors. The signals applied to these connectors should conform to certain specifications, which are summarized in Table 2-10. Following the table, these specifications are described in more detail.

Table 2-10

INPUT SPECIFICATIONS

REMOTE START/STOP	
Switch Closure	TTL low or grounding the center pin.
Switch Open	TTL high or open circuit.
Input impedance	10 kΩ to +5 V.
Minimum duration of low pulses	2 ms.
Minimum time between pulses	10 ms.
Voltage limit	±25 V.
X INPUT	
Ramp polarity	Positive-going.
Ramp amplitude	1 V ±0.25 V.
Permissible voltage offset	Ramp must be 0 V at some point.
Deflection sensitivity	18 cm/V ±0.5 cm/V.
Deflection rate	Between 100 and 200 μs for each 18 cm sweep.
Sweep repetition rate	1000 to 2000 sweeps per second.
Input impedance	10 kΩ.
Common mode rejection voltage limit	Greater than 40 dB at 60 Hz ±25 V.
BLANKING	
Compatibility	TTL compatible; presents less than one standard TTL load.
Input impedance	4.7 kΩ.
Voltage limit	±25 V.
Switching levels	Blanking: ≥2.0 V No blanking: ≤0.8 V

(continued)

Table 2-10 (cont)
INPUT SPECIFICATIONS

Z INPUT	
Amplitude	1 V ±.25 V.
Polarity	
Normal	White: 0 V ±10 mV Black: 1 V ±10 mV.
Reverse	White: 0 V to 1.25 V adjustable. Black: 1 V ±.25 V more negative than white.
Impedance	10 kΩ.
Bandwidth	Greater than 10 MHz.
Voltage limit	±.25 V.
RUN/PAUSE	
Active	TTL low or gnd closure.
Off	TTL high or open circuit.
Load	560 Ω to +5 V.
Voltage limit	±25 V.
2XSPEED	
Active	TTL low or gnd closure.
Off	TTL high or open circuit.
Load	560 Ω to ±5 V.
Voltage limit	±25 V.

Remote Start/Stop

A TTL low at the REMOTE START/STOP connector, or grounding that connector, is equivalent to pressing the RECORD lever switch on the front panel. A TTL high, or open circuit, is equivalent to releasing that lever switch. See Table 2-5 for description of the copy modes.

X Input

The external equipment, whose image signal is to be recorded by the Continuous Recorder, must provide a ramp waveform to the X INPUT connector. (See Figure 2-2). The voltage of this waveform at any instant determines the x-coordinate (position from right to left across the paper) of the spot whose intensity is being specified simultaneously at the Z INPUT connector.

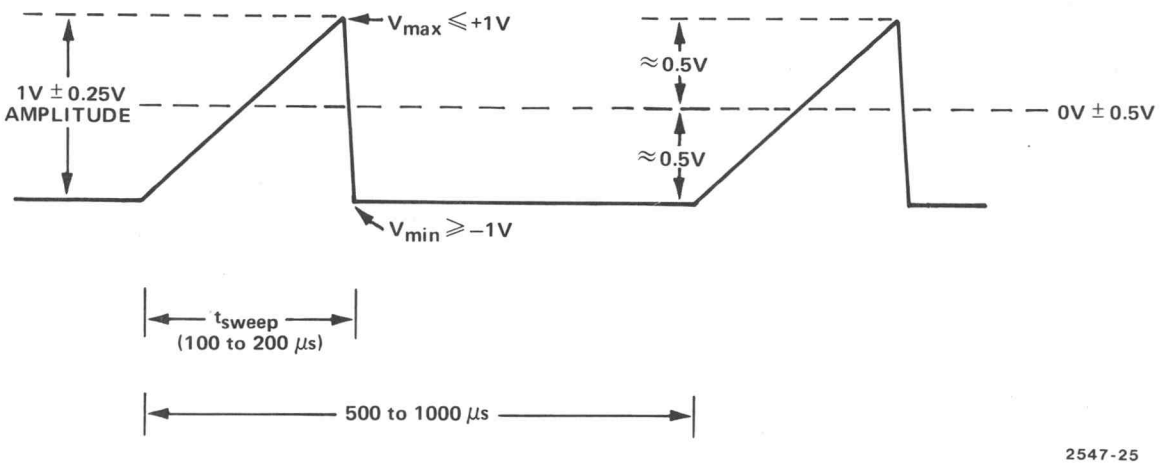


Figure 2-2. X INPUT Ramp Waveform.

Amplitude and Level

The waveform supplied to the X INPUT connector must be a positive-going ramp of amplitude about 1 V. (An "amplitude" control on the Video and Sweep board can adjust for amplitudes in the range of from 0.75 V to 1.25 V.) Ideally, the waveform should be centered about 0 V. (That is, the ramp should go from −0.5 V to +0.5 V.) However, an "x-axis position" control on the Video and Sweep board can adjust for variations in the dc level of the ramp, to permit any one-volt ramp between −1 V minimum and +1 V maximum.

Polarity

The waveform must have a positive ramp. If a reversed image is required, this can be accomplished by means of a switch on the main board which reverses the connections to the deflection yoke.

Deflection Sensitivity

The deflection rate (slope of the X INPUT ramp waveform) must be held between 100 and 200 μs for each 18 cm sweep. Within this range, the automatic z-axis gain control will adjust the spot intensity to compensate for sweep rate variation.

Sweep Repetition Rate

The sweep repetition rate should be at least 1000 sweeps per second; lower repetition rates will trigger the Crt Protective Blanking circuit.

NOTE

The Continuous Recorder includes a circuit to protect the crt's phosphor in case of a failure of the sweep. If the ramp fails to recur at a rate of at least 1000 sweeps per second, or if it does not achieve sufficient amplitude, this circuit will turn off the crt.

Input Impedance

The X INPUT connector presents a 10 kΩ load to the external circuitry driving it.

Common Mode Rejection

There is provision to prevent hum or noise pickup due to slightly differing chassis "ground" voltages between the Continuous Recorder and the external equipment driving it. To reject such hum and noise, the X INPUT connector is isolated from the Continuous Recorder's chassis and the circuitry driven from this connector is designed to respond only to the difference in voltage between the connector terminals, and not to the common-mode voltage between these terminals and the chassis. A potentiometer is provided on the Video and Sweep board to allow adjustment for minimum common-mode response. At least 40 dB of common-mode rejection can be achieved at 60 Hz.

The fact that the X INPUT connector is isolated from the Continuous Recorder's chassis does not mean that this connector should be allowed to float at high voltages with respect to the chassis. On the contrary, it is good safety practice to ground both the chassis of the Continuous Recorder and the chassis of the external equipment driving it.

Blanking

The BLANKING connector on the rear panel provides for introduction of a blanking signal from the external equipment driving the Continuous Recorder. This input is TTL compatible. A TTL high causes blanking of the recorded image when there is no blanking on a TTL low or when the input is left unconnected.

If some device other than a standard TTL gate is used to drive this input, the following data should be helpful:

1. The input presents an impedance of about 4.7 kΩ to ground.

2. The voltage presented to this connector should not be allowed to exceed ±25 V.

3. A voltage of +2 or greater causes blanking, while no blanking occurs if the voltage is less than +0.8 V.

Z Input

The video signal is presented to the Continuous Recorder at the Z INPUT connector.

Amplitude and Polarity

The video waveform must have a voltage which varies in the 0 V to +1 V range. With NORMAL/INVERT jumper on the Video and Sweep board set to NORMAL, 0 V, represents a "white" level and +1 V represents a "black" level. When the jumper is set to its INVERT position, 0 V is "black", and +1 V is "white". For proper adjustment of the NORMAL/INVERT strap function, these levels should be adhered to closely.

Impedance and Bandwidth

The Z INPUT connector presents a 10 kΩ impedance to the external driving circuitry. The bandwidth of the video amplifier exceeds 10 MHz.

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.

Section 3

INSTALLATION

This section contains information about ac power requirements, line voltage selection, selection of various optional configurations of the Continuous Recorder, and connecting the unit to external equipment.

AC POWER REQUIREMENTS

The 4633A may be operated from either a 115 volt or a 230 volt nominal line having a frequency of 48 to 62 Hz. In addition, any of three voltage ranges for 100 V ac or four voltage ranges for 200 V ac may be selected. See Figure 3-1. It normally comes from the factory wired for the 115 volt (Option 48 is a factory-wired instrument for 220 volt operation). Two fuses must be changed when the line voltage is changed. These fuses are located on the back panel. The upper fuse is the line fuse and should be a 7 amp fast blow for 115 volt operation and a 4 amp fast blow for 230 volt operation. The lower fuse is the electronic fuse and should be a 1.6 amp slow blow for 115 volt operation and a 1 amp slow blow for 230 volt operation. When the transformer terminal connections are changed to conform to the new line voltage of 115 volts or 230 volts, the heater (HR 1026) connections must also be changed to the new line voltage.

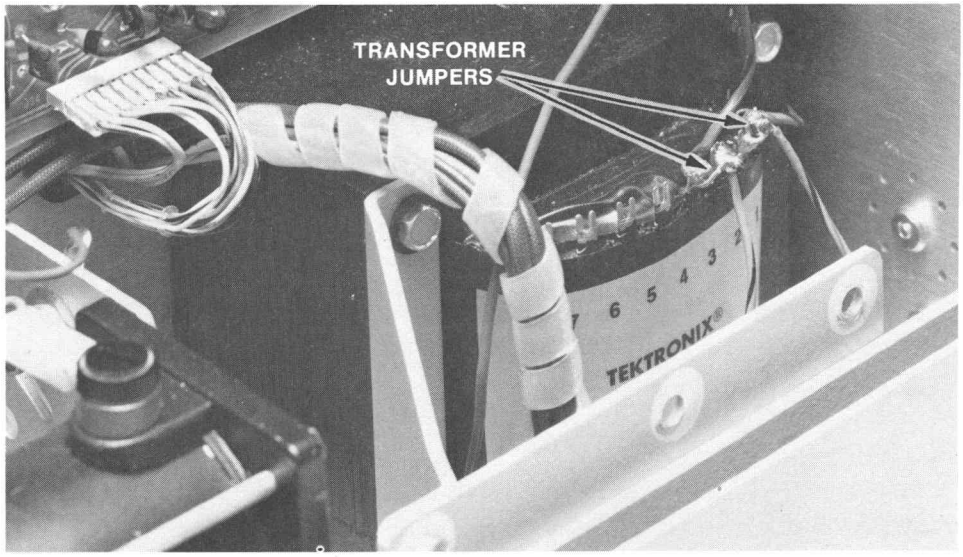
NOTE

*The yellow disc on the back panel indicates the line voltage for which the instrument is set. The disc is **NOT** an adjustment, but should be rotated to indicate the instrument operating voltage.*

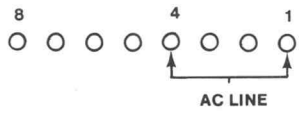
Line Voltage Selection

WARNING

The following instructions are for use by qualified personnel only. To avoid injury, do not perform the following instructions unless you are qualified to do so.



TRANSFORMER TAPS



JUMPER ARRANGEMENT

VOLT ±10%	100	115	120	200	220	230	240
TRANSFORMER TAPS	1-8 4-5	1-2 3-4	1-7 4-6	5-8	5-7	2-3	6-7
J32 HEATER CONNECTOR	GRAY/GREEN—PIN #5 BROWN/WHITE/GRAY —PIN #9			GRAY/GREEN—PIN#1 BROWN/WHITE/GRAY —PIN #5			
J32 JUMPER CONNECTION	PINS 14 AND 15			PINS 13 AND 14			

LINE CORD ALWAYS ATTACHED TO 1 AND 4.

2547-26A

Figure 3-1. Transformer Jumper Arrangement.

A transformer jumper arrangement permits the continuous copier to be modified to suit the supply voltage. To change the line voltage selection, first disconnect the power cord from the line voltage, then remove the top cover. The transformer is located on the right side of the unit. Removing the line voltage cover provides access to the jumper arrangement on the power transformer.

In the figure, the small circles numbered from 1 through 8 denote the transformer taps. As indicated in the figure, the power line conductors (L^1 and L^2) should always be connected to transformer taps 1 and 4. (The fan leads, not shown in the figure, should always be connected to taps 1 and 3.) Jumper straps are soldered between the various transformer taps as listed in the figure. Example: for a 115 line voltage, jumpers should go between terminals 1 and 2, and between terminals 3 and 4. Change the transformer terminal straps to conform to the input ac line.

When the transformer terminal connections have been changed to conform to a new line voltage, change the heater (HR 1026) connections to J32. J32 is located on the control board above the transformer and is labeled with its terminal #1 at the top. J32 connections are changed by moving the positions of the pins in the connector. The wiring of the process or heater plate at connector J32 is shown in the control board schematic diagram. For 115 volt operation, connect the green-gray wire to pin 5, and the brown-white-gray wire to pin 9. For 230 volt operation, connect the green-gray wire to pin 1, and the brown-white-gray wire to pin 5. Also change the jumpers J32-13, 14, 15 for triac drive. The jumpers should be connected across 13 and 14 for 230V operation and 14 and 15 for 115V operation.

After changing the heater, transformer, and triac jumper connections, first change the position of the yellow disc on the rear of the instrument to reflect the change in the instrument operating voltage. Second, be sure the instrument has the proper line cord.

STRAPPABLE OPTIONS

Before connecting the Continuous Recorder to the external equipment whose signals it is to record, one should select which of the various optional configurations are to be used. This is done by means of movable shorting straps or switches within the unit. The various strappable options are described below.

Timing Board Options

Timing board options allow one to choose how the Continuous Recorder will respond to the RECORD lever switch or the REMOTE START/STOP connector's signals and to choose the minimum page length of a recording. In addition, the Timing board has a special RECORD OUT pulse signal available, thus providing external equipment with an indication that a recording is starting.

To choose among these options, first access the Timing board. (See "Access to the Timing Board, Video and Sweep Board" in the Servicing section of this manual.) Figure 3-2 shows the locations of the different shorting straps on the Timing board.

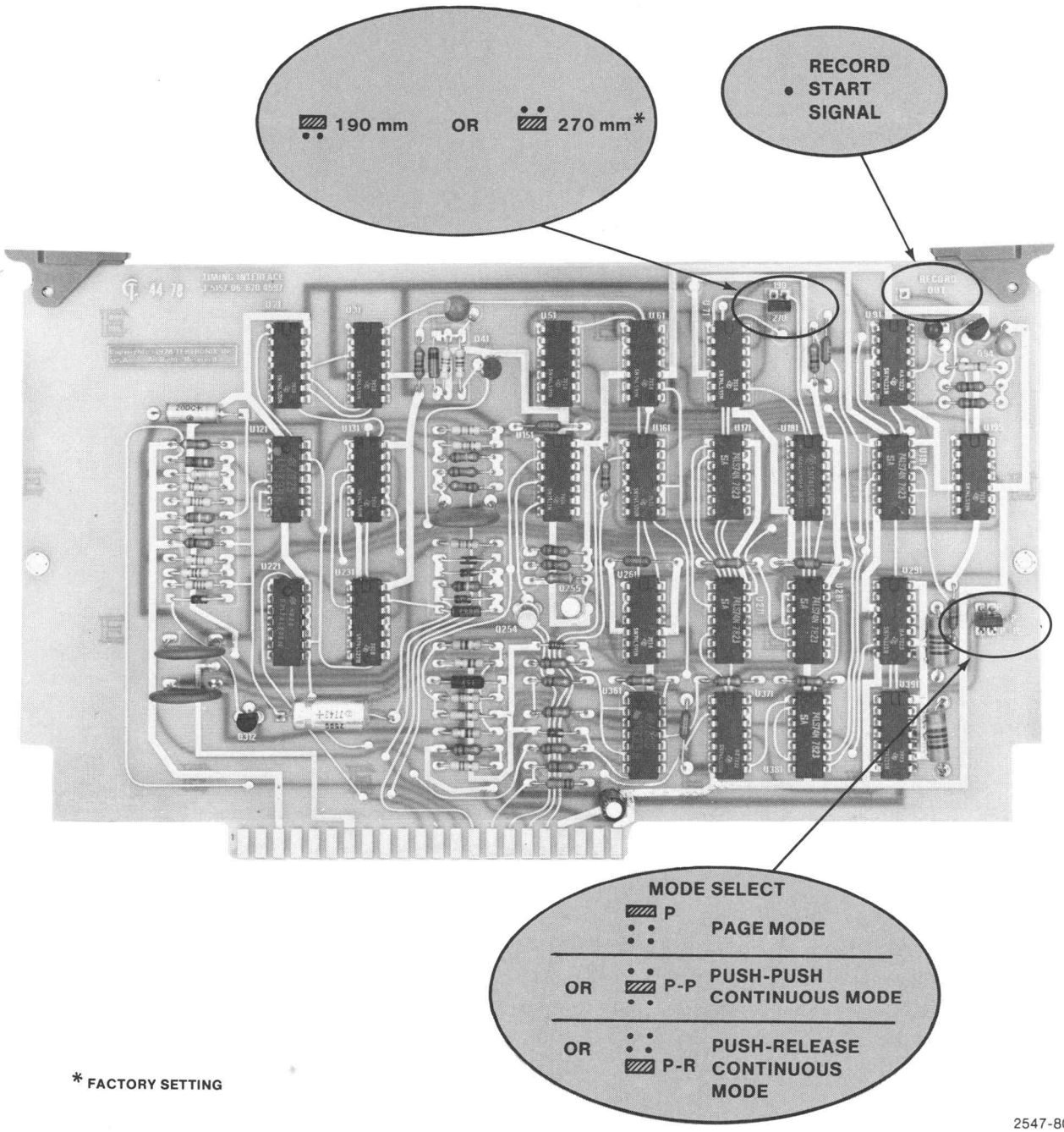


Figure 3-2. Timing Board Strap Locations.

Recording Mode

To select the recording mode, place the selector strap at position P, position P-P, or position P-R, as shown in Figure 3-2.

P. With the strap in position P, the Continuous Recorder is in "Page" mode. Pressing the RECORD lever switch or applying a TTL low pulse at the REMOTE START/STOP connector causes the Continuous recorder to make one recording of minimum page size (as determined by the position of the Minimum Page Length seiector strap).

P-P. With the strap in position P-P, the unit is in "Push-Push-Continuous" mode. Pressing the RECORD lever switch or applying a low to the REMOTE START/STOP connector starts a recording. Pressing the RECORD lever switch or applying a low to the connector a second time ends the recording. (However, the recording does not end until a /minimum page" of 190 or 270 mm has been recorded.)

P-R. With the strap in position P-R, the unit is in "Push-Release-Continuous" mode. To start a recording, depress the RECORD lever switch **and hold it down**; releasing the switch stops the recording. Similarly, a recording is started whan a TTL low (or a short to ground) is presented at the REMOTE START/STOP connector, and terminated when the low (or short) is removed.

Minimum Page Length

The minimum size of a recording may be set at either 190 or 270 mm (7.5 or 10.6 in). To select 270 mm as the minimum page length, set the strap at "270" (Figure 3-2). Similarly, for a 190 mm page, set the strap at "190".

Record Out

The RECORD OUT pin on the Timing board (Figure 3-2) provides a low level (open collector) pulse at the start of each recording. This pin may be used to provide to external equipment a signal that a recording has begun.

Video and Sweep Board Options

Video and Sweep board options allow inversion of the video signal (so that what would otherwise have been recorded as a "white" is recorded as "black", and vice versa) and a choice between "ultrasound" and "slow scan continuous" configurations of the Continuous Recorder.

To choose among these options, first access the Video and Sweep board. (See "Access to the Timing Board, Video and Sweep Board" in Servicing Section of this manual). Figure 3-3 shows the locations of the shorting straps on the Video and Sweep board.

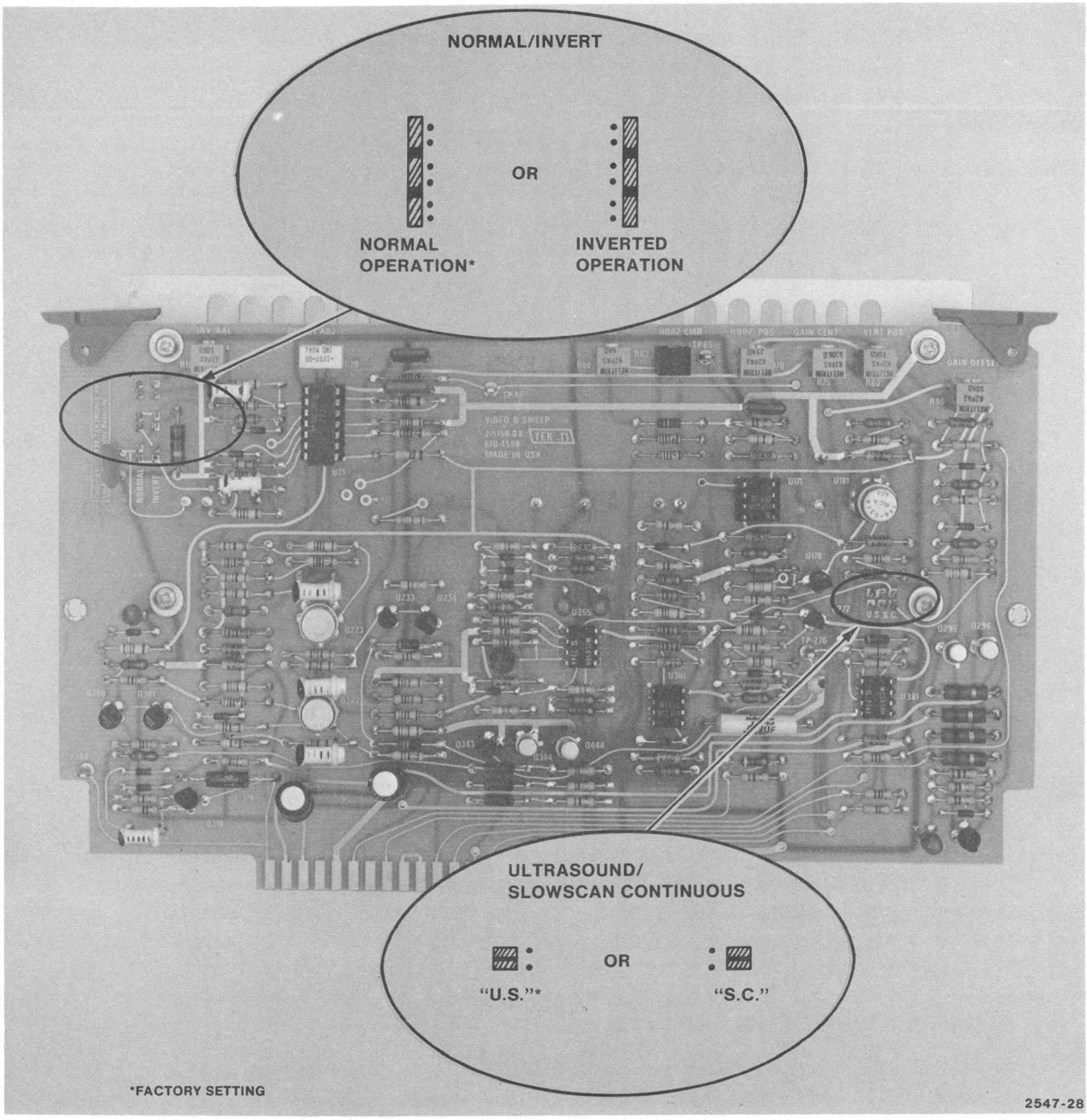


Figure 3-3. Video and Sweep Board Strap Locations.

Normal/Invert

The NORMAL/INVERT selection is made by placing a connector containing three shorting straps at either the NORMAL or the INVERT position on the circuit board (Figure 3-3). With the connector at the NORMAL position, more positive video voltages at the Z INPUT connector result in darker images on the recording paper. With the connector at the INVERT position, more positive signals result in lighter recording density—much as in a photographic negative.

U.S./S.C. (Ultrasound/Slowscan Continuous)

The Ultrasound/Slowscan Continuous selection is made by rotating a dual connector which holds two shorting straps. When the end of the connector holding the straps (marked with a caret for pin one on one side of the connector) is oriented toward the "U.S." label on the circuit board, the Video and Sweep board is configured for medical ultrasound applications. This is the normal position of the connector.

Should the connector be rotated so that the caret on it is oriented toward the "S.C." label on the circuit board, certain features of the Video and Sweep board would be disabled. In particular, the Crt Protective Blanking circuit would no longer function, and the video amplifier gain would no longer be automatically adjusted to compensate for varying paper speeds or horizontal sweep rates.

Main Board Options

The Main board includes a switch for reversing the connections to the horizontal deflection coil and a jumper strap in series with the CUTTER signal line. While the jumper should always be left in, one may change the position of the deflection yoke switch.

To access the Main board, see the directions under "Access to the Main Board" in Section 4, Servicing, of this manual. Figure 3-4 shows the locations of the NORM/REV switch and the CUTTER SIGNAL jumper.

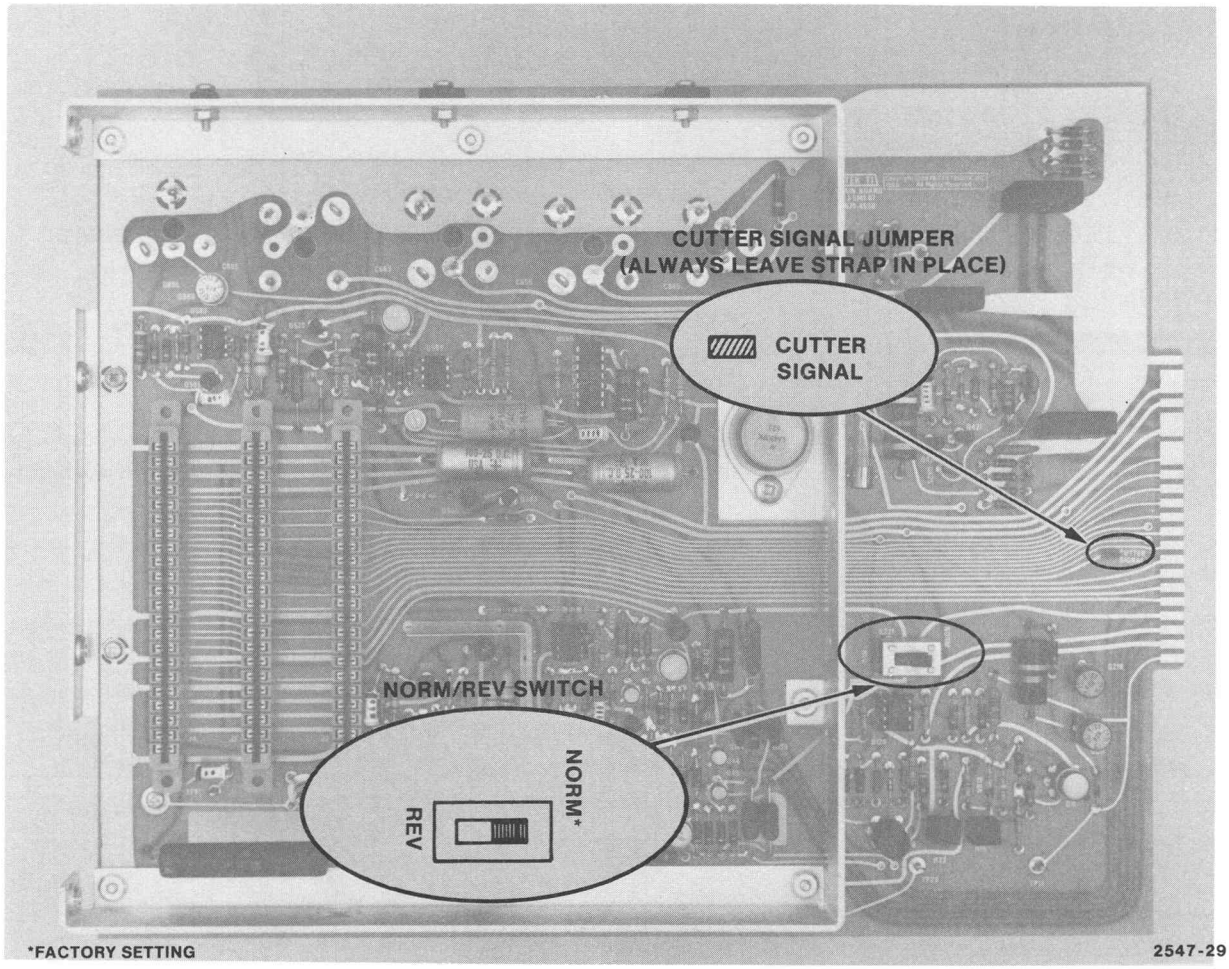


Figure 3-4. Main Board Switch and Jumper Locations.

NORM/REV Switch

The NORM/REV switch on the Main board is used to reverse the connections to the horizontal deflection yoke. Normally, the switch is in its NORM position, and the spot on the crt moves from right to left across the paper in recording an image. The image may be reversed, with the spot scanning from left to right, by setting the switch to its REV position.

Cutter Signal

The CUTTER SIGNAL jumper should always be left in position.

CONNECTING TO EXTERNAL EQUIPMENT

The Continuous Recorder requires three different signals from the external equipment driving it: the video signal itself, the horizontal deflection signal, and a blanking signal to shut off the crt during sweep retrace. These signals should be provided by the external equipment on three coaxial cables equipped with type bnc connectors on their ends. To connect the Continuous Recorder to the external equipment, connect the cable carrying the video signal to the Continuous Recorder's Z INPUT connector, the cable carrying the horizontal sweep signal to the X INPUT connector, and the cable carrying the blanking signal to the BLANKING connector.

If the external equipment driving the Continuous Recorder provides a TTL-compatible output for starting and stopping, that output may be connected to the REMOTE START/STOP connector by a fourth coaxial cable.

WARNING

INSTALLATION IN PATIENT-CARE FACILITIES

Although this instrument is not to be connected directly to a patient, interconnecting this unit to other equipment can result in the application of excessive current to a patient. It is extremely important that the interconnection is made in accordance with National Fire Protection Association Standard NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Areas of Health Care Facilities, section 3038, "Signal Transmission Between Appliances".

Among the situations involving the above-mentioned patient hazard is one in which two or more pieces of interconnected equipment are grounded at locations remote from one another. The standard mentioned in the preceding Warning describes both this hazard and appropriate corrective measures.

Section 4

SERVICING

This section of the manual contains information about disassembly of the instrument to gain access to its parts, planned maintenance, and mechanical and electrical adjustments.

DISASSEMBLY AND REASSEMBLY

Special Tools Required

Screwdriver

Most of the screws in the Continuous Recorder have POZIDRIV heads.[1] To ensure a firm grip on the screws and to avoid stripping their heads, a POZIDRIV screwdriver should be used with these screws. Figure 4-1 illustrates the differences between a POZIDRIVE screwdriver and the more commonly used Phillips screwdriver.

Nutdriver

A 5/16" nutdriver with a 10-inch shaft will be helpful for reaching the hex-head screws which hold the crt yoke.

WARNING

Before proceeding, disconnect the instrument from the power mains.

[1] **POZIDRIV is a registered trade-mark of Phillips Screw Co.**

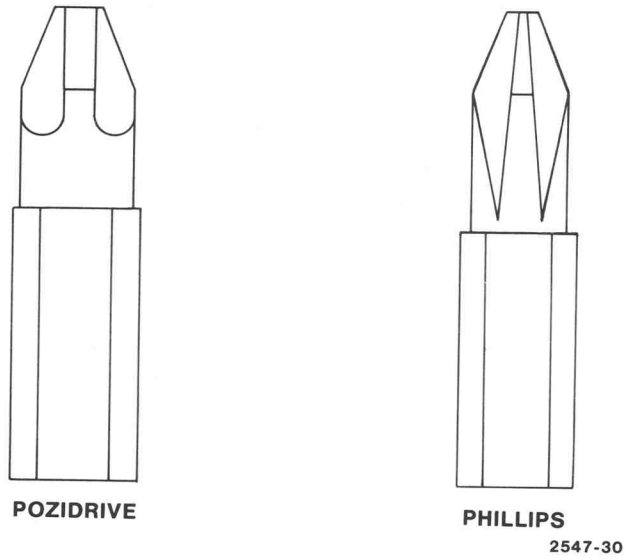


Figure 4-1. POZIDRIV and Phillips Screwdrivers.

Access to Timing Board, Video and Sweep Assembly

1. Remove the instrument top cover by removing the four screws on each side of the unit, then lifting the cover off.

2. The Video and Sweep Assembly is secured to the rear panel by two screws (Figure 4-2). Remove the screws.

3. The circuit boards are held in place by a bracket (Figure 4-3). Remove the circuit board bracket screw (Figure 4-2) and remove the bracket. Now the circuit boards are easily removed or placed on a card extender for troubleshooting or adjustment. (See Replaceable Mechanical Parts Section, under "Optional Accessories", for part numbers of extenders.)

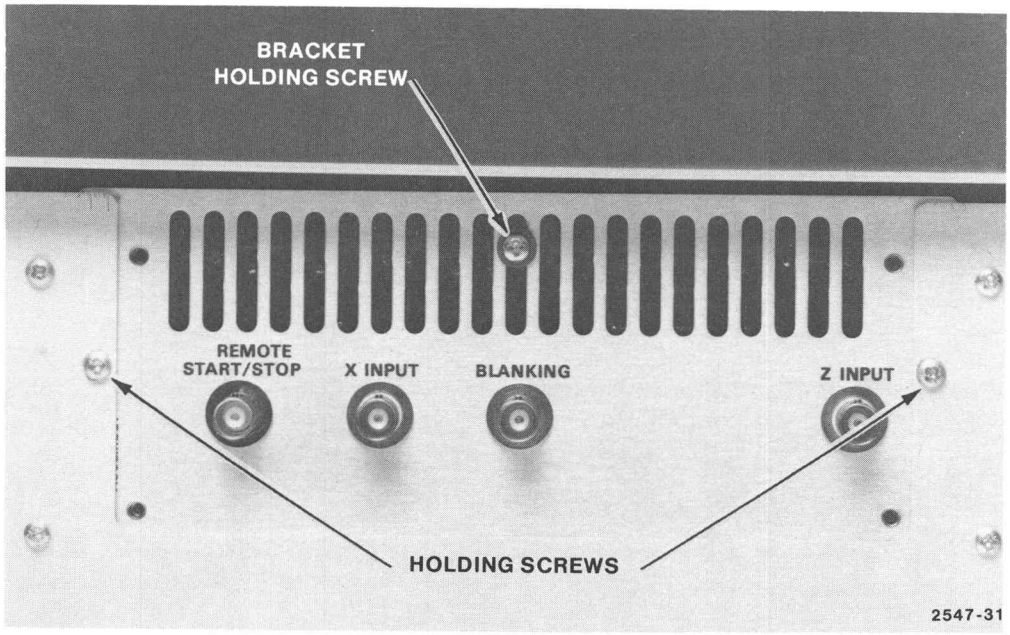


Figure 4-2. Screws Securing Video and Sweep Board Assembly.

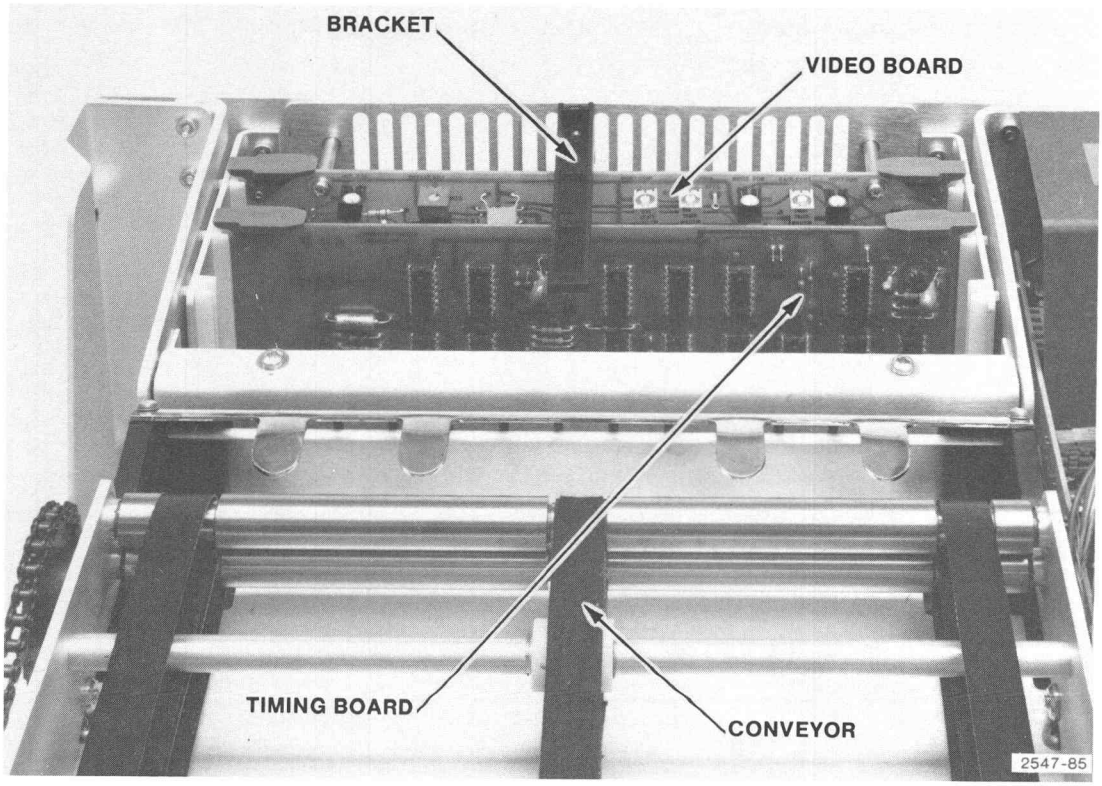


Figure 4-3. Circuit Board Location.

Access to Right Side

The right side of the Continuous Recorder contains the paper transport motor, the main power transformer with its terminals and line voltage jumpers, the Control board, and the holding screws for the right side of the processor. To access these parts, remove the top cover by removing the four screws on each side of the top cover and lifting the cover off.

Access to Left Side

The left side of the unit contains the processor drive chain, holding screws for the left side of the processor, some of the holding screws for the high voltage assembly, and transistors Q1010, Q1012. To access these parts, remove the top cover by removing the four screws on each side of the top cover and lifting the cover off.

Removing Instrument from Cabinet

It may be helpful to remove the instrument from its cabinet for service. Do this as follows:

1. With the top cover on, tip the instrument on its rear. There are seven screws holding the unit to the bottom of the cabinet (Figure 4-4). Using a POZIDRIV screwdriver, remove all but the top two.

2. Set the instrument upright, and slide it far enough forward on the workbench to expose the two remaining screws from underneath. Remove these screws.

3. Remove the top cover by removing the four screws on each side of the top cover and lifting the cover off.

4. There are two screws holding the transformer cover to the frame. Remove these screws, remove the transformer cover, and unsolder the fan-motor leads from transformer taps 1 and 3.

5. The unit may now be lifted up and out of the cabinet for easier servicing. (The fan stays in the cabinet.)

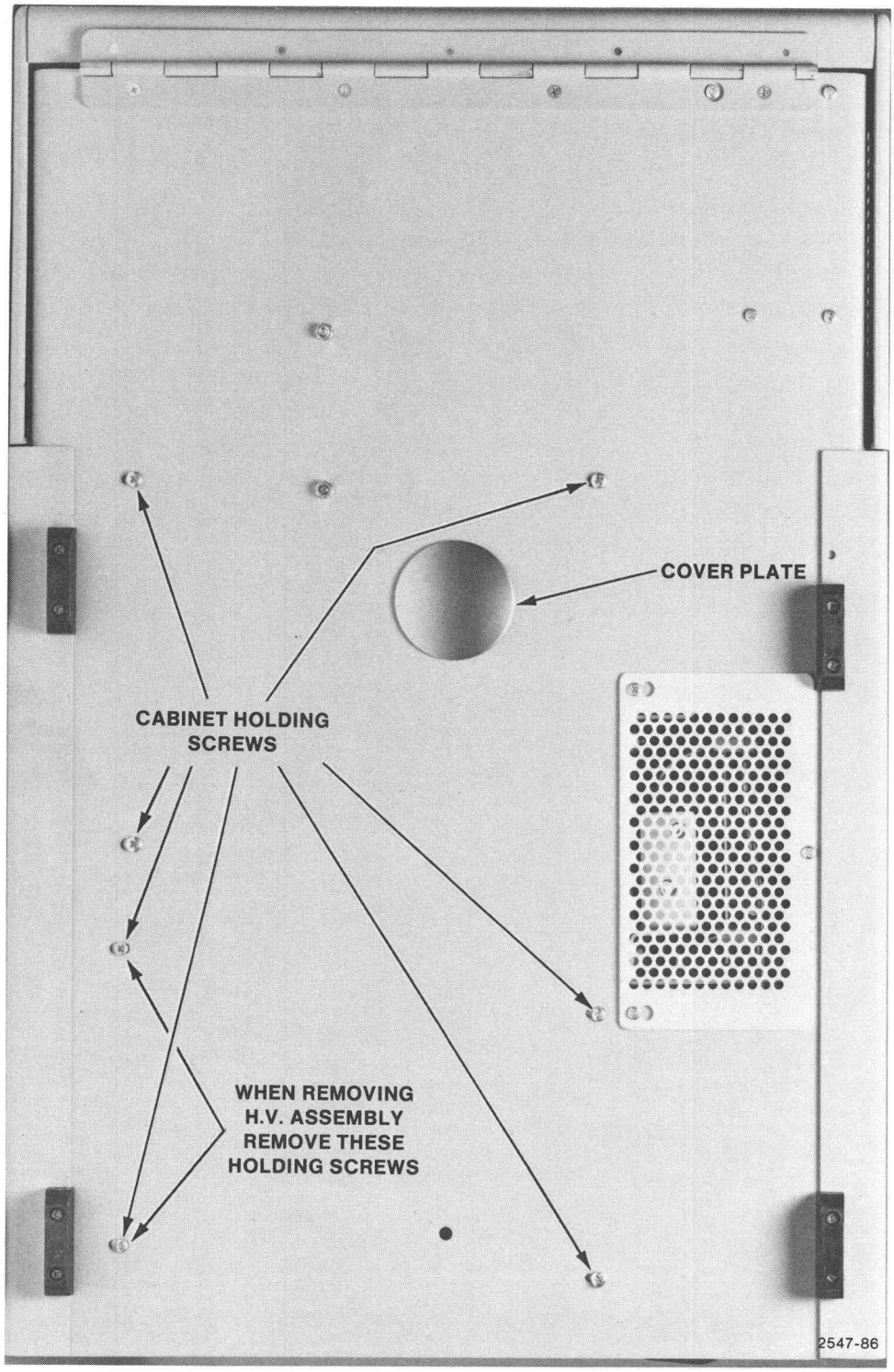


Figure 4-4. Bottom View of Instrument.

Removing the Main Board

The Main board contains the power supplies and some of the amplifiers. To remove the Main board, follow this procedure:

1. Disconnect the instrument from the power mains.

2. Remove the top cover by removing the four screws on each side of the top cover and lifting the cover off. Use a POZIDRIV screwdriver to remove the six rear panel holding screws (Figure 4-5). It is not necessary to remove the screws holding the connector mounting plate to the rear panel, nor to remove the Video and Sweep board and Timing board from their sockets in the Main board.

3. Pull out the back panel and the attached Main board. If desired, a board extender may be inserted in place of the Main board, and the Main board plugged into it to allow troubleshooting on the Main board while the unit is running. (The part number for the board extender can be found in Replaceable Mechanical Parts section, under "Optional Accessories".)

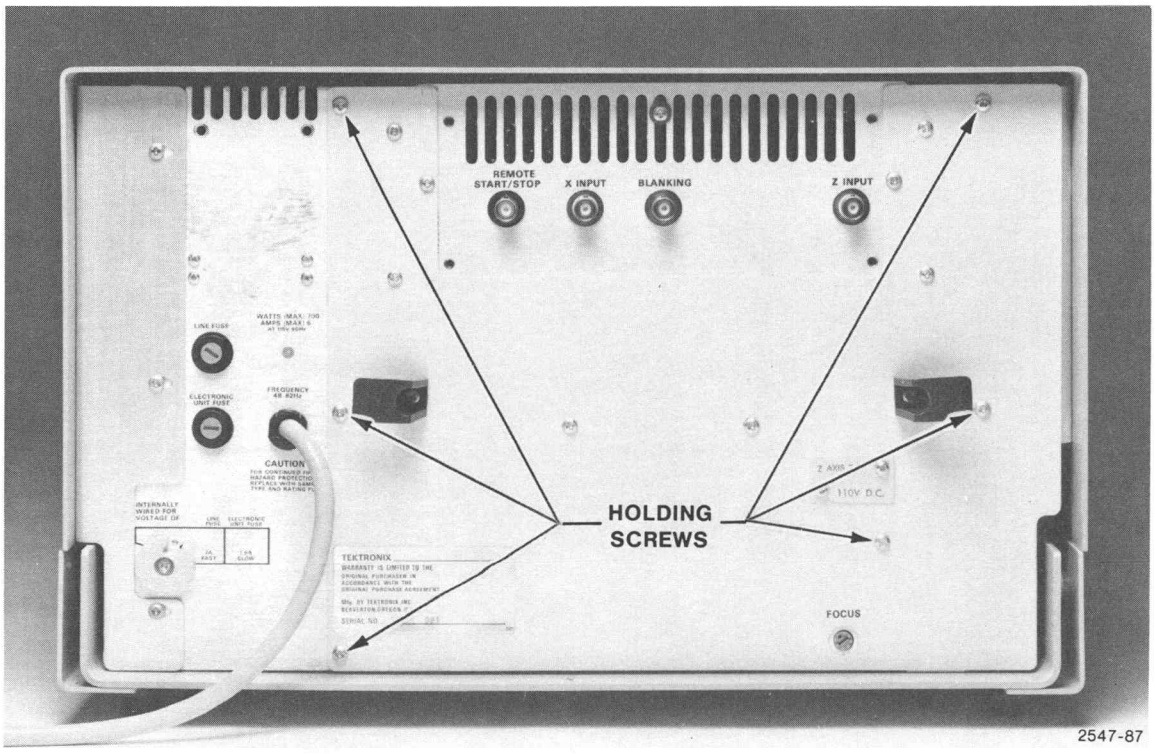


Figure 4-5. Rear Panel Holding Screws.

Removing the High Voltage Assembly

The High Voltage Assembly contains the High Voltage board and the High Voltage Oscillator board. To remove this assembly, proceed as follows:

WARNING

Make certain that the Continuous Recorder has been disconnected from the power mains.

1. Remove the Main board, as described under "Removing the Main Board".

2. Tip the instrument on its side. Remove the two screws which fasten the High Voltage Assembly to the bottom of the cabinet. Also remove the cabinet bottom plug.

3. Reach through the access hole formerly covered by the bottom plug, and disconnect the clip from the crt post accelerator terminal.

WARNING

Be careful not to touch the conductor in the clip or the crt terminal. If the high voltage power supply has failed to discharge properly, dangerous voltages may be present at these points.

4. Turn the instrument upright again. Using a POZIDRIV screwdriver, remove the holding screw (Figure 4-6). Remove also the threaded stand-off in the lower left corner of the mainframe (Figure 4-6). The High Voltage Assembly should now be loose.

5. Detach connector P20 from J20 on the High Voltage Oscillator board.

6. Detach the crt socket from the crt. The High Voltage Assembly, with the crt socket and the crt anode lead attached, may now be pulled out.

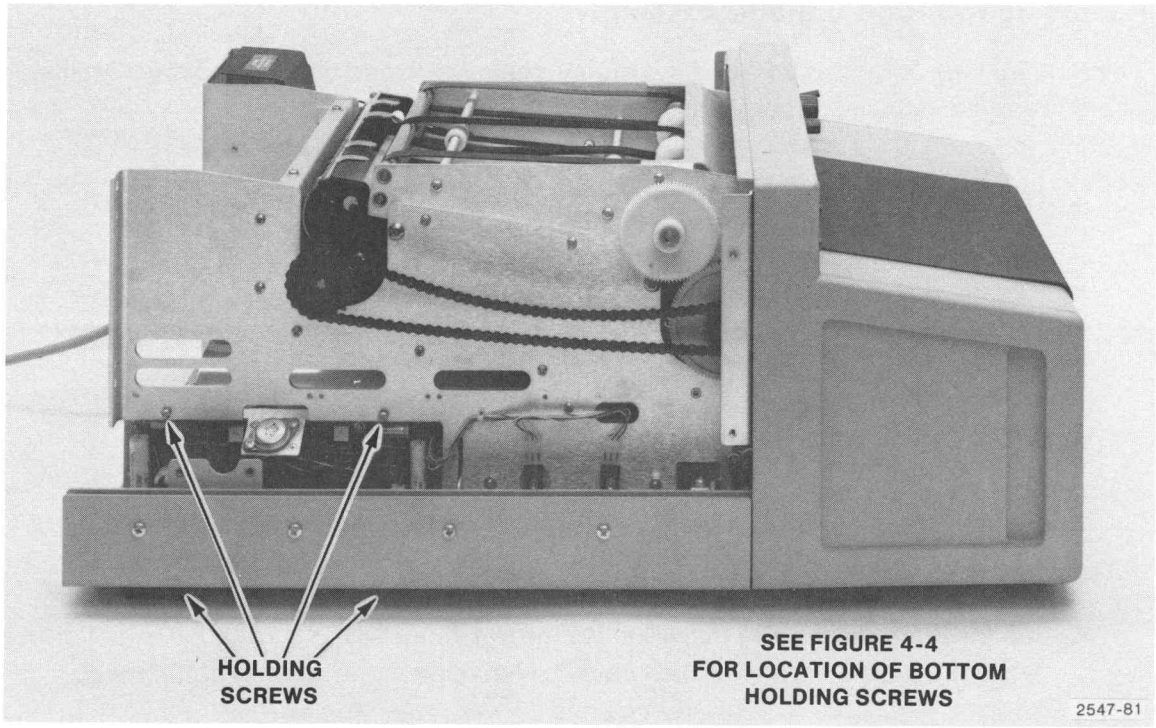


Figure 4-6. Screws Holding the High Voltage Assembly.

Removing and Replacing the Cathode Ray Tube

WARNING

The crt may implode if it is scratched or struck severely enough. Wear protective clothing and a face shield when replacing the crt.

Removing the Crt

To remove the cathode ray tube, follow this procedure:

1. Remove the Main board. (See "Removing the Main Board", earlier in this section.)

2. Disconnect the crt socket.

3. Lay the instrument on its side and remove the cabinet bottom plug located on the bottom, near the center.

4. Disconnect the post accelerator button, accessible through the uncovered hole. Then set the unit back on its base.

5. Swing the cassette holder out and remove the paper cassette. The cassette holder is connected to the unit by cassette arm latches located at the first mechanical junction from the handle knobs. Unlatch these latches and remove the cassette holder.

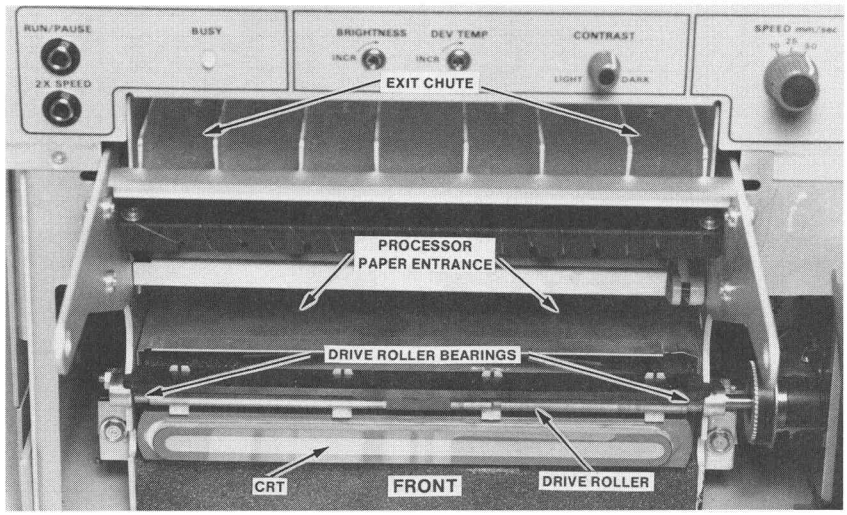
6. Loosen the Allen screw which holds the drive roller clutch assembly to the drive roller shaft (Figure 4-7).

7. Remove the nut which holds the drive roller bearing on the opposite end of the drive roller shaft from the drive roller clutch (left end of the drive roller as you face the instrument). Remove the bearing.

8. Slide the left side of the drive roller forward clear of its mounting and then slide it out of the left side of the instrument. (It may be necessary to loosen the bearing.)

9. Using a POZIDRIV screwdriver with a 10-inch shaft, loosen the two screws which hold the crt clamp on each side of the crt. (It will be necessary to pass the shaft of the screwdriver behind the drive chains and their sprockets.) Loosen the screws about 1/2 inch. Then, using a flat-bladed screwdriver, pry up on the crt's upper clamping strap at the screws, sliding the strap up on the screw on each side, freeing the crt.

10. Lift up the front of the crt to free it from the lower bracket and slide it forward out of the instrument. The neck of the crt slip-fits into the yoke. It may be necessary to rotate the tube slightly to free it from the yoke before pulling the tube out.



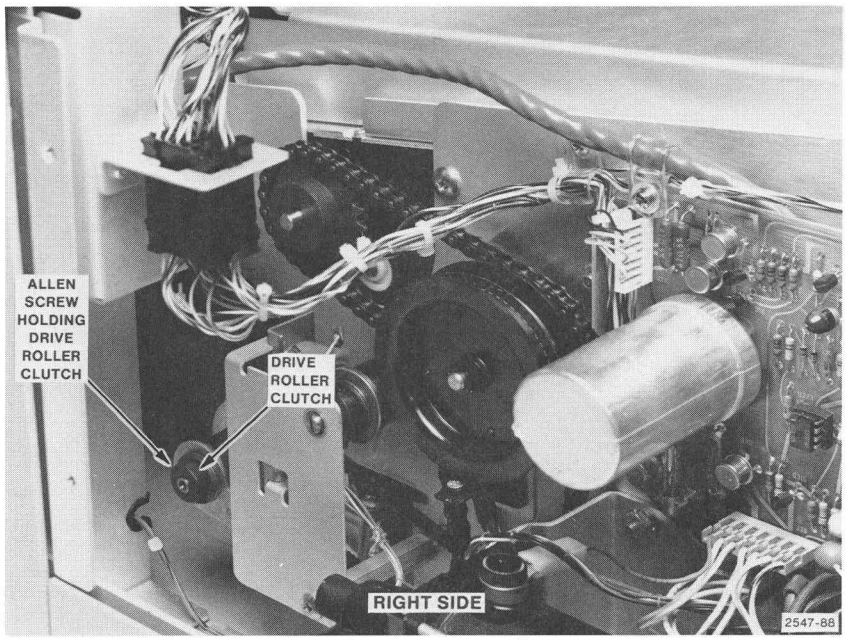


Figure 4-7. Drive Roller and Associated Parts.

Replacing the Crt

To replace the crt, reverse the above procedure. Note that the crt should be fully inserted before the clamp screws are tightened. Be sure to reconnect the post-accelerator cable on the bottom of the crt. After installation of the crt, it may be necessary to readjust the instrument (set crt bias R221 and reposition the trace on the crt). When replacing the crt, be careful to push the foam light shields back into the unit. They should be positioned on top of the crt so as to cover the holes at the holding clamps on each side and across the bottom of the crt.

The crt should be pushed back into the unit far enough so that the face protrudes 0.010 to 0.030 inch in front of the drive roller. It may be necessary to jockey the tube slightly to maintain this spacing all across the face of the tube, before the clamp-holding screws are completely tightened.

If the crt is not level horizontally, it may be leveled by moving the side blocks up or down after loosening the two 5/16 inch hex-head bolts at the front of the holding clamps.

After replacing the crt, it may be necessary to adjust the trace rotation. See "Yoke Adjustment", under "Mechanical Adjustments", later in this section.

Processor Removal and Installation

To remove the Processor Assembly (P/N 640-0522-XX):

1. Disconnect the instrument from the power source.

2. Remove the eight 8x32 pan head screws securing the top cover, and lift off the top cover.

3. Unlock the cassette assembly and slide it away from the front of the instrument.

4. Remove the four 6x32 screws securing the conveyor assembly and lift the conveyor out. Note that there is one screw longer than the remaining three to secure the main wiring harness with a cable clamp and a square washer.

5. Loosen (do not remove) the two nuts securing the chain tension bracket so that the chain is slack. This may require loosening the optodevice bracket mounting screw and removing the interrupter wheel to access these nuts.

6. Disconnect J31 and J32 from the control board.

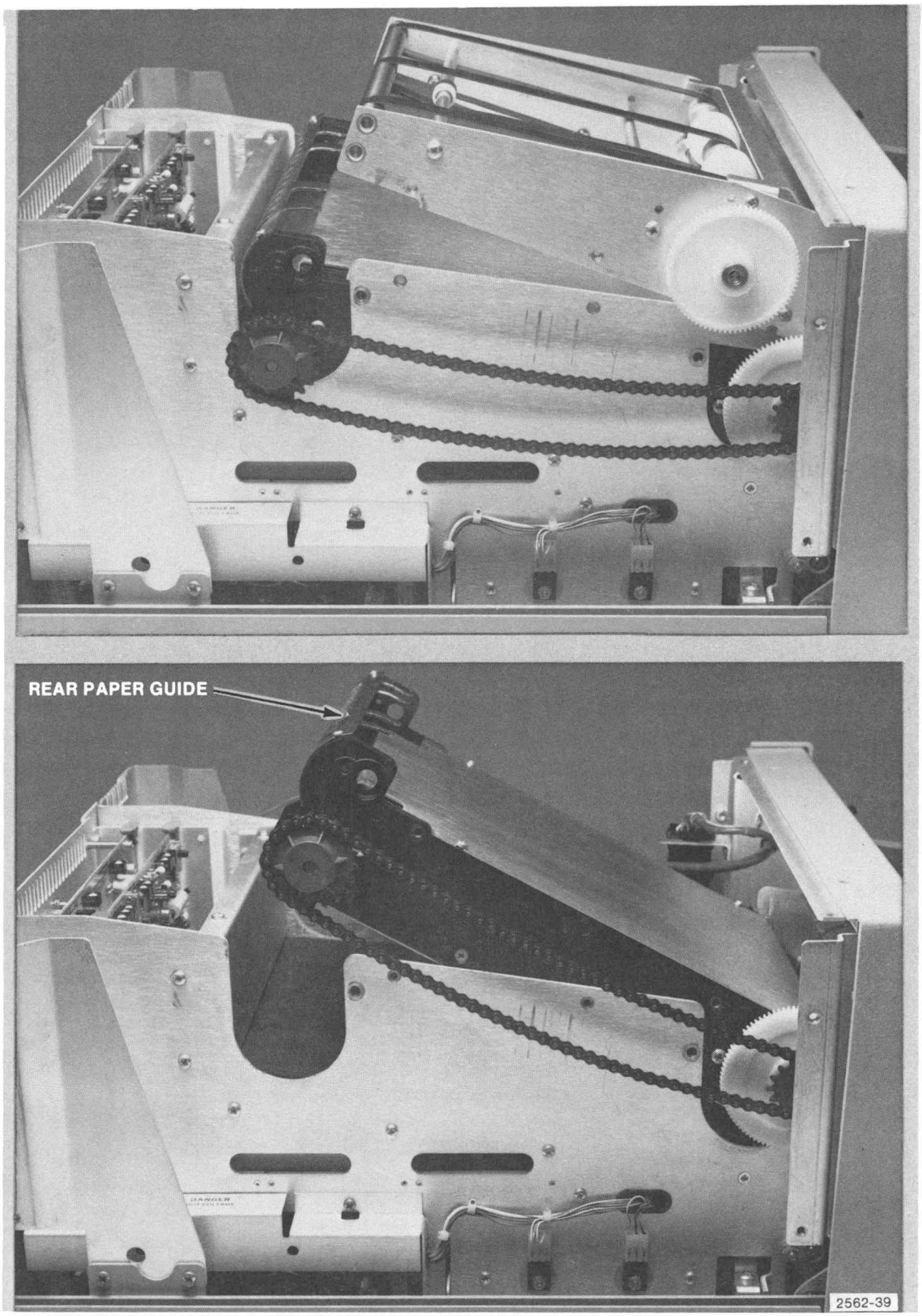


Figure 4-8. Conveyor and Processor Removal.

7. Remove the four 10x32 truss head screws securing the processor within the instrument mainframe.

8. Grasp the processor by the rear paper guide and lifT upward and forward (see Figure 4-8).

9. Disengage the drive chain from the drive sprocket.

10. Lift the processor out of the instrument.

CAUTION

Use care in handling the processor out of the instrument. Bumping the front paper guide against a hard object may cause the tensioned fishline to snap.

Install the processor by reversing the above procedure, keeping in mind the following:

WARNING

Do not approach the feed side of a gear, pulley or sprocket with tools or fingers.

Adjust the chain tension bracket while the instrument is running to allow for accentricities in the sprockets. Use caution as this adjustment involves proximity to moving parts.

If the processor was disassembled, it may be necessary to repositon the processor drive sprocket upon its shaft for the chain to track smoothly without binding. Also, check the instrument for correct motor speed, and recalibrate as necessary.

Processor Disassembly and Assembly

Once removed from the instrument, the processor can be disassembled and reassembled as follows for such maintenance as heater belt or heater element replacement:

The necessary tools are:

Magnetic Screwdriver	003-0293-00 or equivalent
Pozidriv Bit #1	003-0602-00 or equivalent
Pozidriv Bit #2	003-0603-00 or equivalent
3/32" Hex Wrench	003-0091-00 or equivalent
1/4" Nutdriver	003-0132-00 or equivalent
Turbine Oil	006-0626-01

The following steps are referred to in Figure 4-9 :

1. Using the 3/32" hex wrench, remove the processor drive sprocket.

2. Using the #1 Pozidriv bit, remove the two 4x40 screws securing the processor entrance paper guide, and remove the guide.

3. Remove the four 4x40 screws securing the processor top plate, and remove the plate.

4. Remove the two fiberglass insulators. The finished sides should be up when reassembling.

5. Use the 1/4" nutdriver to remove the nuts on the heating element studs. Remove the flat washers beneath these nuts.

6. Remove the two 4x40 screws securing the processor rear paper guide, and remove the guide.

7. Gently pry out the inside paper guide. Finger pressure may be sufficient.

8. Remove the four 4x40 screws securing the processor bottom plate, and remove the plate.

9. Using the #2 Pozidriv bit, remove two 8x32 pan head screws and one 6x32 countersunk screw from the processor right frame section.

10. In order not to disrupt the wiring to J31 and J32, remove the right frame section and the heating element together. Slide the heating element out from between the thick spacers and the rubber heating belt.

11. Remove the loose idler roller.

12. Remove the heater belt.

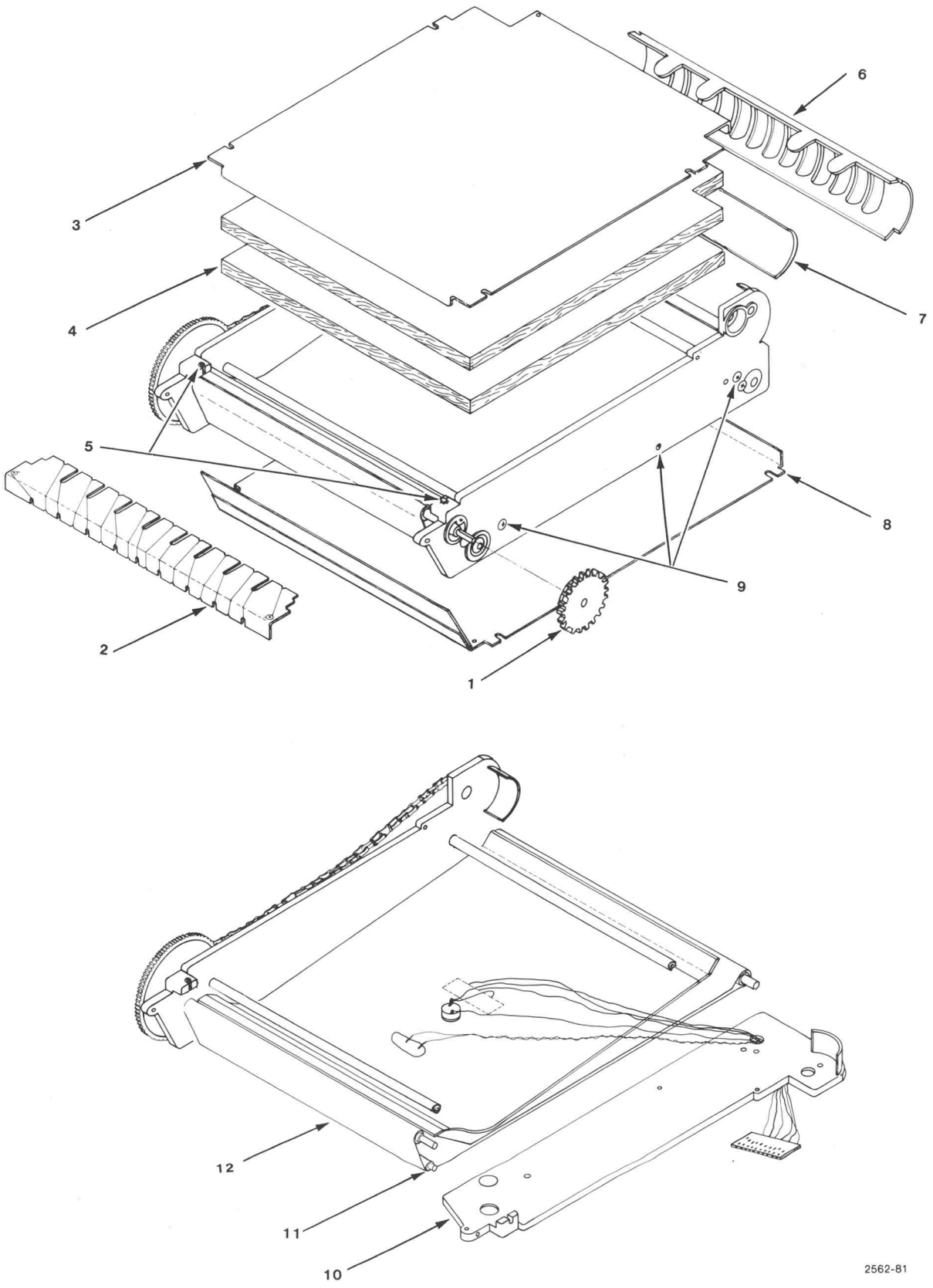


Figure 4-9. Steps in Processor Disassembly and Assembly.

At this time, inspect the heating element for wear. Worn elements contribute to premature belt failure. The first indications of excessive wear appear along the crease on the rear of the element. If the nickel plating appears pitted, cratered, highly polished or flaking off, replace the element. Avoid the use of sandpaper or emery cloth. Sanding drastically reduces the life of heating elements and heater belts.

Inspect the frame sections for large scratches. Such damage may impair the functioning of the conductive paint sprayed onto the *outer surface*. When in doubt, measure for a resistance of about 1 KΩ per inch.

It is also convenient at this time to put two drops of turbine oil onto each wick within each bearing. There are six wicks.

When installing the heater belt, put the rough finished seam on the inside (to travel over the drive rollers).

Reassemble the processor by reversing the above procedure. If the connectors fall out of the holder for J32, see Figure 4-10 for color coding of the wires for either 110 volts or 220 volts operation.

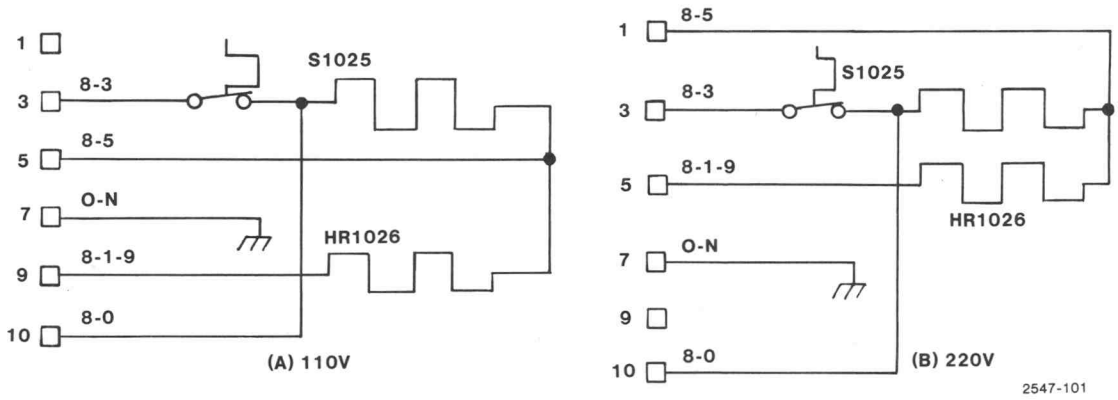


Figure 4-10. J32 Color Coding for 110V or 220V Operation.

PLANNED MAINTENANCE

As with all mechanical devices, a certain amount of planned maintenance is desirable in order to maintain copy quality and avoid breakdowns. Table 4-1 details the recommended planned maintenance. The "Interval" columns indicate the frequency that service procedures are to be performed.

For instance, the check marks in column three show that procedures 1, 2, 3, 5, 8, etc. should be performed every 10 rolls or 1,000 operating hours, whichever comes first.

1-ROLL and 4-ROLLS service may be performed by the operator, according to instructions given in the General Description and Operation section of this manual. The more comprehensive service procedures—10-rolls/1,000 hours, 20-rolls/2,000 hours, and 200-rolls overhaul—should be performed only by a qualified electronic serviceman. It is recommended that a log book be kept of service performed, date and copy or roll count.

Table 4-1
PLANNED MAINTENANCE SCHEDULE

Interval					Service Procedure
1-ROLL	4-ROLLS	10-ROLLS or 1,000 HR	20-ROLLS or 2,000 HR	200-ROLLS	
x	x	x	x	x	1. Remove any dust or paper chaff visible in the area of the rollers and cutter blades. **WARNING** *Use caution around the blades—They are sharp!* Use a brush or soft cloth to wipe out any accumulated dust or paper residue.
	x	x	x	x	2. Clean the unit thoroughly. A small vacuum cleaner is recommended for chaff, dust, etc. **WARNING** *Do not clean the interior of the instrument with compressed air, as this may cause dirt to be blown into the eyes.*

(continued)

Table 4-1 (cont)
PLANNED MAINTENANCE SCHEDULE

Interval					Service Procedure
1-ROLL	4-ROLLS	10-ROLLS or 1,000 HR	20-ROLLS or 2,000 HR	200-ROLLS	
					Any hardened buildup of the paper sublimate should be removed using a soft cloth dampened in a mild detergent solution. The cloth should be well wrung out. Nylon scouring pads may be used, but gently. Possible locations of buildup and resulting jams are: (a) the slotted exit guide at the rear of the processor, (b) the guides that bolt into the top of the rotary blade (in the cassette holder assembly), and (c) the rear lip of the paper tray (under the top cover).
x	x	x	x	x	3. Wipe the face of the crt with a damp, soft cloth. **DO NOT** use alcohol or petroleum-based solvents; they may damage the drive rollers and the processor belt. Be careful not to scratch the crt face.
			x	x	4. Remove the Main board assembly to clean the electronic components.
		x			5. Pull out the interlock button and turn on the unit. Visually check the processor belt for slippage, stalling, or damage. If problems are evident, replace the belt using the kit for that purpose.[a]
			x	x	6. Examine the heater plate for worn plating at the bend near the rear edge. If the nickel plating is worn through to the metal, replace the heater plate. A worn plate will cause excessive belt wear, reducing its life.
			x		7a. Install Motor Processor Maintenance Kit.[a]
			x		7b. At the same time examine the conveyor belts for wear (cuts, loose, etc.). Replace if necessary.
				x	8. Install Overhaul Maintenance Kit.[a]
		x	x	x	9. Check drive belt tension. The brown cogged belt should be just snug, not tight. The four motor bracket retaining nuts may be loosened and the motor moved forward or backward to adjust belt tension.

[a]**Part numbers for maintenance kits are located in the Accessories portion of the Mechanical Parts list.**

(continued)

Table 4-1 (cont)
PLANNED MAINTENANCE SCHEDULE

Interval					Service Procedure
1-ROLL	4-ROLLS	10-ROLLS or 1,000 HR	20-ROLLS or 2,000 HR	200-ROLLS	
		x	x	x	10. Check drive chain free play. The drive chain from the motor should have a small amount—about 1/4"—of free play. Raise or lower the timing sprocket, if indicated, to adjust.
		x	x	x	11. Lubricate the eight processor bearings. Turbine oil is recommended. Place a drop of oil in the timing sprocket where it turns on its shaft. See "Lubrication" in this section.
		x	x	x	12. Grease the drive roller bearings, the cassette assembly rollers' bearings, the cutter arm actuator, and the left end of the rotary blade.
		x	x	x	13. Check the cut edges of a copy. The paper coating may have small nicks, but the paper itself should be cut cleanly, with no "furry" spots or tearing. Tighten the lower blade adjusting screws, if necessary, in the area not cutting. Do not overtighten. If the blades cut properly when operated by hand, but leave a small tear in the right side when the unit is operating, try adjusting the lower cutter blade position. If this does not help, check the adjustment of the cutter actuator arm. (See "Paper Cutter Adjustment" and "Cutter Actuator Adjustment" later in this section.)
		x	x	x	14. Check for unusual or objectionable noise. Potential noise generators are the drive roller clutch (groan), processor belt (groan), and interrupter wheel (squeak). Also, the paper cannister may squeak or groan when nearly empty of paper. Clutch groan may be prevented with the application of Turbine Oil. Disassembly of the clutch may be required. If this procedure fails, replace the clutch. The drive roller clutch solenoid must be kept clean and free of lubricants. Processor belt groan is generally due to the belt rubbing against the left or right side frame section. Replace the belt.

(continued)

Table 4-1 (cont)
PLANNED MAINTENANCE SCHEDULE

Interval					Service Procedure
1-ROLL	4-ROLLS	10-ROLLS or 1,000 HR	20-ROLLS or 2,000 HR	200-ROLLS	
					Interrupter wheel squeak is caused by the wheel rubbing against the LED-phototransistor bracket. Readjust the bracket or wheel position on the timing sprocket shaft.
		x	x	x	15. Check drive motor current during idle with PAPER SPEED set to 25 mm/sec. If the current is more than 2.5 A, remove the drive chain and drive belt from the motor drive sprocket and check the motor current "unloaded" which should be about 0.6 A. If the unloaded motor current is O.K., look for a drag problem in the transport. If the motor current exceeds 0.7 A, replace the brushes or replace the motor to correct.
		[b]	[b]	x	16. Verify electrical performance as described under "Electrical Adjustments" later in this section. Make adjustments as required.
x	x	x	x	x	17. Load the new roll of paper and turn on the unit. After warmup, make several copies and check paper contrast. Adjust the processor temperature if indicated.
		x	x	x	18. Check the range of the CONTRAST control for its effect on the copies. Also check NORMAL/INVERT operation by moving the NORMAL/INVERT strap on the Video and Sweep board.
		x	x	x	19. Make other adjustments as necessary to provide good quality copies.

[b]Electrical calibration of the unit is recommended at least once per year. In installations where copy quality, especially grey scale is critical, the electrical performance should be verified each 1,000 operating hours.

Lubrication

The Continuous Recorder is properly lubricated at the factory. Relubrication is recommended after 10 rolls of paper have been processed or every 4 months, whichever comes first.

Remove the paper cannister, and refer to Figure 4-11. Apply a small amount of Houghtons Cosmolube 102-T2470 to each end of all three rollers in the cassette assembly. It is not necessary to remove the rollers; the lubricant will work in. Put a little Cosmolube on the cutter actuator arm at the right end of the cutter, and to each end of the rotary blade where it makes contact with the stationary blade. Rub a little stick lubricant, such as Door-Ease, along the rest of the moving cutter.

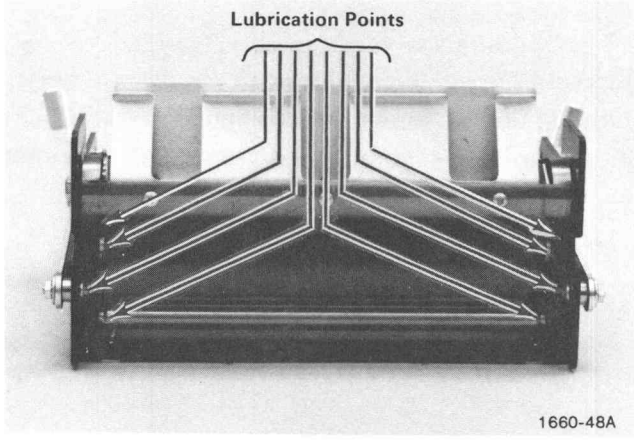


Figure 4-11. Cassette Assembly Lubrication Points.

Use Cosmolube on the bearings at each end of the drive roller that runs just above the crt. Also put a dab on the outside of these bearings where they slide into the slots on the cassette assembly.

Oil holes and wicks are provided at each end of the three rollers in the processor. These can be seen at the four corners of the unit. Put a drop or two of Union AW 313 Turbine Oil in each hole. Put a drop of oil on the shaft of the timer sprocket. The two clutches should not require lubrication.However, if a definite indication of sticking occurs, place a drop of Turbine Oil at each end of the clutch and check operation several times. If trouble persists, replace the clutch.

The chains should not need lubrication. However, if they appear dry, apply oil very sparingly.

MECHANICAL ADJUSTMENTS

The following procedures describe various mechanical adjustments in the Continuous Recorder. Before reading these procedures, the reader may find it helpful to read the "Mechanical Description" in the Theory of Operation section, which gives an overview of the instrument's various mechanical components.

Cutter Actuator Adjustment

If the paper frequently jams at the paper cutter assembly, it is possible that the cutter actuator may be out of adjustment. Before attempting this adjustment, read the description of the "Cutter Actuating Mechanism" in the Theory of Operation section of this manual.

Figure 5-6 in the Theory of Operation section shows the various parts of the cutter actuating mechanism. Note that the cutter clutch is attached to the shaft of the cutter actuator cam by two setscrews. The cutter actuator adjustment consists of finding the proper rotational position of the actuator cam with respect to the cutter clutch, and then tightening the two setscrews to hold it in that position.

1. Turn the power off and loosen the two setscrews holding the cutter clutch to the shaft of the actuator cam. The end of the shaft is slotted to accept a screwdriver blade. When the setscrews have been loosened, one can use a screwdriver to rotate the shaft without turning the cutter clutch.

2. Pull out the cassette assembly holding the paper cannister and the paper cutter. The cutter actuator will then be visible on the inside of the instrument, below the processor. Use a screwdriver to turn the actuator cam shaft, and note at what position of the cam the cutter actuator reaches the top of its travel.

3. Figure 4-12 illustrates the adjustment. Turn the actuator cam shaft until the actuator is at the top of its travel. Tighten the two setscrews, clamping the cutter clutch onto the shaft at that position.

4. Turn the power on, and press the RECORD lever switch to make the instrument go through a recording cycle. Watch the motion of the cutter actuator; as the cutter clutch engages, the actuator should fall to the bottom of its travel and then rise to its home position.

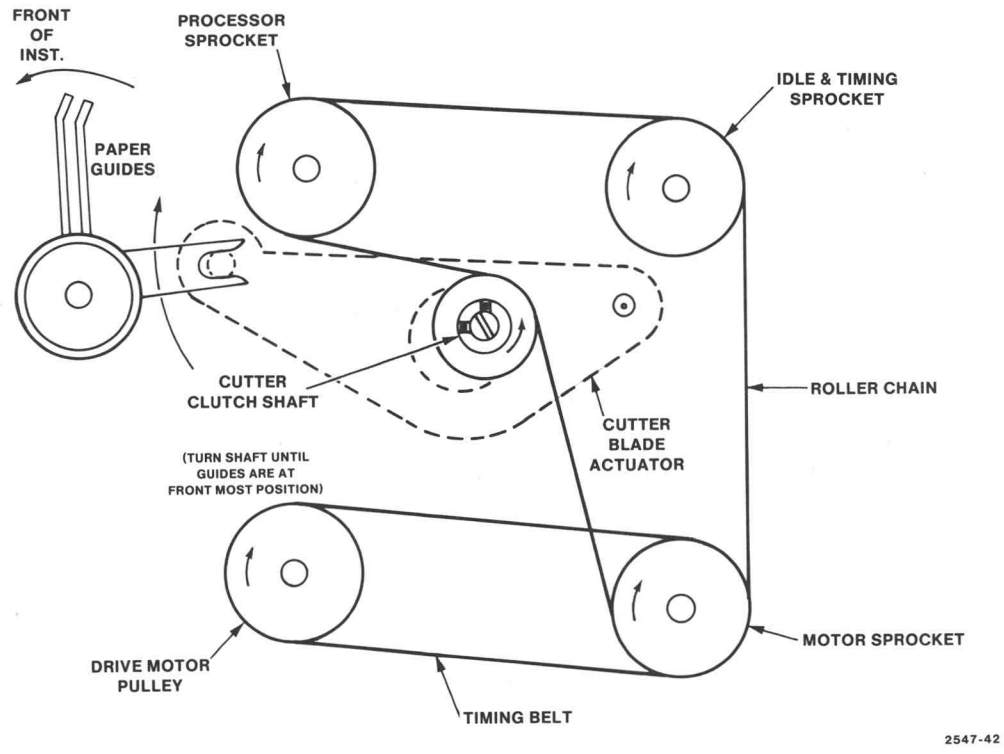


Figure 4-12. Cutter Actuator Adjustment.

Cutter Blades

If the paper is not being properly cut, the paper cutter may need adjustment. With the cassette assembly removed from the instrument, the rotary cutter blade can be operated by hand. If a drag or "hump" is felt, loosen all four screws on the stationary blade. Tighten the two outside screws to a minimum tension, yet tight enough to bring the blades into smooth contact. Then adjust the two inner screws just tight enough to cut paper as you pull it through the cutters and operate the cutter manually. Adjust for paper cutting with minimum of drag between the blades.

Paper Tracking

If the paper does not track properly, pulling to one side as it emerges from the cutter area, adjust the cams on the roller assembly as follows:

1. With the cassette holder removed, locate the eccentric cam nuts on each side of the roller assembly (Figure 4-13) and mark the position of these cams.

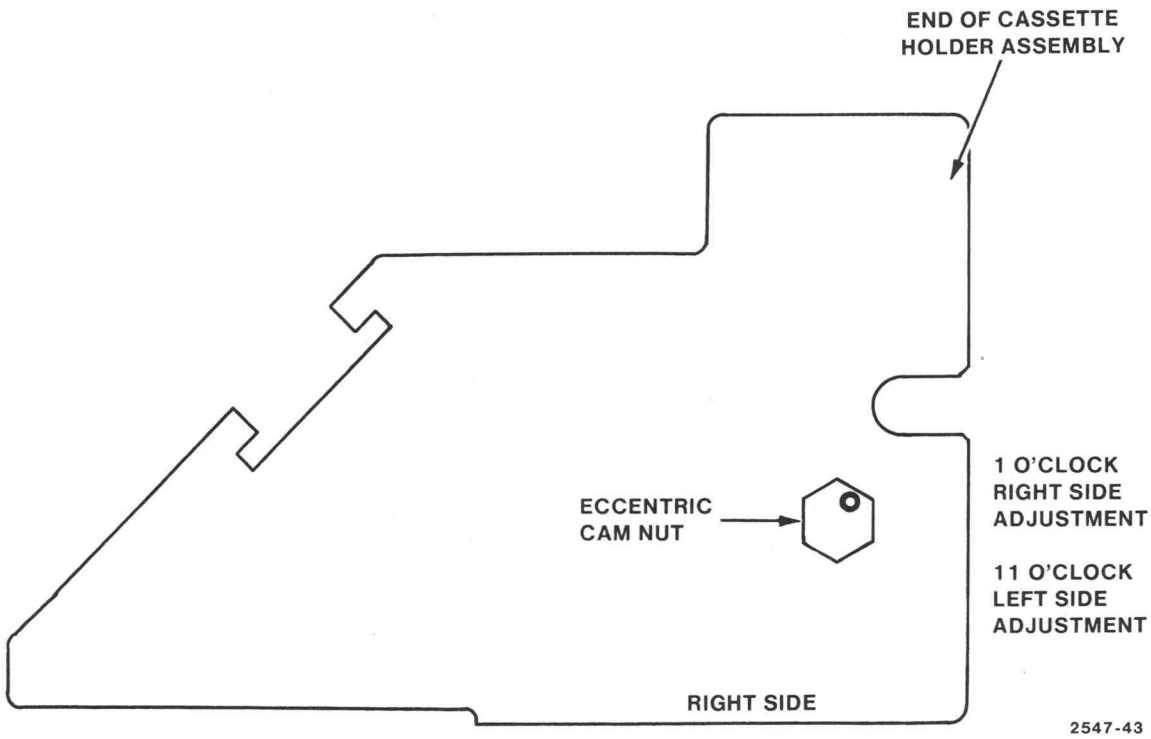


Figure 4-13. Eccentric Cam Nuts for Adjusting Rollers.

2. Hold the cam in place and loosen the flat-head POZIDRIV screw in its center. Repeat for the other cam nut. Loosen these screws only enough to be able to turn the cam.

3. Remove the processor entrance paper guide (Figure 4-14) by loosening the screw on either side, toward the rear of the instrument. **Do not** loosen the two screws toward the front, which hold the paper guide springs.

4. Slide the paper guide forward out of the instrument and lay it aside.

5. Install the cassette assembly. Make sure the assembly is properly seated. Install the paper.

6. Turn the Continuous Recorder on and press the RECORD lever switch. Guide the paper by hand. (It will not go through the processor with the guide removed.) Check that the paper exits from the cutter blade area approximately centered in the rotary cutter blade's attached paper guide.

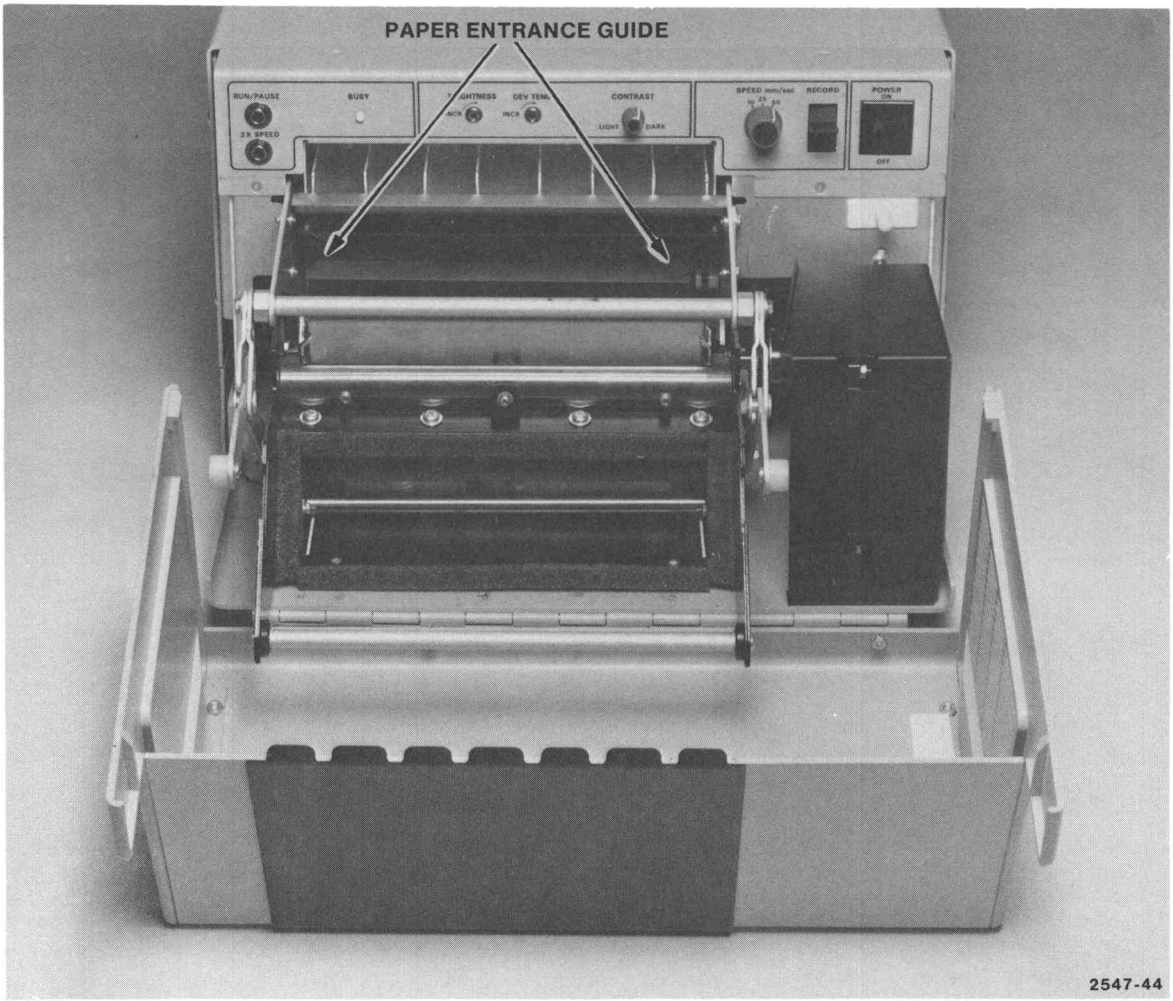


Figure 4-14. Processor Entrance Paper Guide.

7. If the paper does not appear even, adjust the cam nuts, using the special Roller Adjusting Wrench. (The part number for this wrench may be found in the Replaceable Mechanical Parts section under "Optional Accessories".) The normal orientation for these cams is close to that shown in Figure 4-13.

8. Run several copies after adjusting the cams. If the tracking is still unsatisfactory, repeat the adjustment. The paper tension may affect the tracking, so the adjustment may vary with the amount of paper left on the roll.

9. Replace the paper guide. Make sure it is seated all the way back and that the washers are in position on top.

Drive Chain

If for any reason the drive chain should need adjustment, loosen the two hex nuts holding the timing sprocket bracket and move it up or down as necessary. The chain should be just tight enough to drive smoothly without binding. (The drive chain may also be tightened by tightening the drive belt—see below.)

Drive Belt

It should not be necessary to adjust the drive belt. However, the bracket that holds the motor to the mainframe has slotted holes. The motor can be moved forward or back as required for proper belt tension after loosening the four hex nuts. The belt should be just snug, not tight. (This also affects the drive chain adjustment.)

Yoke Adjustment

CAUTION

The crt shield and crt neck shield are fabricated from a metal that protects the crt yoke and the electron trajectories from external magnetic interference. Since a sharp blow may cause the shield to lose some of its protective properties, handle it carefully.

If the crt is replaced, it may be necessary to adjust the deflection yoke so that the trace is horizontal. Use this procedure:

1. Remove the cassette assembly that holds the paper cannister. Turn power off, and temporarily remove the Main board. With the Main board removed, the deflection yoke holding nuts are accessible (Figure 4-15). Loosen these nuts so that the yoke can be rotated; then re-insert the Main board.

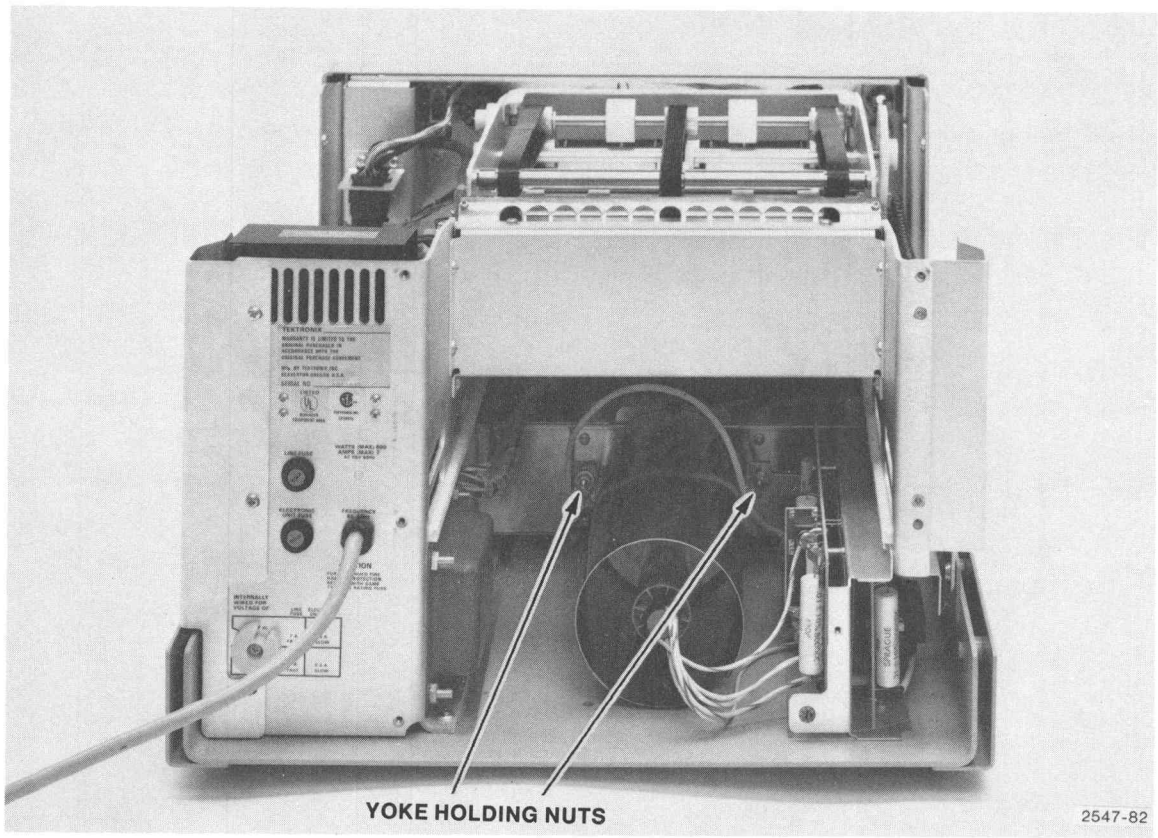


Figure 4-15. Yoke Holding Nuts.

2. Next, put a trace on the crt's screen. To do this, apply a signal (such as a +1 V dc) at the Z INPUT connector and a sweep signal at the X INPUT connector, and press the RECORD button to start a recording.

3. A lever attached to the yoke protrudes from the left side of the mainframe to allow rotating the yoke while observing the crt. Move this lever up or down as required to obtain an even trace.

4. After adjustment, turn the power off and remove the Main board again to gain access to the yoke holding nuts. CAREFULLY tighten the yoke holding nuts.

ELECTRICAL ADJUSTMENTS

Test Equipment Required

To fully calibrate and adjust the Continuous Recorder, the following test equipment is needed:

1. Oscilloscope:

   Bandwidth: DC to at least 30 MHz.
   Minimum deflection factor: 5 mV/div.

   For example, a Tektronix Model 465 or equivalent.

2. Precision DC voltmeter:

   Accuracy: at least ±0.5%
   Range: ±6 kV.

   For example, a Tektronix Model DM 501 Digital Multimeter or equivalent.

   Use a high voltage divider (such as Fluke model 80k-40 H.V. Probe) with the voltmeter to measure voltages above 500 volts.

3. An ammeter capable of measuring DC currents of at least 3.5 amps.

   For example, the Triplett Model 630-NA VOM.

4. A signal generator capable of producing a 60 Hz 2 V p-p ac signal.

   For example, the Tektronix FG 501 Function Generator or equivalent.

5. A metered ac variable power source, capable of supplying at least 750 watts at line voltages of 104 to 126 volts ac.

   For example, the General Radio Model W10MT3W Autotransformer Variac.

6. A digital counter capable of measuring periods of TTL pulses from 0 to 100 ms (10 Hz) with .01 ms resolution and averaging up to 1000 cycles.

   For example, the Tektronix Model DC 503 Universal counter.

7. A 10 ohm, 100 watt resistor. (The 10 ohm resistor can be made by using 5—2 ohm, 25 watt resistors in series Tektronix Part Number 308-0205-00; or 5—50 ohm, 25 watt resistors in parallel Tektronix Part Number 308-0164-00.)

8. A metric scale of at least 30 cm.

9. A time mark generator capable of generating pulses of at least 1 volt amplitude, of 1 second period, width of at least 50 ms, and period accuracy of at least .3%.

   For example, the Tektronix Model TG 501 Time Mark Generator.

10. A function generator capable of producing the ramp as shown in Figure 4-16 with parameters as follows:

    a) DC baseline between about −2 to +1 volt.

    b) Ramp amplitude variable between 0 volts and 2 volts.

    c) Ramp duration between 100 μsec and 200 μsec.

    d) Sweep rep rate between 1000 and 2000 sweeps/sec. The generator must also provide a gate output which is TTL low during each ramp and between 2 and 10 volts the rest of the time.

       For example, a Tektronix Model PG 501 Pulse Generator can be used to gate a Tektronix FG 501 Function Generator which is in the positive ramp mode. The gate output can be produced from the minus output of the FG 501 by passing it through a voltage divider to shift the negative going pulse to a positive referenced pulse.

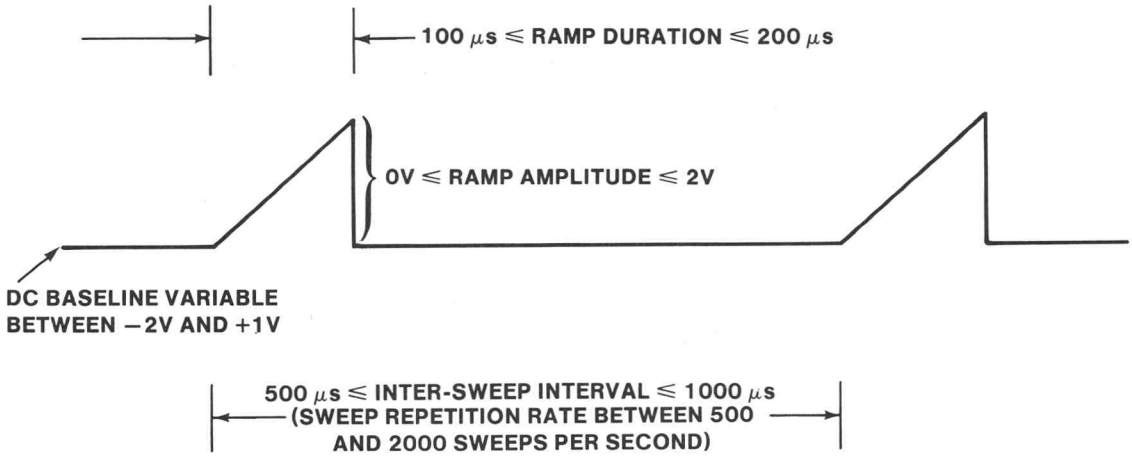


Figure 4-16. Sweep Generator Output Waveform.

11. A pulse generator capable of producing a 2 MHz 30% duty cycle which can be synchronized with the ramp, a rise and fall time of less than 5 nsec, and 1.0 volt amplitude going from 0 to 1 volt.

    For example, the Tektronix Model PG 501 Pulse Generator, using the Tektronix Model FG 501 Function Generator to gate the PG 501 in synchronization with the X INPUT ramp.

12. A 1.00 volt (±1%) DC voltage source.

Short Form Electrical Adjustment Procedure and Index

This short-form electrical adjustment procedure is provided to aid in checking the operation of the Continuous Recorder. It may be used as a guide by the experienced calibrator, or it may be used as an index to the full adjustment procedure which follows:

(continued)

Electrical Adjustment Procedure

NOTE

The instrument must have a warmup period of 20 minutes before electrical adjustment procedure is started.

1. Visual Inspection

a. Disconnect the power cord from the power source and remove the cabinet top.

b. Check for the following:

1) Semiconductors out of sockets.
2) Damaged or missing parts.
3) Circuit cards improperly installed.
4) Interconnecting cables incorrectly installed.
5) Improper or blown fuses.

2. Low Voltage Power Supplies

a. Remove Timing board and Video/Sweep assembly.

b. Pull out Cassette assembly. This disengages cutter and pinch roller.

c. Connect the line cord to the metered autotransformer, set to 117 V ac, and turn on the Continuous Recorder.

d. ADJUST—the +15 volt supply (R472).

1) Connect the precision dc voltmeter to J2-20 (Figure 4-17) on the Main board.

2) ADJUST—R472 for a voltage of 15.0 volts.

NOTE

All supplies are ultimately referenced to the +15 volt supply, so it must be properly adjusted first before checking the other supplies.

e. CHECK—all supplies for proper voltage and ripple as the line voltage is varied between high line (126 V ac) and low line (104 V ac), using the precision dc voltmeter and the oscilloscope.

1) CHECK—the +15 volt supply at J2-20 (Figure 4-17) for a voltage between +14.85 and +15.15 volts, and a ripple of less than 50 mV.

2) CHECK—the −15 volt supply at J2-21.

voltage: −14.55 to −15.45
ripple: <50 mV

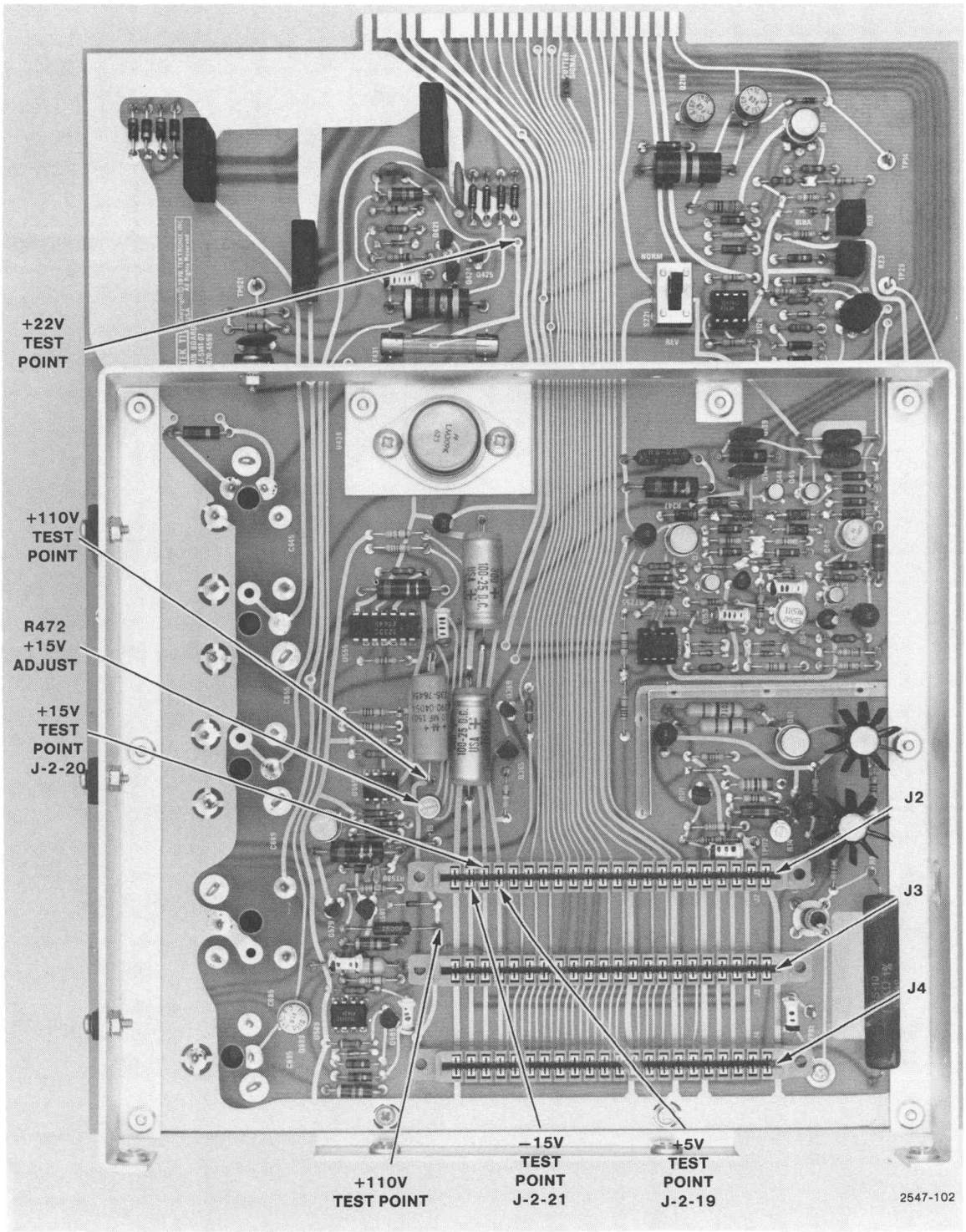


Figure 4-17. Power Supply Test Points and Adjustments.

3) CHECK—the +5 volt supply at J2-19.

voltage: +4.8 to +5.2
ripple: <50 mV

4) CHECK—the +110 volt supply at the J3 end of R583 (Figure 4-17).

a) Turn instrument off, insert the Timing board into J2, and turn instrument on again.

b) CHECK—for an idle voltage at R583 of about 25 volts.

c) Press RECORD (assure that the unit is in the "Push-Push Continuous" mode).

d) CHECK—for:

voltage: +106.7 to +113.3
ripple: <100 mV

f. CHECK—for proper operation of the indicator light in the POWER switch; it should light when POWER is on, and turn off when POWER is off.

g. Reinstall the Video/Sweep assembly.

3. Control board

NOTE

If the unit has been producing usable records just prior to doing this Electrical Adjustment Procedure, then go to Step 9 of this procedure. After completing Step 9, then return to Step 3b (do not do 3a) and continue through the procedure.

a. PRESET—Motor speed

1) If the unit is not already in "Push-Push Continuous" mode, put it in that mode by moving the "mode select" jumper on the Timing board to position P-P.

2) Connect a frequency counter to pin 1 of U342 (Figure 4-18).

3) Press—the RECORD switch to put the unit in recording mode.

4) ADJUST—R61 (Figure 4-8), with PAPER SPEED set to 50 mm/sec, for a frequency reading of 164 Hz ±2 Hz.

5) ADJUST—R134 (Figure 4-18), with PAPER SPEED set to 10 mm/sec, for a frequency reading of 32 Hz ±2 Hz.

6) REPEAT—Steps 4 and 5 until both frequency readings are right, since the setting of R61 and R134 interact.

7) Switch the PAPER SPEED to 25 mm/sec. The frequency reading should be 80 Hz ±2 Hz.

b. CHECK—Operation of Heater control.

WARNING

The following procedure requires access to dangerous line voltage.

1) Remove the fish paper obscuring the rear of the control board. Connect oscilloscope probe to pin 5 of J32 (Figure 4-18).

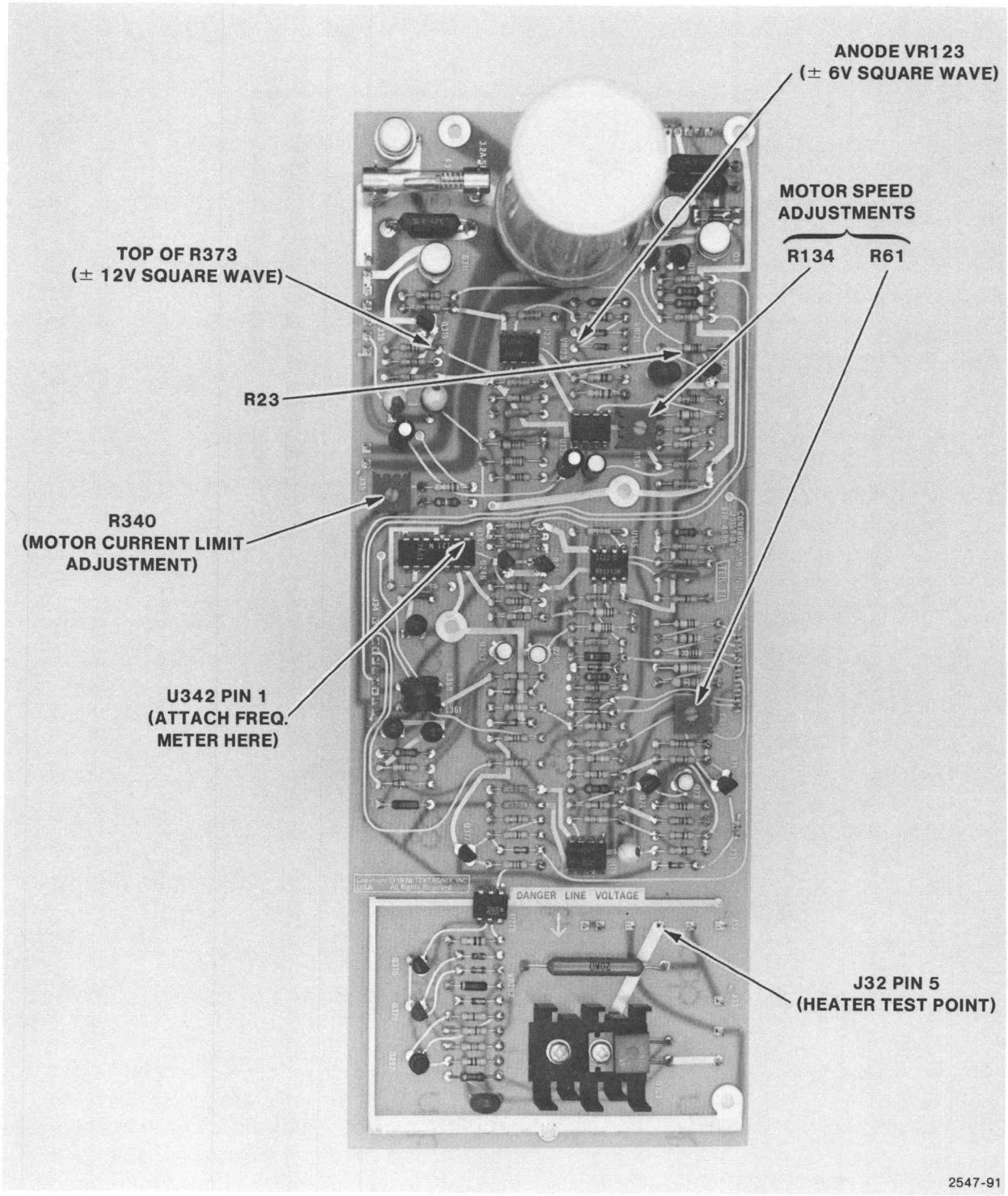


Figure 4-18. Control Board Test Points and Adjustments.

2) CHECK—for a pulsed heater control waveform as shown in Figure 4-19.

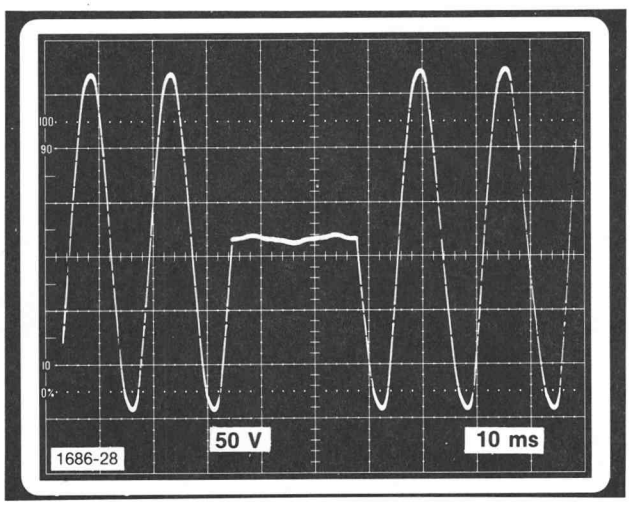


Figure 4-19. Heater Control Waveform.

3) Remove P31 from J31 on the control board. Note that the AC waveform on the oscilloscope no longer pulses.

4) Replace P31 and replace the fish paper.

c. CHECK—motor circuit operation.

1) CHECK—the anode of VR123 (Figure 4-18), with the oscilloscope for a ±6 volt squarewave.

2) CHECK—the top end of R323, with the oscilloscope, for a ±12 volt squarewave.

d. ADJUST—motor current-limiting circuit.

1) Turn the power off, and disconnect the motor terminals from the Control board. (To access the lower motor terminal, remove the motor access plate (Figure 4-20). Do not confuse the motor terminals with the tachometer terminals: the motor terminals are at the left end of the motor (forward end), the tachometer terminals are at the right end (rear end). Connect a 10 ohm 100 watt resistor in series with an ammeter in place of the motor (Figure 4-21).

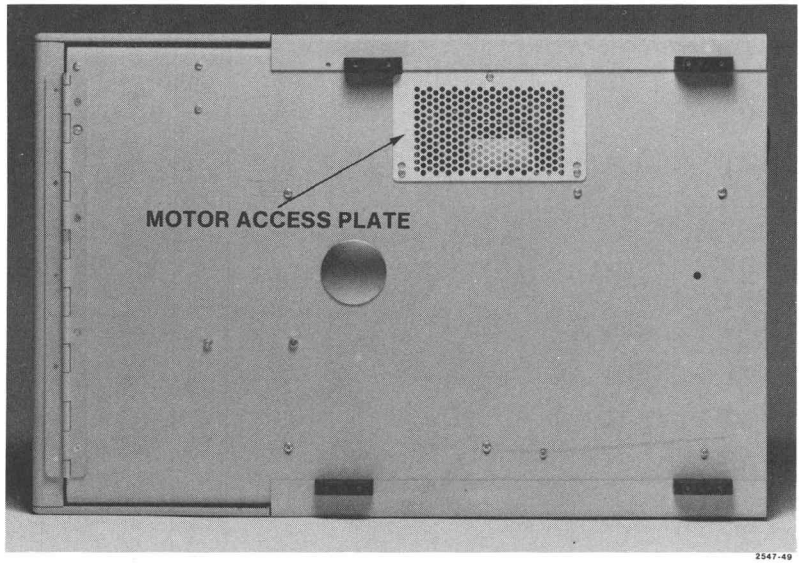


Figure 4-20. Motor Access Plate.

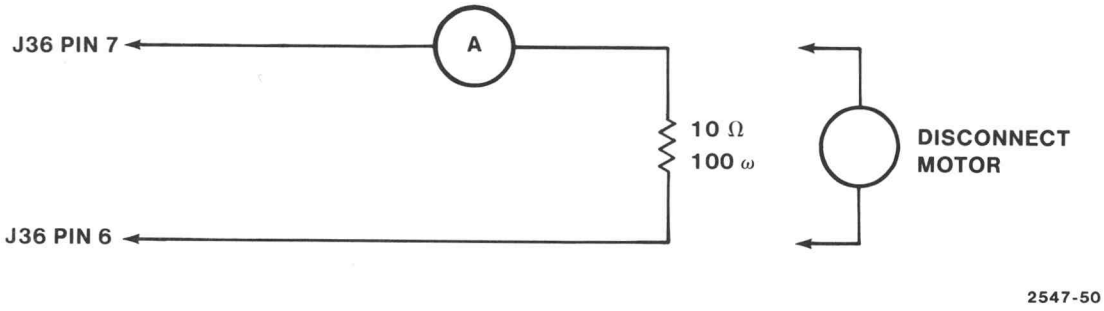


Figure 4-21. Motor Current-Limit Test Circuit.

2) ADJUST—R340 (Figure 4-18) fully clockwise.

3) ADJUST—the line voltage to low line (104 Vac).

4) Turn the power back on. The ammeter should read less than 3.0 amps. Attach the oscilloscope probe to the bottom of resistor R23 (3.07K). The voltage should be about 7.5 volts.

5) ADJUST—the line voltage upward slowly till the reading on the ammeter is 3.0 amps.

6) ADJUST—R340, slowly counterclockwise, until the voltage on R23 drops to near zero. This adjustment is sensitive, so care must be taken to do the adjustment slowly.

e. CHECK—motor current-limiting circuit.

1) Turn power off, wait at least 10 seconds, and then turn it back on.

2) The voltage at resistor R23 should read 0 ±0.5 V after about 3 to 6 seconds. Readjust if necessary.

3) Turn the power off, remove the 10 ohm, 100 watt resistor, and the ammeter from the motor circuit. Replace the motor access plate. Turn the power back on.

f. CHECK—for proper operation of clutches.

1) Press RECORD to start record cycle.

2) CHECK—that the drive roller clutch activates, so that the drive roller turns.

3) Press RECORD to stop the record cycle.

4) CHECK—that after several revolutions of the drive roller, the drive roller clutch disengages. The cutter clutch then engages, allowing the cutter actuator drive shaft to rotate once.

4. Timing Board

a. CHECK—the operation of the "length select" jumper.

1) Turn the power off, and place the "mode select" and "length select" jumpers at their "P" and "190" positions (Figure 3-2). Turn the power back on.

2) Press the RECORD switch.

3) CHECK—that the drive roller turns five revolutions during the record cycle.

4) Turn the power off, and change the "length select" jumper to its "270" position. Turn the power back on.

5) Press the RECORD switch.

6) CHECK—that the drive roller turns seven revolutions during the record cycle.

b. CHECK—the operation of the "mode select" jumper.

1) Turn the power off, and change the "mode select" jumper to its "P-P" position. Turn the power back on.

2) Press the RECORD switch twice.

3) CHECK—that the record cycle starts (drive roller turns), and that seven revolutions of the drive roller occur before the record cycle ends (drive roller stops and cutter actuator moves).

4) Press the RECORD switch once.

5) CHECK—that the record cycle starts, and continues past seven revolutions of the drive roller.

6) After the drive roller has revolved at least seven times, press the RECORD switch once again.

7) CHECK—that the record cycle ends promptly.

8) Turn the power off, and move the "mode select" jumper to its "P-R" position. Turn the power back on.

9) Press the RECORD switch and release it.

10) CHECK—that the record cycle starts, and continues for just seven revolutions of the drive roller.

11) Press the RECORD switch and HOLD IT DOWN.

12) CHECK—that the record cycle does not terminate.

13) CHECK—that when the RECORD switch is released, the record cycle stops promptly.

14) Turn the power off, and return the "mode select" jumper to the "P-P" position. Turn the power back on.

c. CHECK—the function of the REMOTE START/STOP connector by shorting its center pin to the chassis and verifying that this has the same effect as pressing the RECORD switch.

d. CHECK—RUN/PAUSE and 2XSPEED operation.

1) Connect remote switches to RUN/PAUSE and 2XSPEED jacks. Make sure the Recorder is running with the motor at idle speed and the BUSY light is off.

2) CHECK—that when the RUN/PAUSE switch is closed, that the Recorder goes into a recording cycle at selected speed.

3) CHECK—that when the RUN/PAUSE switch is released, the motor drops into idle after a delay which allows exposed copy to be properly heat developed: approximately 9 seconds at 50 mm/sec, 17 seconds at 25 mm/sec, and 40 seconds at 10 mm/sec.

4) CHECK—that when the 2XSPEED switch is closed, the Recorder goes into a recording cycle at twice the selected speed.

5) CHECK—that when the 2XSPEED switch is released, that the motor drops into idle after an appropriate delay (see 3 above).

6) Press the RECORD switch to terminate the record cycle.

5. Video and Sweep Assembly

a. Remove the shield and connector P280 from the High Voltage assembly. The high voltage is disabled for this part of the procedure.

b. Turn power off and move the Timing board from connector J3 on the Main board to connector J2. This will give better access to the Video and Sweep board. Turn power back on.

c. Center Brightness potentiometer R1017.

d. ADJUST—HORZ CMR (horizontal common mode rejection) potentiometer R63.

1) Connect oscilloscope to test point 65 (Figure 4-22), short together the shield and center conductor of the X INPUT connector. Connect them to the output of the signal generator, and set the signal generator to apply a 60 Hz signal of about 2 V p-p between the two terminals of the X INPUT connector and ground.

2) ADJUST—R63 to null out the common mode signal being applied by the signal generator.

3) CHECK—CMR. The amplitude of the signal at TP65 should be no greater than 1/100 of that on the X INPUT connector (40 db).

4) Disconnect the signal generator and remove the short from across the terminals of the X INPUT connector.

e. ADJUST—HORZ AMP (horizontal amplitude) and HORZ POS (horizontal position) potentiometers R60 and R70.

1) Connect the ramp signal from the function generator specified in "Test Equipment Required" list (item no. 10) to the X INPUT connector. Set the ramp generator to the following specifications and as shown in Figure 4-23.

a) Repetition rate: 1500 Hz

b) Amplitude: 1 volt (−0.5 V to +0.5 V)

c) Ramp time: 200 μsec (slew rate: 1 V/200 μsec)

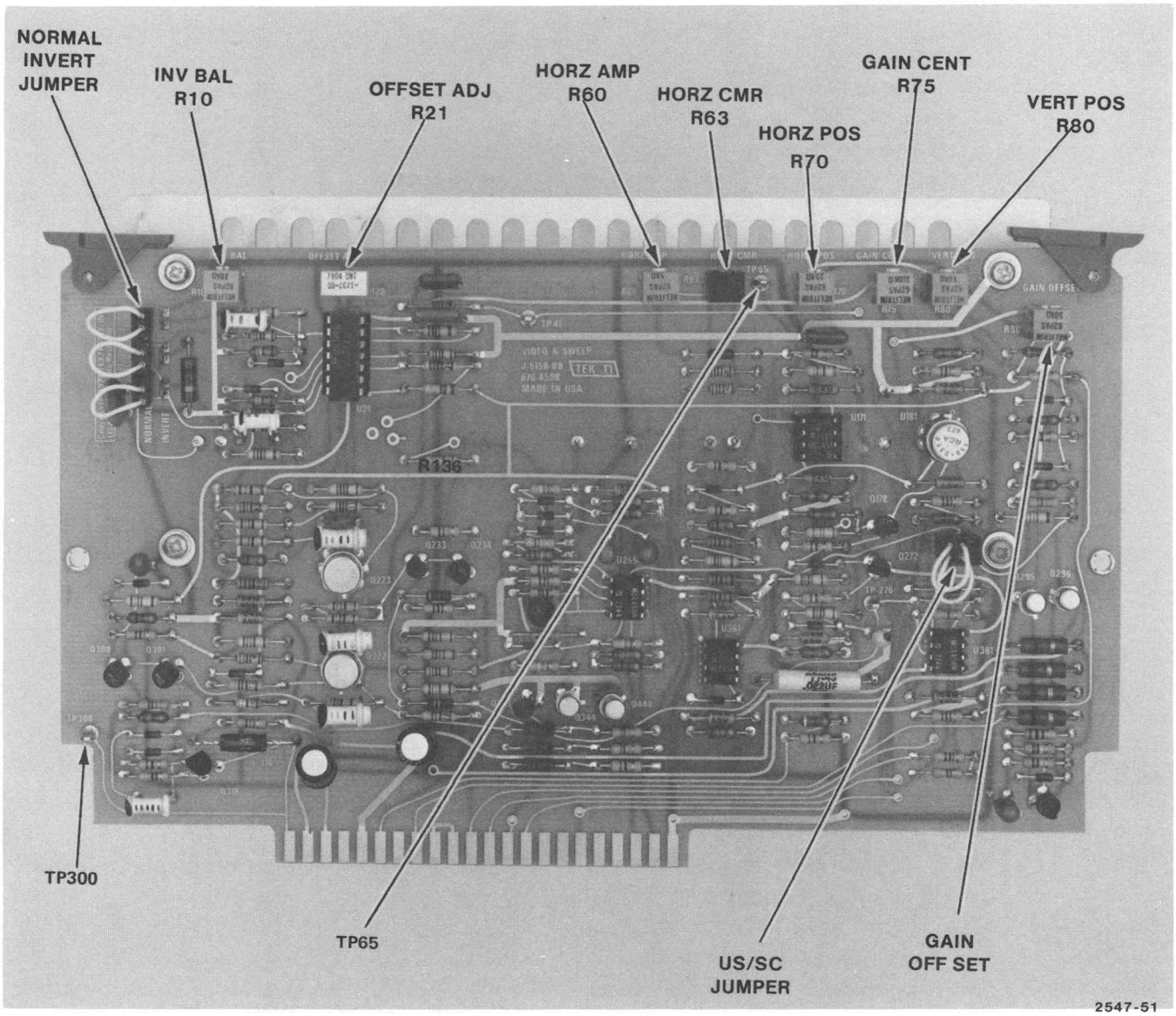


Figure 4-22. Video and Sweep Board Adjustments.

A suggested method of producing the X INPUT ramp is to use the equipment listed in no. 11 of "Test Equipment Required". A FG 501 is connected to a PG 501 (Figure 4-24). Connect the + output of PG 501 to the GATE IN of the FG 501. Set the two generators using an oscilloscope prior to connection to the instrument by first setting the PG 501 for a positive period of 200 μsec and a frequency of 1500 Hz and an amplitude of 3 volts. Set the FG 501 to 2500 Hz and the phase control to a lead of 90 degrees. Minor adjustments may be necessary to synchronize the FG 501 to the PG 501.

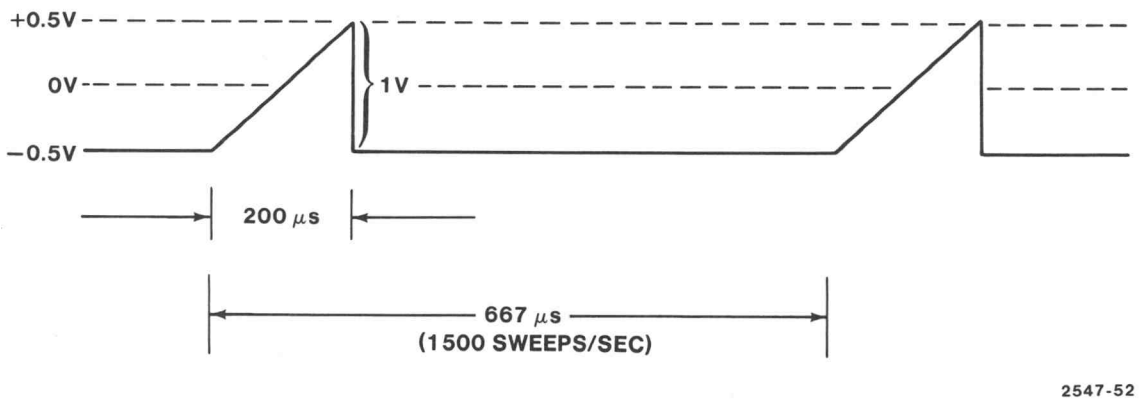


Figure 4-23. X INPUT Waveform Required From Sweep Generator and at TP 65.

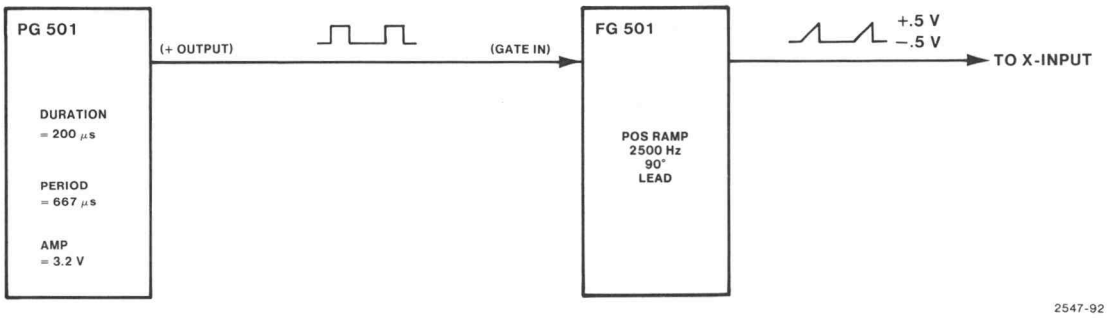


Figure 4-24. X INPUT Waveform Generation.

2) ADJUST—R60 to obtain a 1.0 volt p-p ramp at TP65.

3) ADJUST—R70 to center the ramp around zero volts dc. The resulting waveform should be identical to the generator waveform in Figure 4-23.

f. ADJUST—OFFSET ADJ and GAIN OFFSET; R20 and R90

1) CHECK—that the NORMAL-INVERT jumper is in the NORMAL position and that the U.S.-S.C. (ultrasound-slowscan continuous) is in the U.S. position (Figure 4-22).

2) Connect the precision DC meter to TP300, set the control panel SPEED switch for 10 mm/sec, and set the CONTRAST potentiometer fully counterclockwise.

3) Press the RECORD switch to start a record cycle.

4) ADJUST—R20 for zero volts at TP300.

5) Apply a +1.00 volt dc signal to the Z INPUT.

6) ADJUST—R90 for zero volts at TP300.

7) Remove the 1.00 volt dc signal from the Z INPUT.

8) READJUST—R20 for a zero volt level.

9) Repeat Steps 4 through 8 until TP300 is zero volts whether the Z INPUT signal is zero volts or +1.00 volt.

g. ADJUST—GAIN CENT (gain centering) potentiometer R75.

1) Apply +1.00 volt to the Z INPUT and set the control panel SPEED to 50 mm/sec.

2) ADJUST—CONTRAST for 500 mV ±10 mV at TP300.

3) Switch SPEED to 10 mm/sec.

4) ADJUST—R75 to put the level at 225 mV ±10 mV.

5) Repeat steps 2 through 4 until the voltage at TP300 is 500 mV when SPEED is at 50 mm/sec and 225 mV when SPEED is at 10 mm/sec without adjusting CONTRAST or R75.

h. The GAIN CENT potentiometer interacts with the OFFSET ADJ potentiometer.

1) Remove the +1.00 volt dc signal at the Z INPUT connector and set the SPEED to 10 mm/sec.

2) READJUST—R20 to return the voltage at TP300 to zero volts dc.

i. Repeat Steps g and h until the voltages at TP300 are all within 10 mV or less.

j. CHECK—for the following voltages at TP 300.

330 ±30 mV	at 25 mm/sec with 1 volt at the Z INPUT
800 ±50 mV	at 100 mm/sec with 1 volt at the Z INPUT

k. CHECK—AGC performance for a slew rate of 1 V/100 μsec.

1) Readjust the ramp generator to provide a 100 μsec 1 volt ramp (Figure 4-25). (Change the positive period of the PG 501 from 200 μsec to 100 μsec and readjust the FG 501 for an amplitude of 1 volt.)

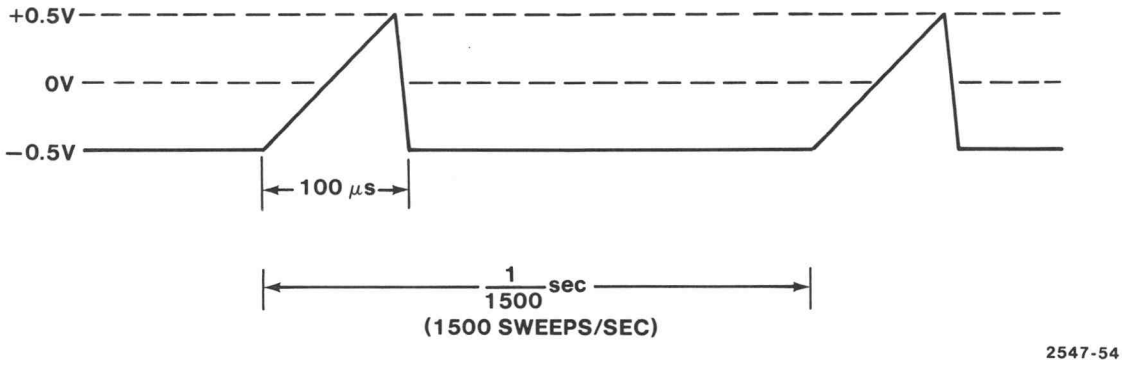


Figure 4-25. X INPUT Waveform at 1V/100 μs Slew Rate.

2) Set SPEED to 50 mm/sec. Apply +1.00 V to the Z INPUT.

3) CHECK—for the following voltages at TP300.

310 ±45 mV	at 10 mm/sec
450 ±45 mV	at 25 mm/sec
675 ±68 mV	at 50 mm/sec
1075 ±150 mV	at 100 mm/sec

4) Return the X INPUT to 1 V/200 μsec sweep by resetting the controls on the ramp generator.

l. CHECK and ADJUST INVERT operation.

1) Move the NORMAL-INVERT jumper to the INVERT position (Figure 4-22). Keep the 1 volt dc signal at the Z INPUT connector, but turn the CONTRAST fully clockwise and set the SPEED to 10 mm/sec.

2) ADJUST—INV BAL R10 (invert balance) to give a voltage at TP300 of zero volts.

3) Remove the 1 volt from the Z INPUT connector and switch SPEED to 50 mm/sec.

4) Set the CONTRAST for 500 mV at TP300.

5) CHECK—at TP300, with SPEED settings of 25 mm/sec and 10 mm/sec, for voltages of 350 mV and 225 mV, respectively.

6) Return the NORMAL-INVERT jumper to NORMAL and the SPEED to 50 mm/sec.

m. CHECK—the operation of the Blanking circuits.

1) CHECK—while slowly decreasing the ramp amplitude at the X INPUT connector to about 0.5 volts, the voltage at TP300 drops to about −0.9 volts.

2) Return the X INPUT ramp to its normal amplitude (−0.5 V to +0.5 V).

n. Reconnect P28 to the High Voltage assembly.

6. High Voltage Power Supplies

a. Turn the instrument off. Short TP300 to ground, turn the CONTRAST fully counterclockwise, replace P280 onto J280 on the High Voltage Oscillator Board, and turn the instrument on.

b. CHECK—the +180 volt input to the High Voltage Oscillator Board, (pin 2 of P280), using the dc voltmeter, for a voltage between 162 volts to 198 volts.

c. ADJUST—the −5.5 kV supply and CHECK the +5.5 kV supply (Figure 4-26).

1) Connect the high voltage probe to the −5.5 kV test point (lower end of C205).

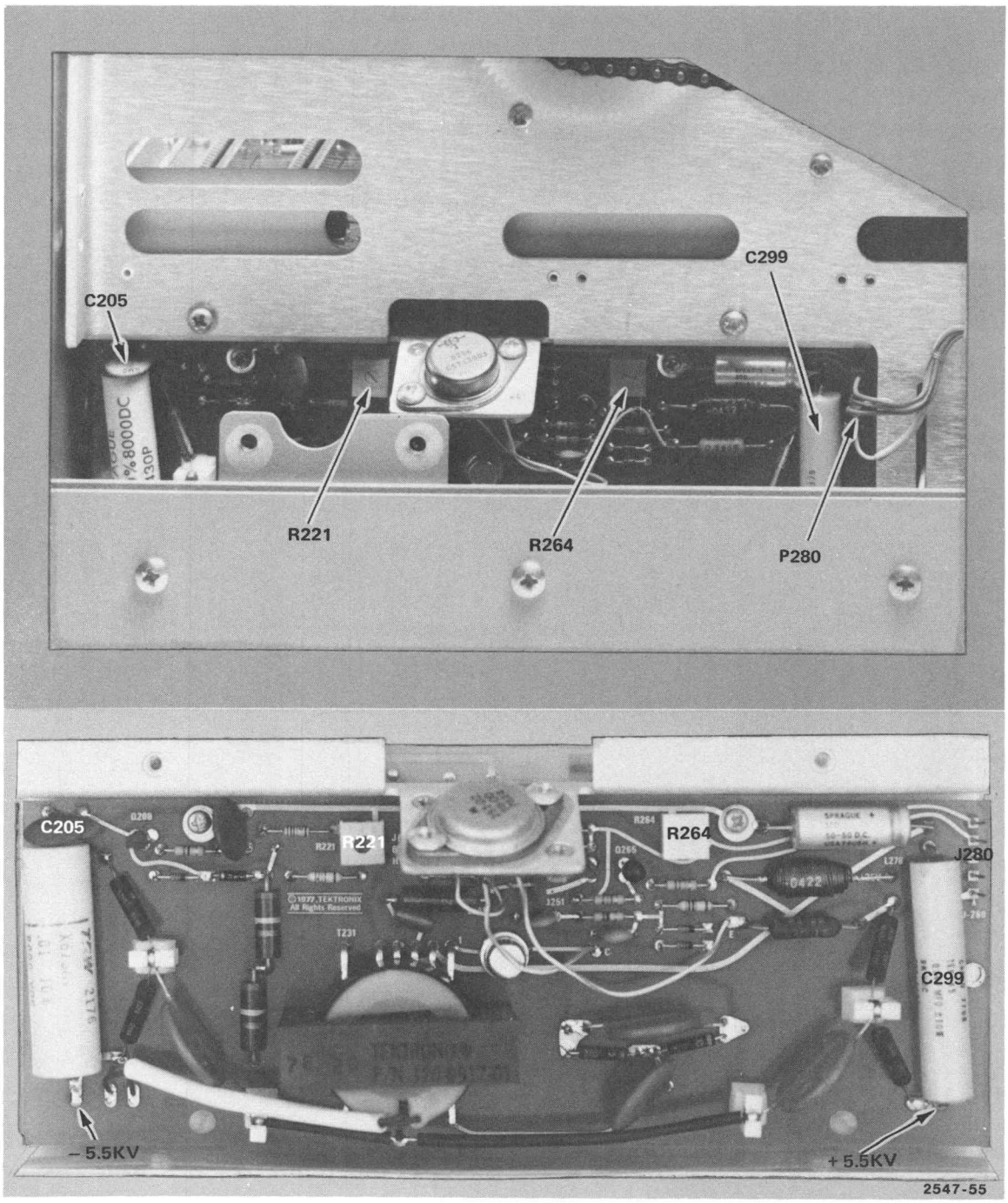


Figure 4-26. High Voltage Test Point and Intensity Locations.

CAUTION

Make the following adjustment slowly to prevent possible CRT damage.

2) ADJUST—R264 for a voltmeter reading of −5500 volts.

3) Connect the high voltage probe to the +5.5 kV test point (lower end of C299).

4) CHECK—that the voltmeter reads between +5225 volts and +5775 volts.

7. CRT Trace

a. ADJUST—the intensity of the CRT trace.

1) Turn power off. If the Timing board is in connector J2, move it back to connector J3. Connect the dc voltmeter to the front end of R82 on the Main board (Figure 4-27).

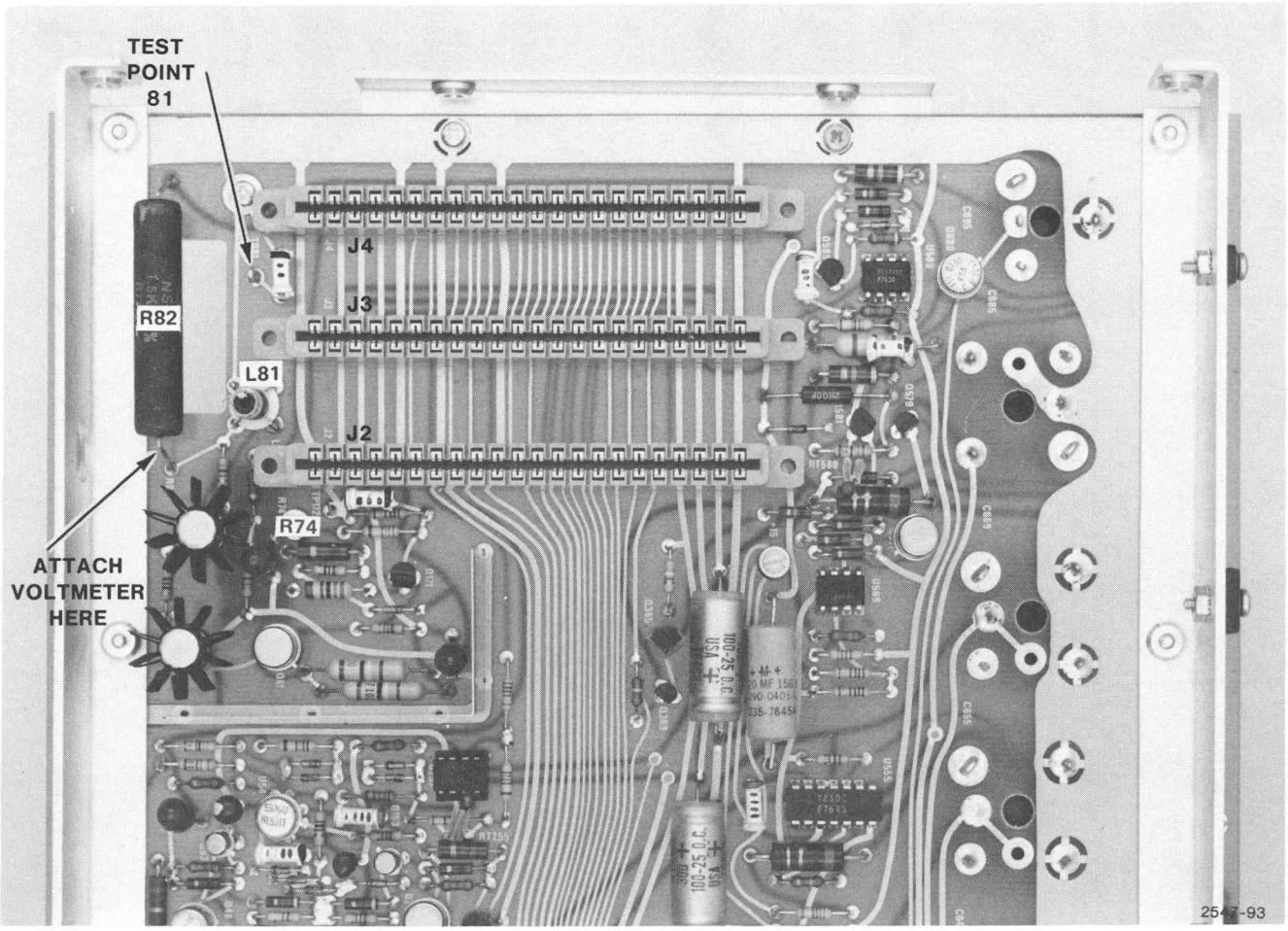


Figure 4-27. Test Point 81, R82, R74 and L81.

2) Turn the power back on and push RECORD.

3) ADJUST—R74, on the Main board (Figure 4-27), for a +20 volt dc reading at the front end of R82.

4) Connect a blanking signal which is synchronous with the X INPUT ramp which has the following characteristics:

   a) 3 volt amplitude between 0 and 3 volts.

   b) Zero volt level during X INPUT ramp and 3 volts the rest of the time (Figure 4-28).

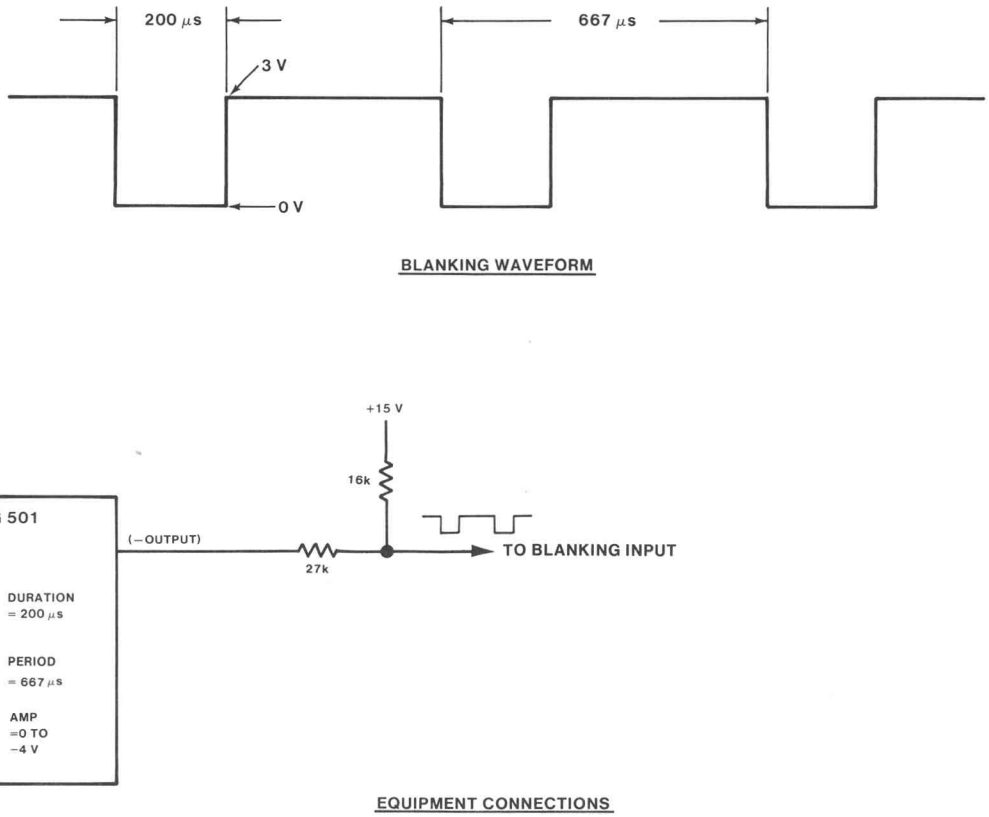


Figure 4-28. Blanking Waveform Generation.

A suggested method of producing the Blanking signal is to use the test equipment listed in no. 10 of "Test Equipment Required". When the positive output of a PG 501 is used to gate the X INPUT ramp, the Blanking signal can be produced by using a voltage divider and the negative output of the PG 501 (Figures 4-24 and 4-26).

Connect a 16 kΩ and a 27 kΩ resistor in series. Connect the 16 kΩ resistor to a +15 V source. (This can be obtained from the Video and Sweep board at pin 8 of U171 or a separate +15 V power supply.) Connect the 27 kΩ resistor to negative output of the PG 501. Set the output level to −4.0 volts. The Blanking signal is available at the junction of the two resistors and is connected to the BLANKING INPUT of the Recorder.

5) ADJUST—R221, on the High Voltage Oscillator board (Figure 4-26), so that a faint trace is visible on the face of the crt.

6) Replace the shield onto the High Voltage assembly.

b. ADJUST—the length of CRT Trace.

1) Remove the ground from TP300, and apply a 1 volt dc signal to the Z INPUT connector.

2) Turn CONTRAST up about one third.

3) ADJUST—HORZ AMP (horizontal amplitude) R60 on the Video and Sweep board (Figure 4-22) for a trace length of 18 cm. It may be necessary to adjust HORZ POS (horizontal position) R70 to show all of the trace on the crt face.

c. ADJUST—the position of the Trace.

1) ADJUST—HORZ POS (horizontal position) R70 on the Video and Sweep board to center the trace horizontally.

2) ADJUST—VERT POS (vertical position) R80 to center the trace vertically.

3) CHECK—that the trace is horizontal. If not, see the "Yoke Adjustment" in the "Mechanical Adjustments" section of the manual.

d. CHECK—the Horizontal current-limiting feature.

1) Connect the oscilloscope to TP29 on the Main board. This test point is accessible through an opening on the left side of the chassis (Figure 4-29).

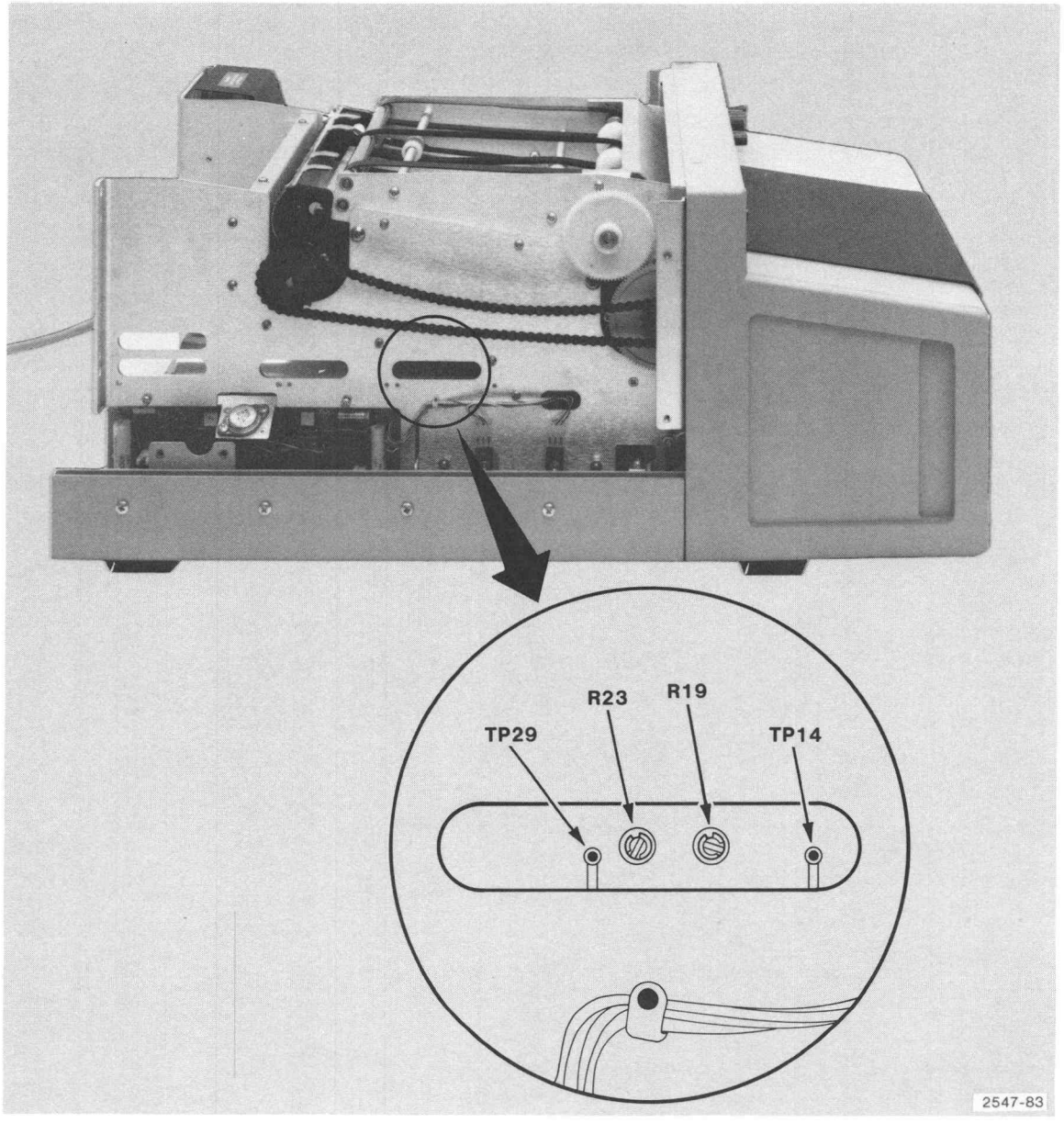


Figure 4-29. Test Points and Controls for Dynamic Focus Adjustment.

2) Increase the Ramp amplitude driving the X INPUT connector so its amplitude is about 2 volts.

3) CHECK—while adjusting the base line of the X INPUT ramp between −2 volts and +1 volt, that the waveform at TP29 is limited to about ±0.7 volts.

e. Preset the DYNAMIC FOCUS.

1) Connect the oscilloscope to TP14. Set the X INPUT ramp to 1 volt amplitude (−.5 volts to +0.5 volts) and the slew rate to 1 V/100 μsec (Figure 4-25).

2) ADJUST—R23 (Figure 4-29) to obtain the smooth parabolic shape shown in Figure 4-30.

3) ADJUST—R19 to set the amplitude of the waveform at TP14 to about 200 volts.

4) Repeat steps 2 and 3 until the waveform shown in Figure 4-30 is obtained.

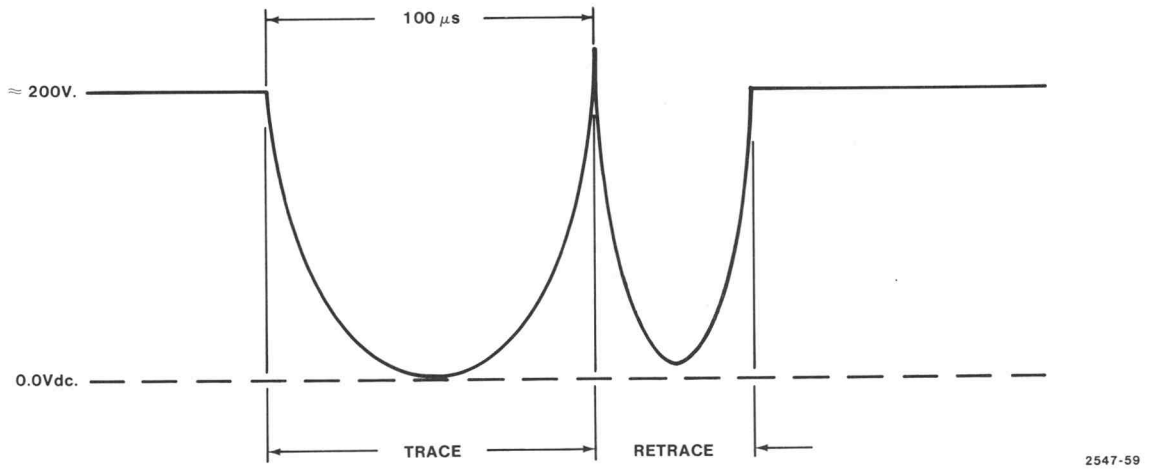


Figure 4-30. Dynamic Focus Waveform at TP 14.

f. ADJUST—FOCUS and DYNAMIC FOCUS.

1) Replace the 1 volt dc signal on the Z INPUT connector with the 2 MHz 30% duty cycle 1 volt amplitude squarewave.

A suggested method for producing this signal is to use test equipment listed in no. 11 of "Test Equipment Required". Connect the GATE IN of the FG 501 to the + output of the PG 501 which is being used to produce X INPUT ramp (Figure 4-31). Set the frequency of the FG 501 to 2 MHz and connect its output to the TRIGGER/DURATION IN of the second PG 501. The amplitude of the FG 501 output should be sufficient to trigger the PG 501 (>+1 volt). Set the + output of the PG 501 to a 1 volt amplitude, 30% duty cycle signal, and connect this output to the Z INPUT of the Recorder.

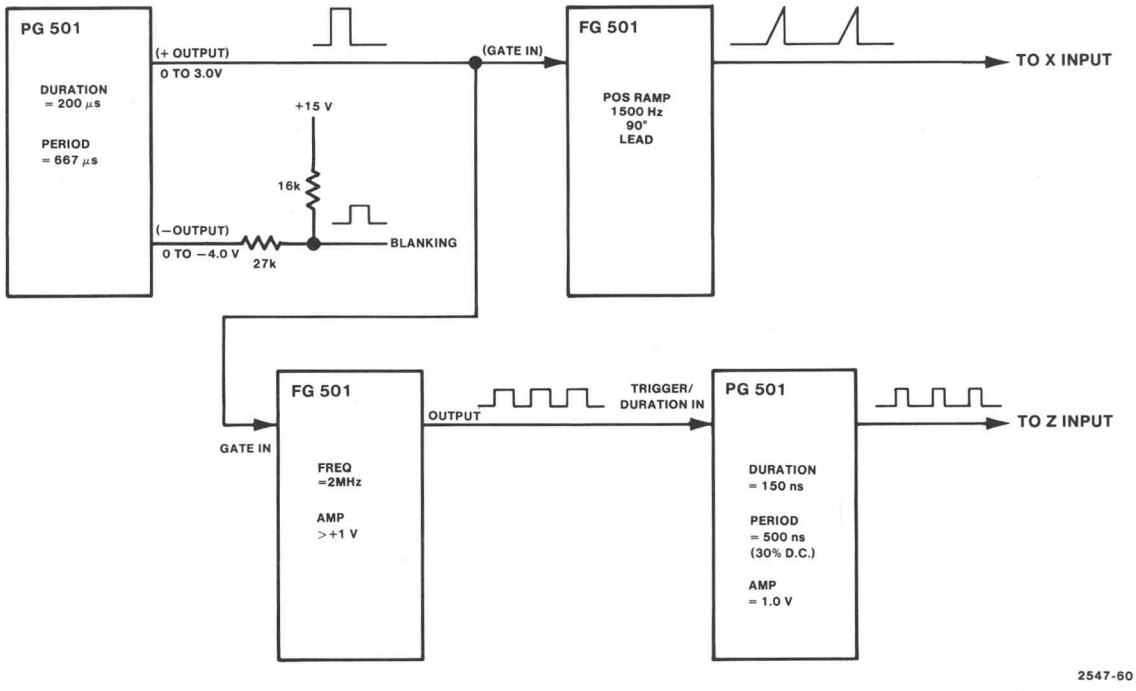


Figure 4-31. Test Signals.

2) ADJUST—the main FOCUS control on the rear panel (Figure 4-32) for the best focus of the trace at the center of the crt.

3) ADJUST—R19 (Figure 4-29), the dynamic focus amplitude potentiometer for the best focus at the sides of the crt trace.

4) READJUST—the main FOCUS control for the best center focus.

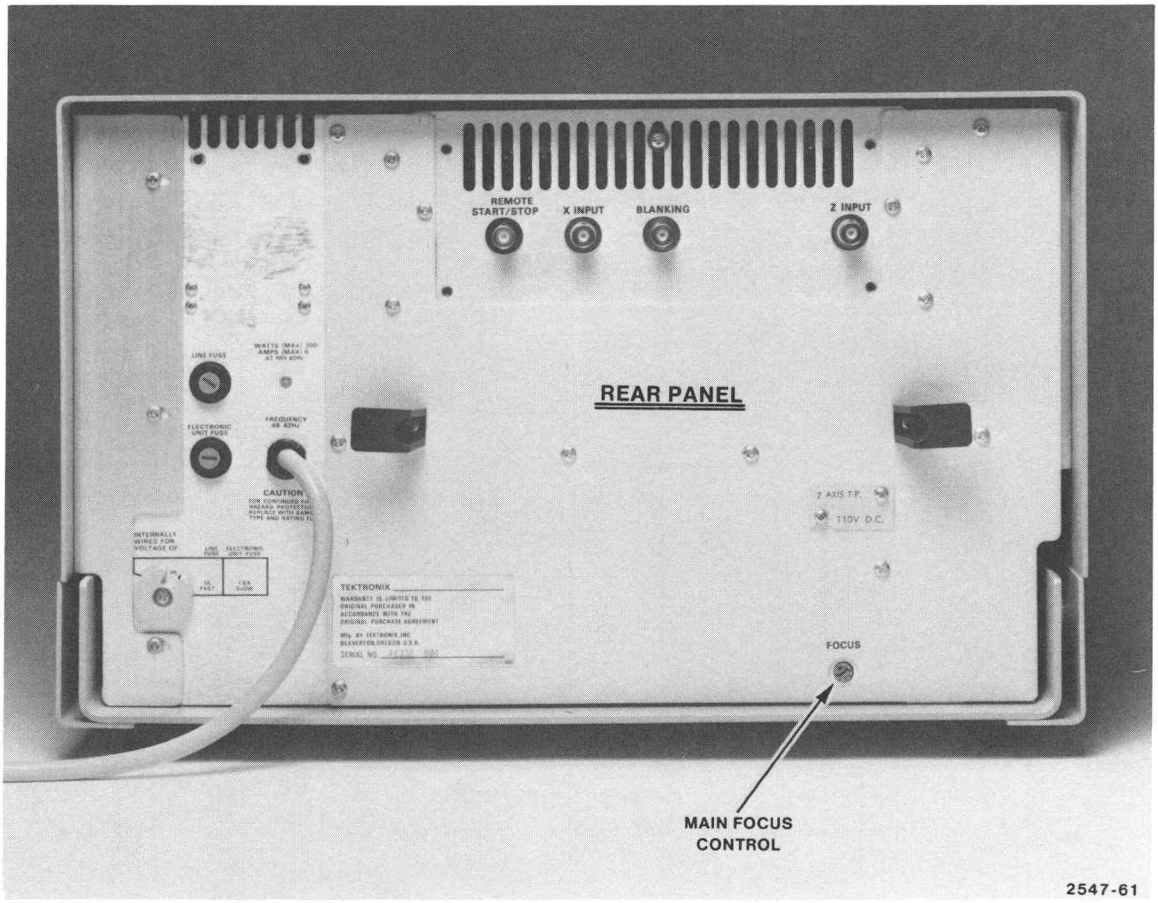


Figure 4-32. Main Focus Control.

5) Repeat steps 3 and 4 until the focus is as good as possible.

g. ADJUST—L81 on the Main board for best frequency response.

1) Turn the power off and remove the Timing board. Attach the oscilloscope to TP81 on the Main board (Figure 4-27). Replace the Timing board in J2.

2) Turn the power back on, and press RECORD switch to begin a record cycle. The waveform at TP81 should be a squarewave (assuming that the Z INPUT is still a 2 MHz squarewave).

3) ADJUST—the tuning slug in coil L81 (Figure 4-27) for a square edged waveform at TP81.

8. Paper Checks

a. Load the paper as described in the General Description and Operation section and press RECORD switch. A copy will be made and ejected through the opening in the front panel.

b. ADJUST—the processor developing temperature (DEV TEMP), as described in "Processor Temperature Adjustment". Use the 2 MHz squarewave (1 volt amplitude, 0 volt to +1 volt) at the Z INPUT connector, and make sure the X INPUT ramp has a 1 volt amplitude (−0.5 volts to +0.5 volts), a duration of 100 μsec, and a repetition rate of 1500 ramps/sec.

c. ADJUST—the horizontal position and width of the image.

1) ADJUST—HORZ POS R70 on the Video and Sweep board to center the trace on the paper.

2) It should not be necessary to adjust the trace width, as this has already been set at 18 cm. However, HORZ AMP R60 can be used to make any desired fine adjustments on the trace width.

d. ADJUST—BRIGHTNESS potentiometer R1017.

1) Set SPEED to 10 mm/sec, remove the Z INPUT signal.

2) ADJUST—R1017 on front panel until the recording shows a very faint gray background. Back off R1017 until the background gray just disappears (goes white to match the unexposed paper).

9. Motor Speed Adjustment

a. Remove paper.

b. Disconnect the Z INPUT signal and replace it with (or, if coming directly to this step from Step 3,) connect the Time Mark generator (TG 501) set to 1 second marker time. Connect the digital counter (DC 503) to pin 1 of U342 on the Control board, set SPEED to 50 mm/sec, and press RECORD.

c. ADJUST—R61 for a period reading of 6.25 ms.

d. Press RECORD to terminate record cycle. Reload paper and make a record of at least 700 mm (27.5 in.) in length.

e. MEASURE—the combined length of any four marker divisions near the end of the record.

f. Find the measured paper length from Step "e" on Motor Speed Correction Chart (Table 4-2) and note the period reading for 50 mm/sec and 10 mm/sec.

g. READJUST—R61 for the period indicated for 50 mm/sec on the table. Switch SPEED to 10 mm/sec.

h. ADJUST—R134 for the period indicated on the table. Switch SPEED back to 50 mm/sec.

i. Repeat Steps g and h until both are set correctly.

j. CHECK—motor speed accuracy with the Time Mark Generator by running minimum 700 mm record lengths at speeds of 10, 25, 50, and 100 mm/sec and measuring respectively the combined length of 20, 8, 4, and 2 marker divisions. These measurements should all be 200 ±6 mm.

10. Final Step

a. Disconnect all test equipment and re-install any removed panels. Your Continuous Recorder is now re-calibrated and ready for use.

Table 4-2

MOTOR SPEED CORRECTION

Measured Length (mm) 4 Marker Divisions	Period (ms) Paper Speed 50mm/sec	Period (ms) Paper Speed 10mm/sec	Measured Length (mm) 4 Marker Divisions	Period (ms) Paper Speed 50mm/sec	Period (ms) Paper Speed 10mm/sec
180	5.625	28.125	196.5	6.14063	30.7031
180.5	5.64063	28.2031	197	6.15625	30.7813
181	5.65625	28.2813	197.5	6.17188	30.8594
181.5	5.67188	28.3594	198	6.1875	30.9375
182	5.6875	28.4375	198.5	6.20313	31.0156
182.5	5.70313	28.5156	199	6.21875	31.0938
183	5.71875	28.5938	199.5	6.23438	31.1719
183.5	5.73438	28.6719	200	6.25	31.25
184	5.75	28.75	200.5	6.26563	31.3281
184.5	5.76563	28.8281	201	6.28125	31.4063
185	5.78125	28.9063	201.5	6.29688	31.4844
185.5	5.79688	28.9844	202	6.3125	31.5625
186	5.8125	29.0625	202.5	6.32813	31.6406
186.5	5.82813	29.1406	203	6.34375	31.7188
187	5.84375	29.2188	203.5	6.35938	31.7969
187.5	5.85938	29.2969	204	6.375	31.875
188	5.875	29.375	204.5	6.39063	31.9531
188.5	5.89063	29.4531	205	6.40625	32.0313
189	5.90625	29.5313	205.5	6.42188	32.1094
189.5	5.92188	29.6094	206	6.4375	32.1875
190	5.9375	29.6875	206.5	6.45313	32.2656
190.5	5.95313	29.7656	207	6.46875	32.3438
191	5.96875	29.8438	207.5	6.48438	32.4219
191.5	5.98438	29.9219	208	6.5	32.5
192	6	30	208.5	6.51563	32.5781
192.5	6.01563	30.0781	209	6.53125	32.6563
193	6.03125	30.1563	209.5	6.54688	32.7344
193.5	6.04688	30.2344	210	6.5625	32.8125
194	6.0625	30.3125	210.5	6.57813	32.8906
194.5	6.07813	30.3906	211	6.59375	32.9688
195	6.09375	30.4688	211.5	6.60938	33.0469
195.5	6.10938	30.5469	212	6.625	33.125
196	6.125	30.625	212.5	6.64063	33.2031

(continued)

Table 4-2 (cont)
MOTOR SPEED CORRECTION

Measured Length (mm) 4 Marker Divisions	Period (ms) Paper Speed 50mm/sec	Period (ms) Paper Speed 10mm/sec	Measured Length (mm) 4 Marker Divisions	Period (ms) Paper Speed 50mm/sec	Period (ms) Paper Speed 10mm/sec
213	6.65625	33.2813	217	6.78125	33.9063
213.5	6.67188	33.3594	217.5	6.79688	33.9844
214	6.6875	33.4375	218	6.8125	34.0625
214.5	6.70313	33.5156	218.5	6.82813	34.1406
215	6.71875	33.5938	219	6.84375	34.2188
215.5	6.73438	33.6719	219.5	6.85938	34.2969
216	6.75	33.75	220	6.875	34.375
216.5	6.76563	33.8281			

Section 5

THEORY OF OPERATION

This section describes the mechanical and electrical operation of the Continuous Recorder.

MECHANICAL DESCRIPTION

Principle of Operation

Refer to Figure 5-1.

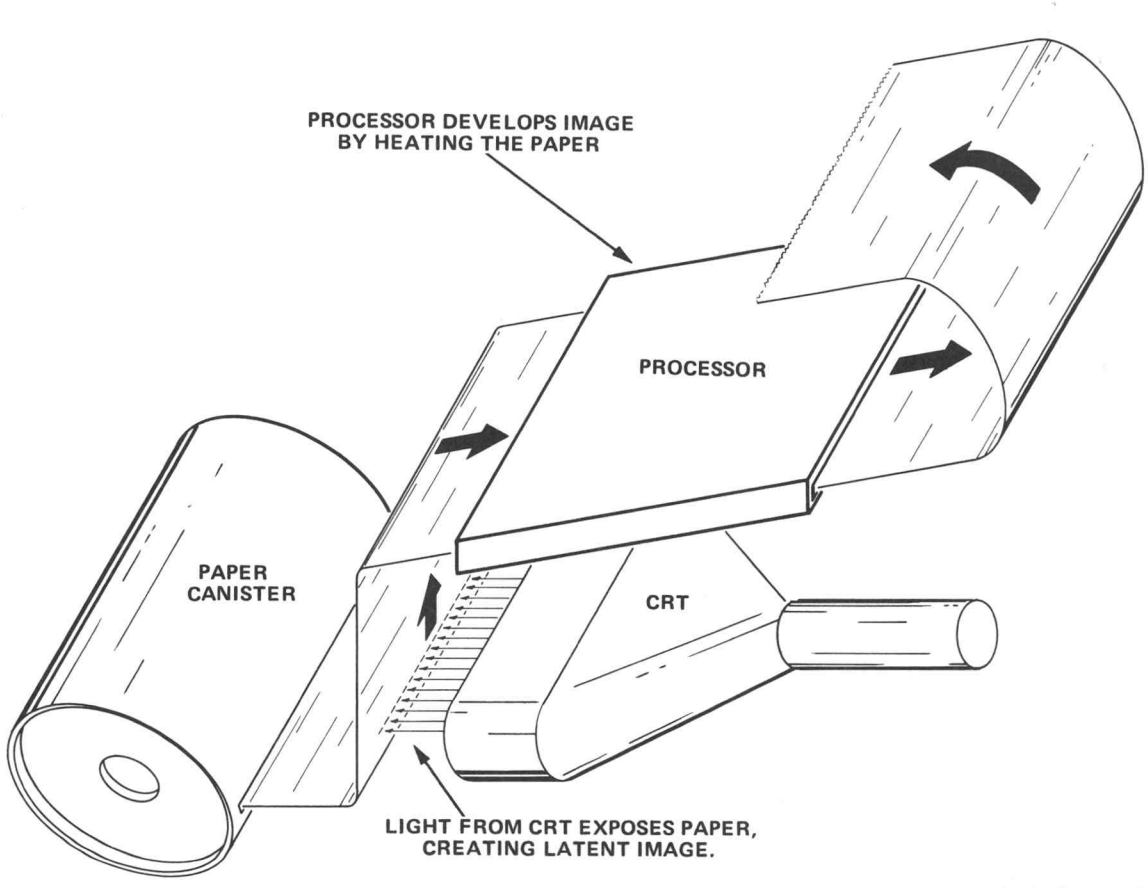


Figure 5-1. Principle of Operation.

When the Continuous'Recorder records an image, it pulls the paper out of a storage cannister and past the face of a cathode ray tube (crt). The electrical signals representing the image have been processed by the unit's electronic circuitry, with the result that successive "lines" (horizontal sections) of the image appear on the face of the crt. As the paper moves past the crt, successive sections of paper are exposed to successive lines of the image. This creates on the paper a latent image of the picture being recorded.

After passing the crt, the paper moves through a "processor", which develops the latent image by heating the paper. (The paper's photographic emulsion is of a type which is developed by heat rather than by a chemical bath.) As the paper leaves the processor, it emerges through a slot in the Continuous Recorder's front panel.

Paper Cutter

In traveling from the crt to the processor's entrance, the paper passes through a rotary knife assembly (Figure 5-2). At the end of a recording, this knife cuts off the length of paper on which the image has been recorded. The sequence of events is as follows:

1. The crt is turned off.

2. The paper continues to advance, carrying the last part of the recorded image past the paper cutter blades.

3. The Continuous Recorder stops pulling paper out of the cannister and pushing it into the paper cutter assembly (drive roller is disengaged).

4. When the paper has stopped, the cylindrical paper cutter blade rotates, cutting the paper.

5. The cut length of paper is pulled on through the processor, where the image is developed. As the paper leaves the processor, it emerges from an opening in the instrument's front panel.

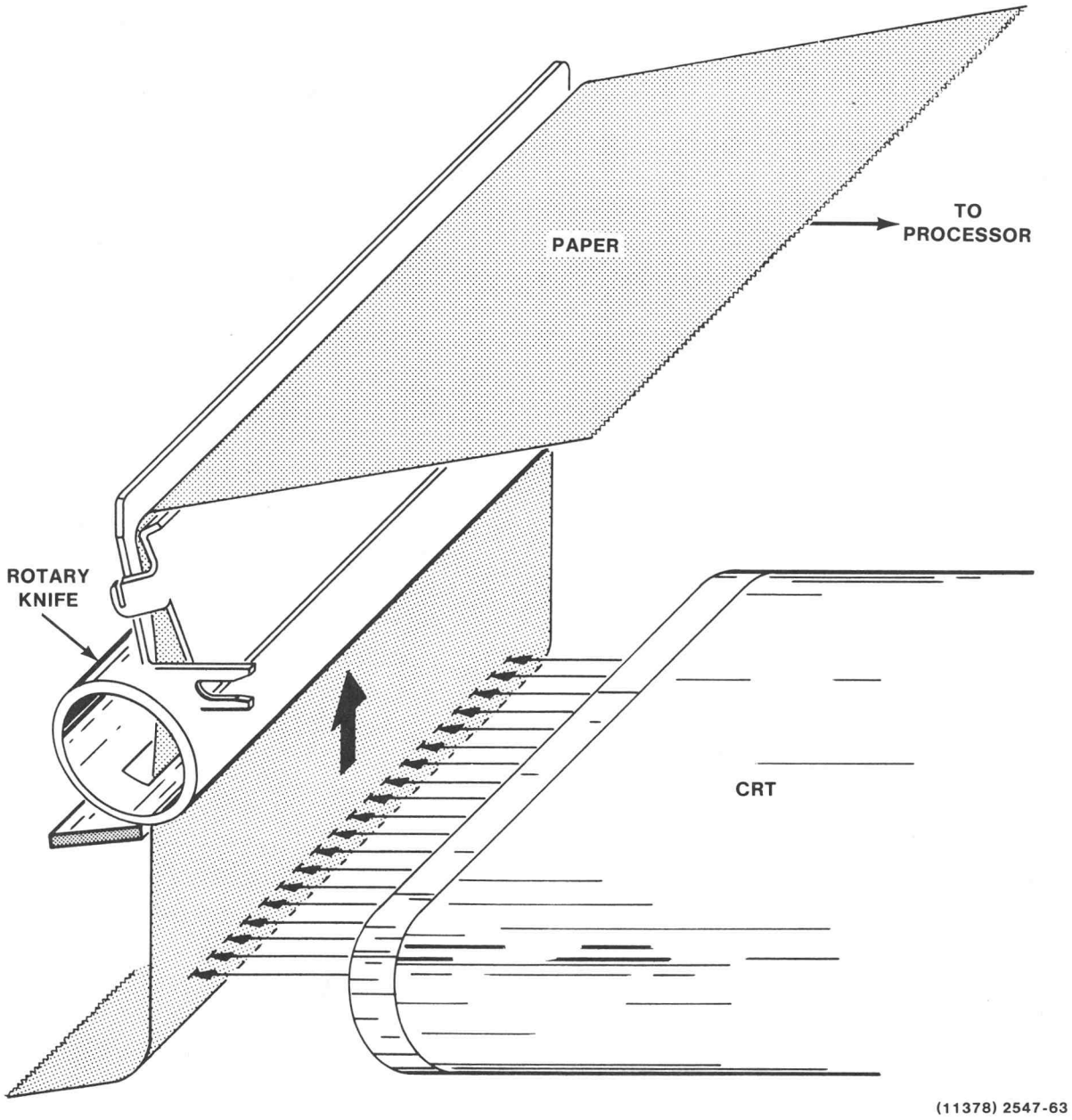


Figure 5-2. Rotary Knife Assembly.

Paper Transport

Refer to Figure 5-3. The paper is propelled and guided on its way through the instrument by a number of rollers, paper guides, and belts. These are located as follows:

1. Mounted on the cassette holder assembly is a metal idle roller, a foam pressure roller (to hold the paper against the crt face), a pinch roller (to press the paper against the drive roller), and the rotary paper cutter knife with its attached paper guides.

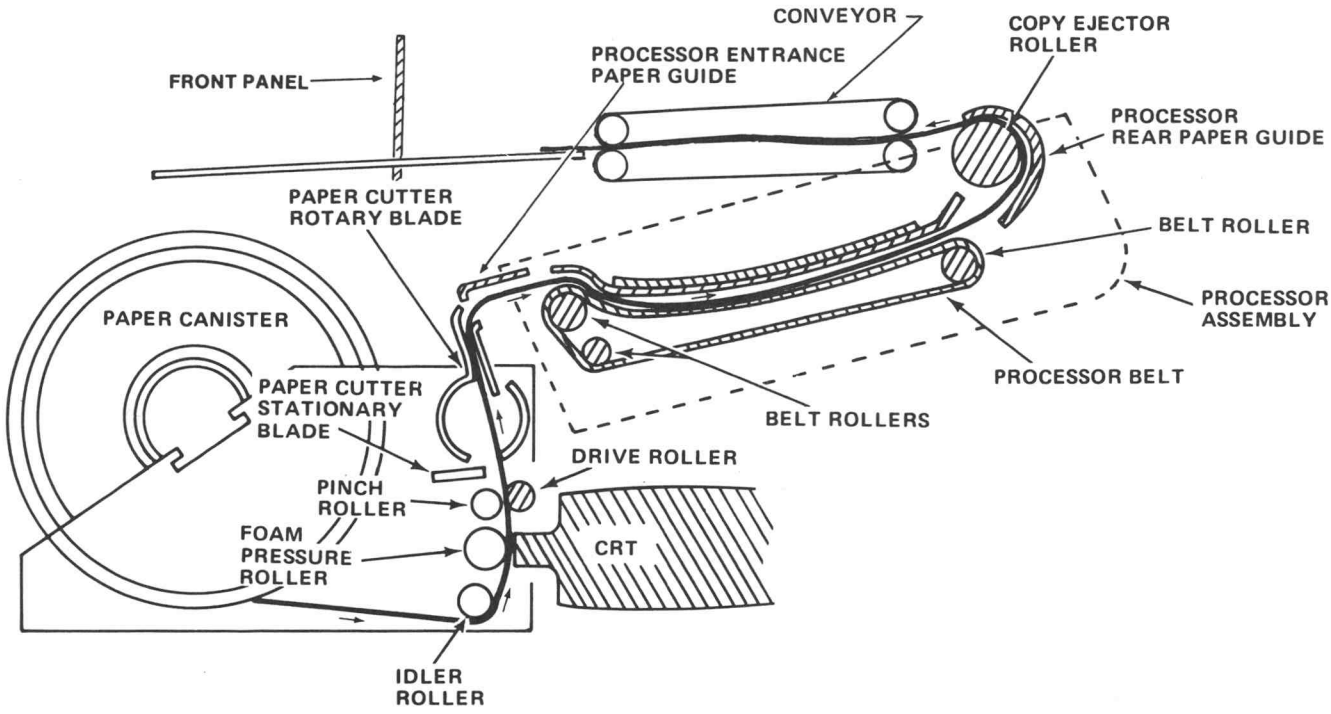


Figure 5-3. Paper Transport.

2. Mounted on the main frame near the crt is a drive roller. This roller pulls the paper out of the cannister and pushes it toward the rotary paper cutter assembly.[1]

3. Comprising part of the processor assembly over the processor entrance paper guide is a drive belt which holds the paper against the heater plate and propels it through the processor and the processor rear paper guide.

4. A belt-driven paper conveyor is mounted on top of the processor assembly. As the paper leaves the rear guide, it enters and passes through the conveyor, and emerges through an opening in the instrument's front panel.

Drive Mechanism

Figure 5-4 shows the Continuous Recorder's main drive mechanism. The motor's speed is reduced by a gearbox, which supplies power to a drive belt and a drive chain.

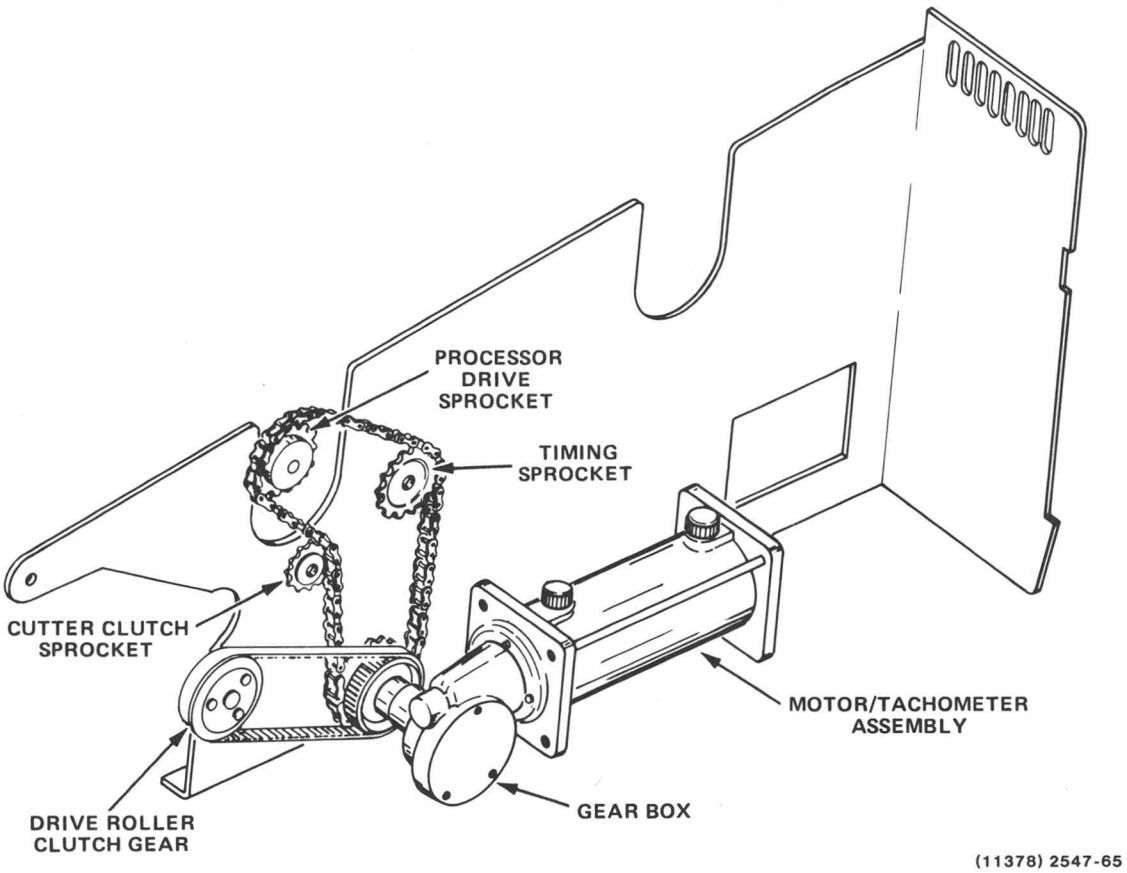


Figure 5-4. Drive Mechanism.

[1]**Not shown in Figure 5-3 is a small plastic paper guide which rides loosely on the drive roller shaft. Once a copy has been made and the paper has been cut, this guide holds the cut edge of the paper in position, so that it is ready to enter the slot at the bottom of the paper cutter rotary blade.**

The belt drives the drive roller clutch gear. When that clutch is engaged, this gear turns the drive roller (Figures 5-3 and 4-7), causing paper to be pulled from the cannister and pushed into the paper-cutter assembly.

The chain drives the cutter clutch sprocket, the processor drive sprocket, and the timing sprocket. The processor drive sprocket drives the processor's moving parts. Similarly, the cutter clutch sprocket, when the cutter clutch is engaged, drives the paper-cutter mechanism. The timing sprocket turns an "interrupter rotor" used to provide timing pulses to the Continuous Recorder's electronic circuitry.

Drive Roller Clutch

See Figure 5-5. When paper is to be pulled from the cannister, the Continuous Recorder's electronic circuitry sends current through the drive roller clutch solenoid. As the solenoid pulls in, it releases a tab on the plastic outer sleeve of the clutch, allowing that sleeve to be turned by the drive roller clutch gear. This engages the clutch, which turns the drive roller.

Cutter Actuating Mechanism

See Figure 5-6. When the cassette holder assembly which holds the paper cutter blades is slid into place, the fork on the rotary paper-cutter blade engages a pin on the cutter blade actuator.

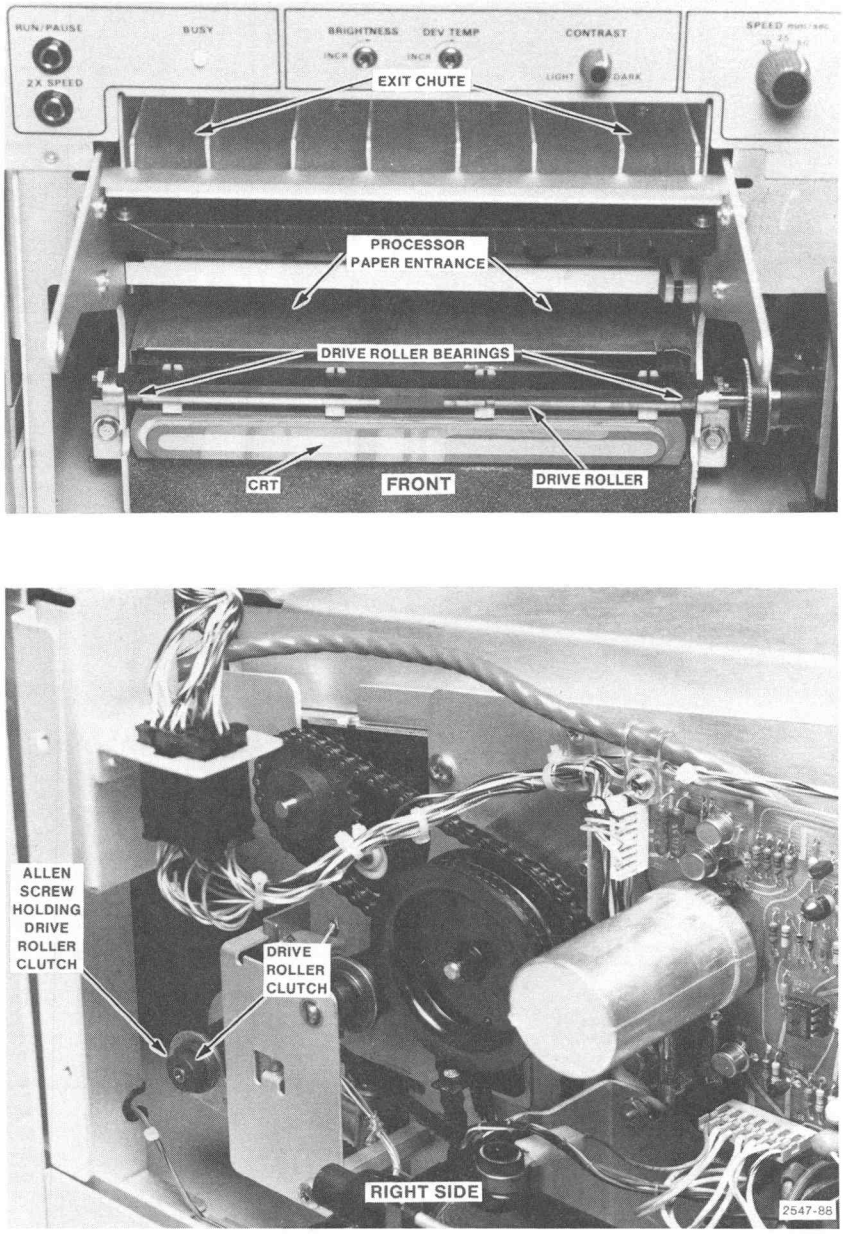
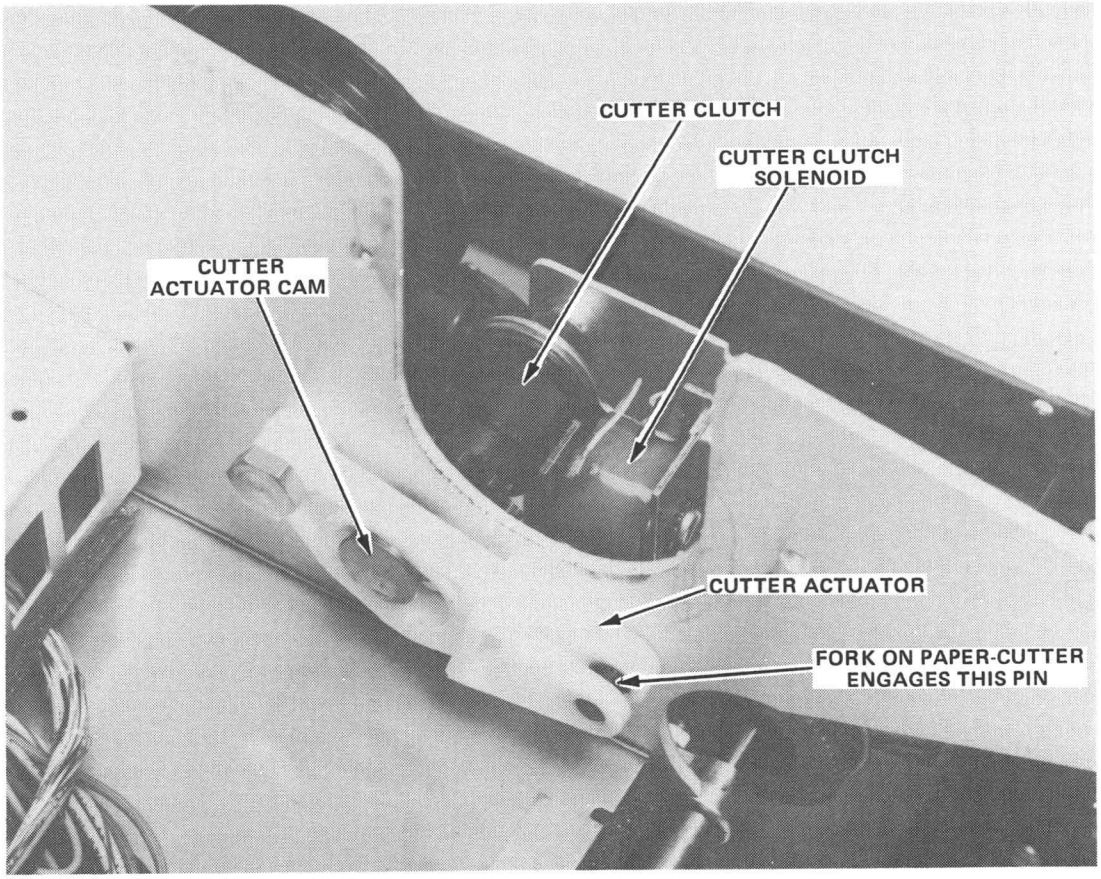


Figure 5-5. Drive Roller and Associated Parts.



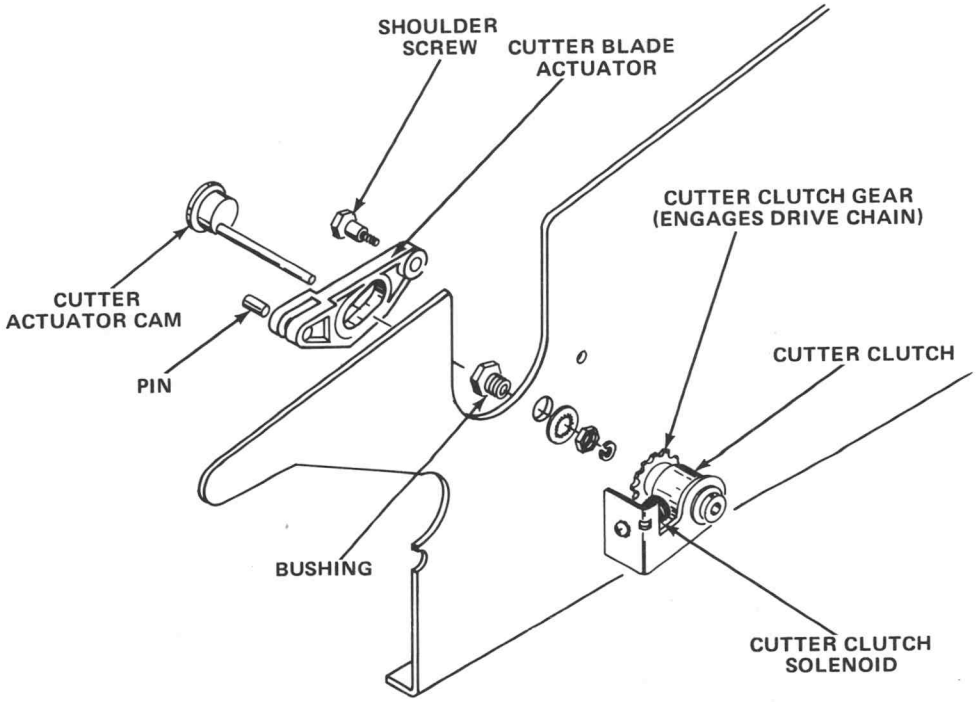


Figure 5-6. Cutter Actuating Mechanism.

When the paper is to be cut, the Continuous Recorder's electronic circuitry sends current through the cutter clutch solenoid. As the solenoid pulls in, it causes the cutter clutch to engage. The cutter actuator cam is then driven by the cutter clutch gear, and rotates through 360 degrees. As the cam rotates, the cutter actuator first moves downward, and then upward, returning to its original position. The downward motion rotates the paper cutter rotary blade, cutting the paper; the upward motion returns the blade to its home position.

Interrupter

See Figure 5-7. The timing sprocket on the drive chain drives the "interrupter rotor". As the rotor turns, it chops a light beam passing from a light-emitting diode to a phototransistor. The phototransistor provides timing pulses to the Continuous Recorder's electronic circuitry.

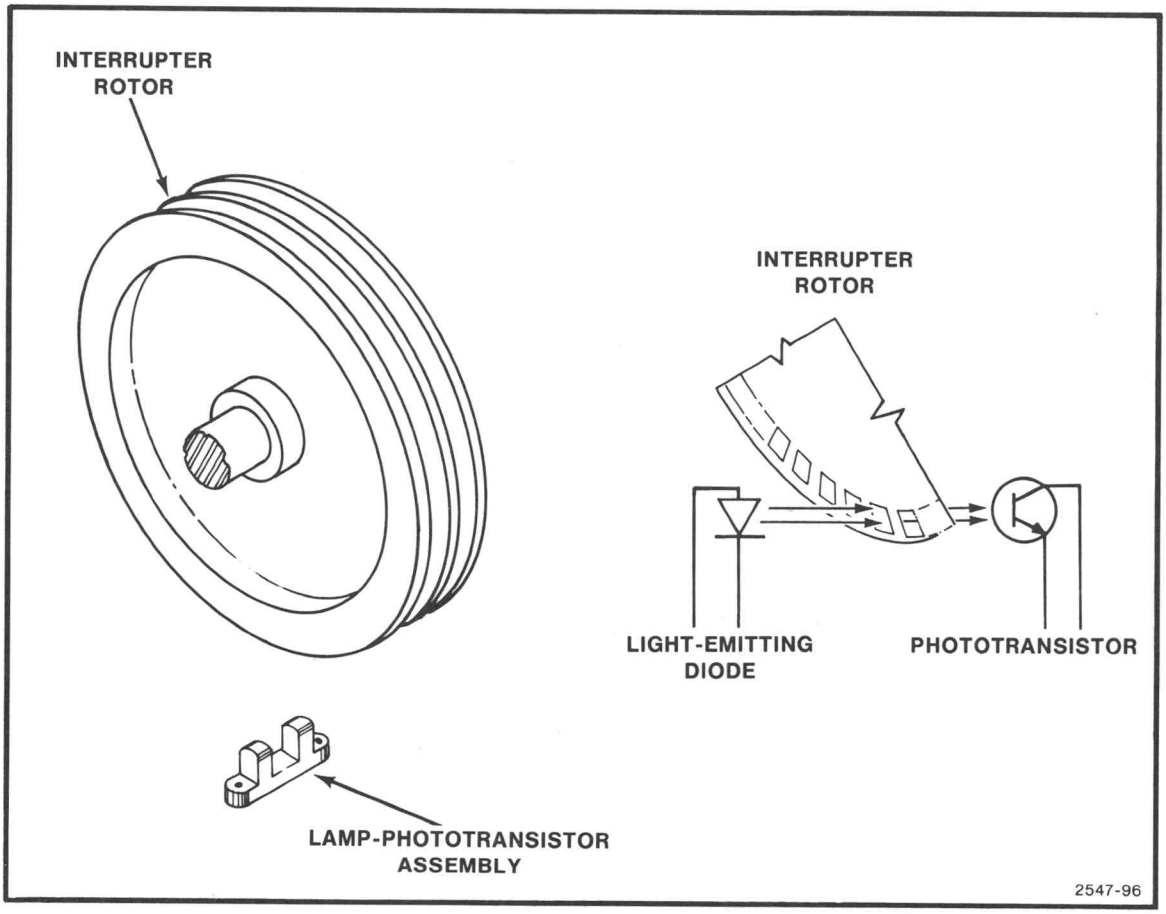


Figure 5-7. Interrupter.

Processor

See Figure 5-8. The primary processor component is the heater plate, which heats paper moving under it in order to develop the latent image on the paper. The processor belt holds the paper against the heater plate and propels it through the processor. This belt receives its power from a roller connected to the processor drive sprocket. A sprocket on the other end of that roller drives a chain; the chain, through a sprocket and some gears, drives the rear belt roller and the belt driven conveyor.

CIRCUIT DESCRIPTION

Refer to the Block Diagram and the Cabling Diagram (fold-outs in the "Diagrams" section, just before the schematics). While some of the Continuous Recorder's electrical components are mounted directly on the chassis, most are located on one or another of the circuit boards, or on the control panel. The circuitry may be conveniently grouped according to location: Main board, Video and Sweep board, Timing board, Control board, and High Voltage Assembly.

The Main board serves as a "motherboard" into which the Video and Sweep, and Timing boards are inserted. It also holds the power supplies (except for the high voltage supplies) and some of the amplifying circuitry.

The Video and Sweep board holds low-level signal amplifiers and a circuit to position the sweep vertically on the crt's face. The rear-panel connectors are mounted on the connector mounting plate, which is attached to this board.

The Timing board holds counters and timers which control the sequence of operations during the making of a recording.

The Control board holds circuitry to drive the Continuous Recorder's electromechanical components: the motor, the solenoids for the drive roller and cutter clutches, the LED and phototransistor for the interrupter rotor, and the processor's heating element.

The High Voltage Assembly holds the high voltage power supplies which drive the crt, as well as the Grid Bias, Grid Drive, and Focus circuits for the crt.

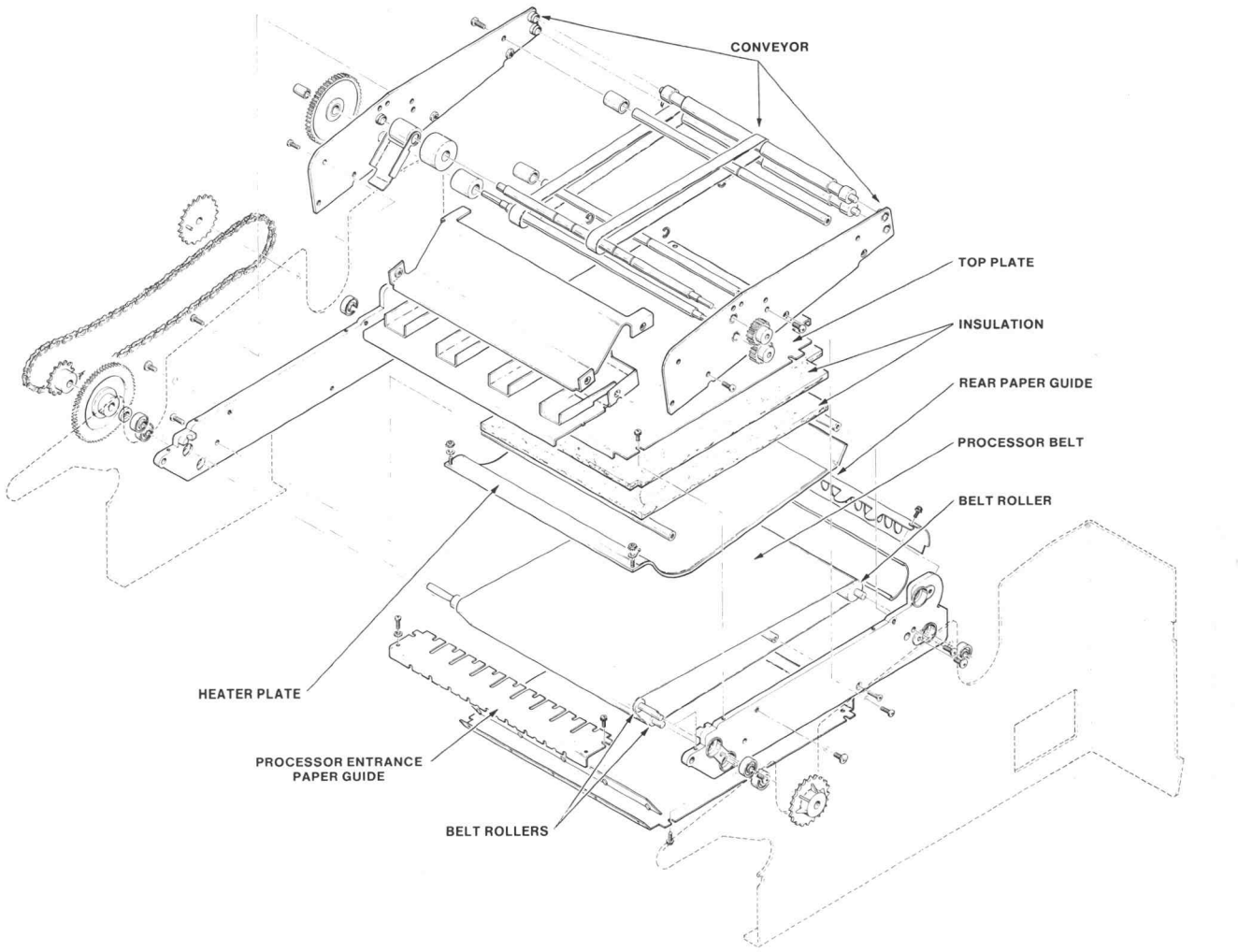


Figure 5-8. Processor.

Main Board

The Continuous Recorder's Main board includes components which may be grouped into three major categories:

1. The power supplies.
2. Amplifiers and focus control circuitry.
3. Connectors and circuit board traces which function like a wiring harness.

Each category is discussed separately.

Power Supplies

Refer to Schematic 1-1. Five of the main power transformer's secondary windings are connected through J1 and P1 to the Main board, where they drive power supplies which provide unregulated voltages at +400 V, +30 V and −20 V, and regulated voltages at +180 V, +110 V, +22 V, +15 V, +5 V, and −15 V.

+400 V. The +400 V supply is a simple full-wave bridge followed by filter capacitors. It supplies power for the Dynamic Focus circuit and the +180 V supply.

+180 V. The regulated +180 V supply for the crt grid bias is obtained from the +400 V supply. Q421 senses any change in the +180 V output. The change is coupled to shunt regulator Q425 through Q424. When the voltage is higher than +180 V, Q425 draws more current, causing the voltage to drop back to +180 V. When the voltage is lower than +180 V, Q425 draws less current, allowing the voltage to rise back to +180 V.

+110 V. The +110 V supply is voltage-regulated and current-limited, and provides power for the Z-Axis Amplifier on the Main board. That amplifier draws maximum current when the face of the crt is dark (no image being recorded). To save power when no recording is being made, and to prevent overheating of components near R81 in the Z-Axis Amplifier, the +110 V supply is reduced to about +25 V whenever the DRIVE ROLLER signal is absent.

Operational amplifier U589 compares the +110 V output to the −15 V supply. Its output is amplified by Q589 to set the voltage of series pass emitter followers Q689 and Q795.

R583 and Q581 monitor the current in the +110 V output line, causing the series pass element to turn off (increase its resistance) if the current is excessive.

Q369 and Q365 reduce the voltage to the emitter whenever the DRIVE ROLLER signal is absent, causing the output voltage to drop to about +25 V.

+30 V. The +30 V supply is a simple, unregulated full-wave bridge with filter capacitor. It supplies power for the Deflection Amplifier, the +22 V supply, and the +15 V supply.

+22 V. The +22 V supply uses a monolithic voltage regulator. The voltage output is fixed by a voltage divider network referenced to the +15 V supply. It supplies power for the High Voltage Oscillator in the High Voltage assembly.

+15 V. The +15 V supply uses a voltage-regulator integrated circuit to control a series pass element. The output voltage is set by adjusting R472. Current limiting occurs at about 600 mA.

+5 V. The +5 V supply uses a monolithic 5 V voltage regulator.

−15 V. The −15 V regulated supply derives its power from the unregulated −20 V supply. Operational amplifier U569 compares the −15 V output to the +15 V line; the error voltage is amplified and used to control series pass element Q769. R574 and Q579 provide current limiting at about 650 mA.

−20 V. The −20 V supply, like the +30 V supply, is an unregulated full-wave bridge with filter capacitor.

Amplifiers and Focus Control Circuitry

In addition to the power supplies, the Main board includes the Z-Axis Amplifier, the Deflection Amplifier, and the Dynamic Focus circuit. Their schematics appear on Schematic 1-2.

Z-Axis Amplifier. The Z-Axis Amplifier takes the Z-AXIS signal from the Video and Sweep board and amplifies it to the amplitude needed to drive the grid of the crt. The amplified signal is then sent on to the Grid Drive circuit of the High Voltage board.

To prevent excessive heat dissipation when no signal is being recorded on the paper, the +110 V power for this amplifier is reduced to about +25 V when no DRIVE ROLLER signal is present.

Deflection Amplifier. The Deflection Amplifier takes the X-AXIS signal from the Video and Sweep board and amplifies it to the level needed to drive the horizontal deflection coil in deflection yoke. (The voltage applied to one end of the horizontal deflection coil is fed back to the Video and Sweep board as the RAMP SENSE signal.)

Dynamic Focus. As the spot sweeps across the face of the crt, the distance traveled by the beam varies. Consequently, a different focus voltage is required when the beam is at one end of its sweep than when it is at the center of the screen. The Dynamic Focus circuit compensates for this by providing a correcting voltage to be superimposed on the dc focus voltage.

To do this, the Dynamic Focus circuit monitors the RAMP SENSE voltage from the horizontal deflection coil. If the RAMP SENSE voltage is negative, it is passed through CR30; if positive, it is inverted by U126 and then passed through CR29. Thus, the voltage at the anodes of CR29 and CR30 is a measure of the distance of the spot from the center of the screen. This voltage is then amplified (in a deliberately non-linear manner) to become the DYNAMIC FOCUS signal. The DYNAMIC FOCUS output is coupled to the Focus circuit on the High Voltage board.

Interconnections Provided by the Main Board

Connectors J2, J3, and J4 on the Main board are wired in parallel on a 44-conductor bus. This bus, into which the Video and Sweep board and the Timing board are inserted, is interconnected with the power supplies and signal-processing circuitry on the Main board, and with edge connector P1. P1 provides the connection to the main wiring harness, through which connections are made to the other circuit boards and to the chassis-mounted components.

Because the rear-panel connector mounting plate is attached to it, the Video and Sweep board must be inserted into connector J4 on the J2-J3-J4 bus. The Timing board may be inserted into either J2 or J3.

Next to Schematic 1-3 there is a diagram showing the way the J2-J3-J4 bus and edge connector P1 are interconnected.

Video and Sweep Board

The Video and Sweep board fits into connector J4 on the Main board's J2-J3-J4 bus. Attached to it is the connector mounting plate, which holds the four rear-panel bnc connectors. The circuitry of this board is divided into these functional blocks: Horizontal Preamp, Vertical Position, Blanking, CRT Protector, Z-Axis Preamp, and Z-Axis Gain Control.

While reading the descriptions of these blocks, refer to Schematic 2-1.

Horizontal Preamp

Two operational amplifiers at the X INPUT connector amplify the ramp waveform applied there by external equipment. The outputs of these amplifiers are summed at potentiometer R63, which can be adjusted to nullify any common-mode component of the X INPUT voltage. Potentiometers in the circuitry associated with a third operational amplifier provide adjustments to compensate for variations in the amplitude or the dc level of the input waveform. The output of this circuit is the X AXIS signal, which is sent on to the Deflection Amplifier on the Main board.

Vertical Position

The Vertical Position circuit provides a means of adjusting the vertical position of the spot on the crt face. The Y-Axis output is fed through the Main board to the vertical deflection coil in the deflection yoke.

Blanking Circuit

The Blanking circuit has three pull-down transistors whose outputs are connected in a "wired-OR" configuration to a point in the signal path of the Z-Axis Preamp. When any of these transistors turn on, diodes CR306 and CR307 in the Z-Axis Preamp are back-biased, Q318 in that preamp is turned off, and the Z-Axis output drops to about −0.9 V, blanking the crt.

One of these blanking transistors is turned on by a BLANK signal from the Timing board, while another responds to a TTL high from the rear-panel BLANKING connector. The third blanking transistor is driven by the Crt Protective Blanking circuit.

Crt Protective Blanking

The Crt Protective Blanking circuit monitors the horizontal deflection yoke current, using an operational amplifier to amplify this RAMP SENSE signal. As long as the deflection yoke current continues to oscillate with sufficient frequency and amplitude, C252 in the Crt Protective Blanking circuit will be charged negative, and C253 will be charged positive. This causes the output of the Crt Protective Blanking circuit's second operational amplifier to stay negative. However, should horizontal sweeps fail to recur frequently enough, or with sufficient amplitude, C252 and C253 will discharge, the output of the second operational amplifier will go positive, and Q444 will turn on and blank the crt.

Z-Axis Gain Control

The purpose of the Z-Axis Gain Control is to provide a control voltage to the MC1495 four-quadrant multiplier in the Z-Axis Preamp. This control voltage is proportional to (a) the rate at which the spot sweeps across the face of the crt, (b) the rate at which the photographic paper moves past the crt, and (c) the setting of the front-panel CONTRAST control. Since the MC1495 in the Z-Axis Preamp multiplies this control voltage by the amplified signal from the Z INPUT connector, the control voltage serves to adjust the spot intensity to compensate for variations in sweep rate and paper speed.

The sweep rate is sensed by monitoring the X-AXIS signal from the Horizontal Preamp. This signal is inverted and differentiated by an operational amplifier connected as a differentiator, to produce the waveform shown in Figure 5-9. The waveform is negative during the positive ramp of the X-AXIS signal, with an amplitude proportional to the sweep rate (slope of the ramp). This negative part of the differentiator output waveform, which indicates the sweep rate, is passed through CR279 and used to charge capacitor C278. Thus, the voltage of C278 is a measure of the rate at which the spot is sweeping across the face of the crt. This voltage is amplified and applied to the gain control input of a type CA3080 variable-transconductance amplifier.

The input to the CA3080 variable-transconductance amplifier is just the MOTOR SPEED voltage from the Control board. Thus the output of the amplifier is proportional to both the sweep rate and the motor speed.

The GAIN CENTER potentiometer is provided to compensate for input offset currents in the CA3080 and to impart an additional dc offset. When correctly adjusted, it will cause the voltage at TP276 to have this offset plus a voltage proportional to the motor speed. This response is necessary to provide the voltage ratios for exposing the paper for good copies at all speeds.

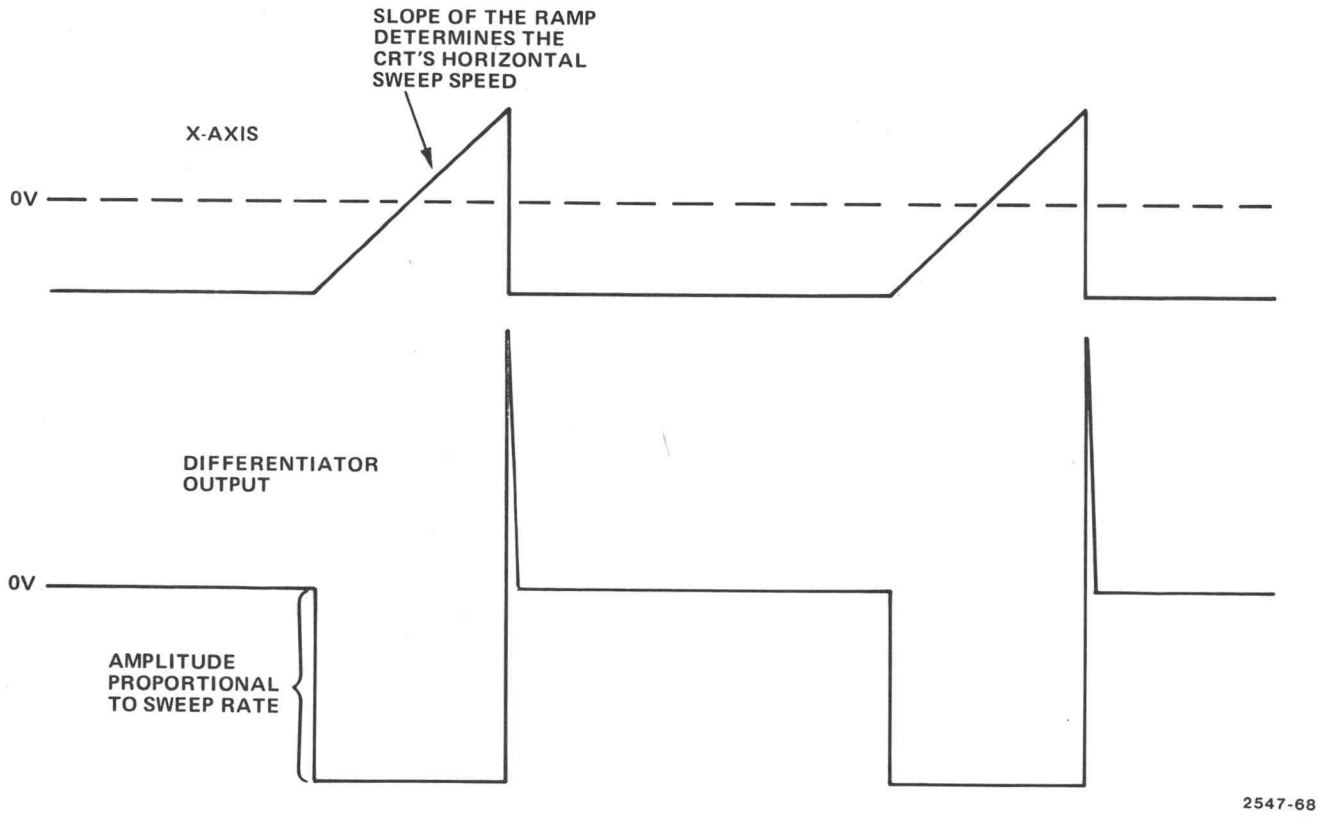


Figure 5-9. X-AXIS Signal Before and After Passing Through the Differentiator.

The CONTRAST potentiometer is connected as a voltage divider at TP276. The voltage at its wiper is jointly proportional to (a) the sweep rate, (b) the motor speed, and (c) the CONTRAST setting. This is the required function for controlling the Z-Axis gain; so this voltage is amplified and applied to the MC1495 four-quadrant multiplier in the Z-Axis Preamp. The GAIN OFFSET potentiometer serves as an offset adjustment for the MC1495's input.

Z-Axis Preamp

The Z-Axis Preamp amplifies the signal from the Z INPUT connector, preparing it for the Z-Axis Amplifier on the Main board. The voltages at the two terminals of the Z INPUT connector are applied to the "X" inputs of an MC1495.

This MC1495 is used to apply automatic gain control to the Z-Axis signal. This is done by multiplying that signal, applied at its "X" inputs, by the control voltage at its "Y" inputs.

The OFFSET ADJUST control compensates for dc offset in the MC1495 output or in the amplifiers following the MC1495. After all other controls in the Z-Axis Gain Control and the Z-Axis Preamp have been adjusted, this control is set to provide a voltage of zero at TP300 when the Z INPUT connector is shorted.

Timing Board

The Timing board controls the timing of the various mechanical and electrical operations in recording a video signal on paper. It controls the drive roller clutch, the cutter clutch, the front panel BUSY lamp, the blanking of the crt, and motor idling. In addition, a RECORD OUT pulse is available for controlling external equipment at the start of each recording.

The sequence of operations is as follows:

1. When the RECORD switch, the RUN/PAUSE switch, or the 2X SPEED switch closes, or the REMOTE START/STOP circuit receives a low pulse signal, the Timing board lights the BUSY lamp and engages the drive roller clutch, so that the paper starts to move past the crt.

2. Shortly thereafter, the Timing board turns off the BLANK signal, so that the crt starts to record data on the paper passing its face.

3. As the paper advances past the crt, the Timing board counts STEPPER pulses from the Control board, and causes the recording to cease. Just when this occurs depends on the settings of the "length select" and "mode select" jumpers. The "length select" jumper determines whether the minimum page length is 190 or 270 mm (7.5 or 10.6 inches), while the "mode select" jumper determines whether "Page", "Push-Push-Continuous", or "Push-Release Continuous" mode is used.

    a. In "Page" mode, as soon as the Timing board, by counting STEPPER pulses, determines that a minimum size page has been recorded, it sends the BLANK signal to blank the crt.

    b. In "Push-Push-Continuous" mode, the Timing board waits to blank the crt until a minimum-size page has been recorded and an end of record signal has been received.

Additional variations in the recording cycle occur when the RUN/PAUSE switch is used.

NOTE

The RUN/PAUSE mode functions properly only when the Timing board is strapped for "PUSH-PUSH-CONTINUOUS" mode. The RUN/PAUSE mode is engaged when a connector is in the RUN/PAUSE jack. It may operate alone or in conjunction with the 2XSPEED switch.

Inserting a plug for a remote switch into the RUN/PAUSE jack on the front panel engages the Run/Pause mode of operation. Closing the switch initiates a recording. The switch must remain closed to continue recording. Opening the switch causes the crt to blank and cause the paper to travel at idle speed, after a delay which allows the exposed copy to be properly heat developed. Reclosing the switch starts the recording process again. To end the recording, press the RECORD lever switch on the front panel of the unit.

The paper speed can be doubled by a remote switch plugged into the 2XSPEED jack on the front panel. Closing the switch causes the paper to travel at double the selected paper speed. When used in conjunction with a RUN/PAUSE switch, closing either switch initiates a recording and opening both switches causes the paper to travel at idle speed as in case one above. Reclosing the 2XSPEED switch starts the paper to once again travel at double the selected paper speed. To end the recording press the RECORD lever switch on the front panel of the unit.

A switch or signal applied to the REMOTE START/STOP connector can initiate or terminate a copy in place of the front panel RECORD switch.

c. In "PUSH-RELEASE"mode, the Timing board waits to blank the crt until a minimum page has been recorded and the low pulse from the RECORD switch or the REMOTE START/STOP connector has ended.

4. After blanking the crt, the Timing board allows three centimeters of paper to pass the crt and then turns off the DRIVE ROLLER signal, to disengage the drive roller clutch.

5. The Timing board waits for 32 STEPPER pulses to be sure that the drive roller clutch has had time to disengage. It then sends a CUTTER signal to engage the cutter clutch.

6. After 16 more STEPPER pulses, the Timing board disengages the cutter clutch.

7. After 80 more STEPPER pulses, the Timing board resets all its counters and latches. At this point, the BUSY lamp goes out, and the Hard Copy Unit is ready to begin another recording operation.

The circuitry of the Timing board is functionally divided into these blocks: Initialize, Start, Drive Roller Control, Run/Pause, 2XSpeed, Busy, Stepper Counter, Start Record, Blanking Request, Mode Select, End Record, Drive Roller Turn-Off, Cutter Control and Reset. These blocks are discussed in the order in which they perform their respective functions.

While reading these circuit descriptions, refer to Schematic 3-1.

Initialize

The Initialize circuit consists of a transistor switch Q41 and logic gate U221A. On power-up, Q41 is saturated for a short time, providing a TTL low at its collector. This low is used to clear the Busy and Drive Roller circuits and initialize the RUN/PAUSE and 2XSPEED circuits. These circuits in turn clear the counters and flip-flops on the Timing board, so that the Timing board is ready for its first recording operation.

Start

The Start circuit detects the presence of a TTL low coming from the RECORD switch, the RUN/PAUSE switch, the 2XSPEED switch, or the REMOTE START/STOP connector. After waiting a short while for contact bounces to subside, it sends a pulse to the Drive Roller Control which causes the drive roller clutch to be engaged. In "Page" mode only, the inverted version of this pulse is passed through the Mode Select circuit to the End Record circuit. This inverted pulse serves as a signal that the recording may be terminated as soon as a minimum-length page has been recorded.

Drive Roller Control

The Drive Roller Control includes a type D flip-flop which is cleared by the Initialize circuit on power-up and by the Drive Roller Turn-Off after a recording has been made. At the start of a recording this flip-flop is set by a pulse from the Start circuit. As it is set, it sends the DRIVE ROLLER signal to the Control board, causing paper to start moving past the crt, and sets the Busy latch.

Run Pause

A switch connects the Front Panel jack. When the switch is closed a signal is sent to the Control board. The Control board sends a signal to the Timing board as a TTL low starting the Recording cycle. Recording continues while the switch is closed. When the switch is open, the crt blanks and the RUN/PAUSE timer (U31) begins counting. The timer circuit provides a coincidence signal at U21C when sufficient paper has run through the processor to develop the exposed image. The coincidence signal triggers a 1.5 second time delay (U121B anc U21C) which in turn sends an IDLE command to the control board to slow down the paper speed. When the operator closes the switch again, the crt unblanks and the motor runs at the selected recording speed. The RUN/PAUSE circuit can start a recording, but can not end it.

2XSpeed

A switch connects to the Front Panel jack. The 2XSpeed and Run/Pause switches are ORed on the Control board; thus, either switch initiates a copy cycle and places the Recorder in the Run/Pause mode. The 2XSpeed switch works with transistor Q251 and changes operational amplifier U145B from a voltage follower to a times two dc amplifier which doubles the voltage output. The motor control circuit changes the motor speed to twice the selected value (20, 50, 100 mm/sec). The 2XSpeed circuit can start a recording only when a switch is in the Run/Pause connector on the front panel, but it can not end the recording.

Busy

The Busy circuit includes a type D flip-flop which is cleared by the Initialize circuit on power-up and by the Reset circuit after a recording has been made and the paper has been cut. When this latch is cleared, it resets several counters on the Timing board and enables the Start circuit to respond to signals from the RECORD switch, the RUN/PAUSE switch, the 2XSPEED switch, and the REMOTE START/STOP connector.

At the start of a recording, the Busy flip-flop is set by a pulse from the Drive Roller Control. As it is set, it turns on the front panel BUSY lamp and enables the Stepper Counter. The BUSY lamp is on until the Timing board receives a STOP signal. Now it flashes at about 2-3 Hz. The flashing of the BUSY lamp is an indication for the operator from the recorder. The recorder indicates it will stop the recording and cut the paper after a minimum length of paper (190 mm or 270 mm) passes through the unit.

Stepper Counter

The Stepper Counter is a simple binary up-counter which counts STEPPER pulses from the Control board. It starts its count when enabled by the Busy circuit at the start of a recording. Outputs of this counter are used by the Start Record, End Record, Drive Roller Turn-Off, Cutter Control, and Reset circuits.

Start Record

On the eighth STEPPER pulse after the Busy circuit has enabled the Stepper Counter, a pulse from that counter triggers a type D flip-flop in the Start Record circuit. As this flip-flop is set, it triggers a one-shot which sends a pulse to the Timing Board's RECORD OUT pin, for use by external equipment. Also, when the Start Record latch is set, it turns off the Blanking Request gate, so that the crt begins to record video information on the paper moving past its face.

Blanking

The Blanking Logic responds to signals from the Start Record, End Record and RUN/PAUSE circuits. It turns off the BLANK signal at the start of a recording and turns it on again at the end of recording and between records in the RUN/PAUSE mode of operation. When the BLANK signal is on, the image on the crt is suppressed.

Mode Select

The Mode Select circuit provides an OK TO STOP signal to the End Record circuit. This signal indicates that the current recording should be terminated as soon as a minimum-size page has been recorded. Just when the OK TO STOP signal is sent depends on the setting of the "Mode Select" strap.

1. In "Page" mode, the OK TO STOP signal occurs as soon as the Start circuit's initial pulse ends.

2. In "Push-Push-Continuous" mode, this signal is sent when the front-panel RECORD switch has been pressed twice, or when two successive low pulses have come from the REMOTE START/STOP connector. (See Timing board circuit description in this section for the variations in recording cycle when the RUN/PAUSE and 2XSPEED switches are used.)

3. In "Push-Release-Continuous" mode, the OK TO STOP signal occurs at the end of the initial low pulse from the RECORD switch or the REMOTE START/STOP connector. As long as that initial low pulse continues, the OK TO STOP signal is suppressed and the recording will continue.

End Record

The End Record circuit signals the moment when the recording is to end. This circuit includes two latches, one of which is set by the OK TO STOP signal from the Mode Select circuit, and the other by the Stepper Counter's reaching the count of 512 or 768 (512 for the 190 mm minimum page, 768 for the 270 mm page).

When both latches have been set, the End Record circuit causes the Blanking Request circuit to turn off the crt and enables the Driver Roller Turn-Off timer.

Drive Roller Turn-Off

Once having been enabled by the End Record circuit, the Drive Roller Turn-Off circuit starts a timing sequence. On the 96th STEPPER pulse after being enabled, this circuit sends a STOP DRIVE signal which clears the Drive Roller Control latch and enables the Cutter Control circuit. As the Drive Roller Control is cleared, it causes the drive roller clutch to be released, so that the paper stops moving past the crt.

Cutter Control

After waiting 32 STEPPER pulses for the paper to stop moving, the Cutter Control circuit sets an internal latch and sends the CUTTER signal to the Control board. This causes the cutter clutch to be engaged and the paper to be cut.

As the Cutter Control starts the cutting of the paper, it also enables the Reset timer.

Reset

Once having been enabled by a START CUT signal from the Cutter Control, the Reset circuit starts a timing sequence. On the 16th STEPPER pulse after being enabled, this circuit sends a STOP CUT signal to the Cutter control, causing that circuit to release the cutter clutch. On the 96th STEPPER pulse, the Reset circuit sends a RESET signal to the Busy circuit, causing that circuit to revert to its "not busy" state. As it does so, the Busy circuit (a) turns off the BUSY lamp, (b) clears the Stepper Counter, and (c) clears latches in the End Record and Cutter Control circuits.

As latch U171A in the Cutter Control is cleared, it in turn clears the Reset circuit. At this point, the Timing board has had all its circuits reset to their initial conditions, and is ready for another recording cycle to begin.

Control Board

The Control board (Schematic 4-1) contains circuitry for controlling the Continuous Recorder's various electromechanical parts. This circuitry is functionally divided into these blocks: Drive Roller Clutch Drive, Cutter Clutch Drive, Pulse Shaper, Motor Control, and Heater Control.

Drive Roller and Cutter Clutch Drives

The DRIVE ROLLER and CUTTER signals from the Timing board turn on transistors which in turn activate the solenoids on the drive roller clutch and the cutter clutch.

Pulse Shaper

Attached to the drive shaft is an interrupter rotor, which interrupts light passing from an LED to a phototransistor. The Pulse Shaper takes the resulting current pulses from the phototransistor and uses them to trigger a one-shot. The pulses from that one-shot comprise the STEPPER signal, and are used to clock the circuits on the Timing board. There are 128 STEPPER pulses in each revolution of the interrupter rotor.

Motor Control

The front panel speed switch sets a voltage divider network. The output of the network determines the dc voltage supplied through an operational amplifier (voltage follower U145B) to the motor control circuit for motor speeds (10, 25, or 50 mm/sec). The 2XSPEED switch in conjunction with transistor Q251 changes the operational amplifier (U145B) from a voltage follower to a times two dc amplifier, thus doubling the output voltage supplied to the motor control circuit.

The idle signal from the Timing board causes transistor Q253 to saturate. This switching action developes a low dc voltage for the motor control circuit developing the idle speed. The motor control circuit consists of an error amplifier (U135), a pulse width oscillator (U223), and output transistors (Q311 and Q315). The oscillator drives the output transistors which supply the voltage pulses to the motor. As the motor turns, a tachometer generates a voltage proportional to speed. The error amplifier compares the tachometer output with the dc control voltage and produces a correction voltage for the pulse width oscillator. Thus, the motor maintains the selected speed. If the recorder jams, the current overload circuit biases the error amplifier and the motor pulse output from the control circuit reduces to zero, stopping the motor.

Heater Control

The Heater Control regulates the processor temperature by switching the heater current. At faster motor speeds, the temperature is higher, to compensate for the shorter time the paper spends passing through the processor.

A relaxation oscillator's output is buffered by an emitter follower and fed to the non-inverting input of comparator U179. This device compares the oscillator's sawtooth waveform against a reference voltage. The comparator output is a train of positive pulses whose lengths are greater for greater reference voltages.

The comparator output is amplified, passed through an opto-isolator, amplified again, and used to trigger a triac. The triac switches current from the power mains through the heater. The opto-isolator is needed because the triac and its driving circuitry are connected directly to the power mains.

The Heater Control will turn off the heater in case of excessive motor current, such as might occur if the paper should jam. Excessive motor current causes silicon-controlled rectifier (SCR) Q25 in the Motor Control to fire. This grounds the comparator output through CR279, so that no comparator pulses are passed through the opto-isolator to trigger the triac. Transistor Q379 protects the triac by preventing its being triggered except during the "zero-crossing" part of the power mains waveform. When the mains voltage exceeds about ten volts in amplitude, Q379 turns on. In the positive half-cycle of the mains voltage, as Q379 turns on, it pulls the voltage at Q392's base down to that of the "neutral" ("ungrounded") mains conductor, thus preventing Q392 from turning on. This prevents the triac's gate from going sufficiently positive to trigger the triac.

In the negative half-cycle of the mains, as Q379 turns on, it applies a negative voltage to Q392's base, again turning off Q392 and preventing the triac from being triggered. Thus, it is only at the "zero-crossing" of the mains voltage that the pulse from the comparator can cause the triac to trigger.

As mentioned above, the length of the pulses keying the triac depends on the comparator reference voltage. This, in turn, depends on the MOTOR SPEED voltage and the resistance of the thermistor sensing the processor temperature. Greater MOTOR SPEED voltages raise the comparator reference voltage and the triac duty cycle until the temperature rises enough to cause thermistor-controlled transistor Q71 to pull the reference voltage back down again. Thus, greater MOTOR SPEED voltages cause higher regulated processor temperatures.

High Voltage Assembly

The High Voltage Assembly holds the circuits which drive the crt. It includes the High Voltage board and the High Voltage Oscillator board.

The High Voltage Oscillator board and the High Voltage board contain the high voltage power supplies for driving the crt. They are connected to the Main board through connector J280 on the High Voltage Oscillator board and a harmonica connector on the main wiring harness. They are connected to each other by soldered connections, and to the crt by the crt socket and the crt anode lead, which are soldered to the High Voltage board. The AMPLIFIED Z-AXIS signal from the Main board is connected to the High Voltage board by means of a spring contact.

Refer now to Schematic 5-1. The high voltage circuitry may be divided into these functional blocks: High Voltage Oscillator, +5.5 kV Supply, −5.5 kV Supply, High Voltage Regulator, Filament Supply, Grid Drive, and Focus.

High Voltage Oscillator

Blocking oscillator Q1016 switches the current through high voltage transformer T1015's primary winding. The High Voltage Regulator circuit can vary the duty cycle of the blocking oscillator by varying Q1016's base bias.

+5.5 kV and −5.5 kV Supplies

T1015's high voltage winding drives the +5.5 kV and −5.5 kV supplies. Each of these consists of a voltage doubler followed by a capacitive filter. The −5.5 kV is applied to the cathode of the crt, and +5.5 kV to its post accelerator.

High Voltage Regulator

Voltage divider R352 on the High Voltage board compares the −5.5 kV output with the regulated +15 V line. The voltage at the tap of this divider may be adjusted by means of R264 on the High Voltage Oscillator board, in order to set the −5.5 kV line at the desired voltage.

Any error in the −5.5 kV line's voltage appears (in attenuated form) at the voltage divider tap, and is amplified by Q265, Q257 and Q251 to produce a change in the dc bias at Q1016's base. This changes the High Voltage Oscillator duty cycle to correct for the error on the −5.5 kV line.

Filament Supply

The crt filaments are driven from a secondary winding of high voltage transformer T1015. The filament leads are connected through R373 and R375 to the −5.5 kV line, so that the filament voltage is in the proximity of the cathode voltage.

Grid Drive

The Grid Drive circuit biases the crt grid with respect to the cathode at a voltage which is determined by (a) the setting of INTENSITY control R221, and (b) the AMPLIFIED Z-AXIS signal from the Main board.

Refer to Figure 5-10, which is a simplification of the Grid Bias circuit in Schematic 5-1. In the figure, protection devices (resistors and neons) are omitted.

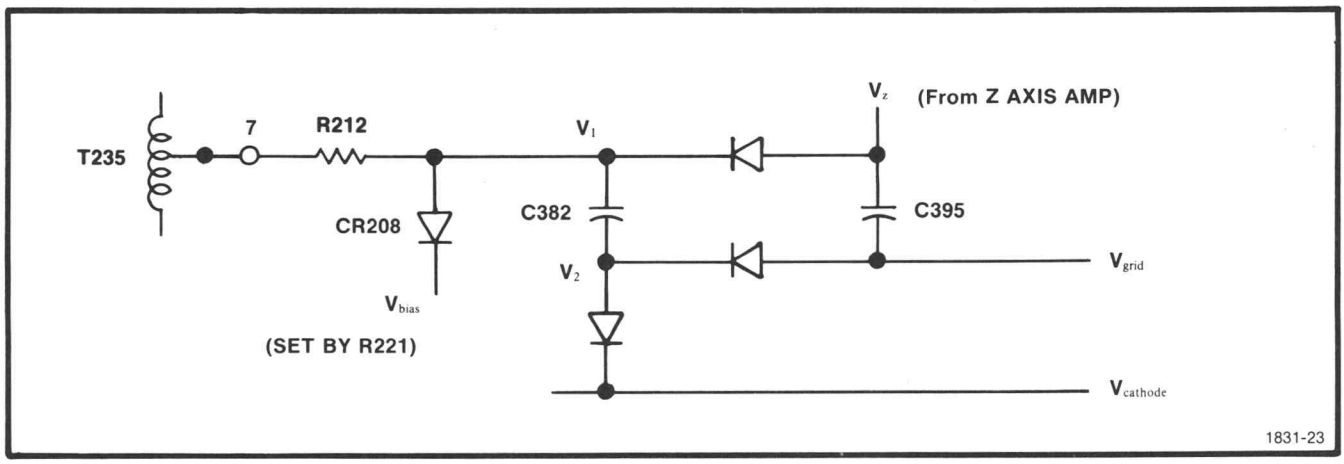


Figure 5-10. Simplified Grid Drive Unit.

During each positive half-cycle at transformer tap 7, V_1 is approximately equal to V_{bias}, and V_2 is approximately equal to $V_{cathode}$. Therefore, the voltage across C382 is equal to $V_{bias}-V_{cathode}$. During the negative half-cycle this charge is transferred to C395. The voltage across C395 is V_z-V_{grid}; this is now equal to $V_{bias}-V_{cathode}$:

$$V_z-V_{grid}=V_{bias}-V_{cathode}$$

Therefore, the grid voltage is now equal to the cathode voltage minus the difference between the grid bias and the voltage from the Z-Axis Amplifier:

$$V_{grid}=V_{cathode}-(V_{bias}-V_z).$$

The grid bias may be set (by R221) so that in the absence of a Z-Axis signal, the beam of the crt is just barely cut off.

Focus

The voltage at taps 6 and 9 of the high voltage is rectified, doubled, and filtered by C268, C269, CR268 and CR269. This dc voltage is adjusted by FOCUS potentiometer R340 and combined with the output of the Dynamic Focus circuit on the Main board to provide the voltage for the crt focus electrode.

Section 6
REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Changes to instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the lastest 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.

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
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
01963	CHERRY ELECTRICAL PRODUCTS CORPORATION	3600 SUNSET AVENUE	WAUKEGAN, IL 60085
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
03888	KDI PYROFILM CORPORATION	60 S JEFFERSON ROAD	WHIPPANY, NJ 07981
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172
14099	SEMTECH CORP.	652 MITCHELL RD.	NEWBURY PARK, CA 91320
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR PRODUCTS GROUP	P.O. BOX 600,600 W. JOHN ST.	HICKSVILLE, NY 11802
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
32293	INTERSIL, INC.	10900 N. TANTAU AVE.	CUPERTINO, CA 95014
32480	JONES MOTROLA CORPORATION	P. O. BOX 825,432 FAIRFIELD AVE.	STAMFORD, CT 06904
32496	PSI, DIV. WARNER ELECTRIC BRAKE AND CLUTCH COMPANY	P O BOX 118	PITMAN, NJ 08071
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
50157	MIDWEST COMPONENTS INC.	P. O. BOX 787 1981 PORT CITY BLVD.	MUSKEGON, MI 49443
54473	MATSUSHITA ELECTRIC, CORP. OF AMERICA	1 PANASONIC WAY	SECAUCUS, NJ 07094
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
63810	WARNER ELECTRIC BRAKE AND CLUTCH CO.	449 GARDNER ST.	SOUTH BELOIT, IL 61080
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
73559	CARLINGSWITCH, INC.	505 NEW PARK AVENUE	WEST HARTFORD, CT 06110
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
77820	BENDIX CORP., THE, ELECTRICAL COMPONENTS DIVISION	SHERMAN AVE.	SIDNEY, NY 13838
79727	C-W INDUSTRIES	550 DAVISVILLE RD.,P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
82877	ROTRON, INC.	7-9 HASBROUCK LANE	WOODSTOCK, NY 12498
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
99409	SYNTRONIC INSTRUMENTS, INC.	100 INDUSTRIAL	ADDISON, IL 60101

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				ASSEMBLIES		
A1	670-4596-05			CKT BOARD ASSY:MAIN	80009	670-4956-05
A2	672-0759-01	B010100	B021255	CKT BOARD ASSY:VIDEO/SWEEP	80009	672-0759-01
A2	672-0759-02	B021256		CKT BOARD ASSY:VIDEO/SWEEP	80009	672-0759-02
A2A1	670-4598-XX			CKT BOARD ASSY:NOT AVAILABLE,SEE A2		
A3	670-4597-03			CKT BOARD ASSY:TIMING	80009	670-4597-03
A4	670-4599-03	B010100	B010239	CKT BOARD ASSY:CONTROL	80009	670-4599-03
A4	670-4599-05	B010240	B010394	CKT BOARD ASSY:CONTROL	80009	670-4599-04
A4	670-4599-06	B010395	B010634	CKT BOARD ASSY:CONTROL	80009	670-4599-06
A4	670-4599-07	B010635		CKT BOARD ASSY:CONTROL	80009	670-4599-07
A5	672-0692-03			CKT BOARD ASSY:HIGH VOLTAGE	80009	672-0692-03
A5A1	670-5408-XX			CKT BOARD ASSY:NOT AVAILABLE,SEE A5		
A5A2	670-5724-XX			CKT BOARD ASSY:NOT AVAILABLE,SEE A5		
				A1 MAIN ASSEMBLY		
A1	670-4596-05			CKT BOARD ASSY:MAIN	80009	670-4596-05
C53	281-0529-00			CAP.,FXD,CER DI:1.5PF,+/-0.25PF,500V	72982	301-000C0K0159C
C54	290-0718-00			CAP.,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035PE4
C55	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C72	290-0718-00			CAP.,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035PE4
C81	281-0627-00			CAP.,FXD,CER DI:1PF,+/-0.25PF,500V	72982	301-000C0K0109C
C153	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C154	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
C162	290-0718-00			CAP.,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035PE4
C172	281-0505-00			CAP.,FXD,CER DI:12PF,+/-1.2PF,500V	72982	301-012C0G0120K
C248	290-0718-00			CAP.,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035PE4
C421	281-0579-00			CAP.,FXD,CER DI:21PF,5%,500V	72982	301-050C0G0210J
C423	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C425	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C445	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C449	290-0215-00			CAP.,FXD,ELCTLT:100UF,+75-10%,25V	56289	30D107G025DD9
C455	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
C465	290-0215-00			CAP.,FXD,ELCTLT:100UF,+75-10%,25V	56289	30D107G025DD9
C475	290-0405-00			CAP.,FXD,ELCTLT:10UF,+50-10%,150V	56289	30D106F150DD4
C584	281-0580-00			CAP.,FXD,CER DI:470PF,10%,500V	04222	7001-1374
C585	281-0543-00			CAP.,FXD,CER DI:270PF,10%,500V	72982	301055X5P271K
C629	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
C645	290-0668-00			CAP.,FXD,ELCTLT:10UF X 10UF,500V	56289	68D20200
C655	290-0508-00			CAP.,FXD,ELCTLT:18,000UF,+100-10%,15V	56289	68D10444
C669	290-0520-00			CAP.,FXD,ELCTLT:4500UF,+100-0%,40V	56289	68D10474
C685	290-0520-00			CAP.,FXD,ELCTLT:4500UF,+100-0%,40V	56289	68D10474
C695	290-0511-00			CAP.,FXD,ELCTLT:250UF,+75-10%,250V	90201	20-35958
CR26	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR29	153-0057-00			SEMICOND DVC,SE:SILICON,40 PIV,200MA,SEL	80009	153-0057-00
CR30	153-0057-00			SEMICOND DVC,SE:SILICON,40 PIV,200MA,SEL	80009	153-0057-00
CR46	152-0066-01			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0066-01
CR47	152-0066-01			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0066-01
CR48	152-0066-01			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0066-01
CR51	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR52	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR53	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR57	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR59	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR111	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	07263	FDH-6012

A1 MAIN ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR146	152-0066-01			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0066-01
CR147	152-0066-01			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0066-01
CR152	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR157	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR159	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR165	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR245	152-0066-01			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0066-01
CR411	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR412	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR413	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR414	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR415	152-0462-00			SEMICOND DEVICE:RECT,SI,200V,2.5A	04713	SDA10228
CR422	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR583	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	07263	FDH2161
CR594	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR613	152-0462-00			SEMICOND DEVICE:RECT,SI,200V,2.5A	04713	SDA10228
CR624	152-0462-00			SEMICOND DEVICE:RECT,SI,200V,2.5A	04713	SDA10228
CR711	152-0586-00			SEMICOND DEVICE:SILICON,600V,500MA	14936	RGP10J
CR712	152-0586-00			SEMICOND DEVICE:SILICON,600V,500MA	14936	RGP10J
CR713	152-0586-00			SEMICOND DEVICE:SILICON,600V,500MA	14936	RGP10J
CR714	152-0586-00			SEMICOND DEVICE:SILICON,600V,500MA	14936	RGP10J
F431	159-0024-00			FUSE,CARTRIDGE:3AG,0.062A,250V,0.3 SEC	71400	AGC 1/16
L81	120-1114-00			XFMR,RF:VARIABLE	80009	120-1114-00
Q11	151-0232-00			TRANSISTOR:SILICON,NPN,DUAL	80009	151-0232-00
Q29	151-0361-00			TRANSISTOR:SILICON,NPN,DUAL	80009	151-0361-00
Q44	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q45	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q48	151-0407-00			TRANSISTOR:SILICON,NPN	04713	SS2456
Q53	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q61	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00
Q62	151-0604-00			TRANSISTOR:SILICON,NPN	80009	151-0604-00
Q72	151-0604-00			TRANSISTOR:SILICON,NPN	80009	151-0604-00
Q139	151-0465-00			TRANSISTOR:SILICON,PNP	80009	151-0465-00
Q144	151-0466-00			TRANSISTOR:SILICON,NPN	04713	SJE327
Q153	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q171	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
Q211	151-0169-00			TRANSISTOR:SILICON,NPN	80009	151-0169-00
Q219	151-0169-00			TRANSISTOR:SILICON,NPN	80009	151-0169-00
Q248	151-0406-00			TRANSISTOR:SILICON,PNP	01295	SGC7282
Q365	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q369	151-0190-02			TRANSISTOR:SILICON,NPN	80009	151-0190-02
Q421	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
Q424	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
Q425	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q571	151-0134-00			TRANSISTOR:SILICON,PNP	80009	151-0134-00
Q579	151-0190-02			TRANSISTOR:SILICON,NPN	80009	151-0190-02
Q581	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q589	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q689	151-0150-00			TRANSISTOR:SILICON,NPN	80009	151-0150-00
Q747	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	04713	SJE924
Q769	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	04713	SJE924
Q795	151-0311-01			TRANSISTOR:SILICON,NPN	80009	151-0311-01
R12	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R13	321-0230-00			RES.,FXD,FILM:2.43K OHM,1%,0.125W	91637	MFF1816G24300F
R14	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125

A1 MAIN ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R15	315-0304-00			RES.,FXD,CMPSN:300K OHM,5%,0.25W	01121	CB3045
R19	311-1282-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	32997	3329W-L58-502
R21	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R22	315-0103-03			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R23	311-1282-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	32997	3329W-L58-502
R24	315-0471-03			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R25	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R26	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R29	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R39	308-0245-00			RES.,FXD,WW:0.6 OHM,5%,2W	91637	CW-2B30.60HM 5%
R43	308-0245-00			RES.,FXD,WW:0.6 OHM,5%,2W	91637	CW-2B30.60HM 5%
R44	315-0221-03			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R45	315-0221-03			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R46	315-0101-03			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R48	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R49	315-0471-03			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R50	301-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.50W	01121	EB1815
R51	315-0102-03			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R52	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R54	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R57	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R59	321-0274-00			RES.,FXD,FILM:6.98K OHM,1%,0.125W	91637	MFF1816G69800F
R61	321-0244-00			RES.,FXD,FILM:3.4K OHM,1%,0.125W	91637	MFF1816G34000F
R62	321-0298-00			RES.,FXD,FILM:12.4K OHM,1%,0.125W	91637	MFF1816G12401F
R64	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R65	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R72	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R73	301-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.50W	01121	EB7515
R74	311-1264-00			RES.,VAR,NONWIR:1.5K OHM,10%,0.50W	32997	3329P-L58-152
R75	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R76	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R82	308-0809-00			RES.,FXD,WW:1.5K OHM,2%,10W	91637	NS10-B15000G
R112	315-0102-03			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R113	306-0154-00			RES.,FXD,CMPSN:150K OHM,10%,2W	01121	HB1541
R118	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R119	315-0102-03			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R121	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R122	315-0821-03			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R124	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R131	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R132	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R143	301-0560-00			RES.,FXD,CMPSN:56 OHM,5%,0.50W	01121	EB5605
R147	315-0101-03			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R148	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R149	315-0471-03			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R153	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R155	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
R160	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R161	323-0135-00			RES.,FXD,FILM:249 OHM,1%,0.50W	91637	MFF1226G249R0F
R162	323-0135-00			RES.,FXD,FILM:249 OHM,1%,0.50W	91637	MFF1226G249R0F
R164	322-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.25W	75042	CEBT0-1501F
R167	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R171	321-0229-00			RES.,FXD,FILM:2.37K OHM,1%,0.125W	91637	MFF1816G23700F
R172	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R244	308-0365-00			RES.,FXD,WW:1.5 OHM,5%,3W	91637	CW2B-1R500J
R245	308-0677-00			RES.,FXD,WW:1 OHM,5%,2W	75042	BWH-1R000J
R252	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325

A1 MAIN ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R253	315-0102-03			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R254	301-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.50W	01121	EB1815
R255	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R257	321-0328-00			RES.,FXD,FILM:25.5K OHM,1%,0.125W	91637	MFF1816G25501F
R261	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R361	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R365	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R421	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R422	305-0823-00			RES.,FXD,CMPSN:82K OHM,5%,2W	01121	HB8235
R423	321-0378-00			RES.,FXD,FILM:84.5K OHM,1%,0.125W	91637	MFF1816G84501F
R424	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R425	321-0481-03			RES.,FXD,FILM:1M OHM,0.25%,0.125W	91637	HFF1813D10003C
R426	301-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.50W	01121	EB3035
R472	311-1263-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329P-L58-102
R548	321-0257-00			RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
R549	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
R550	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R551	308-0677-00			RES.,FXD,WW:1 OHM,5%,2W	75042	BWH-1R000J
R557	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R562	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R563	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R564	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R565	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R571	315-0102-03			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R572	315-0221-03			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R573	315-0221-03			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R574	308-0677-00			RES.,FXD,WW:1 OHM,5%,2W	75042	BWH-1R000J
R575	315-0102-03			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R576	315-0103-03			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R581	321-0120-00			RES.,FXD,FILM:174 OHM,1%,0.125W	91637	MFF1816G174R0F
R582	301-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.50W	01121	EB4735
R583	309-0058-00			RES.,FXD,FILM:2 OHM,1%,0.50W	91637	A20-2R000F
R584	323-0360-00			RES.,FXD,FILM:54.9K OHM,1%,0.50W	75042	CECT0-5492F
R585	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R586	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R594	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R595	315-0101-03			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R596	315-0103-03			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R597	301-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.50W	01121	EB4735
R623	321-0203-00			RES.,FXD,FILM:1.27K OHM,1%,0.125W	91637	MFF1816G12700F
R626	321-0139-00			RES.,FXD,FILM:274 OHM,1%,0.125W	91637	MFF1816G274R0F
R639	301-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.50W	01121	EB1525
RT255	307-0124-00			RES.,THERMAL:5K OHM,10%	50157	1D1618
RT580	307-0124-00			RES.,THERMAL:5K OHM,10%	50157	1D1618
S221	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
TP14	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
TP29	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
TP81	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
TP172	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
TP621	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
U54	156-0122-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE531T
U126	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U257	156-1149-00			MICROCIRCUIT,LI:OPERATIONAL AMP,JFET INPUT	27014	LF351N
U439	156-0176-00			MICROCIRCUIT,LI:5V REGULATOR	07263	SL22648
U555	156-0071-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	04713	MC1723CL
U569	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U589	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U635	156-1161-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	27014	LM317T
VR18	152-0279-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0279-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				A2 VIDEO/SWEEP ASSEMBLY		
A2	672-0759-01	B010100	B021254	CKT BOARD ASSY:VIDEO/SWEEP	80009	672-0759-01
A2	670-0759-02	B021255		CKT BOARD ASSY:VIDEO/SWEEP	80009	670-0759-02
A2A1	670-4598-06	B010100	B021254	CKT BOARD ASSY:NOT AVAILABLE,SEE A2		
A2A1	670-4598-07	B021255		CKT BOARD ASSY:NOT AVAILABLE,SEE A2	80009	670-4598-07
C13	281-0626-00			CAP.,FXD,CER DI:3.3PF,1%,500V	72982	301-000C0J0339B
C15	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C30	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N031Z5U0105Z
C32	283-0129-00			CAP.,FXD,CER DI:0.56UF,20%,100V	56289	725C7
C73	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N031Z5U0105Z
C79	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C89	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C119	281-0626-00			CAP.,FXD,CER DI:3.3PF,1%,500V	72982	301-000C0J0339B
C129	281-0629-00			CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
C130	283-0077-00			CAP.,FXD,CER DI:330PF,5%,500V	56289	40C94A3
C157	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C177	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C187	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C202	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C214	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C218	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C229	281-0519-00			CAP.,FXD,CER DI:47PF,+/-4.7PF,500V	72982	308-000C0G0470K
C248	290-0718-00			CAP.,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035PE4
C249	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C252	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C253	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C267	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C278	290-0524-00			CAP.,FXD,ELCTLT:4.7UF,20%,10V	90201	TDC475M010EL
C309	281-0662-00			CAP.,FXD,CER DI:10PF,+/-0.5PF,500V	72982	301-000H3M0100D
C325	281-0629-00			CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
C328	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
C336	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
C365	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C371	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C373	285-0683-00			CAP.,FXD,PLSTC:0.022UF,5%,100V	56289	410P22351
C383	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C490	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
CR12	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR13	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR148	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR149	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR168	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR190	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR192	152-0141-02	XB021255		SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR196	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR205	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR241	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR273	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR279	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR306	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR307	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR312	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR340	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR345	152-0071-00	B010100	B021254X	SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865
CR347	152-0071-00	B010100	B021254X	SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865

A2 VIDEO/SWEEP ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR349	152-0071-00			SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865
CR361	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR399	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
J1011	131-0126-00			CONNECTOR,RCPT,:BNC,FEMALE	77820	9663-1 NT-34
J1012	131-0274-00			CONNECTOR,RCPT,:BNC	91836	KC79-67
J1013	131-0274-00			CONNECTOR,RCPT,:BNC	91836	KC79-67
J1015	131-0126-00			CONNECTOR,RCPT,:BNC,FEMALE	77820	9663-1 NT-34
L316	108-0147-00			COIL,RF:FIXED,2.15UH	80009	108-0147-00
Q178	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q223	151-0354-00			TRANSISTOR:SILICON,PNP,DUAL	32293	ITS1200A
Q233	151-0190-02			TRANSISTOR:SILICON,NPN	80009	151-0190-02
Q234	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q272	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
Q295	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q296	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q300	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q301	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q318	151-0190-02			TRANSISTOR:SILICON,NPN	80009	151-0190-02
Q322	151-0232-00			TRANSISTOR:SILICON,NPN,DUAL	80009	151-0232-00
Q343	151-0190-02			TRANSISTOR:SILICON,NPN	80009	151-0190-02
Q344	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q345	151-0188-00	XB021255		TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q444	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q490	151-0281-00			TRANSISTOR:SILICON,NPN	03508	X16P4039
R10	311-1283-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	32997	3329W-L58-103
R12	321-0378-00			RES.,FXD,FILM:84.5K OHM,1%,0.125W	91637	MFF1816G84501F
R14	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R15	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
R18	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
R19	301-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.50W	01121	EB1025
R20	311-1237-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3386X-T07-102
R31	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R33	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
R35	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
R36	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R38	321-0255-00			RES.,FXD,FILM:4.42K OHM,1%,0.125W	91637	MFF1816G44200F
R60	311-1282-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	32997	3329W-L58-502
R63	311-1276-00			RES.,VAR,NONWIR:50 OHM,+/-10%,0.5W	32997	3329W-L58-500
R65	321-0235-00			RES.,FXD,FILM:2.74K OHM,1%,0.125W	91637	MFF1816G27400F
R67	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R69	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R70	311-1285-00			RES.,VAR,NONWIR:25K OHM,10%,0.5W	32997	3329W-L58-253
R75	311-1287-00			RES.,VAR,NONWIR:TRMR,100K OHM,0.50W	32997	3329W-L58-104
R76	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R77	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
R80	311-1283-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	32997	3329W-L58-103
R85	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
R87	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R90	311-1286-00			RES.,VAR,NONWIR:50K OHM,10%,0.5W	32997	3329W-L58-503
R95	315-0562-00	B010100	B021254	RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R95	315-0202-00	B021255		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB1025
R97	315-0363-00			RES.,FXD,CMPSN:36K OHM,5%,0.25W	01121	CB3635
R112	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R113	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R116	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F

A2 VIDEO/SWEEP ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R117	321-0185-09			RES.,FXD,FILM:825 OHM,1%,0.125W	91637	MFF1816C825R0F
R118	321-0185-09			RES.,FXD,FILM:825 OHM,1%,0.125W	91637	MFF1816C825R0F
R119	321-0121-00			RES.,FXD,FILM:178 OHM,1%,0.125W	91637	MFF1816G178R0F
R128	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R136	321-0374-00			RES.,FXD,FILM:76.8K OHM,1%,0.125W	91637	MFF1816G76801F
R139	315-0113-00			RES.,FXD,CMPSN:11K OHM,5%,0.25W	01121	CB1135
R147	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R158	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R159	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R167	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R168	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R169	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R178	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R179	315-0155-00			RES.,FXD,CMPSN:1.5M OHM,5%,0.25W	01121	CB1555
R188	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R192	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R194	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R196	315-0102-00	XB021255		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R197	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R198	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R199	321-0200-00			RES.,FXD,FILM:1.18K OHM,1%,0.125W	91637	MFF1816G11800F
R206	321-0230-00			RES.,FXD,FILM:2.43K OHM,1%,0.125W	91637	MFF1816G24300F
R208	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R209	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R210	321-0121-00			RES.,FXD,FILM:178 OHM,1%,0.125W	91637	MFF1816G178R0F
R211	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R212	321-0130-00			RES.,FXD,FILM:221 OHM,1%,0.125W	91637	MFF1816G221R0F
R219	321-0219-00			RES.,FXD,FILM:1.87K OHM,1%,0.125W	91637	MFF1816G18700F
R227	321-0121-00			RES.,FXD,FILM:178 OHM,1%,0.125W	91637	MFF1816G178R0F
R228	321-0121-00			RES.,FXD,FILM:178 OHM,1%,0.125W	91637	MFF1816G178R0F
R236	321-0157-00			RES.,FXD,FILM:422 OHM,1%,0.125W	91637	MFF1816G422R0F
R237	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R239	321-0299-00			RES.,FXD,FILM:12.7K OHM,1%,0.125W	91637	MFF1816G12701F
R243	315-0114-00			RES.,FXD,CMPSN:110K OHM,5%,0.25W	01121	CB1145
R244	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R245	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R246	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R247	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R261	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R263	321-0347-00			RES.,FXD,FILM:40.2K OHM,1%,0.125W	91637	MFF1816G40201F
R265	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R266	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
R270	321-0409-00			RES.,FXD,FILM:178K OHM,1%,0.125W	91637	MFF1816G17802F
R271	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R275	321-0361-00			RES.,FXD,FILM:56.2K OHM,1%,0.125W	91637	MFF1816G56201F
R276	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R277	321-0361-00			RES.,FXD,FILM:56.2K OHM,1%,0.125W	91637	MFF1816G56201F
R281	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R285	321-0275-00			RES.,FXD,FILM:7.15K OHM,1%,0.125W	91637	MFF1816G71500F
R286	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R287	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R303	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R304	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R308	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R309	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
R310	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R312	321-0156-00			RES.,FXD,FILM:412 OHM,1%,0.125W	91637	MFF1816G412R0F

A2 VIDEO/SWEEP ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R313	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499R0F
R314	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R316	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R325	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
R330	321-0296-00			RES.,FXD,FILM:11.8K OHM,1%,0.125W	91637	MFF1816G11801F
R332	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
R333	321-0219-00			RES.,FXD,FILM:1.87K OHM,1%,0.125W	91637	MFF1816G18700F
R334	321-0235-00			RES.,FXD,FILM:2.74K OHM,1%,0.125W	91637	MFF1816G27400F
R335	321-0156-00			RES.,FXD,FILM:412 OHM,1%,0.125W	91637	MFF1816G412R0F
R341	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R350	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R351	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R352	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R355	315-0103-00	B010100	B021254	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R355	315-0472-00	B021255		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R357	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R359	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R367	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R371	315-0334-00			RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R375	315-0911-00			RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
R377	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R385	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R388	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R389	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R390	301-0101-00	B010100	B021254	RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
R390	303-0151-00	B021255		RES.,FXD,CMPSN:150 OHM,5%,1W	01121	GB1515
R392	301-0101-00	B010100	B021254	RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
R392	303-0151-00	B021255		RES.,FXD,CMPSN:150 OHM,5%,1W	01121	GB1515
R394	301-0101-00	B010100	B021254	RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
R394	301-0750-00	B021255		RES.,FXD,CMPSN:75 OHM,5%,0.50W	01121	EB7505
R395	315-0222-00	XB021255		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R396	301-0101-00	B010100	B021254	RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
R396	301-0750-00	B021250		RES.,FXD,CMPSN:75 OHM,5%,0.50W	01121	EB7505
R397	315-0151-00	B010100	B021254	RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R397	304-0221-00	B021255		RES.,FXD,CMPSN:220 OHM,10%,1W	01121	GB2211
R398	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R399	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
TP41	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
TP65	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
TP276	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
TP300	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
U21	156-0407-00			MICROCIRCUIT,LI:4-QUAD,ANALOG MULT	04713	MC1495L
U171	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U181	156-0356-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0356-00
U255	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U361	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U381	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				A3 TIMING ASSEMBLY		
A3	670-4597-03			CKT BOARD ASSY:TIMING	80009	670-4597-03
C42	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
C84	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C93	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C95	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C111	290-0301-00			CAP.,FXD,ELCTLT:10UF,10%,20V	56289	150D106X9020B2
C146	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C151	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C211	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C248	290-0246-00			CAP.,FXD,ELCTLT:3.3UF,10%,15V	56289	162D335X9015CD2
C261	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C281	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C293	281-0770-00			CAP.,FXD,CER DI:0.001UF,20%,100V	72982	8035D9AADX5R102M
C311	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C341	290-0309-00			CAP.,FXD,ELCTLT:100UF,20%,25V	56289	109D107X0025F2
C361	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
C393	281-0770-00			CAP.,FXD,CER DI:0.001UF,20%,100V	72982	8035D9AADX5R102M
C460	290-0776-00			CAP.,FXD,ELCTLT:22UF,+50-10%,10V	55680	10ULA22V-T
CR42	152-0071-00			SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865
CR214	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR241	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR242	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR244	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR245	152-0075-00			SEMICOND DEVICE:GE,25V,40MA	14433	G866
CR255	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR353	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
Q41	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q94	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q254	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q255	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q312	151-0254-00			TRANSISTOR:SILICON,NPN	80009	151-0254-00
R41	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R42	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R43	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R83	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R96	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R97	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R98	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R112	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R113	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R114	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R115	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R116	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R117	315-0124-00			RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245
R118	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R119	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R141	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R142	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R143	315-0134-00			RES.,FXD,CMPSN:130K OHM,5%,0.25W	01121	CB1345
R144	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R145	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R148	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R161	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R211	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825

A3 TIMING ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R212	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R213	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R243	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R246	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R247	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R252	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R253	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R254	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R256	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R271	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R294	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R341	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R342	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R343	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R344	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R345	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R352	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R353	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R354	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R355	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R356	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R361	315-0134-00			RES.,FXD,CMPSN:130K OHM,5%,0.25W	01121	CB1345
R371	315-0134-00			RES.,FXD,CMPSN:130K OHM,5%,0.25W	01121	CB1345
R381	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
U21	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74LS00(N OR J)
U31	156-0646-00			MICROCIRCUIT,DI:4 BIT BINARY COUNTER	01295	SN74LS93N
U51	156-0646-00			MICROCIRCUIT,DI:4 BIT BINARY COUNTER	01295	SN74LS93N
U61	156-0646-00			MICROCIRCUIT,DI:4 BIT BINARY COUNTER	01295	SN74LS93N
U71	156-0646-00			MICROCIRCUIT,DI:4 BIT BINARY COUNTER	01295	SN74LS93N
U91	156-0072-00			MICROCIRCUIT,DI:MONOSTABLE MV,TTL,14 DIP	80009	156-0072-00
U121	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP,SGL SUPPLY	27014	LM339N
U131	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74LS00(N OR J)
U151	156-0140-00			MICROCIRCUIT,DI:HEX BFR,15V,TTL	80009	156-0140-00
U161	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74LS00(N OR J)
U171	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
U181	156-0480-00			MICROCIRCUIT,DI:QUAD 2-INPUT AND GATE	01295	SN74LS08(N OR J)
U191	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
U195	156-0646-00			MICROCIRCUIT,DI:4 BIT BINARY COUNTER	01295	SN74LS93N
U221	156-0383-00			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	80009	156-0383-00
U231	156-0718-00			MICROCIRCUIT,DI:TRIPLE 3-INP POS-NOR GATES	80009	156-0718-00
U261	156-0646-00			MICROCIRCUIT,DI:4 BIT BINARY COUNTER	01295	SN74LS93N
U271	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
U281	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
U291	156-0072-00			MICROCIRCUIT,DI:MONOSTABLE MV,TTL,14 DIP	80009	156-0072-00
U361	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP,SGL SUPPLY	27014	LM339N
U371	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN74LS00(N OR J)
U381	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
U391	156-0072-00			MICROCIRCUIT,DI:MONOSTABLE MV,TTL,14 DIP	80009	156-0072-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				A4 CONTROL ASSEMBLY		
A4	670-4599-03	B010100	B010239	CKT BOARD ASSY:CONTROL	80009	670-4599-03
A4	670-4599-05	B010240	B010394	CKT BOARD ASSY:CONTROL	80009	670-4599-04
A4	670-4599-06	B010395	B010634	CKT BOARD ASSY:CONTROL	80009	670-4599-06
A4	670-4599-07	B010635		CKT BOARD ASSY:CONTROL	80009	670-4599-07
C27	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
C41	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C43	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C47	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N031Z5U0105Z
C111	290-0509-00			CAP.,FXD,ELCTLT:3000UF,+100-10%,50V	56289	68D10454
C125	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C135	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
C136	290-0778-00			CAP.,FXD,ELCTLT:1UF,+50-10%,50V	54473	ECE-A50N1
C141	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C148	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C154	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C179	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C220	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C227	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C233	281-0788-00			CAP.,FXD,CER DI:470PF,10%,100V	72982	8005H9AADW5R471K
C234	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C272	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C273	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
C292	283-0249-00	XB010240		CAP.,FXD,CER DI:0.068UF,10%,50V	72982	8131N075 C 683K
C294	290-0722-00	B010100	B010239	CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
C240	290-0755-00	B010294		CAP.,FXD,ELCTLT:100UF,+50-10%,10V	56289	502D223
C331	290-0719-00			CAP.,FXD,ELCTLT:47UF,20%,25V	56289	196D476X0025TE3
C332	290-0719-00			CAP.,FXD,ELCTLT:47UF,20%,25V	56289	196D476X0025TE3
C335	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
C347	281-0788-00			CAP.,FXD,CER DI:470PF,10%,100V	72982	8005H9AADW5R471K
C348	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
C353	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C363	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C364	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
CR3	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR4	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR79	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR157	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR160	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR161	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR235	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR237	152-0141-02	XB010240		SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR260	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR263	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR279	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR280	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR281	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR283	152-0141-02	B010100	B010239	SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR283	152-0066-00	B010240		SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR284	152-0141-02	XB010240		SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR286	152-0141-02	XB010240		SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR305	152-0412-00			SEMICOND DEVICE:SILICON,50V,3A	80009	152-0412-00
CR375	152-0075-00			SEMICOND DEVICE:GE,25V,40MA	14433	G866
F301	159-0026-00			FUSE,CARTRIDGE:3AG,3.2A,125V,SLOW-BLOW	71400	MDX 3 2/10

A4 CONTROL ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
L359	108-0406-00			COIL,RF:80UH,TOROIDAL	80009	108-0406-00
L361	108-0406-00			COIL,RF:80UH,TOROIDAL	80009	108-0406-00
Q5	151-0136-00			TRANSISTOR:SILICON,NPN	02735	35495
Q6	151-0136-00			TRANSISTOR:SILICON,NPN	02735	35495
Q11	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q12	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q20	151-0188-00	XB010240		TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q25	151-0503-00	B010100	B010239	SCR:SILICON,TO-92	04713	SCR5138
Q25	151-0192-00	B010240		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
Q71	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
Q73	151-0504-00			TRANSISTOR:SILICON,N-CHAN,UNIJUNCTION	04713	2N4851
Q74	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q193	151-0522-00			TRANSISTOR:SILICON,TRIAC,400V	03508	SC141DX164
Q245	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q246	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q251	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q253	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q311	151-0183-00			TRANSISTOR:SILICON,NPN	80009	151-0183-00
Q315	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q376	151-0190-00	B010100	B010239	TRANSISTOR:SILICON,NPN	07263	S032677
Q376	151-0216-00	B010240		TRANSISTOR:SILICON,PNP	04713	SPS8803
Q377	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q379	151-0192-00	B010100	B010239	TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
Q379	151-0188-00	B010240		TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q392	151-0254-00	B010100	B010239	TRANSISTOR:SILICON,NPN	80009	151-0254-00
Q392	151-0435-00	B010240		TRANSISTOR:SILICON,PNP	07263	S43187
R1	308-0388-00	B010100	B010394	RES.,FXD,WW:47 OHM,5%,3W	91637	RS2B-K47R00J
R1	308-0620-00	B010395		RES.,FXD,WW:27 OHM,1%,3W	91637	RS2B-K47R00J
R13	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R15	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R17	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R19	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R23	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
R29	315-0332-00	XB010240		RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R31	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
R33	321-0265-00			RES.,FXD,FILM:5.62K OHM,1%,0.125W	91637	MFF1816G56200F
R35	315-0244-00			RES.,FXD,CMPSN:240K OHM,5%,0.25W	01121	CB2445
R36	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R41	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R43	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R45	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R48	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R51	321-0155-00			RES.,FXD,FILM:402 OHM,1%,0.125W	91637	MFF1816G402R0F
R53	321-0172-00			RES.,FXD,FILM:604 OHM,1%,0.125W	91637	MFF1816G604R0F
R55	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R57	321-0249-00			RES.,FXD,FILM:3.83K OHM,1%,0.125W	91637	MFF1816G38300F
R59	321-0275-00			RES.,FXD,FILM:7.15K OHM,1%,0.125W	91637	MFF1816G71500F
R61	311-1228-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	32997	3386F-T04-103
R67	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R69	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R73	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R75	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R77	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R79	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
R119	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R120	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045

A4 CONTROL ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R127	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R131	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R134	311-1224-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	32997	3386F-T04-501
R150	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R152	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R156	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R158	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R160	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R166	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R167	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R169	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R171	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R172	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R173	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R175	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R180	308-0272-00	B010100	B010239	RES.,FXD,WW:20K OHM,5%,5W	91637	RS2A-B20001J
R180	308-0212-00	XB010240		RES.,FXD,WW:10K OHM,5%,3W	91637	CW2B-B10001J
R182	308-0212-00	B010240		RES.,FXD,WW:10K OHM,5%,3W	91637	CW2B-B10001J
R231	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R235	321-0205-00	B010100	B010239	RES.,FXD,FILM:1.33K OHM,1%,0.125W	91637	MFF1816G13300F
R235	321-0301-00	B010240		RES.,FXD,FILM:13.3K OHM,1%,0.125W	91637	MFF1816G13301F
R236	321-0218-00	B010100	B010239	RES.,FXD,FILM:1.82K OHM,1%,0.125W	91637	MFF1816G18200F
R236	321-0314-00	B010240		RES.,FXD,FILM:18.2K OHM,1%,0.125W	91637	MFF1816G18201F
R237	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
R241	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R242	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R243	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R247	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R248	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R251	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R258	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R261	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R265	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R270	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R275	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R277	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R279	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R280	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R282	315-0303-00	XB010240		RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R283	315-0303-00	B010100	B010239X	RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R284	315-0512-00	XB010240		RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R291	315-0103-00	B010100	B010239X	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R292	315-0682-00	B010100	B010239X	RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R239	315-0300-00	B010100	B010239X	RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
R294	315-0102-00	B010100	B010239X	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R306	308-0463-00	B010100	B010239	RES.,FXD,WW:0.3 OHM,1%,3W	91637	RS2B-KR3000F
R306	308-0795-00	B010240		RES.,FXD,WW:0.2 OHM,5%,3W	91637	RS2BR2000J
R319	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R320	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R323	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R325	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R327	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R338	315-0363-00	B010100	B010239	RES.,FXD,CMPSN:36K OHM,5%,0.25W	01121	CB3635
R338	315-0124-00	B010240		RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245
R339	315-0334-00	B010100	B010239	RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R339	315-0684-00	B010240		RES.,FXD,CMPSN:680K OHM,5%,0.25W	01121	CB6845
R340	311-1227-00			RES.,VAR,NONWIR:5K OHM,20%,0.50W	32997	3386F-T04-502

A4 CONTROL ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R369	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R390	315-0682-00	XB010240		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R392	315-0103-00	XB010240		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R393	315-0102-00	XB010240		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R394	315-0300-00	XB010240		RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
U135	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U145	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
U179	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U223	156-0105-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM301AN
U279	156-0885-00			MICROCIRCUIT,LI:OPTOELECTRONIC ISOLATOR	04713	SOC123A
U342	156-0072-00			MICROCIRCUIT,DI:MONOSTABLE MV,TTL,14 DIP	80009	156-0072-00
VR121	152-0280-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
VR123	152-0280-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
VR282	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	SZG35009K2
VR371	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	SZG35009K2

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				A5 HIGH VOLTAGE ASSEMBLY		
A5	672-0692-03			CKT BOARD ASSY:HIGH VOLTAGE	80009	672-0692-03
A5A1	670-5408-XX			CKT BOARD ASSY:NOT AVAILABLE,SEE A5		
A5A2	670-5724-XX			CKT BOARD ASSY:NOT AVAILABLE,SEE A5		
C205	285-1138-00			CAP.,FXD,PLSTC:0.01UF,10%,8000V	56289	430P558
C208	285-1112-00			CAP.,FXD,PLSTC:0.1UF,20%,400V	14752	230B1E104
C215	283-0043-00			CAP.,FXD,CER DI:0.0068UF,3000V	56289	41C186A
C236	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N031Z5U0105Z
C251	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C261	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C268	283-0043-00			CAP.,FXD,CER DI:0.0068UF,3000V	56289	41C186A
C269	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C277	290-0117-00			CAP.,FXD,ELCTLT:50UF,+75-10%,50V	56289	30D506G050DD9
C281	283-0043-00			CAP.,FXD,CER DI:0.0068UF,3000V	56289	41C186A
C299	285-1137-00			CAP.,FXD,PLSTC:0.0047UF,10%,8000V	56289	430P472980
C315	285-1136-00			CAP.,FXD,PLSTC:0.001UF,10%,8000V	56289	430P559
C335	283-0043-00			CAP.,FXD,CER DI:0.0068UF,3000V	56289	41C186A
C341	285-1138-00			CAP.,FXD,PLSTC:0.01UF,10%,8000V	56289	430P558
C350	283-0291-00			CAP.,FXD,CER DI:25PF,10%,6000V	56289	41C426
C355	285-1136-00			CAP.,FXD,PLSTC:0.001UF,10%,8000V	56289	430P559
C361	283-0183-00			CAP.,FXD,CER DI:0.045UF,20%,500V	56289	275C10
C365	285-1136-00			CAP.,FXD,PLSTC:0.001UF,10%,8000V	56289	430P559
C395	285-1138-00			CAP.,FXD,PLSTC:0.01UF,10%,8000V	56289	430P558
CR207	152-0429-00			SEMICOND DEVICE:SILICON,5000V,10MA	14099	SA3282
CR208	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR209	152-0429-00			SEMICOND DEVICE:SILICON,5000V,10MA	14099	SA3282
CR211	152-0426-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G2017-1
CR242	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	07263	FDH-6012
CR251	152-0412-00			SEMICOND DEVICE:SILICON,50V,3A	80009	152-0412-00
CR266	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR267	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR268	152-0385-00			SEMICOND DEVICE:SILICON,2000V,100MA	80009	152-0385-00
CR269	152-0385-00			SEMICOND DEVICE:SILICON,2000V,100MA	80009	152-0385-00
CR289	152-0429-00			SEMICOND DEVICE:SILICON,5000V,10MA	14099	SA3282
CR291	152-0429-00			SEMICOND DEVICE:SILICON,5000V,10MA	14099	SA3282
CR259	152-0426-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G2017-1
CR360	152-0426-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G2017-1
CR363	152-0426-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G2017-1
DS373	150-0030-00			LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS	08806	A2B-T
DS374	150-0030-00			LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS	08806	A2B-T
DS375	150-0030-00			LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS	08806	A2B-T
DS385	150-0030-00			LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS	08806	A2B-T
DS390	150-0030-00			LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS	08806	A2B-T
E370	119-0181-00			ARSR,ELEC SURGE:230V,GAS FILLED	80009	119-0181-00
L241	108-0234-00			COIL,RF:130UH	80009	108-0234-00
L278	108-0422-00			COIL,RF:FIXED,82UH	80009	108-0422-00
Q208	151-0443-00			TRANSISTOR:SILICON,PNP	80009	151-0443-00
Q251	151-0334-00			TRANSISTOR:SILICON,NPN	80009	151-0334-00
Q257	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
Q265	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
Q1016	151-0256-00			TRANSISTOR:SILICON,NPN	04713	SJ2304
R208	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R211	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F

A5 HIGH VOLTAGE ASSEMBLY (CONT)

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R212	303-0754-00			RES.,FXD,CMPSN:750K OHM,5%,1W	01121	GB7545
R213	303-0754-00			RES.,FXD,CMPSN:750K OHM,5%,1W	01121	GB7545
R221	311-1214-00			RES.,VAR,NONWIR:200K OHM,20%,0.50W	73138	72-16-0
R222	321-0411-00			RES.,FXD,FILM:187K OHM,1%,0.125W	91637	MFF1816G18702F
R255	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R256	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R261	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R262	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R264	311-1232-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	32997	3386F-T04-503
R265	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R266	321-0431-00			RES.,FXD,FILM:301K OHM,1%,0.125W	91637	MFF1816G30102F
R278	308-0463-00			RES.,FXD,WW:0.3 OHM,1%,3W	91637	RS2B-KR3000F
R310	307-0428-00			RES.,FXD,FILM:100M OHM,10%,1W	03888	FL1-F10005K
R311	315-0243-03			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R325	315-0243-03			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R326	301-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.50W	01121	EB1025
R330	305-0565-00			RES.,FXD,CMPSN:5.6M OHM,5%,2W	01121	HB5655
R332	305-0755-00			RES.,FXD,CMPSN:7.5M OHM,5%,2W	01121	HB7555
R340	311-1312-00			RES.,VAR,NONWIR:5M OHM,20%,1W	32997	81C1D-E24-BA0328
R348	315-0224-01			RES.,FXD,CMPSN:240K OHM,5%,0.25W	01121	CB2245
R352	307-0314-01			RES.,FXD,FILM:VOLTAGE DIVIDER	80009	307-0314-01
R357	315-0472-03			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R358	301-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.50W	01121	EB1035
R359	315-0101-03			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R364	315-0136-01			RES.,FXD,CMPSN:13M OHM,5%,0.25W	01121	CB1365
R368	301-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.50W	01121	EB2225
R371	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R372	301-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.50W	01121	EB6815
R373	301-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.50W	01121	EB2225
R375	301-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.50W	01121	EB2225
R380	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R399	301-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
T231	120-0917-01			XFMR,PWR,SDN&SU:HIGH VOLTAGE	80009	120-0917-01

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
B1024 B1025	147-0039-01			MOTOR,DC:BRUSH,72 W,155 RPM,24V,W/TACH	32480	PP1112-103
BT1003	119-0026-00			FAN,AXIAL:1.500 X 4.750 INCH,WHISPER	82877	WR2A1
CR1001	152-0475-00			SEMICOND DEVICE:RECT,SILICON,50V,12A	80009	152-0475-00
CR1003	152-0274-00			SEMICOND DEVICE:SILICON,100V,10A	80009	152-0274-00
DS1012	----- -----			(FURNISHED AS A UNIT WITH S1002)		
F1001	159-0151-00			FUSE,CARTRIDGE:7A,250V,FAST BLOW	75915	314007
F1001	159-0017-00			FUSE,CARTRIDGE:3AG,4A,250V,FAST BLOW	71400	MTH4
	----- -----			(OPTION 48 ONLY)		
F1002	159-0003-00			FUSE,CARTRIDGE:3AG,1.6A,250V,SLOW-BLOW	71400	MDX 1 6/10
F1002	159-0019-00			FUSE,CARTRIDGE:3AG,1A,250V,SLOW BLOW	71400	MDL1
	----- -----			(OPTION 48 ONLY)		
HR1026	119-0475-03			HEATING ELEM,EL:	80009	119-0475-03
J1050	131-2231-00			JACK,TELEPHONE:2 CONT,CL,1 CONT OPEN	82389	12A
J1052	131-2231-00			JACK,TELEPHONE:2 CONT,CL,1 CONT OPEN	82389	12A
L1012	108-0863-00			COIL,TUBE DEFLE:1.2UH HORIZ,1.48UH VERT	99409	C9895-1
L1020	105-0519-01	B010100	B010394	CLUTCH,MAGNETIC:10VDC,CCW,SELECTED	80009	105-0519-01
L1020	105-0519-02	B010395		CLUTCH,MAGNETIC:12VDC,CCW	63810	501061G
L1022	105-0520-00	B010100	B010394	CLUTCH,MAGNETIC:24VDC,W/SPROCKET ON INPUT	32496	501063
L1022	105-0520-01	B010395		CLUTCH,MAGNETIC:12V	32496	501063F
Q1010	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	04713	SJE924
Q1012	151-0373-00			TRANSISTOR:SILICON,PNP	80009	151-0373-00
Q1026	151-0477-00			TRANSISTOR:SILICON,NPN	01295	EP1425
R1017	311-0326-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	01121	W7683
R1020	311-0387-00			RES.,VAR,NONWIR:5K OHM,20%	01121	W7565A
R1023	311-0310-00			RES.,VAR,NONWIR:5K OHM,20%,0.50W	01121	W-7350A
S1001	260-1497-00			SWITCH,PUSH:DPDT,10A,250VAC	01963	E79-30A
S1002	260-1804-00			SWITCH,ROCKER:DPST,15A,125VAC,ON/OFF	73559	LTGM-0501-GNXTE5
	----- -----			(S1002, ALSO 10A,250VAC)		
S1012	260-1930-00			SWITCH,TOGGLE:SPDT,0.4 VA,20V	09353	7108-J4-ZB8E-2
S1022	260-1876-00			SWITCH,ROTARY:FUNCTION-SPEED SELECTOR	80009	260-1876-00
S1025	----- -----			(FURNISHED AS A UNIT WITH HR1026)		
T1001	120-1115-00			XFMR,PWR,SDN&SU:	80009	120-1115-00
U1020	156-0417-00			MICROCIRCUIT,DI:OPTOELECTRONIC	03508	H13B1
V1	154-0739-00			ELECTRON TUBE:CRT	80009	154-0739-00

Section 7

DIAGRAMS

Symbols and Reference Designators

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

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

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.

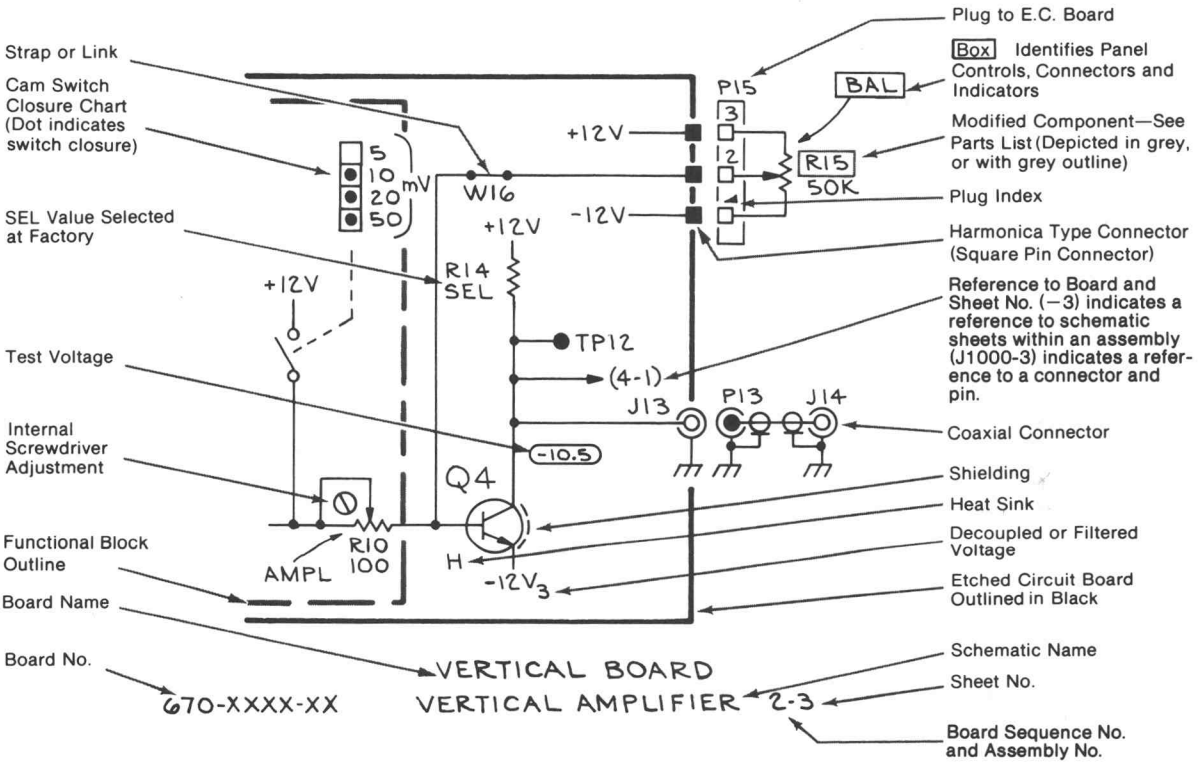
Abbreviations are based on ANSI Y1.1-1972.
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

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.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc)	H	Heat dissipating device (heat sink, heat radiator, etc)	S	Switch or contactor
AT	Attenuator, fixed or variable	HR	Heater	T	Transformer
B	Motor	HY	Hybrid circuit	TC	Thermocouple
BT	Battery	J	Connector, stationary portion	TP	Test point
C	Capacitor, fixed or variable	K	Relay	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CB	Circuit breaker	L	Inductor, fixed or variable	V	Electron tube
CR	Diode, signal or rectifier	M	Meter	VR	Voltage regulator (zener diode, etc.)
DL	Delay line	P	Connector, movable portion	W	Wirestrap or cable
DS	Indicating device (lamp)	Q	Transistor or silicon-controlled rectifier	Y	Crystal
E	Spark Gap, Ferrite bead	R	Resistor, fixed or variable	Z	Phase shifter
F	Fuse	RT	Thermistor		
FL	Filter				

The following special symbols may appear on the diagrams:



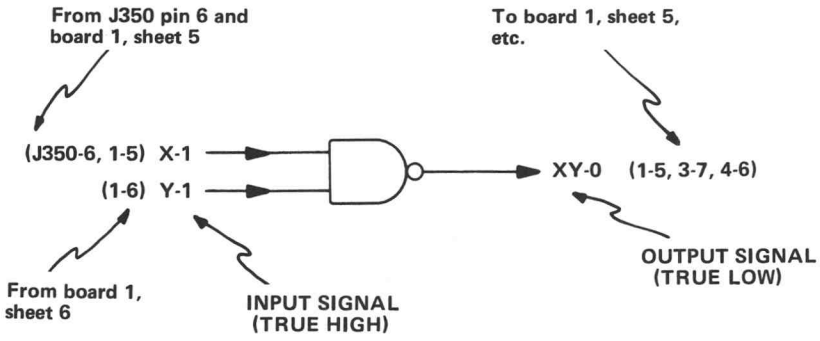
1. TRUE HIGH and TRUE LOW Signals

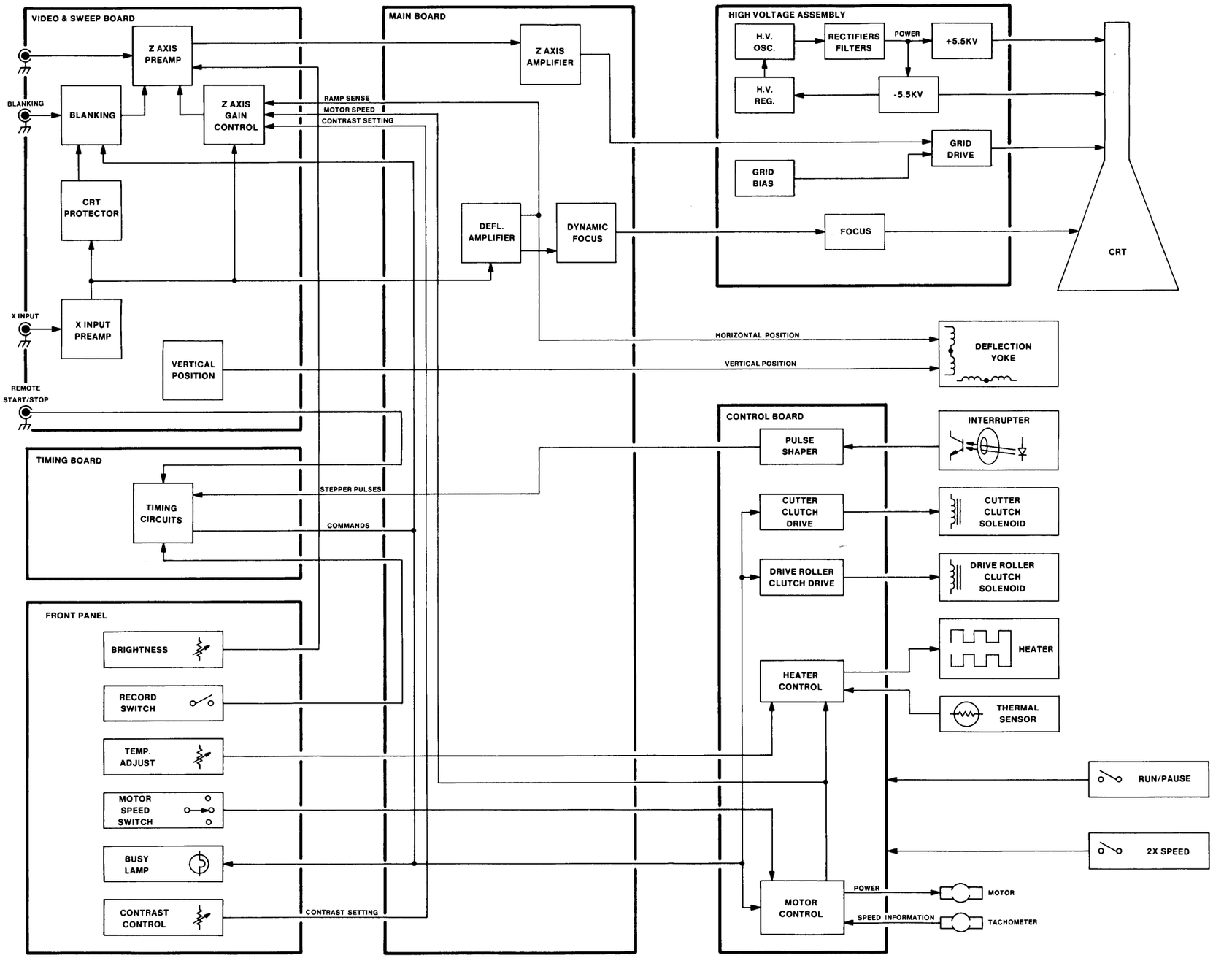
Signal names on the schematics are followed by −1 or −0. A TRUE HIGH signal is indicated by −1, and a TRUE LOW signal is indicated by −0.

SIGNAL−1 = TRUE HIGH
SIGNAL−0 = TRUE LOW

2. Cross-References

Schematic cross-references (from/to information) are included on the schematics. The "from" reference only indicates the signal "source," and the "to" reference lists all loads where the signal is used. All from/to information will be enclosed in parentheses.





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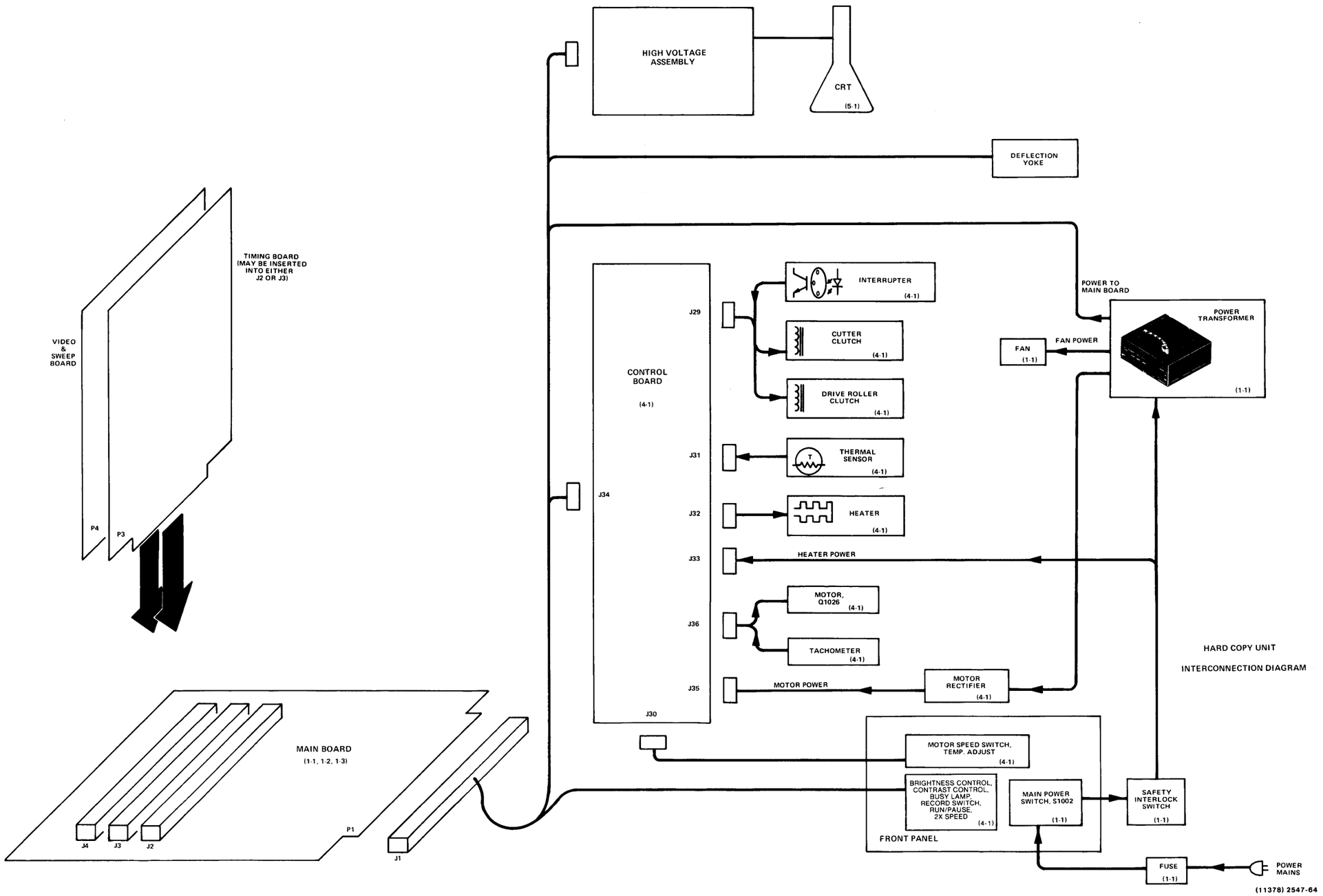
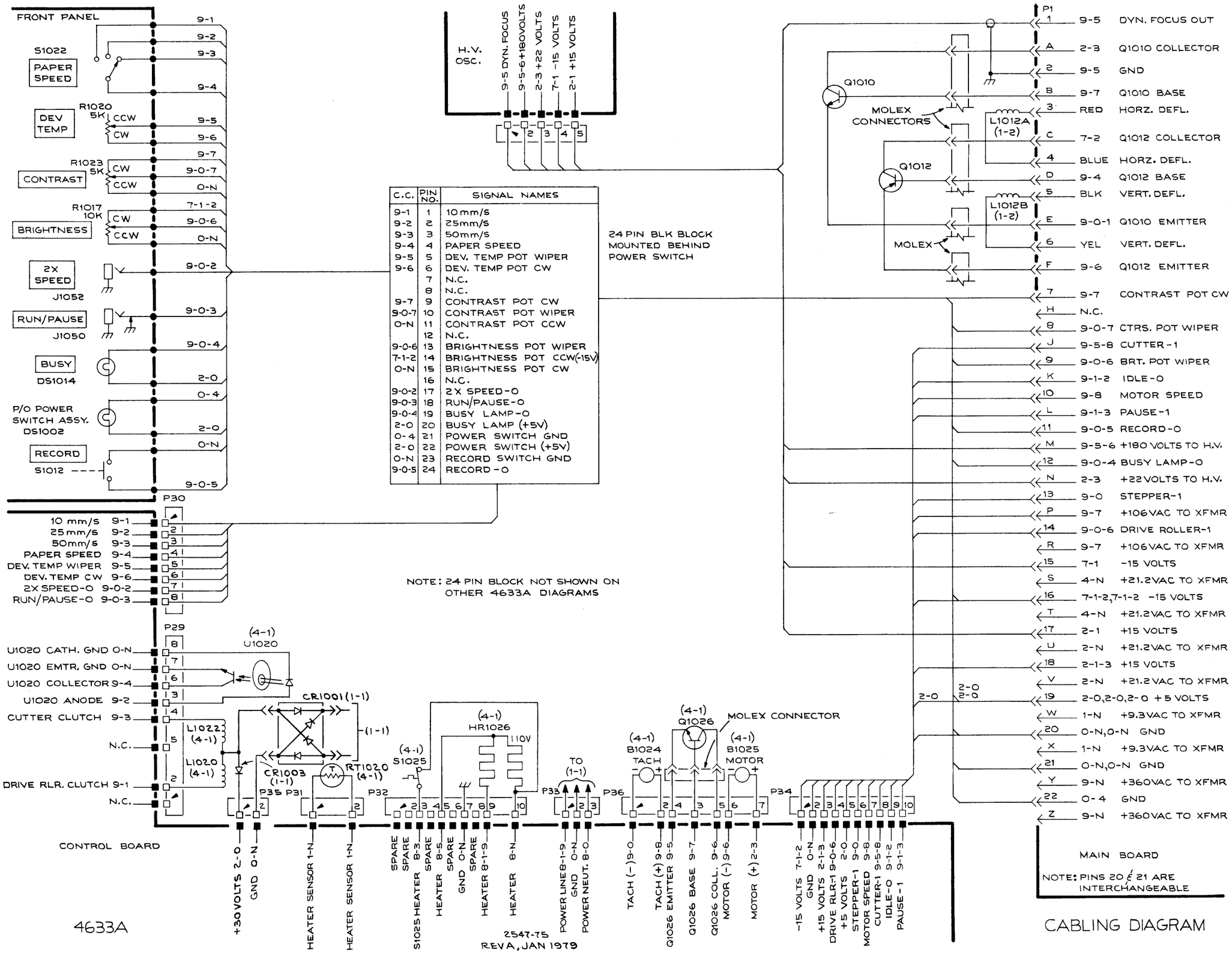
SYSTEM BLOCK DIAGRAM
11137/2547-78

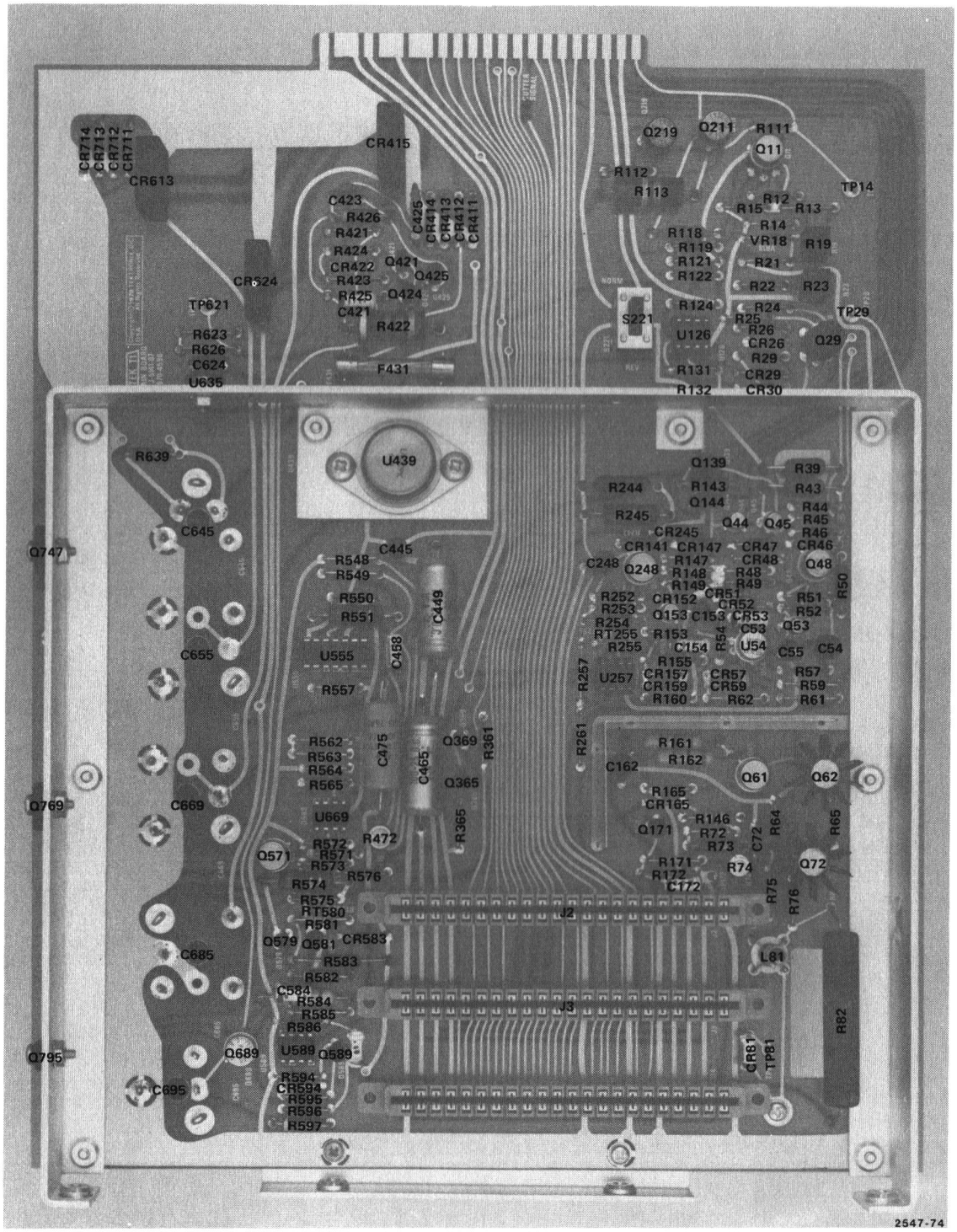

HIGH VOLTAGE ASSEMBLY
CRT
(5-1)
DEFLECTION YOKE
TIMING BOARD (MAY BE INSERTED INTO EITHER J2 OR J3)
VIDEO & SWEEP BOARD
P4
P3
CONTROL BOARD
(4-1)
J29
J31
J34
J32
J33
J36
J35
J30
INTERRUPTER
(4-1)
CUTTER CLUTCH
(4-1)
DRIVE ROLLER CLUTCH
(4-1)
THERMAL SENSOR
(4-1)
HEATER
(4-1)
HEATER POWER
MOTOR, Q1026
(4-1)
TACHOMETER
(4-1)
MOTOR POWER
MOTOR RECTIFIER
(4-1)
POWER TO MAIN BOARD
POWER TRANSFORMER
(1-1)
FAN
(1-1)
FAN POWER
MAIN BOARD
(1-1, 1-2, 1-3)
P1
J4
J3
J2
J1
MOTOR SPEED SWITCH, TEMP. ADJUST
(4-1)
BRIGHTNESS CONTROL, CONTRAST CONTROL, BUSY LAMP, RECORD SWITCH, RUN/PAUSE, 2X SPEED
(4-1)
FRONT PANEL
MAIN POWER SWITCH, S1002
(1-1)
SAFETY INTERLOCK SWITCH
(1-1)
FUSE
(1-1)
POWER MAINS
HARD COPY UNIT
INTERCONNECTION DIAGRAM
(11378) 2547-64



C.C.	PIN NO.	SIGNAL NAMES
9-1	1	10 mm/s
9-2	2	25mm/s
9-3	3	50mm/s
9-4	4	PAPER SPEED
9-5	5	DEV. TEMP POT WIPER
9-6	6	DEV. TEMP POT CW
	7	N.C.
	8	N.C.
9-7	9	CONTRAST POT CW
9-0-7	10	CONTRAST POT WIPER
0-N	11	CONTRAST POT CCW
	12	N.C.
9-0-6	13	BRIGHTNESS POT WIPER
7-1-2	14	BRIGHTNESS POT CCW(-15V)
0-N	15	BRIGHTNESS POT CW
	16	N.C.
9-0-2	17	2X SPEED-O
9-0-3	18	RUN/PAUSE-O
9-0-4	19	BUSY LAMP-O
2-0	20	BUSY LAMP (+5V)
0-4	21	POWER SWITCH GND
2-0	22	POWER SWITCH (+5V)
0-N	23	RECORD SWITCH GND
9-0-5	24	RECORD-O

INDEX
MAIN BOARD

@



Main Board Component Locations (670-4596-05).

Section 8
REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Changes to 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.

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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
S3629	PANEL COMPONENTS CORP.	2015 SECOND ST.	BERKELEY, CA 94170
000AG	INDUSTRIAL GASKET, INC.	1623 SE 6TH	PORTLAND, OR 97214
000AH	STANDARD PRESSED STEEL CO., UNBRAKO DIV.	8535 DICE ROAD	SANTA FE SPRINGS, CA 90670
000AQ	CONNOR SPRING & MFG. COMPANY	1426 SE 6TH	PORTLAND, OR 97214
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214
000EB	AIR-O-PLASTIK	150 FIELDCREST AVENUE	EDISON, NJ 08817
000EH	DURO FOAM PRODUCTS	30518 UNION CITY BLVD.	UNION CITY, CA 94587
000FX	WATERS INDUSTRIES INC.	1306 N.W. 18TH	PORTLAND, OR 97209
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02768	ILLINOIS TOOL WORKS, INC., FASTEX DIV.	195 ALGONQUIN ROAD	DES PLAINES, IL 60016
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
04963	MINNESOTA MINING AND MFG. CO., ADHESIVES COATINGS AND SEALERS DIVISION	3M CENTER	ST. PAUL, MN 55101
05574	VIKING INDUSTRIES, INC.	21001 NORDHOFF STREET	CHATSWORTH, CA 91311
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
06666	GENERAL DEVICES CO., INC.	525 S. WEBSTER AVE.	INDIANAPOLIS, IN 46219
06915	RICHCO PLASTIC CO.	5825 N. TRIPP AVE.	CHICAGO, IL 60646
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
13150	VERNITRON ELECTRICAL COMPONENTS, BEAU PRODUCTS DIVISION	P O BOX 10	LACONIA, NH 03246
14519	DESIGNATRONICS, INC.	55 S. DENTON AVE.	NEW HYDE PARK, NY 11040
18121	WILSHIRE FOAM PRODUCTS, INC.	2665 COLUMBIA ST.	TORRANCE, CA 90503
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
22599	ESNA, DIV. OF AMERACE CORPORATION	16150 STAGG STREET	VAN NUYS, CA 91409
26066	MINNESOTA MINING AND MFG. CO., INDUSTRIAL TAPE DIV.	3M CENTER	ST. PAUL, MN 55101
26365	GRIES REPRODUCER CO., DIV. OF COATS AND CLARK, INC.	125 BEECHWOOD AVE.	NEW ROCHELLE, NY 10802
27264	MOLEX PRODUCTS CO.	5224 KATRINE AVE.	DOWNERS GROVE, IL 60515
27907	PLASTIMATIC, INC.	380 CHESTNUT ST.	NORWOOD, NJ 07648
28520	HEYMAN MFG. CO.	147 N. MICHIGAN AVE.	KENILWORTH, NJ 07033
29440	WINFRED M BERG, INC.	499 OCEAN AVENUE	EAST ROCKAWAY, LI, NY 11518
31223	MICRO PLASTICS, INC.	20821 DEARBORN STREET	CHATSWORTH, CA 91311
32480	JONES MOTROLA CORPORATION	P. O. BOX 825,432 FAIRFIELD AVE.	STAMFORD, CT 06904
32496	PSI, DIV. WARNER ELECTRIC BRAKE AND CLUTCH COMPANY	P O BOX 118	PITMAN, NJ 08071
49671	RCA CORPORATION	30 ROCKEFELLER PLAZA	NEW YORK, NY 10020
50293	GENERAL ELECTRIC COMPANY, INSTALLATION AND SERVICE ENGINEERING DEPT.	1 RIVER ROAD	SCHENECTADY, NY 12306
52831	SALEM STEEL CO., INC.	1720 VARGRAVE	WINSTON SALEM, NC 27102
63810	WARNER ELECTRIC BRAKE AND CLUTCH CO.	449 GARDNER ST.	SOUTH BELOIT, IL 61080
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
72962	ESNA, DIV. OF AMERACE CORPORATION	2330 VAUXHALL ROAD	UNION, NJ 07083
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
74921	ITEN FIBRE CO.,	4001 BENEFIT AVE., P O BOX 9	ASHTABULA, OH 44004
77132	DOT FASTENER CO., A UNITED-CARR DIV. OF TRW INC.	ROUND HOUSE INDL PK,PO BOX 710	WATERBURY, CT 06720
77250	PHEOLL MANUFACTURING CO., DIVISION OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
77342	AMF INC., POTTER AND BRUMFIELD DIV.	200 RICHLAND CREEK DRIVE	PRINCETON, IN 47670
77820	BENDIX CORP., THE, ELECTRICAL COMPONENTS DIVISION	SHERMAN AVE.	SIDNEY, NY 13838
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78553	EATON CORPORATION, ENGINEERED FASTENERS DIVISION, TINNERMAN PLANT	PO BOX 6688,8700 BROOKPARK RD.	CLEVELAND, OH 44101
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
82877	ROTRON, INC.	7-9 HASBROUCK LANE	WOODSTOCK, NY 12498
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
83486	ELCO INDUSTRIES, INC.	1103 SAMUELSON ROAD	ROCKFORD, IL 61101
86445	PENN FIBRE AND SPECIALTY CO., INC.	2032 E. WESTMORELAND ST.	PHILADELPHIA, PA 19134
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
87473	INSULECTRO, A DIVISION OF QUINTEC INDST.	343 CORAL CIRCLE	EL SEGUNDO, CA 90245
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101
94452	BERKLEY AND COMPANY	HWY 9 AND 71	SPIRIT LAKE, IA 51360
95238	CONTINENTAL CONNECTOR CORP.	34-63 56TH ST.	WOODSIDE, NY 11377
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
96904	NATVAR CORP.	211 RANDOLPH AVE.	WOODBRIDGE, NJ 07095
97464	INDUSTRIAL RETAINING RING CO.	57 CORDIER ST.	IRVINGTON, NJ 07111
97913	INDUSTRIAL ELECTRONIC HARDWARE CORP.	109 PRINCE STREET	NEW YORK, NY 10012
98978	INTERNATIONAL ELECTRONIC RESEARCH CORP.	135 W. MAGNOLIA BLVD.	BURBANK, CA 91502

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	200-2234-01			1		COVER,PPR STOR:CENTER,W/HINGE SUPPORT	80009	200-2234-01
						(ATTACHING PARTS)		
-2	213-0124-00			5		SCR,TPG,THD FOR:6-20 X 0.250 INCH,PNH STL	83385	OBD
						- - - * - - -		
-3	334-3446-00			1		MARKER,IDENT:PAPER LOADINGINSTR	80009	334-3446-00
						(ATTACHING PARTS)		
-4	220-0832-00			2		NUT,PLAIN,HEX:4-40 X 0.375 HEX,BRS CAD PL	80009	220-0832-00
						- - - * - - -		
-5	386-4074-00			1		PANEL,OVERLAY:	80009	386-4074-00
						(ATTACHING PARTS)		
-6	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-7	214-2791-00			1		LATCH,COVER:	80009	214-2791-00
						(ATTACHING PARTS)		
-8	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-9	214-2790-00			1		ACTUATOR SW:INTERLOCK	80009	214-2790-00
						(ATTACHING PARTS)		
-10	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-11	200-2233-01			1		COVER,PPR STOR:RIGHT,PAINTED	80009	200-2233-01
						(ATTACHING PARTS)		
-12	210-0457-00			4		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-13	200-2235-01			1		COVER,PPR STOR:LEFT,PAINTED	80009	200-2235-01
						(ATTACHING PARTS)		
	210-0457-00			4		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-14	407-2329-00			1		BRACKET,ANGLE:PAPER COVER,STEEL	80009	407-2329-00
						(ATTACHING PARTS)		
-15	210-0457-00			1		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-16	407-2328-00			1		BRACKET,ANGLE:ARM ASSEMBLY,AL	80009	407-2328-00
						(ATTACHING PARTS)		
-17	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-18	346-0164-00			1		STRAP,GROUNDING:5.0 L	80009	346-0164-00
						(ATTACHING PARTS)		
-19	210-0408-00			2		NUT,PLAIN,HEX.:6-32 X 0.312 INCH,BRS	73743	3040-402
						- - - * - - -		
-20	214-2901-00			1		LINK,ARM ASSY:ALUMINUM	80009	214-2901-00
-21	214-2902-00			1		ARM,PAPER COV:STEEL	80009	214-2902-00
						(ATTACHING PARTS)		
-22	212-0638-00			3		SCREW,CAP.:10-32 X 0.53 HEX,BRASS	80009	212-0638-00
-23	220-0472-00			3		NUT,SLFLKG,HEX:10-32 X 0.375HEX,STL CD PL	22599	22 NTM-02
-24	210-1312-00			6		WASHER,SPRING:0.26 ID X 0.018 THK,STEEL	86928	5808-21-18C1
-25	210-1308-00			2		WASHER,FLAT:0.25 ID X 0.031 THK,FIBER	80009	210-1308-00
-26	210-1309-00			1		WASHER,FLAT:0.25 ID X 0.031 THK,FIBER	80009	210-1309-00
						- - - * - - -		
-27	214-2914-00			1		SPRING,HLEXT:0.5 OD X 4.34L,CROSS LOOP	80009	214-2914-00
-28	407-2178-00			1		BRACKET,RACK MT:RIGHT,ALUMINUM	80009	407-2178-00
						(ATTACHING PARTS)		
-29	212-0023-00			2		SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
						- - - * - - -		
-30	407-2179-00			1		BRACKET,RACK MT:LEFT,ALUMINUM	80009	407-2179-00
						(ATTACHING PARTS)		
-31	212-0023-00			2		SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
						- - - * - - -		
-32	200-2236-00			1		COVER,TOP:	80009	200-2236-00
						(ATTACHING PARTS)		
	212-0023-00			4		SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
						- - - * - - -		
-33	348-0128-00			4		BUMPER,PLASTIC:CABINET MTG,2.022 INCH LONG	80009	348-0128-00
						(ATTACHING PARTS)		
-34	211-0513-00			8		SCREW,MACHINE:6-32 X 0.625 INCH,PNH STL	83385	OBD
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-35	386-4075-00			2		SPACER,PLATE:0.09 X 2.0 X 0.5,ALUMINUM	80009	386-4075-00
-36	407-2174-00			1		BRACKET,ANGLE:CABINET SECT,RIGHT,AL	80009	407-2174-00
-37	407-2175-00			1		BRACKET,ANGLE:CABINET SECT,LEFT,AL	80009	407-2175-00
-38	351-0084-00			PR		SLIDE,DWR,EXT:18.0 X 3.375 L & R	80009	351-0084-00
-39	351-0387-00			PR		SL SECT,DWR EXT:22.0 X 1.75	06666	C-114-14
						(ATTACHING PARTS)		
-40	212-0562-00			8		SCREW,MACHINE:10-32 X 0.875INCH,FLH STL	83385	OBD
	212-0509-00			8		SCREW,MACHINE:10-32 X 0.625INCH,PNH STL	83385	OBD
	----- -----			-		(OPTION 30 ONLY)		
						- - - * - - -		
-41	214-2168-00			1		BUTTON,PLUG:CABINET BOTTOM	77132	XS-48175-K1210
-42	390-0652-01			1		CABINET,BOTTOM:	80009	390-0652-01
-43	380-0553-00			1		HOUSING,FAN:	80009	380-0553-00
						(ATTACHING PARTS)		
-44	211-0507-00			4		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
	346-0164-00	XB010385		1		STRAP,GROUNDING:5.0 L	80009	346-0164-00
						- - - * - - -		
-45	378-2017-00			1		FILTER ELEM:	18121	OBD
-46	214-0762-00			1		GRILLE,METAL:ZINC PLATED STL	82877	20132-2
						(ATTACHING PARTS)		
-47	211-0551-00			4		SCREW,MACHINE:6-32 X 0.562 INCH,PNH STL	83385	OBD
-48	210-0457-00			4		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-49	378-0122-00			1		GRILLE,FAN:	80009	378-0122-00
						(ATTACHING PARTS)		
-50	211-0514-00			4		SCREW,MACHINE:6-32 X 0.750 INCH,PNH STL	83385	OBD
-51	348-0003-00			4		GROMMET,RUBBER:0.312 INCH DIAMETER	70485	1411B6040
-52	166-0030-00			4		SPACER,SLEEVE:0.25 OD X 0.188 INCH LONG	80009	166-0030-00
-53	210-0457-00			4		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-54	119-0026-00			1		FAN,AXIAL:1.500 X 4.750 INCH,WHISPER	82877	WR2A1
-55	175-2307-00			1		CA ASSY,SP,ELEC:2,18 AWG,23.0L	80009	175-2307-00
-56	343-0401-02			2		RETAINER,CABLE:PLASTIC	06915	KKU2
-57	351-0411-00			1		SLIDE,CASSETTE:0.500 INCH OD,PLASTIC	80009	351-0411-00
						(ATTACHING PARTS)		
-58	211-0511-00			1		SCREW,MACHINE:6-32 X 0.500,PNH,STL,CD PL	83385	OBD
-59	210-0457-00			1		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-60	351-0413-00			1		SLIDE,CASSETTE:0.312 INCH OD	80009	351-0413-00
						(ATTACHING PARTS)		
-61	211-0538-00			1		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-62	210-0457-00			1		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-63	351-0412-00			2		SLIDE,GUIDE:CASSETTE UNIT,BRONZE	80009	351-0412-00
						(ATTACHING PARTS)		
-64	211-0538-00			2		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-65	351-0410-00			1		SLIDE:CASSETTE UNIT	80009	351-0410-00
-66	200-2266-00			1		COVER,ACCESS:MOTOR	80009	200-2266-00
						(ATTACHING PARTS)		
-67	211-0507-00			3		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-68	366-1026-00			1		KNOB:ROUND	80009	366-1026-00
-69	366-1207-00			1		KNOB:GRAY	80009	366-1207-00
-70	333-2472-00			1		PANEL,FRONT:	80009	333-2472-00
						(ATTACHING PARTS)		
-71	211-0101-00			4		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-72	407-2268-00			1		BRACKET,ANGLE:CHASSIS,AL	80009	407-2268-00
						(ATTACHING PARTS)		
-73	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		

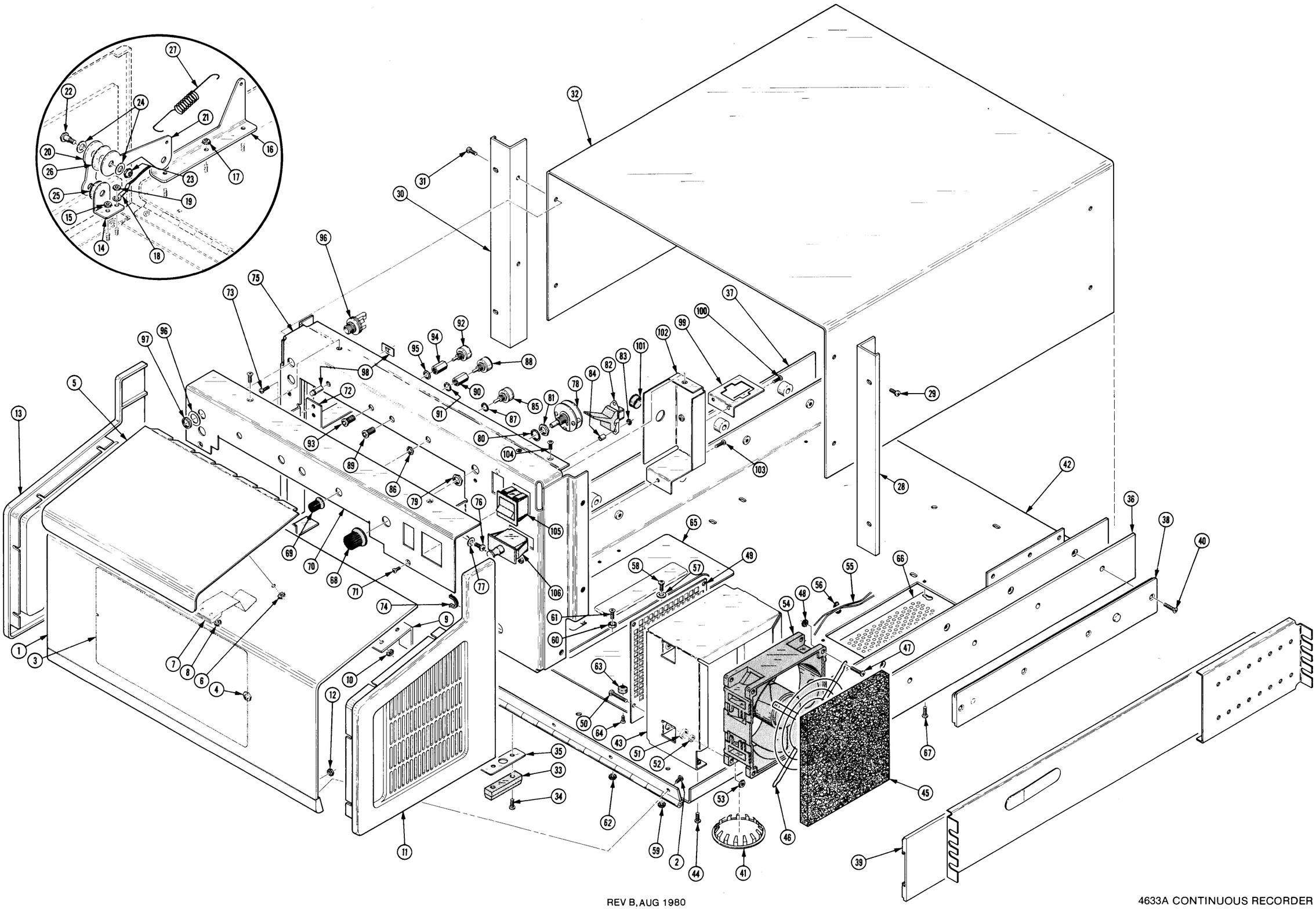

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FIG. 2 CASSETTE

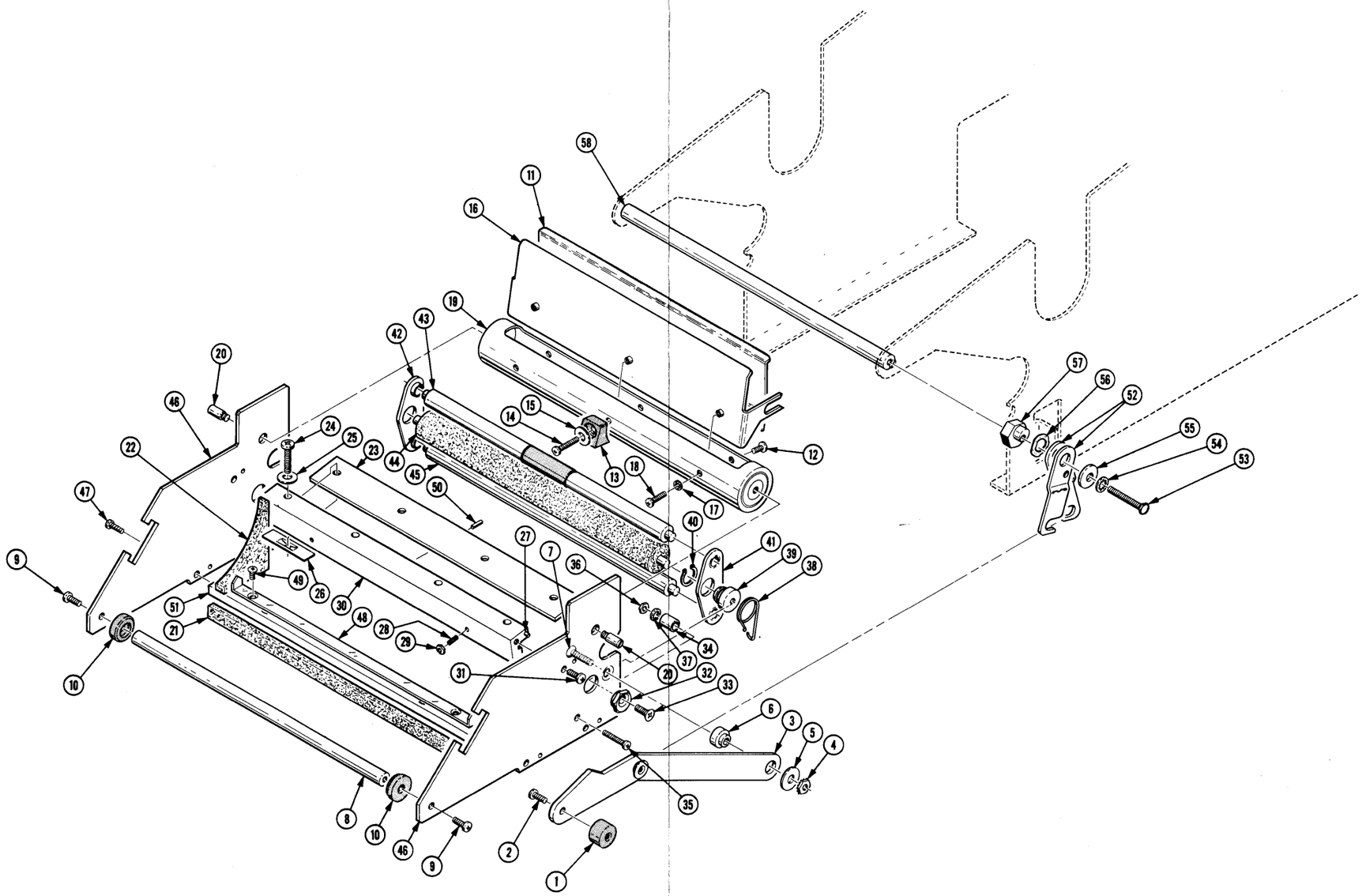


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-	640-0512-00			1		CASSETTE ASSY:	80009	640-0512-00
-1	385-0101-00			2		. INSULATOR,STDF:0.375 L W/8-32 THD THRU,NYL	80009	385-0101-00
						(ATTACHING PARTS)		
-2	212-0023-00			2		. SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
						- - - * - - -		
-3	214-1936-00			2		. ARM,LATCH:CASSETTE HOLDER,RIGHT	80009	214-1936-00
						(ATTACHING PARTS)		
-4	220-0410-00			2		. NUT,EXTENDED WA:10-32 X 0.375 INCH,STL	83385	OBD
-5	210-1061-00			2		. WASHER,FLAT:0.203 ID X 0.062 THK,STL CD	12327	OBD
-6	358-0506-00			2		. BUSHING,HANDLE:0.500 INCH DIAMETER	80009	358-0506-00
-7	212-0624-00			2		. SCREW,MACHINE:10-32 X 0.750,FLH,100 DEG	83385	OBD
						- - - * - - -		
-8	384-0957-00			1		. ROD,SPACER:0.375 OD X 9.8 INCH LONG	80009	384-0957-00
						(ATTACHING PARTS)		
-9	212-0023-00			2		. SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
-10	361-0654-00			2		. SPACER,DISK:CASSETTE CENTERING	80009	361-0654-00
						- - - * - - -		
-11	351-0502-00			1		. GUIDE,PAPER:FRONT	80009	351-0502-00
						(ATTACHING PARTS)		
-12	211-0542-00			2		. SCREW,MACHINE:6-32 X 0.312 INCH,TRH STL	83385	OBD
						- - - * - - -		
-13	105-0591-00			1		. STOP,RTRY KNIFE:	80009	105-0591-00
						(ATTACHING PARTS)		
-14	211-0514-00			1		. SCREW,MACHINE:6-32 X 0.750 INCH,PNH STL	83385	OBD
-15	210-0852-00			1		. WASHER,FLAT:0.188 ID X 0.091 THK,STL CD	12327	OBD
						- - - * - - -		
-16	351-0393-00			1		. GUIDE,PAPER:CASSETTE,FRONT	80009	351-0393-00
						(ATTACHING PARTS)		
-17	211-0513-00			2		. SCREW,MACHINE:6-32 X 0.625 INCH,PNH STL	83385	OBD
-18	210-0055-00			2		. WASHER,LOCK:SPLIT,0.145 ID X 0.253 OD,STL	83385	OBD
						- - - * - - -		
-19	214-1935-01	B010100	B010474	1		. BLADE,PAPER CTR:ROTARY	80009	214-1935-01
	214-1935-02	B010475		1		. BLADE,PAPER CTR:ROTARY,CHECKED	80009	214-1935-02
						(ATTACHING PARTS)		
-20	384-1429-00			2		. SHAFT,STRAIGHT:ROTARY CUTTER	80009	384-1429-00
						- - - * - - -		
-21	348-0382-00			2		. GASKET:LIGHT SEAL,TOP AND BOTTOM	80009	348-0382-00
-22	348-0402-00			2		. GASKET:LIGHT SEAL,SIDES	80009	348-0402-00
-23	214-1934-00			1		. BLADE,PAPER CTR:STATIONARY	80009	214-1934-00
						(ATTACHING PARTS)		
-24	212-0626-00			4		. SCREW,MACHINE:10-24 X 0.875L,PNH,STL	000AH	OBD
-25	210-1227-00			4		. WASHER,FLAT:0.203 ID X 0.50 INCH OD,STL	12327	OBD
-26	220-0784-00			4		. NUT,SHEET SPR:10-24 X 1.138X 0.375,STL	78553	C71011-022-67
						- - - * - - -		
-27	214-1968-00			2		. PIN,SPRING:0.125 OD X 0.375"L,POLARIZING	72962	59-028-125-0375
-28	213-0256-00			2		. SETSCREW:6-32 X 0.375 STL,HEX SKT,CUPPT	74445	OBD
-29	210-0407-00			2		. NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-30	386-2745-00			1		. SPRT,PPR CTR BL:	80009	386-2745-00
						(ATTACHING PARTS)		
-31	212-0023-00			2		. SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
						- - - * - - -		
-32	401-0282-00			2		. CAM,ADJUSTING:ROLLER ASSEMBLY	80009	401-0282-00
						(ATTACHING PARTS)		
-33	212-0613-00			2		. SCREW,MACHINE:10-32 X 0.5 FLH,100 DEG,STL	000BK	OBD
						- - - * - - -		
-34	361-0100-00			2		. POST,ELEC-MECH:0.420 INCH LONG	80009	361-0100-00
						(ATTACHING PARTS)		
-35	211-0516-00			2		. SCREW,MACHINE:6-32 X 0.875 INCH,PNH STL	83385	OBD
-36	210-0407-00			2		. NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-37	210-0055-00			2		. WASHER,LOCK:SPLIT,0.145 ID X 0.253 OD,STL	83385	OBD
						- - - * - - -		
-38	214-2749-00			1		. SPR,HLCL,TRNS:0.75 ID,0.22 L,LEFT	80009	214-2749-00
	214-2750-00			1		. SPR,HLCL,TRSN:0.75 ID,0.22 L,RIGHT	80009	214-2750-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-39	401-0281-00			2		. BEARING:0.625 INCH DIA,ROLLER ASSY SUPPORT	80009	401-0281-00
						(ATTACHING PARTS)		
-40	354-0459-00			2		. RING,RETAINING:FOR 0.50 INCH DIA SHAFT	97464	3100-50STCD
						- - - * - - -		
-41	401-0234-00			1		. BRG,ROLLER ASSY:RIGHT,2.130 INCH LONG	80009	401-0234-00
-42	401-0233-00			1		. BRG,ROLLER ASSY:LEFT,2.130 INCH LONG	80009	401-0233-00
-43	401-0377-00			1		. ROLLER,PAPER:0.438 OD X 9.585 L,SS7	80009	401-0377-00
-44	401-0280-00			1		. ROLLER,PRESSURE:0.840 OD X 9.45 INCH LONG	000EH	OBD
-45	214-1938-00			1		. ROLLER,PAPER:IDLER	80009	214-1938-00
-46	426-1087-00			2		. FRAME SECT,CAB.:CASSETTE HOLDER L AND R	80009	426-1087-00
						(ATTACHING PARTS)		
-47	211-0510-00			2		. SCREW,MACHINE:6-32 X 0.375,PNH,STL,CD PL	83385	OBD
						- - - * - - -		
-48	105-0633-00			1		. STOP,CASSETTE:9.100 INCH LONG	80009	105-0633-00
						(ATTACHING PARTS)		
-49	211-0538-00			2		. SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-50	214-1968-00			6		. PIN,SPRING:0.125 OD X 0.375"L,POLARIZING	72962	59-028-125-0375
-51	426-1084-01			1		. FR SECT,CASSETT:BOTTOM	80009	426-1084-01
-52	214-1933-00			4		ARM,CASSETTE:LATCHING	80009	214-1933-00
						(ATTACHING PARTS)		
-53	212-0520-00			2		SCREW,MACHINE:10 X 32 X 1.25,HEX HD,STL	83385	OBD
-54	210-0010-00			2		WASHER,LOCK:INT,0.20 ID X0.376" OD,STL	78189	1210-00-00-0541C
-55	210-1061-00			2		WASHER,FLAT:0.203 ID X 0.062 THK,STL CD	12327	OBD
-56	210-0077-00			2		WASHER,SPR TNSN:0.375 ID X 0.0025 OD	78189	3515-20-19-1744
-57	401-0243-00			2		CAM,ADJUSTING:HANDLE LATCH,0.665 INCH LONG	80009	401-0243-00
						- - - * - - -		
-58	384-0961-00			1		ROD,SPACER:RIGHT	80009	384-0961-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-	640-0212-00	B010100	B010479	1		CONVEYOR ASSY:	80009	640-0212-00
	640-0212-01	B010480		1		CONVEYOR ASSY:	80009	640-0212-01
-1	386-4001-00	B010100	B010479	1		. PLATE,CONVEYOR:LEFT,AL	80009	386-4001-00
	386-4001-01	B010480		1		. PLATE,CONVEYOR:LEFT,AL	80009	386-4001-01
						(ATTACHING PARTS)		
-2	211-0507-00			2		. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-3	386-4002-00	B010100	B010479	1		. PLATE,CONVEYOR:RIGHT,AL	80009	386-4002-00
	386-4002-01	B010480		1		. PLATE,CONVEYOR:RIGHT,AL	80009	386-4002-01
						(ATTACHING PARTS)		
-4	211-0507-00			2		. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-5	351-0570-00			1		. GUIDE,PAPER:CONVEYOR	80009	351-0570-00
						(ATTACHING PARTS)		
-6	211-0507-00			4		. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-7	436-0151-01			1		. TRAY,PAPER:CONVEYOR,W/GUIDES	80009	436-0151-01
						(ATTACHING PARTS)		
-8	211-0507-00			2		. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-9	401-0458-00			2		. GEAR,SPUR:20 TEETH,W/SETSCREW	27907	OBD
-10	401-0459-00			1		. GEAR,SPUR:80 TEETH,W/SETSCREW	27907	OBD
-11	384-1538-00			1		. SHAFT,PULLEY:10.39 L X 0.312 OD,SST	80009	384-1538-00
-12	384-1537-00			1		. SHAFT,PULLEY:11.29 L X 0.312 OD,SST	80009	384-1537-00
-13	361-0971-00			2		. SPACER,SLEEVE:0.75 L X 0.316 ID,ACETAL	80009	361-0971-00
-14	384-1539-00	B010100	B010374	2		. SHAFT,ROLLER:9.35 L X 0.312 OD,AL	80009	384-1539-00
	384-1539-00	B010375		1		. SHAFT,ROLLER:9.35 L X 0.312 OD,AL	80009	384-1539-00
						(ATTACHING PARTS)		
-15	212-0023-00	B010100	B010374	4		. SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
	212-0023-00	B010375		2		. SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
-16	361-0972-00	B010100	B010374	2		. SPACER,SLEEVE:0.75 L X 0.315 ID,ACETAL	80009	361-0972-00
	361-0972-00	B010375	B010479	1		. SPACER,SLEEVE:0.75 L X 0.315 ID,ACETAL	80009	361-0972-00
	361-0972-01	B010480		1		. SPACER,SLEEVE:0.75 L X 0.315 ID,ACETAL	80009	361-0972-01
-17	351-0599-00			2		. GUIDE,PAPER:CONVEYOR EXIT,AL	80009	351-0599-00
-18	401-0452-00	B010100	B010479	6		. PULLEY,FLAT:AL,0.715 OD X 0.875 THK	80009	401-0452-00
	401-0452-01	B010480		6		. PULLEY,FLAT:AL,0.715 OD X 0.875 THK	80009	401-0452-01
	213-0004-00			6		. SETSCREW:6-32 X 0.188 INCH,HEX.SOC STL	74445	OBD
-19	354-0381-00	B010100	B010374	8		. RING,RETAINING:EXT CRESCENT,U/O 0.312 DIA	79136	5103-31SMD
	354-0381-00	B010375		6		. RING,RETAINING:EXT CRESCENT,U/O 0.312 DIA	79136	5103-31SMD
-20	214-2916-00	B010100	B010479	5		. BELT,FLAT:0.5 W X 0.04 THK X 17.0 L	80009	214-2916-00
	214-3054-00	B010480		5		. BELT,FLAT:0.5 X 17.0 X 0.02 NEOPRENE		
-21	214-2916-01	B010100	B010479	1		. BELT,FLAT:0.5W X 0.04 THK X 17.0 L	80009	214-2916-01
	214-3055-00	B010480		1		. BELT,FLAT:0.5 X 17.0 X 0.02 NEOPRENE		
-22	401-0457-00	B010100	B010479	2		. PULLEY,FLAT:SST,0.5 OD X 9.515 L	80009	401-0457-00
-22.1	426-1714-00	B010480		2		. MOUNT,HOLDER:9.35 L,ALUMINUM	80009	426-1714-00
						(ATTACHING PARTS)		
-22.2	211-0538-00	XB010480		4		. SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-22.3	211-0507-00	XB010480		4		. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-22.4	352-0582-00	XB010480		7		. HOLDER,PULLEY:1.75 L X 1.358 W,BLK PLSTC	80009	352-0582-00
						(ATTACHING PARTS)		
-22.5	211-0542-00	XB010480		14		. SCREW,MACHINE:6-32 X 0.312 INCH,TRH STL	83385	OBD
						- - - * - - -		
-22.6	214-3035-00	XB010480		7		. PULLEY,FLAT:W/PIN,ALUMINUM	80009	214-3035-00
	640-0522-00			1		PROCESSOR ASSY:	80009	640-0522-00
						(ATTACHING PARTS)		
-23	212-0535-00			4		SCREW,MACHINE:10-32 X 0.312 INCH,TRH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. PROCESSOR ASSY INCLUDES:		
-24	351-0583-00			1		. GUIDE,PAPER:PROCESSOR	80009	351-0583-00
-25	386-2791-01			1		. PLATE,PROCESSOR:TOP	80009	386-2791-01
						(ATTACHING PARTS)		
-26	211-0661-00			4		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH,STL	83385	OBD
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-27	342-0217-00			1		. INSUL,PROCESSOR:UPPER,FIBERGLASS	80009	342-0217-00
-28	342-0226-00			1		. INSULATOR:PROCESSOR,UPPER,9 X 9 INCH	80009	342-0226-00
-29	401-0347-00			1		. CHAIN,ROLLER:2.125 FT L,NO. 25,STEEL	80009	401-0347-00
-30	401-0266-00			1		. SPROCKET,WHEEL:21 TEETH	14519	6T7-2521
-31	401-0266-00			2		. SPROCKET,WHEEL:21 TEETH	14519	6T7-2521
	214-2279-00			8		. WICK,OIL:0.156 OD X 0.25 INCH LONG	000AG	OBD
-32	401-0268-00			1		. GEAR,SPUR:96 TEETH	80009	401-0268-00
	213-0126-00			1		. . SETSCREW:6-32 X 0.25,STL BLK OXD,HEX	74445	OBD
-33	210-0963-00			1		. WASHER,FLAT:0-25 ID X 0.500 INCH OD,PLSTC	80009	210-0963-00
-34	401-0265-00			1		. SPROCKET,WHEEL:15 TEETH	80009	401-0265-00
-35	401-0316-00			8		. BEARING,ROLLER:PAPER EJECTOR	80009	401-0316-00
						(ATTACHING PARTS)		
-36	212-0533-00			6		. SCREW,MACHINE:10-24 X 0.312 INCH,TRH STL	83385	OBD
						- - - * - - -		
-37	384-1224-02			2		. SPACER,ROD:9.08 L,W/8-32THO EA END,AL	80009	384-1224-02
						(ATTACHING PARTS)		
-38	212-0008-00			4		. SCREW,MACHINE:8-32 X 0.500 INCH,PNH STL	83385	OBD
						- - - * - - -		
-39	384-0919-00			1		. ROD,SPACER:0.325 OD X 9.07 INCH LONG	80009	384-0919-00
						(ATTACHING PARTS)		
-40	211-0512-00			2		. SCREW,MACHINE:6-32 X 0.50" 100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-41	214-1969-01			1		. BELT,HEATER:7.0 OD X 6.901 ID,SILICONE	80009	214-1969-01
-42	401-0235-02			1		. ROLLER,BELT:REAR,W/PHENOLIC INSERT	80009	401-0235-02
-43	401-0236-01			1		. ROLLER,BELT:FRONT,11.43" L,W/PHEN INSUL	80009	401-0236-01
-44	401-0255-01			1		. ROLLER,BELT:IDLER,9.81" LG,W/PHEN INSUL	80009	401-0255-01
	253-0200-00			RL		. LINE,NYLON:MONOFILAMENT	94452	OBD
-45	351-0582-00			1		. GUIDE,PAPER:PROCESSOR ENTRANCE	80009	351-0582-00
						(ATTACHING PARTS)		
-46	211-0661-00			2		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH,STL	83385	OBD
-47	213-0044-00			2		. SCR,TPG,THD FOR:5-32 X 0.188 INCH,PNH STL	83385	OBD
-48	210-0803-00			2		. WASHER,FLAT:0.15 ID X 0.032 THK,STL CD PL	12327	OBD
						- - - * - - -		
-49	378-2023-00			1		. BAFFLE,AIR:	000FX	OBD
-50	386-2789-02			1		. PLATE,PROCESSOR:	80009	386-2789-02
						(ATTACHING PARTS)		
-51	211-0661-00			4		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH,STL	83385	OBD
						- - - * - - -		
-52	119-0475-03			1		. HEATING ELEM,EL:	80009	119-0475-03
						(ATTACHING PARTS)		
-53	210-0586-00			2		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
-54	210-0994-00			2		. WASHER,FLAT:0.125 ID X 0.25" OD,STL	86928	5714-147-20N
						- - - * - - -		
-55	351-0397-00			1		. GUIDE,PAPER:PROCESSOR,REAR	80009	351-0397-00
						(ATTACHING PARTS)		
-56	211-0661-00			2		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH,STL	83385	OBD
						- - - * - - -		
-57	426-1043-00			1		. FRAME SECTION:PROCESSOR,LEFT	80009	426-1043-00
-58	426-1089-00			1		. FRAME SECTION:PROCESSOR,RIGHT	80009	426-1089-00
	198-2550-00			1		. WIRE SET,ELEC:	80009	198-2550-00
-59	210-0287-00			1		. . TERMINAL,LUG:# 6 RING	00779	34142
-60	352-0169-01			1		. . HLDR TERM CONN:2 WIRE,BROWN	80009	352-0169-01
-61	131-0621-00			3		. . CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
-62	352-0206-02			1		. . CONN BODY,PL,EL:10 WIRE RED	80009	352-0206-02
-63	131-0707-00			2		. . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439

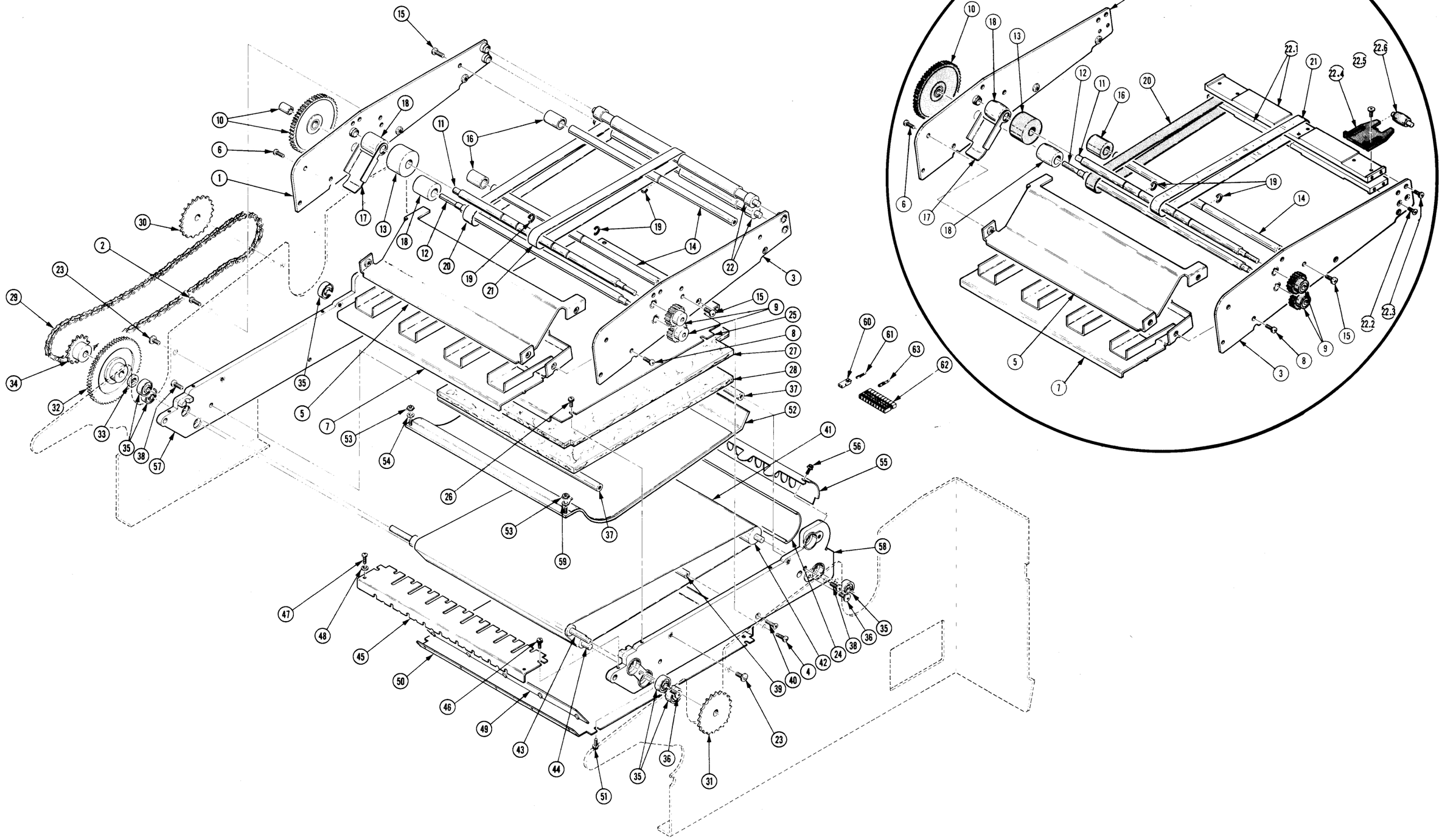


FIG. 3 CONVEYOR & PROCESSOR

FIG. 4 MAINFRAME

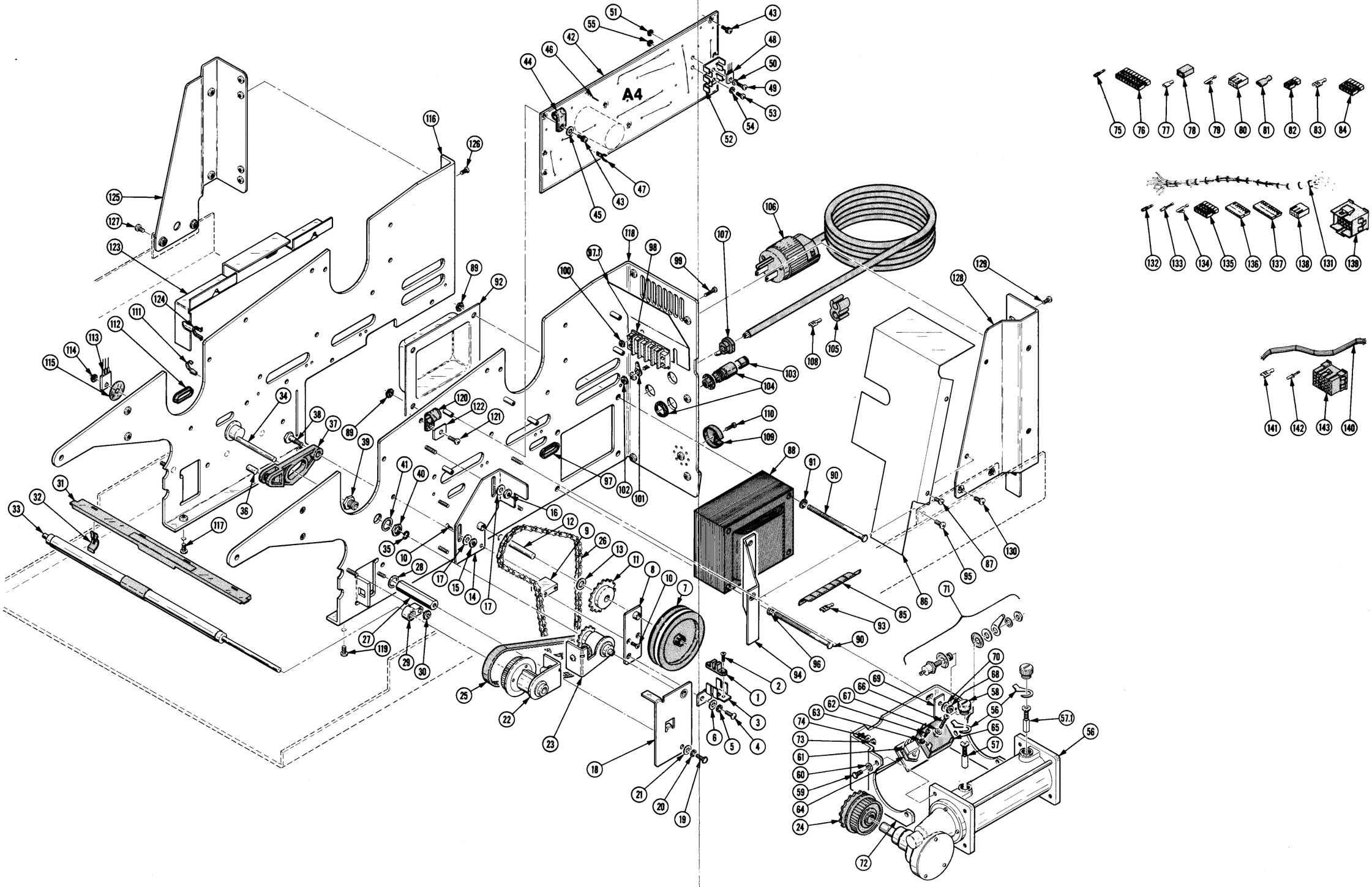


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
4-1	----- -----			1		MICROCIRCUIT,DI:OPTOELECTRONIC(SEE U1020 EPL)		
						(ATTACHING PARTS)		
-2	213-0107-00			2		SCR,TPG,THD FOR:4-40 X 0.25 INCH,FLH STL	93907	OBD
						- - - * - - -		
	162-0503-00			FT		INSUL SLVG,ELEC:0.042 ID,POLYEST,FIBERGL	83309	OBD
-3	407-1857-00			1		BRACKET,INTRPT:ALUMINUM	80009	407-1857-00
						(ATTACHING PARTS)		
-4	212-0099-00			1		SCREW,MACHINE:8-32 X 0.5 HEX HD,STL	83486	OBD
-5	210-0069-00			1		WASHER,LOCK:0.168 ID X 0.293 " OD,SPLIT,STL	83385	OBD
-6	210-0864-00			1		WASHER,FLAT:0.188 ID X 0.05 THK,STL	12327	OBD
						- - - * - - -		
-7	401-0368-00			1		ROTOR,INTRPT:	80009	401-0368-00
-8	352-0467-00			1		HOLDER,BEARING:ALUMINUM	80009	352-0467-00
-9	220-0791-00			1		NUT BLOCK:(2)6-32 THRU,0.75 X 0.69 X 0.312	80009	220-0791-00
						(ATTACHING PARTS)		
-10	211-0538-00			4		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-11	401-0264-01			1		SPROCKET,WHEEL:19 TEETH,FIBERGLASS	14519	6T7-2519
-12	384-1450-00			1		SHAFT,INTRPT:1.85 L X 0.249 OD,SST	80009	384-1450-00
-13	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-14	407-1858-00			1		BRACKET,ANGLE:CHAIN TENSIONER,ALUMINUM	80009	407-1858-00
						(ATTACHING PARTS)		
-15	210-0415-00			1		NUT,PLAIN,HEX.:10-24 X 1.25 INCH,BRS	80009	210-0415-00
-16	220-0410-00			1		NUT,EXTENDED WA:10-32 X 0.375 INCH,STL	83385	OBD
-17	210-0805-00			2		WASHER,FLAT:0.204 ID X 0.438 INCH OD,STL	12327	OBD
						- - - * - - -		
-18	407-1674-00			1		BRACKET,CLUTCH:ALUMINUM	80009	407-1674-00
						(ATTACHING PARTS)		
-19	212-0099-00			1		SCREW,MACHINE:8-32 X 0.5 HEX HD,STL	83486	OBD
-20	210-0804-00			1		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
-21	210-0864-00			1		WASHER,FLAT:0.188 ID X 0.05 THK,STL	12327	OBD
						- - - * - - -		
-22	105-0519-01	B010100	B010394	1		CLUTCH,MAGNETIC:10VDC,CCW,SELECTED	80009	105-0519-01
	105-0519-02	B010395		1		CLUTCH,MAGNETIC:12VDC,CCW	63810	501061G
-23	105-0520-00	B010100	B010394	1		CLUTCH,MAGNETIC:24VDC,W/SPROCKET ON INPUT	32496	501063
	105-0520-01	B010395		1		CLUTCH,MAGNETIC:12V	32496	501063F
-24	401-0241-00			1		PULLEY,GROOVE:MOTOR W/SPROCKET	80009	401-0241-00
	213-0006-00			1		. SETSCREW:8-32 X 0.188 INCH,HSS STL	50293	28701-98C-3B
-25	401-0261-00			1		BELT,POS DRIVE:40 DP,153 TEETH	14519	GRG-153-025
-26	401-0348-00			1		CHAIN,ROLLER:1.583 FEET,NO.25,STL	29440	RC25-72
-27	129-0560-00			1		POST,ELEC-MECH:0.375 HEX X 2.09 LONG	80009	129-0560-00
						(ATTACHING PARTS)		
-28	210-0008-00			1		WASHER,LOCK:INTL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-0541C
						- - - * - - -		
-29	352-0395-01			2		HOLDER,BEARING:W/BEARING	80009	352-0395-01
						(ATTACHING PARTS)		
-30	210-0458-00			2		NUT,PL,ASSEM WA:8-32 X 0.344 INCH,STL	78189	511-081800-00
						- - - * - - -		
-31	351-0551-00			1		GUIDE,PAPER:	80009	351-0551-00
-32	343-0735-00			4		CLAMP,GUIDE:DELRIN	80009	343-0735-00
-33	401-0376-00			1		ROLLER,PAPER DR:0.438 OD X 12.555 L,SST	80009	401-0376-00
	334-3255-00			1		MARKER,IDENT:ROLLER CLEANING	80009	334-3255-00
-34	401-0229-01			1		CAM,CUTTER,ACTR:W/SHAFT	80009	401-0229-01
						(ATTACHING PARTS)		
-35	354-0184-00			1		RING,RETAINING:FOR 0.250 INCH DIA SHAFT	79136	5555-25
						- - - * - - -		
-36	214-1941-00			1		PIN,STR HDLS:0.25 X 0.50 INCH L,STL	74445	OBD
-37	105-0781-00			1		ACTR,CUTTER BL:PLASTIC	80009	105-0781-00
						(ATTACHING PARTS)		
-38	213-0342-00			1		SCREW,SHOULDER:10-24 X 0.375 INCH,HEX.SOC	80009	213-0342-00
						- - - * - - -		
-39	401-0227-00			1		BSHG,MACH.THD:0.375-32 X 0.43 INCH LONG	80009	401-0227-00
						(ATTACHING PARTS)		
-40	210-0413-00			1		NUT,PLAIN,HEX.:0.375-32 X 0.50 INCH,STL	73743	3145-402
-41	210-0013-00			1		WASHER,LOCK:INTL,0.375 ID X 0.688" OD,ST	78189	1220-00-00-0541C
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
4-42	----- -----			1		CKT BOARD ASSY:CONTROL(SEE A4 EPL)		
						(ATTACHING PARTS)		
-43	211-0246-00			6		SCR,ASSEM WSHR:4-40 X 0.625 INCH,PNH,STL	78189	OBD
						- - - * - - -		
-44	343-0004-00			1		CLAMP,LOOP:0.312 INCH DIAMETER,PLSTC	95987	5-16-6B
-45	210-0851-00			1		WASHER,FLAT:0.119 ID X 0.375 INCH OD,STL	12327	OBD
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-46	131-0589-00			18		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
	131-0608-00			28		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-47	344-0154-00			2		. CLIP,ELECTRICAL:FUSE,CKT BD MT	80009	344-0154-00
-48	----- -----			1		. TRANSISTOR:SI,TRIAC,400V (SEE Q193 EPL)		
						(ATTACHING PARTS)		
-49	211-0097-00			1		. SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-50	210-0801-00			1		. WASHER,FLAT:0.14 ID X 0.28I OD NP STL	12327	OBD
-51	210-0586-00			1		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-52	214-1914-00			1		. HEAT SINK,ELEC:	98978	PB1-ZCB
						(ATTACHING PARTS)		
-53	211-0097-00			1		. SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-54	210-0801-00			1		. WASHER,FLAT:0.14 ID X 0.28I OD NP STL	12327	OBD
-55	210-0586-00			1		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
	214-0579-00	XB010240		2		. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
	131-0608-00	XB010240		3		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0993-00	XB010240		1		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
						- - - * - - -		
-56	147-0039-01			1		MOTOR,DC:BRUSH,72 W,155 RPM,24V,W/TACH	32480	PP1112-103
-57	118-0072-00			2		. BRUSH,ELEC CONT:DC MOTOR	32480	PP1112-101-13
-57.1	----- -----			2		. (NOT REPLACEABLE TO INSURE CORRECT		
	----- -----			-		. MOTOR SPEED STABILITY)		
-58	118-0073-00			2		. CAP.,ELECTRICAL:BRUSH DC MOTOR	32480	PP1112-101-14
						(ATTACHING PARTS FOR MOTOR)		
-59	212-0023-00			4		SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
-60	210-0804-00			4		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
						- - - * - - -		
-61	----- -----			1		TRANSISTOR:SILICON,NPN(SEE Q1026 EPL)		
						(ATTACHING PARTS)		
-62	211-0097-00			1		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-63	210-1181-00			1		WASHER,SHLDR:1.22 ID X 0.20D	31223	OBD
						- - - * - - -		
-64	342-0311-00			1		INSULATOR,PLATE:MICA,TO-3 PLSTC TRANSISTOR	01295	10-21-023-105
-65	----- -----			1		SEMICOND DEVICE:RECT,SI,50V,12A(SEE CR1001 EPL)		
						(ATTACHING PARTS)		
-66	211-0513-00			1		SCREW,MACHINE:6-32 X 0.625 INCH,PNH STL	83385	OBD
-67	210-0071-00			1		WASHER,SPR TNSN:0.146 ID X 0.323" OD,STL	78189	4706-05-01-0531
						- - - * - - -		
-68	214-2549-00			1		HT SK,MOT CONT:TRANSISTOR & DIODE	80009	214-2549-00
						(ATTACHING PARTS)		
-69	210-0458-00			2		NUT,PL,ASSEM WA:8-32 X 0.344 INCH,STL	78189	511-081800-00
-70	210-0804-00			2		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
						- - - * - - -		
-71	----- -----			1		SEMICOND DEVICE:(SEE CR1003 EPL)		
-72	407-1404-02			1		BRACKET,MOTOR:ALUMINUM	80009	407-1404-02
						(ATTACHING PARTS)		
-73	210-0458-00			2		NUT,PL,ASSEM WA:8-32 X 0.344 INCH,STL	78189	511-081800-00
-74	210-0804-00			2		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
						- - - * - - -		
	198-4073-00			1		WIRE SET,ELEC:	80009	198-4073-00
	----- -----			-		. CABLE ASSY:J36/Q1026/B1024/B1025		
-75	131-0621-00			7		. . CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
-76	352-0203-06			1		. . CONN BODY,PL,EL:7 WIRE BLUE	80009	352-0203-06
-77	131-0861-00			1		. . TERM,QIK DISC:16-20 AWG,0.22 W X 0.02 THK	00779	42617-2
	131-2065-00			3		. . TERM,QIK DISC:18-22 AWG,BRASS TIN PLATED	00779	2-350799-2
	131-2512-00	B010100	B020384	7		. . TERM,QIK DISC:24-20 AWG,BRASS TIN PLATED	00779	62138-1
	131-2512-00	B010385		6		. . TERM,QIK DISC:24-20 AWG,BRASS TIN PLATED	00779	62138-1

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
4-78	200-1075-00	B010100	B010384	5		. . COVER,TERM:QUICK DISCONNECT	00779	1-480435-0
	200-1075-00	B010385		4		. . COVER,TERM:QUICK DISCONNECT	00779	1-480435-0
-79	131-1790-00			3		. . CONTACT,ELEC:18-24 AWG,FEMALE,BRASS	27264	08-56-0105
-80	352-0463-00			1		. . HLDR,TERM.CONN:3 FEMALE,NYLON	27264	10-01-1034
	----- -----			-		. CABLE ASSY:J35/CR1001		
-81	131-1159-00			2		. . TERM,QIK DISC.:14-18 AWG,U/W0.25 X 0.032	00779	42660-2
	131-0792-00			2		. . CONNECTOR,TERM:18-20 AWG,CU BE GOLD PL	22526	46221
-82	352-0198-05			1		. . HLDR,TERM CONN:2 WIRE GREEN	80009	352-0198-05
	----- -----			-		. CABLE ASSY:J33/TERMINAL STRIP		
-83	131-0861-00			2		. . TERM,QIK DISC:16-20 AWG,0.22 W X 0.02 THK	00779	42617-2
	131-2065-00			1		. . TERM,QIK DISC:18-22 AWG,BRASS TIN PLATED	00779	2-350799-2
	175-1091-00			FT		. CABLE,SP,ELEC:(4) #18 STRANDED WIRE	80009	175-1091-00
	131-0621-00			1		. . CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
	131-0792-00			2		. . CONNECTOR,TERM:18-20 AWG,CU BE GOLD PL	22526	46221
-84	352-0201-03			1		. . CONN BODY,PL,EL:5 WIRE ORANGE	80009	352-0201-03
	131-1216-00			6		. CONTACT,ELEC:CRIMP MT W/BLUE INS	00779	42332-4
	131-0861-00			10		. TERM,QIK DISC:16-20 AWG,0.22 W X 0.02 THK	00779	42617-2
	131-2065-00			2		. TERM,QIK DISC:18-22 AWG,BRASS TIN PLATED	00779	2-350799-2
-85	162-0579-00			FT		INS SLV,ELEC:0.25 ID,SPL WRAP	87473	OBD
-86	337-2592-00			1		SHIELD,ELEC:PRIMARY WIRING	80009	337-2592-00
						(ATTACHING PARTS)		
-87	211-0504-00			2		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-88	120-1115-00			1		XFMR,PWR,SDN&SU:	80009	120-1115-00
						(ATTACHING PARTS)		
-89	220-0410-00			4		NUT,EXTENDED WA:10-32 X 0.375 INCH,STL	83385	OBD
						- - - * - - -		
	----- -----			-		. XFMR ASSY INCLUDES:		
-90	212-0523-00			4		. SCREW,MACHINE:10-32 X 2.750,HEX HD STL	83385	OBD
-91	210-0812-00			4		. WASHER,NONMETAL:#10,FIBER	86445	OBD
	166-0457-00			4		. INSUL SLVG,ELEC:0.19 ID X 1.875"LONG MYLAR	80009	166-0457-00
-92	200-0234-00			1		. COVER,ELEC XFMR:3.437 X 4.125X 1.0,STEEL	80009	200-0234-00
-93	131-1159-00			2		. TERM,QIK DISC.:14-18 AWG,U/W0.25 X 0.032	00779	42660-2
-94	407-2177-00			1		BRACKET,XFMR:ALUMINUM	80009	407-2177-00
						(ATTACHING PARTS)		
-95	212-0023-00			1		SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
						- - - * - - -		
-96	210-0813-00			2		WSHR,SHOULDERED:# 10 FIBER	74921	OBD
-97	348-0253-00			2		GROMMET,PLASTIC:BLACK,OBLONG,3.0X0.925	80009	348-0253-00
	337-2712-00	XB010270		1		SHIELD,ELEC:TERMINAL BOARD,FIBER SHEET	80009	337-2712-00
-98	124-0320-00			1		TERMINAL CARD:4-SECT,W/10 0.187 QDISC TAB	13150	OBD
						(ATTACHING PARTS)		
-99	211-0014-00	B010100	B010269	4		SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
	211-0015-00	B010270		4		SCREW,MACHINE:4-40 X 0.500,RDH,STL,CD PL	83385	OBD
-100	210-0586-00			4		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-101	210-0202-00			2		TERMINAL,LUG:0.146 ID,LOCKING,BRZ TINNED	78189	2104-06-00-2520N
						(ATTACHING PARTS)		
-102	210-0407-00			2		NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
						- - - * - - -		
-103	200-2264-00			2		CAP.,FUSEHOLDER:3AG FUSES	S3629	031.1666(MDLFEU)
-104	204-0832-00			2		BODY,FUSEHOLDER:3AG,5 X 20MM FUSES	S3629	031.1673(MDLFEU)
-105	343-0439-00			1		RTNR,CA TO CA:0.269 OD,POLYETH BLACK	80009	343-0439-00
-106	161-0119-00			1		CABLE ASSY,PWR,:3,18 AWG,125V,96.0 L	80009	161-0119-00
						(ATTACHING PARTS)		
-107	358-0529-00			1		BSHG,STRAIN RLF:FOR 0.3-0.36 OD CABLE,STR	28520	1207 (UL 6P3-4)
						- - - * - - -		
	----- -----			-		. PWR CORD ASSY INCLUDES:		
-108	131-0861-00			1		. TERM,QIK DISC:16-20 AWG,0.22 W X 0.02 THK	00779	42617-2
	334-2551-00			1		MARKER,IDENT:MKD WARNING POWER PLUG	80009	334-2551-00
-109	366-1522-00			1		KNOB:LINE VOLTAGE INDICATOR	80009	366-1522-00
						(ATTACHING PARTS)		
-110	211-0507-00			1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
4-111	343-0088-00			1		CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-112	348-0253-00			1		GROMMET,PLASTIC:BLACK,OBLONG,3.0X0.925	80009	348-0253-00
-113	----- -----			2		TRANSISTORS:(SEE Q1010 AND Q1012 EPL)		
						(ATTACHING PARTS)		
-114	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-115	342-0136-00			2		INSULATOR,WSHR:0.812 OD X 0.0025 INCH THK	04713	OBD
-116	426-1085-02			1		FRAME SECT,CAB.:LEFT	80009	426-1085-02
						(ATTACHING PARTS)		
-117	211-0507-00			6		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
	334-3379-00			1		MARKER,IDENT:MARKED GROUND SYMBOL	80009	334-3379-00
-118	426-1086-04			1		FRAME SECT,CAB.:RIGHT	80009	426-1086-04
						(ATTACHING PARTS)		
-119	211-0507-00			6		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-120	343-0004-00			1		CLAMP,LOOP:0.312 INCH DIAMETER,PLSTC	95987	5-16-6B
						(ATTACHING PARTS)		
-121	211-0511-00			1		SCREW,MACHINE:6-32 X 0.500,PNH,STL,CD PL	83385	OBD
-122	210-0863-00			1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
						- - - * - - -		
-123	337-1965-00			1		SHIELD,ELEC:POWER SUPPLY	80009	337-1965-00
-124	348-0171-00			1		GROMMET,PLASTIC:U-SHAPED	80009	348-0171-00
-125	386-3977-00			1		SUPPORT,FRAME:LEFT REAR	80009	386-3977-00
						(ATTACHING PARTS)		
-126	211-0538-00			2		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-127	212-0023-00			2		SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
	211-0510-00			1		SCREW,MACHINE:6-32 X 0.375,PNH,STL,CD PL	83385	OBD
						- - - * - -		
-128	386-3978-00			1		SUPPORT,FRAME:RIGHT REAR	80009	386-3978-00
						(ATTACHING PARTS)		
-129	211-0507-00			3		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-130	212-0023-00			2		SCREW,MACHINE:8-32 X 0.375 INCH,PNH STL	83385	OBD
						- - - * - - -		
-131	179-2647-00			1		WIRING HARNESS:MAIN	80009	179-2647-00
-132	131-0621-00			4		. CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
	131-0622-00			1		. CONTACT,ELEC:0.577"L,28-32 AWG WIRE	22526	46241
	131-0707-00			21		. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-133	131-1818-00			7		. CONTACT,ELEC:SERIES MR,MALE,GOLD PL	00779	350019-2
-134	131-1918-00			6		. CONTACT,ELEC:22-26 AWG WIRE,CRIMP ON,BRS	27264	08-56-0107
-135	352-0201-00			1		. CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0201-00
-136	352-0166-00			1		. CONN BODY,PL,EL:8 WIRE BLACK	80009	352-0166-00
	352-0166-09			1		. HLDR,TERM CONN:8 WIRE WHITE	80009	352-0166-09
-137	352-0168-04			1		. CONN BODY,PL,EL:10 WIRE YELLOW	80009	352-0168-04
-138	204-0671-00			2		. BODY,CONN,PLUG,:3 FEMALE POSN. NYLON	27264	09-50-4031
-139	204-0682-00			1		. CONN BODY,RCPT:SERIES MR,24 FEM-POSN,NYLON	00779	1-480627-9
-140	179-2646-00			1		WIRING HARNESS:FRONT PANEL	80009	179-2646-00
-141	131-1215-00			2		. CONTACT,ELEC:CRIMP MT W/RED INS	77342	42599-4
-142	131-1819-00			20		. CONTACT,ELEC:26-18 AWG,MALE,GOLD PL	00779	350018-3
-143	204-0681-00			1		. CONN BODY,RCPT:SERIES,24 MALE-POS,NYLON	00779	1-480626-9

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
5-	----- -----			1		CKT BOARD ASSY:VIDEO/SWEEP(SEE A2 EPL)		
						(ATTACHING PARTS)		
-1	211-0504-00			2		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. VIDEO/SWEEP ASSY INCLUDES:		
-2	----- -----			-		. CKT BOARD ASSY:VIDEO/SWEEP(SEE A2 EPL)		
						(ATTACHING PARTS)		
-3	211-0244-00			4		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
						- - - * - - -		
	----- -----			-		. . CKT BOARD ASSY INCLUDES:		
-4	105-0160-02			2		. . EJECTOR,CKT CD:BLUE PLASTIC	80009	105-0160-02
						(ATTACHING PARTS)		
-5	214-1337-00			2		. . PIN,SPRING:0.10 OD X 0.25 INCH L,STL	80009	214-1337-00
						- - - * - - -		
-6	136-0220-00			1		. . SKT,PL-IN ELEK:TRANSISTOR 3 CONTACT,PCB MT	71785	133-23-11-034
-7	136-0237-00			1		. . SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062
-8	136-0269-02			1		. . SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-9	136-0514-00			1		. . SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-10	214-0579-00			4		. . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-11	131-0608-00			18		. . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-2053-00			1		. . LINK,TERM. CONN:3,26 AWG,1.5"L	80009	131-2053-00
-12	131-2084-00			6		. . . TERM,QUICK DISC:26 AWG,COPPER NICKEL	00779	5250-207-2
-13	352-0166-00			1		. . . CONN BODY,PL,EL:8 WIRE BLACK	80009	352-0166-00
	131-2054-00			1		. . LINK,TERM. CONN:2,26 AWG,1.5"L	80009	131-2054-00
-14	131-0787-00			4		. . . CONTACT,ELEC:0.64 INCH LONG	22526	47359
-15	352-0177-00			1		. . . CONN BODY,PL,EL:6 WIRE,DBL ROW BLACK	80009	352-0177-00
-16	131-0126-00			2		. CONNECTOR,RCPT,:BNC,FEMALE	77820	9663-1 NT-34
						(ATTACHING PARTS)		
-17	210-0241-00			2		. TERMINAL,LUG:0.515 ID X 0.625 INCH OD SE	80009	210-0241-00
						- - - * - - -		
-18	131-0274-00			2		. CONNECTOR,RCPT,:BNC	91836	KC79-67
-19	386-4016-00			1		. PL,RTNR,ELEC CO:	80009	386-4016-00
-20	----- -----			1		CKT BOARD ASSY:TIMING(SEE A3 EPL)		
-21	105-0160-02			2		. EJECTOR,CKT CD:BLUE PLASTIC	80009	105-0160-02
						(ATTACHING PARTS)		
-22	214-1337-00			2		. PIN,SPRING:0.10 OD X 0.25 INCH L,STL	80009	214-1337-00
						- - - * - - -		
-23	131-0993-00			2		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-24	131-0608-00			11		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-25	351-0303-00			6		GUIDE,CKT CARD:3 INCH LONG,PLASTIC	80009	351-0303-00
-26	348-0023-00			4		PLUG,HOLE:	02768	207090201000101
-27	386-2778-00			2		SUPPORT,GUIDE:CIRCUIT BOARD	80009	386-2778-00
						(ATTACHING PARTS)		
-28	211-0504-00			4		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-29	407-0322-02			2		BRKT,POWER CA:CHARCOAL GRAY,DELRIN	80009	407-0322-02
						(ATTACHING PARTS)		
-30	211-0510-00			2		SCREW,MACHINE:6-32 X 0.375,PNH,STL,CD PL	83385	OBD
						- - - * - - -		
-31	200-1757-00			1		COVER,ACCESS:2 AXIS TEST POINT	80009	200-1757-00
						(ATTACHING PARTS)		
-32	211-0244-00			2		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
						- - - * - - -		
-33	386-4017-00			1		PANEL,REAR:	80009	386-4017-00
						(ATTACHING PARTS)		
-34	211-0507-00			3		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-35	211-0504-00			3		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-36	407-2242-00			1		BRACKET,ANGLE:CKT BOARD,PLASTIC	80009	407-2242-00
						(ATTACHING PARTS)		
-37	211-0510-00			1		SCREW,MACHINE:6-32 X 0.375,PNH,STL,CD PL	83385	OBD
-38	210-0935-00			1		WASHER,NONMETAL:FIBER,0.14 IDX 0.375"OD	74921	OBD
	220-0625-00			1		NUT,SHEET SPR:6-32 THD,STL	78553	C8090-632-24
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
5-39	----- -----			1		CKT BOARD ASSY:MAIN(SEE A1 EPL)		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-40	129-0273-00			1		. POST,ELEC-MECH:0.625 X 0.188 INCH OD	80009	129-0273-00
						(ATTACHING PARTS)		
-41	211-0244-00			1		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
						- - - * - - -		
-42	407-1407-00			1		. BRACKET,CKT BD:REAR	80009	407-1407-00
						(ATTACHING PARTS)		
-43	211-0244-00			2		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
						- - - * - - -		
-44	214-1291-00			2		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
-45	337-1964-00			1		. SHIELD,ELEC:CIRCUIT CARD	80009	337-1964-00
-46	136-0183-00			3		. SOCKET,PLUG-IN:3 PIN,ROUND	80009	136-0183-00
-47	136-0514-00			2		. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-48	136-0220-00			1		. SKT,PL-IN ELEK:TRANSISTOR 3 CONTACT,PCB MT	71785	133-23-11-034
-49	131-0993-00			1		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-50	131-0608-00			2		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-51	344-0154-00			2		. CLIP,ELECTRICAL:FUSE,CKT BD MT	80009	344-0154-00
-52	131-1229-00			3		. CONNECTOR,RCPT:22/44 CONTACT	95238	600-120-5Y25A
-53	214-0579-00			5		. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-54	----- -----			1		. TRANSISTOR:SILICON,NPN(SEE Q795 EPL)		
						(ATTACHING PARTS)		
-55	211-0198-00			1		. SCREW,MACHINE:4-40 X 0.438 PNH,STL,POZ	77250	OBD
-56	210-1122-00			1		. WASHER,LOCK:0.228 ID X 0.375 INCH OD,STL	04713	B52200F006
-57	210-0586-00			1		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-58	342-0202-00			1		. INSULATOR,PLATE:TRANSISTOR	01295	10-21-023-106
-59	----- -----			2		. TRANSISTOR:SILICON,NPN(SEE Q747,Q769 EPL)	80009	
						(ATTACHING PARTS)		
-60	211-0198-00			2		. SCREW,MACHINE:4-40 X 0.438 PNH,STL,POZ	77250	OBD
-61	210-1122-00			2		. WASHER,LOCK:0.228 ID X 0.375 INCH OD,STL	04713	B52200F006
-62	210-0586-00			2		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-63	342-0163-00			2		. INSULATOR,PLATE:XSTR,0.675 X 0.625 X 0.001"	80009	342-0163-00
-64	----- -----			1		. MICROCIRCUIT,LI:5V REGULATOR(SEE U439 EPL)		
						(ATTACHING PARTS)		
-65	211-0542-00			2		. SCREW,MACHINE:6-32 X 0.312 INCH,TRH STL	83385	OBD
						- - - * - - -		
-66	----- -----			1		. MICROCIRCUIT,LI:VOLTAGE REG(SEE U635 EPL)		
						(ATTACHING PARTS)		
-67	211-0097-00			1		. SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-68	210-1178-00			1		. WSHR,SHOULDERED:FOR MTG TO-220 TRANSISTOR	49671	DF 137A
-69	210-0994-00			1		. WASHER,FLAT:0.125 ID X 0.25" OD,STL	86928	5714-147-20N
-70	210-0586-00			1		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-71	342-0202-00			1		. INSULATOR,PLATE:TRANSISTOR	01295	10-21-023-106
-72	407-1409-02			1		. BRACKET,CKT BD:ALUMINUM	80009	407-1409-02
						(ATTACHING PARTS)		
-73	211-0244-00			8		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
						- - - * - - -		
-74	200-2308-00			1		GUARD,ELEC CONN:	80009	200-2308-00
						(ATTACHING PARTS)		
-75	213-0124-00			2		SCR,TPG,THD FOR:6-20 X 0.250 INCH,PNH STL	83385	OBD
						- - - * - - -		
-76	386-2788-02			1		SUPPORT,INSUL:	80009	386-2788-02
						(ATTACHING PARTS)		
-77	213-0124-00			2		SCR,TPG,THD FOR:6-20 X 0.250 INCH,PNH STL	83385	OBD
	211-0538-00			1		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-78	200-1687-03			1		COVER,INSUL:	80009	200-1687-03
						(ATTACHING PARTS)		
-79	211-0507-00			2		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-80	210-0803-00			2		WASHER,FLAT:0.15 ID X 0.032 THK,STL CD PL	12327	OBD
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
5-81	136-0156-01			1		CONNECTOR,RCPT,:22/44 PIN,CHASSIS MOUNT	05574	2VH22-1AN5
						(ATTACHING PARTS)		
-82	211-0014-00			2		SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
-83	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-84	252-0603-00			FT		PLASTIC STRIP:0.25 X 0.125 URETHANE FOAM	000EB	OBD
-85	386-2746-01			1		SUPPORT,FR SECT:	80009	386-2746-01
						(ATTACHING PARTS)		
-86	211-0507-00			12		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-87	351-0303-00			4		GUIDE,CKT CARD:3 INCH LONG,PLASTIC	80009	351-0303-00
-88	351-0087-00			2		GUIDE,CKT CARD:4.75 INCH LONG,PLASTIC	80009	351-0087-00
	----- -----			1		CKT BOARD ASSY:HV(SEE A5 EPL)		
						(ATTACHING PARTS)		
-89	211-0507-00			2		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-90	211-0510-00			2		SCREW,MACHINE:6-32 X 0.375,PNH,STL,CD PL	83385	OBD
-91	211-0504-00			1		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. HIGH VOLTAGE ASSY INCLUDES:		
-92	366-0261-00	B010100	B010294	1		. KNOB:0.312 OD X 0.406 INCH LONG	80009	366-0261-00
	366-0261-02	B010295		1		. KNOB:GRAY,0.129 IDX 0.312 OD X 0.406 H	80009	366-0261-02
	214-0949-00	B010100	B010294	1		. . SPR,HLCL,TRSN:0.282" OD X 0.125" LONG	80009	214-0949-00
	214-2564-00	B010295		1		. . SPR,HLCL,TRSN:0.23 ID X 0.084 1,0.256 OD	000AQ	OBD
-93	384-1227-00			1		. EXTENSION SHAFT:0.123 OD X 3.650 INCH LONG	80009	384-1227-00
-94	376-0029-00			1		. CPLG,SHAFT,RGD:0.128 ID X 0.312 OD X 0.5"L	80009	376-0029-00
	213-0075-00			1		. . SETSCREW:4-40 X 0.094,STL BK OXD,HEX SKT	000BK	OBD
-95	----- -----			-		. CKT BD ASSY:HIGH VOLTAGE(SEE A5A1 EPL)		
						(ATTACHING PARTS)		
-96	211-0040-00			2		. SCREW,MACHINE:4-40 X 0.25",BDGH PLSTC	26365	OBD
-97	129-0143-00			2		. INSULATOR,STDF:0.312 OD X 0.406" L,NYLON	80009	129-0143-00
-98	211-0244-00			2		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
						- - - * - - -		
	----- -----			-		. . CKT BOARD ASSY INCLUDES:		
-99	131-1530-00			1		. . CONTACT,ELEC:GROUNDING,CU BE	80009	131-1530-00
	136-0680-01			1		. . SKT,PL-IN ELEK:	80009	136-0680-01
-100	131-1819-00			6		. . . CONTACT,ELEC:26-18 AWG,MALE,GOLD PL	00779	350018-3
-101	136-0278-00			1		. . . SOCKET,PLUG-IN:WITH PINS	80009	136-0278-00
	343-0088-00			1		. . CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-102	----- -----			1		. . RES.,VAR,NONWIR:5M OHM,20%,1W(SEE R340 EPL)		
-103	342-0275-00			1		. INSUL SH,ELEC:HIGH VOLTAGE	80009	342-0275-00
-104	----- -----			1		. CKT BOARD ASSY:HV OSCILLATOR(SEE A5A2 EPL)		
						(ATTACHING PARTS)		
-105	211-0040-00			2		. SCREW,MACHINE:4-40 X 0.25",BDGH PLSTC	26365	OBD
-106	129-0143-00			2		. INSULATOR,STDF:0.312 OD X 0.406" L,NYLON	80009	129-0143-00
-107	211-0244-00			2		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
						- - - * - - -		
	----- -----			-		. . CKT BOARD ASSY INCLUDES:		
-108	131-0589-00			5		. . TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-109	124-0118-00			4		. . TERMINAL BOARD:1 NOTCH,CERAMIC,CLIP MTD	80009	124-0118-00
-110	361-0008-00			4		. . SPACER,SLEEVE:0.11 ID X 0.25 OD X 0.28"H	80009	361-0008-00
-111	120-0917-01			1		. . XFMR,PWR,SDN&SU:HIGH VOLTAGE	80009	120-0917-01
	198-2899-00			1		. . WIRE SET,ELEC:	80009	198-2899-00
-112	342-0274-01			1		. INSUL SH,ELEC:HIGH VOLTAGE OSCILLATOR	80009	342-0274-01
-113	----- -----			1		. TRANSISTOR:SILICON,NPN(SEE Q1016 EPL)		
						(ATTACHING PARTS)		
-114	213-0104-00			2		. SCR,TPG,THD FOR:6-20 X 0.375 INCH,TRH STL	83385	OBD
						- - - * - - -		
-115	386-0978-00			1		. INSULATOR,PLATE:TRANSISTOR,MICA	80009	386-0978-00
-116	136-0280-00			1		. SOCKET,PLUG-IN:FOR TO-3	97913	LST 2202-2
						(ATTACHING PARTS)		
-117	211-0038-00			2		. SCREW,MACHINE:4-40 X 0.312,FLH,100 DEG	83385	OBD
-118	210-0586-00			2		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-119	441-1191-03			1		. CHAS,HD COPY UN:HIGH VOLTAGE	80009	441-1191-03
-120	131-1108-01			1		LEAD,ELECTRICAL:STRD,16 AWG,23KV,26.0 L	00779	863559-1

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
5-	253-0056-00			FT		CUSHION:POLYURETHANE FOAM,PRESSURE SENS	04963	4116
-121	343-0081-00			1		STRAP,RETAINING:	95987	3/16-H
						(ATTACHING PARTS)		
-122	211-0507-00			1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-123	348-0085-00			1		GROMMET,PLASTIC:U-SHAPED	80009	348-0085-00
-124	----- -----			1		COIL,TUBE DEFLE:(SEE L1012 EPL)		
						(ATTACHING PARTS)		
-125	211-0655-00			2		SCREW MACHINE:6-32 X 0.50 INCH,HHS	000AH	OBD
-126	210-1227-00			2		WASHER,FLAT:0.203 ID X 0.50 INCH OD,STL	12327	OBD
						- - - * - - -		
	162-0013-00			FT		INSUL SLVG,ELEC:0.148 ID,BLK VINYL,105 DEG	96904	TYP400-SIZ7-BLK
-127	105-0592-00			1		LEVER,MNL CONT:	80009	105-0592-00
-128	337-1931-00			1		SHLD,ELCTRN TUB:REAR	80009	337-1931-00
						(ATTACHING PARTS)		
-129	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-130	210-1227-00			2		WASHER,FLAT:0.203 ID X 0.50 INCH OD,STL	12327	OBD
						- - - * - - -		
	358-0561-01			1		BUSHING,SLEEVE:1.15 ID X 1.20D X 1.0 L	80009	358-0561-01
	----- -----			1		ELECTRON TUBE:CRT(SEE V1 EPL)		
-131	348-0383-00			1		GASKET:LIGHT SEAL	80009	348-0383-00
-132	348-0384-00			2		GASKET:LIGHT SEAL	80009	348-0384-00
-133	407-1405-00			2		BRKT,CRT SHIELD:FRONT,STEEL	80009	407-1405-00
						(ATTACHING PARTS)		
-134	211-0503-00			4		SCREW,MACHINE:6-32 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-135	343-0462-00			2		CLAMP,HOLD DOWN:ELECTRON TUBE	80009	343-0462-00
						(ATTACHING PARTS)		
-136	212-0509-00			2		SCREW,MACHINE:10-32 X 0.625INCH,PNH STL	83385	OBD
						- - - * - - -		
-137	391-0117-00			2		BLOCK,CRT MTG:FRONT	80009	391-0117-00
						(ATTACHING PARTS)		
-138	213-0090-00			2		SCREW,MACHINE:10-32 X 0.50 INCH,HEX	83385	OBD
-139	210-1227-00			2		WASHER,FLAT:0.203 ID X 0.50 INCH OD,STL	12327	OBD
						- - - * - - -		
-140	343-0463-00			2		CLAMP HALF:ELECTRON TUBE	80009	343-0463-00
-141	348-0003-00			1		GROMMET,RUBBER:0.312 INCH DIAMETER	70485	1411B6040
-142	337-1932-00			1		SHLD,ELCTRN TUB:FRONT	80009	337-1932-00
						(ATTACHING PARTS)		
-143	211-0510-00			4		SCREW,MACHINE:6-32 X 0.375,PNH,STL,CD PL	83385	OBD
-144	210-0457-00			4		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-145	342-0218-00			1		INSULATOR:PROCESSOR,LOWER	80009	342-0218-00
						- - - * - - -		

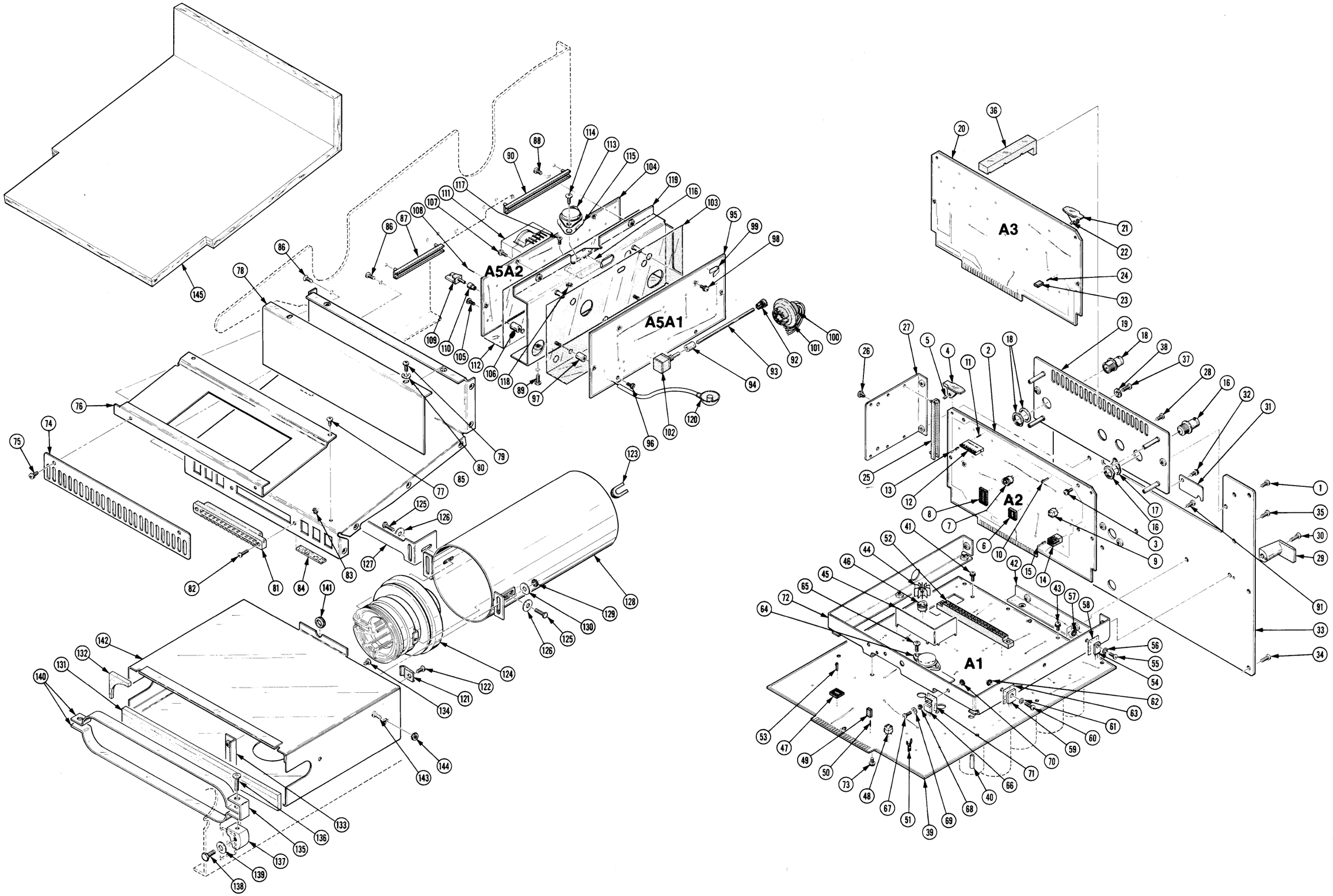
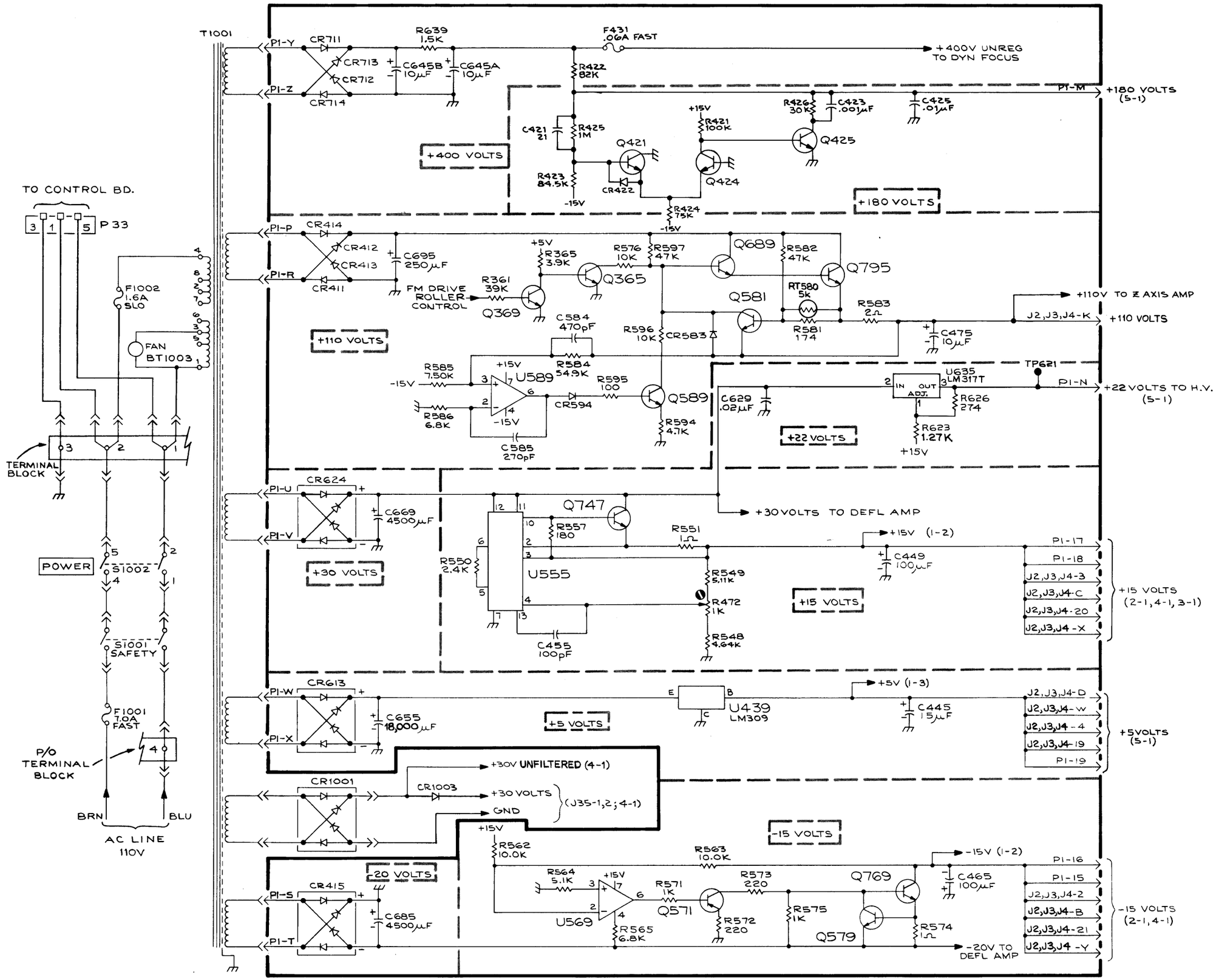


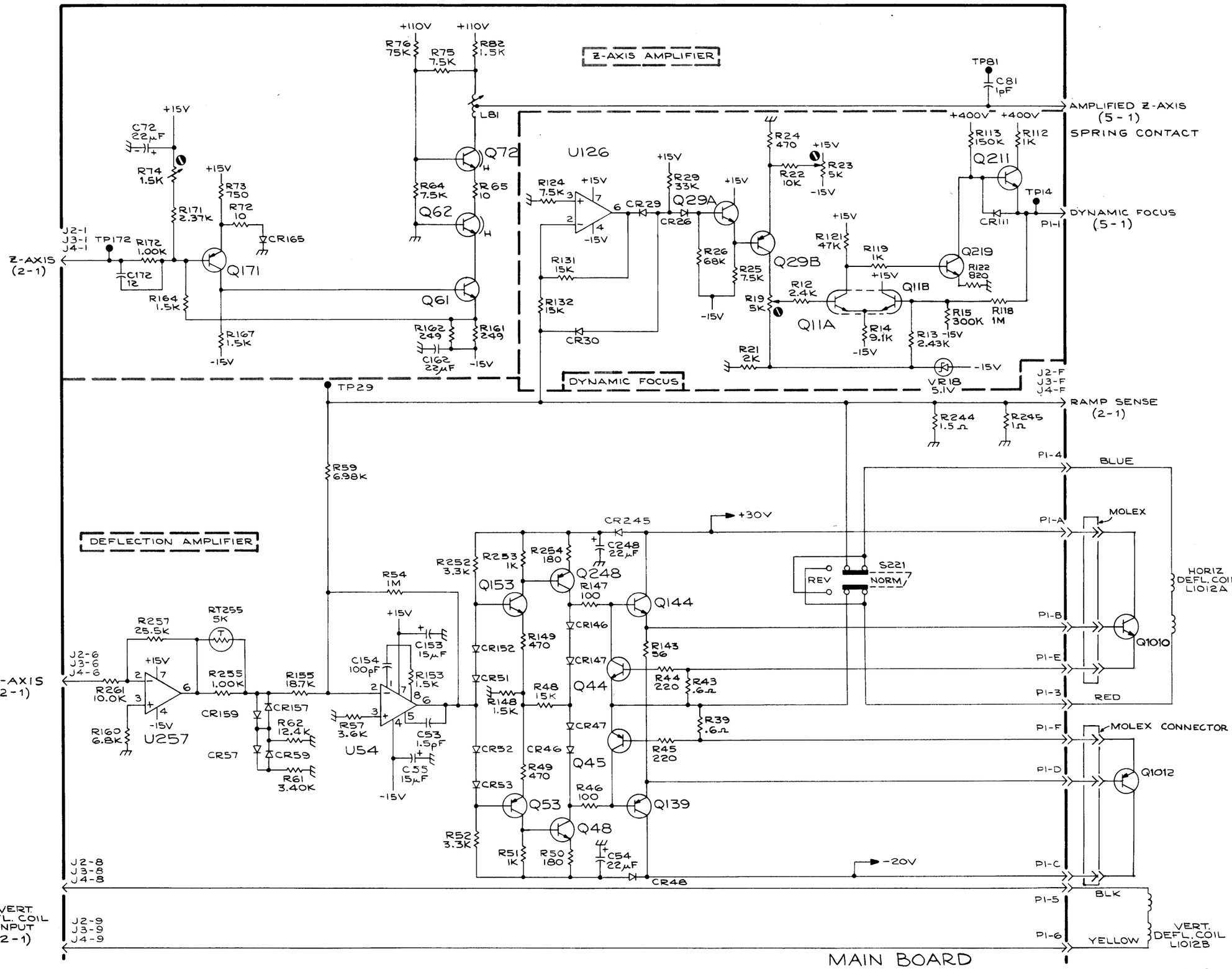
FIG. 5 CRT & REAR



4633 A

2547-1
REV A, JAN 1979

670-4596-05 MAIN BOARD 1-1
POWER SUPPLY

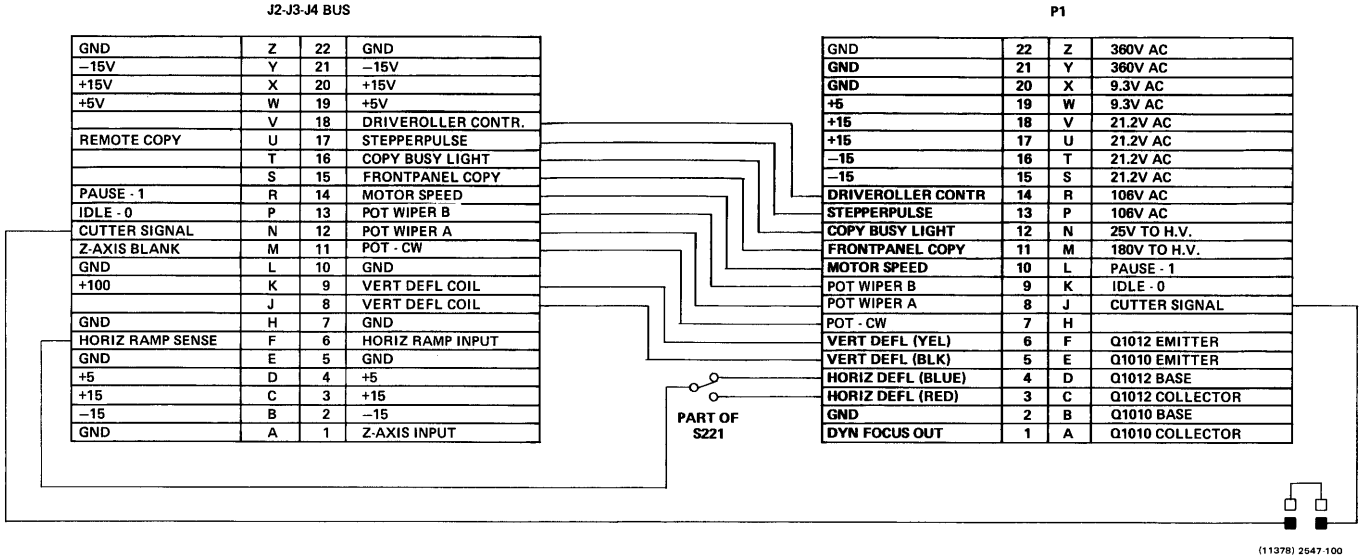


4633 A

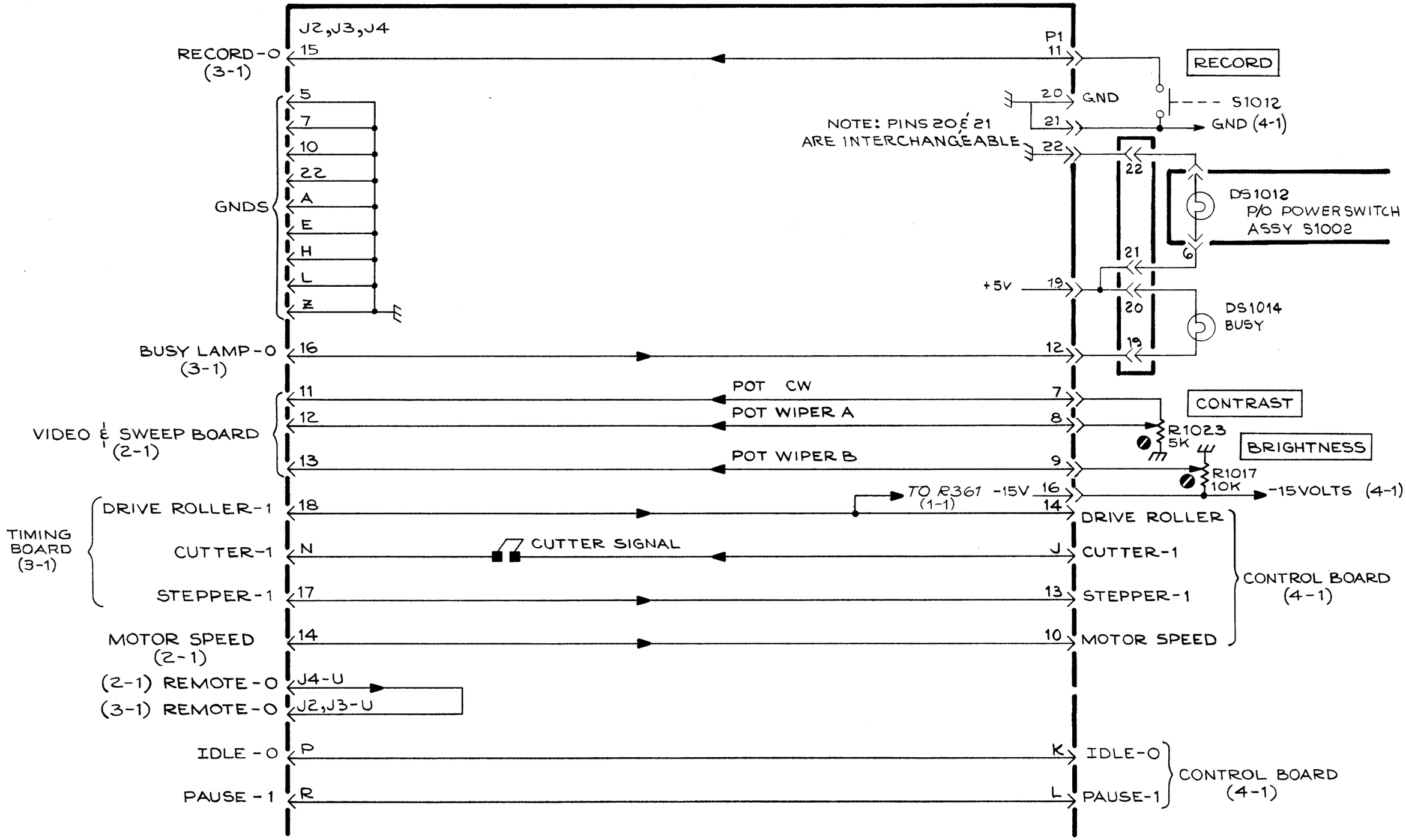
@ 2547-2

670-4596-05

MAIN BOARD
Z AXIS & DEFLECTION AMPLIFIER 1-2



(11378) 2547-100

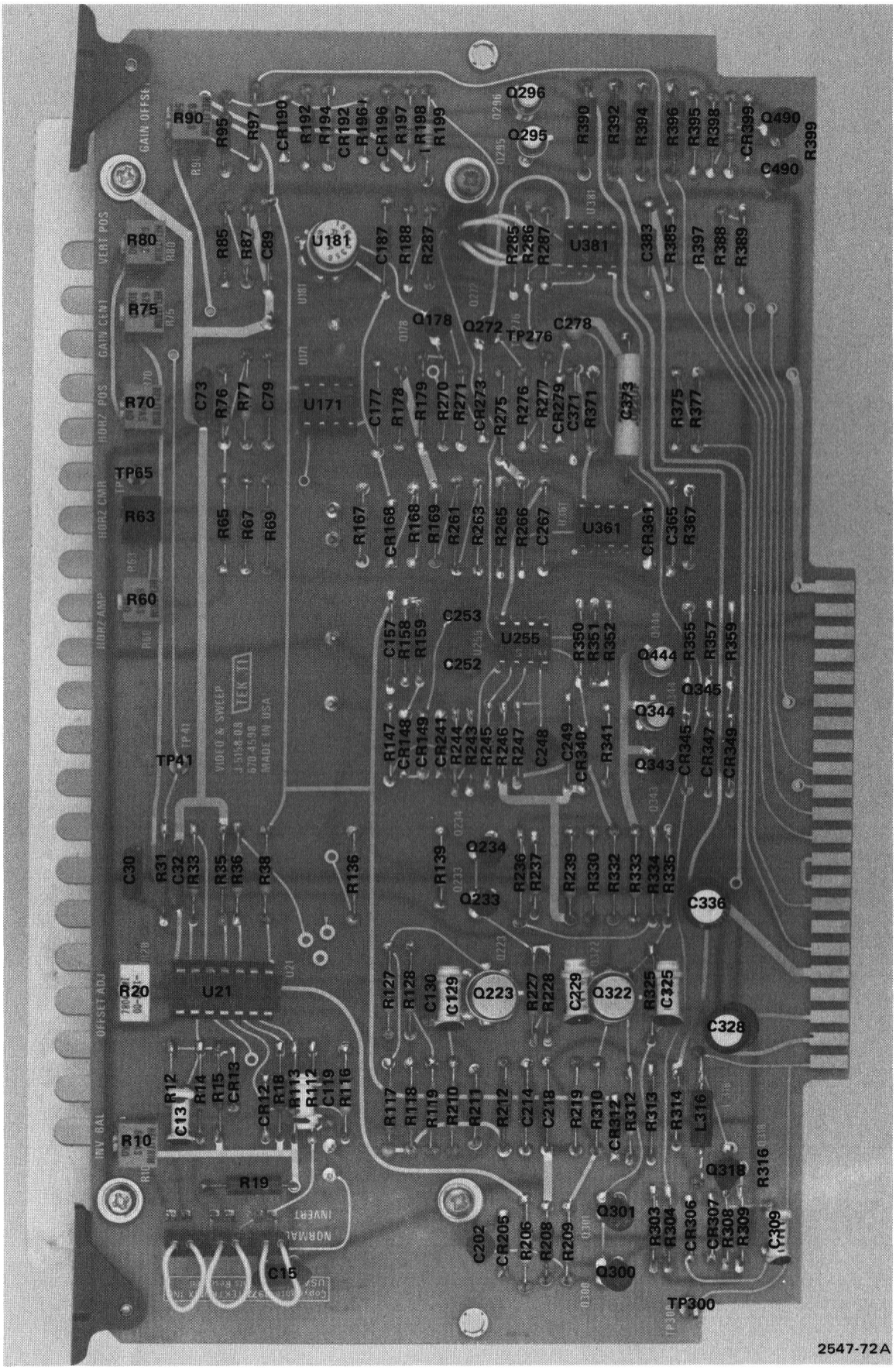


4633A

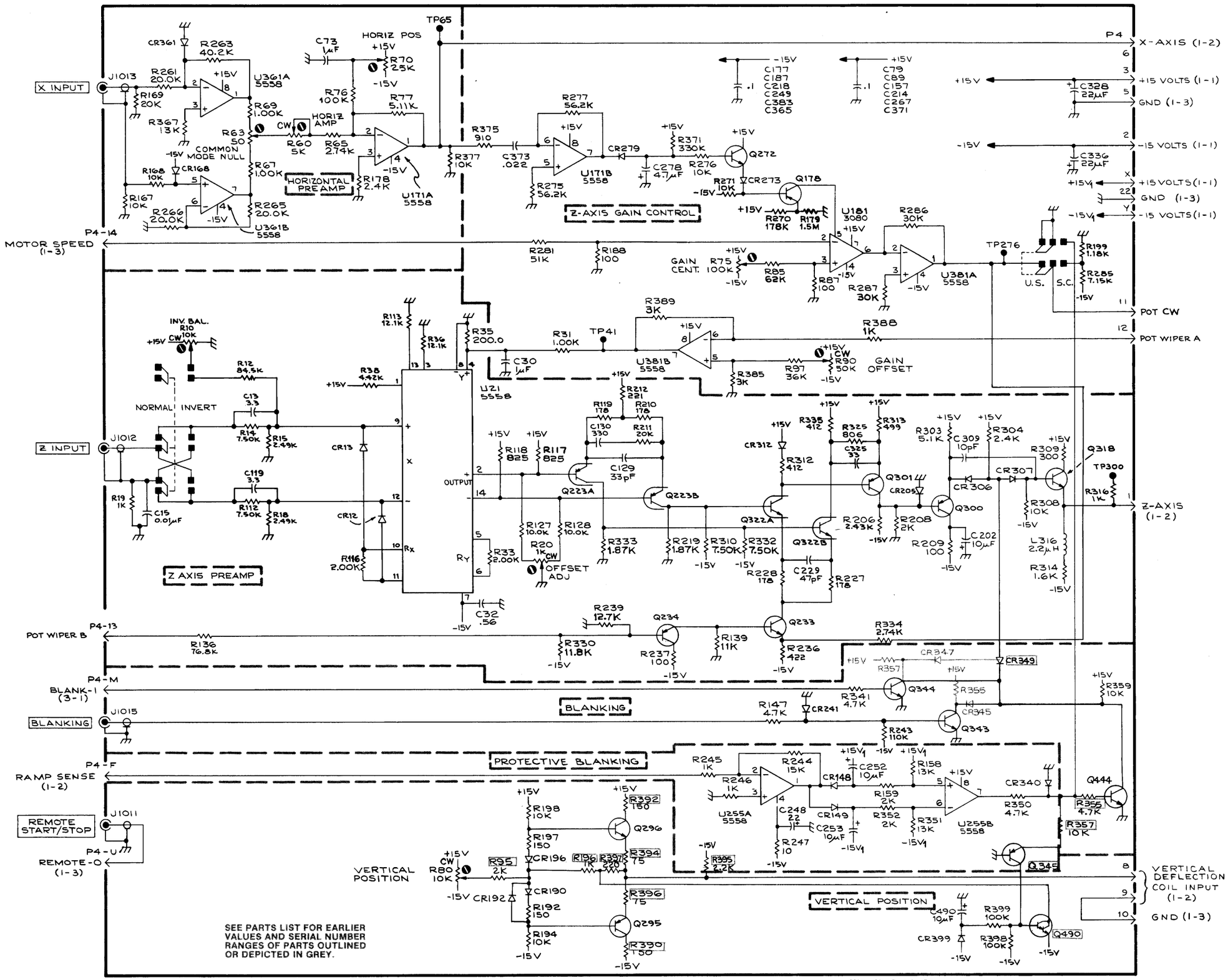
2547-3
REV B, JUN 1979

670-4596-05

MAIN BOARD INTERCONNECTIONS 1-3



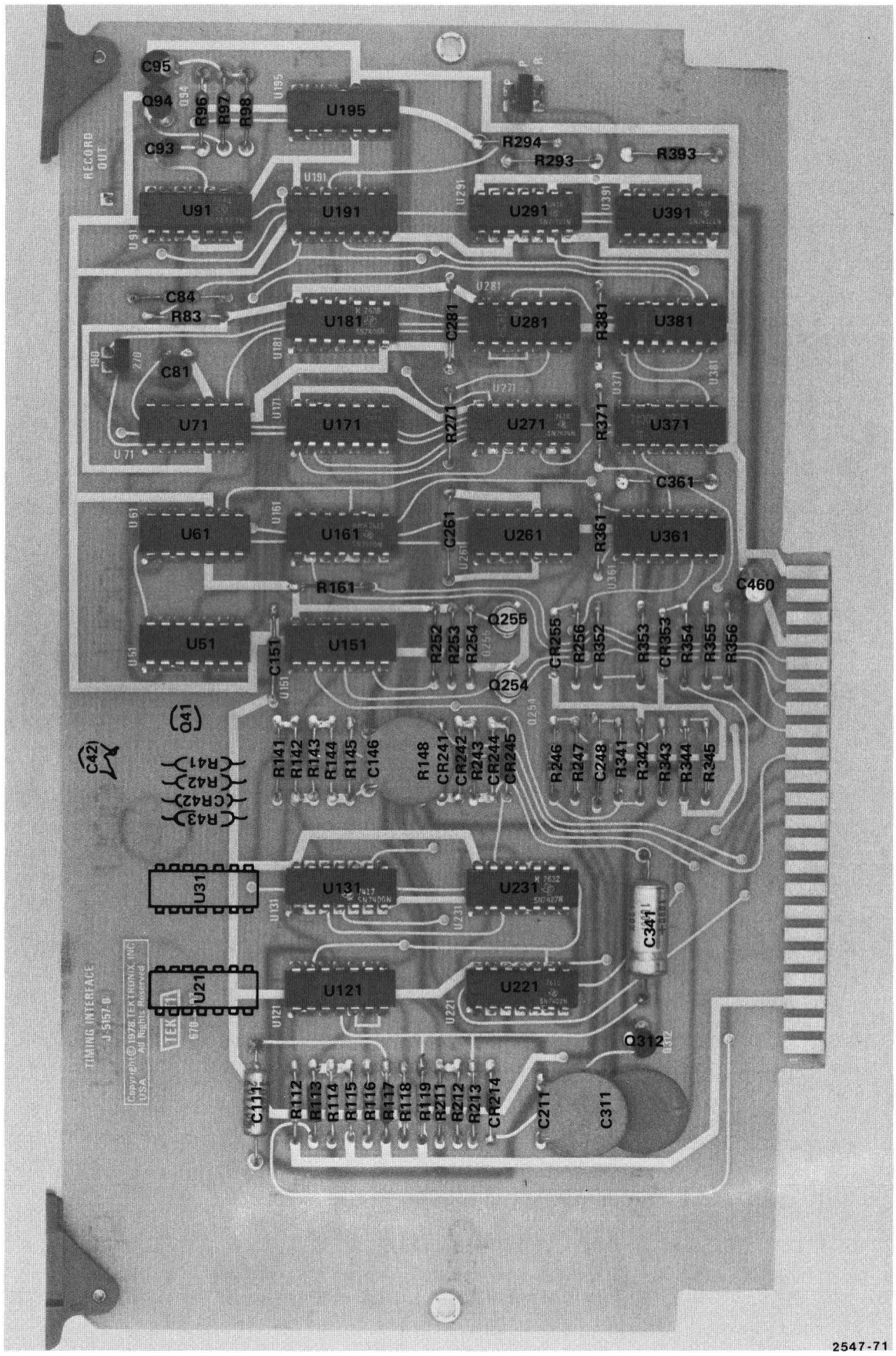
Video & Sweep Board Component Locations (670-4598-06,07, 672-0759-01,02).



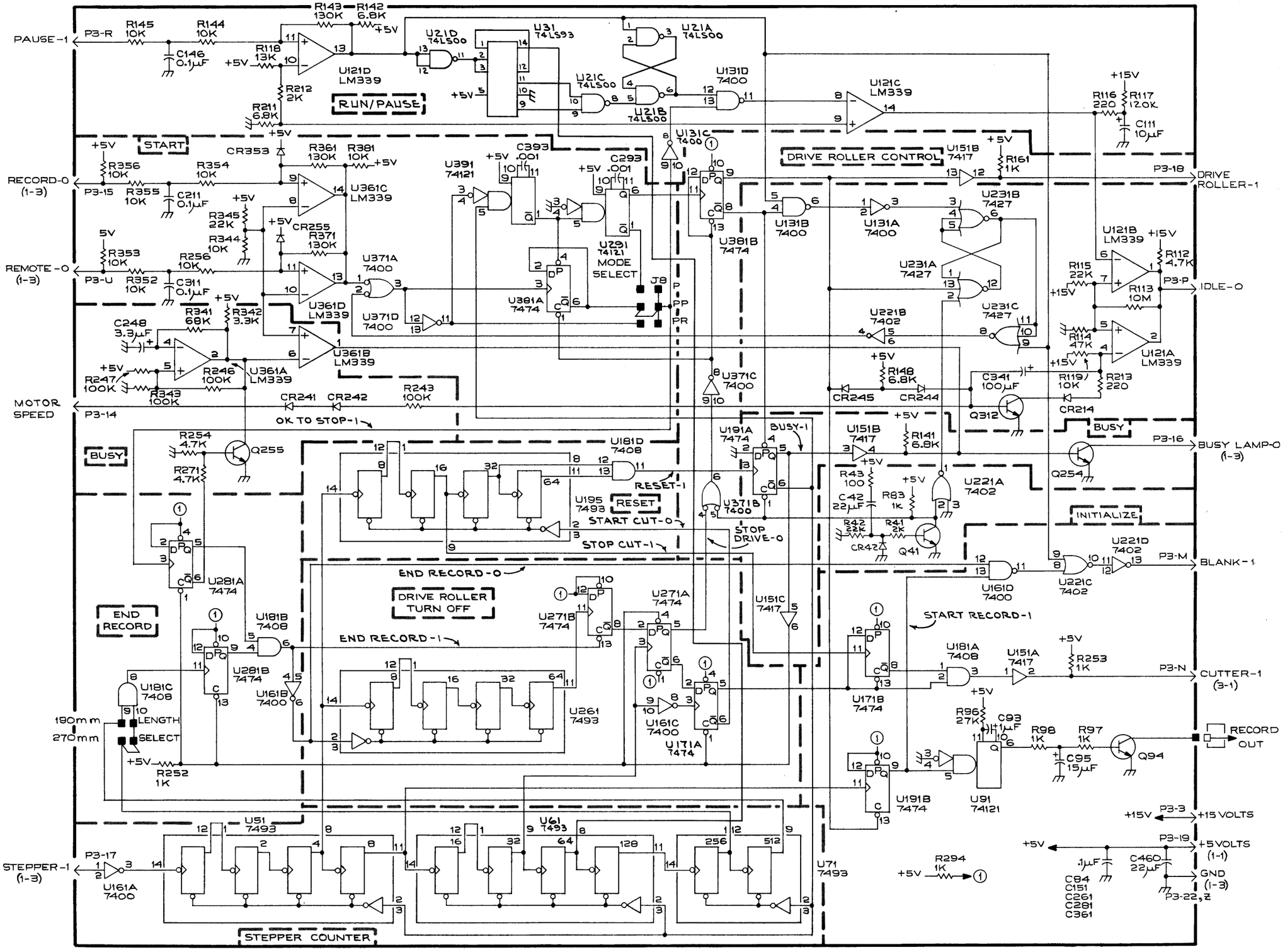
4633A

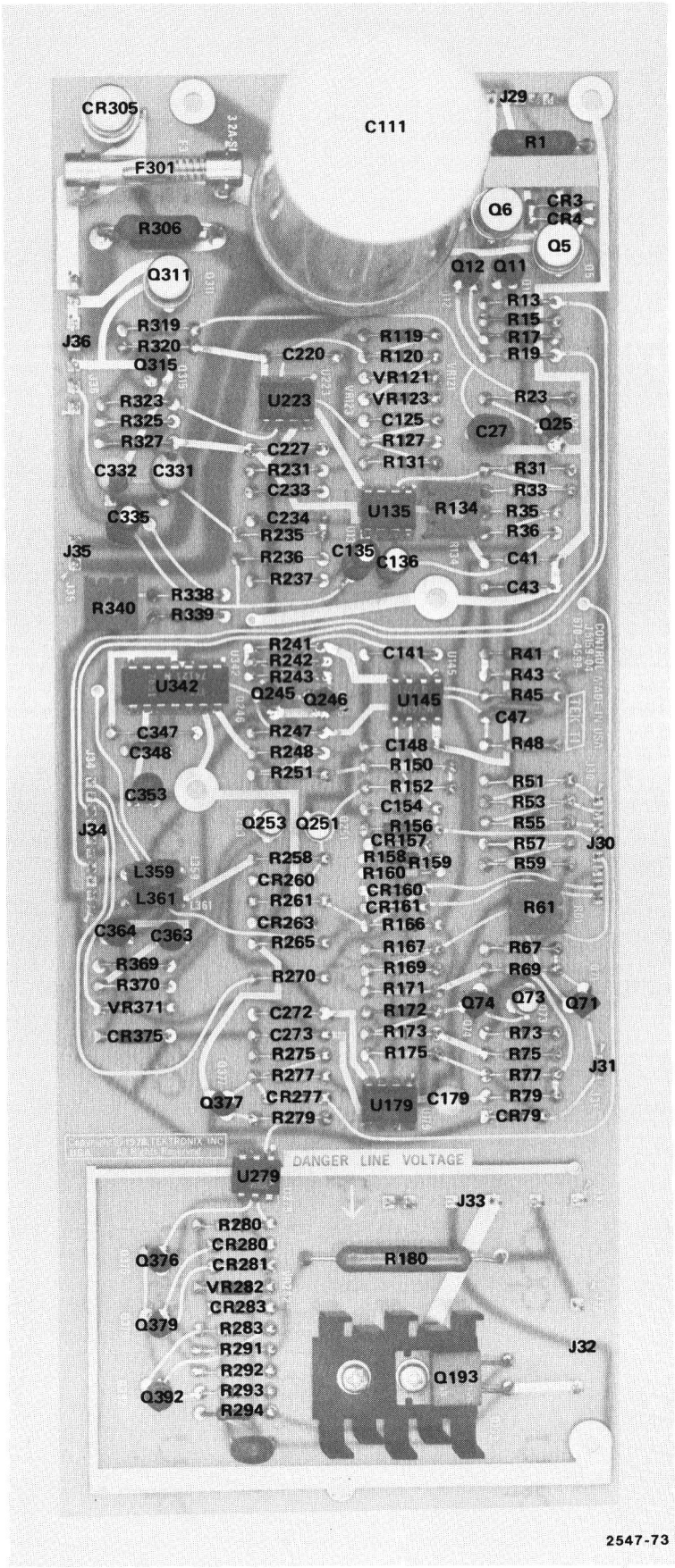
2547-4
REV B, OCT 1980

670-4598-06,07
672-0759-01,02 VIDEO & SWEEP BOARD 2-1

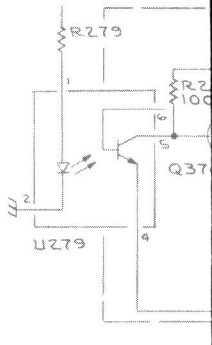


Timing Board Component Locations (670-4597-03).


PAUSE-1
P3-R
R145 10K
R144 10K
C146 0.1µF
R143 130K
R142 6.8K
+5V
R118 13K
R212 2K
R211 6.8K
U121D LM339
RUN/PAUSE
U21D 74LS00
U31 74LS93
U21C 74LS00
U21A 74LS00
U21B 74LS00
U131D 7400
U121C LM339
+15V
R116 220
R117 12.0K
C111 10µF
START
CR353
R361 130K
R381 10K
C393 .001
C293 .001
U131C 7400
DRIVE ROLLER CONTROL
U151B 7417
R161 1K
P3-18
DRIVE ROLLER-1
RECORD-0
(1-3)
P3-15
R356 10K
R354 10K
R355 10K
C211 0.1µF
U361C LM339
U391 74121
U231B 7427
U131B 7400
U131A 7400
U381B 7474
U231A 7427
U121B LM339
R115 22K
R112 4.7K
R113 10M
P3-P
IDLE-0
REMOTE-0
(1-3)
P3-U
R353 10K
R256 10K
R352 10K
C311 0.1µF
R345 22K
R344 10K
CR255
R371 130K
U371A 7400
U371D 7400
U361D LM339
U391A 7474
U291 74121 MODE SELECT
J8
P
PP
PR
U221B 7402
U231C 7427
U121A LM339
R114 47K
R119 10K
R213 220
C248 3.3µF
R341 68K
R342 3.3K
U361B LM339
U361A LM339
R247 100K
R246 100K
R343 100K
R243 100K
U371C 7400
R148 6.8K
CR245
CR244
C341 100µF
Q312
CR214
MOTOR SPEED
P3-14
CR241
CR242
OK TO STOP-1
BUSY
R254 4.7K
Q255
R271 4.7K
U181D 7408
U191A 7474
BUSY-1
U151B 7417
R141 6.8K
BUSY
P3-16
BUSY LAMP-0
(1-3)
Q254
U195 7493
RESET
RESET-1
START CUT-0
STOP CUT-1
U371B 7400
STOP DRIVE-0
R43 100
C42 22µF
R83 1K
U221A 7402
INITIALIZE
R42 22K
R41 2K
CR42
Q41
U221D 7402
P3-M
BLANK-1
U161D 7400
U221C 7402
END RECORD-0
DRIVE ROLLER TURN OFF
U271A 7474
U151C 7417
START RECORD-1
END RECORD
U281A 7474
U181B 7408
U271B 7474
END RECORD-1
U181A 7408
U151A 7417
R253 1K
P3-N
CUTTER-1
(3-1)
U281B 7474
U161B 7400
U261 7493
U171B 7474
R96 27K
C93 .1µF
R98 1K
R97 1K
RECORD OUT
U181C 7408
190mm
270mm
LENGTH SELECT
+5V
R252 1K
C95 15µF
Q94
U191B 7474
U91 74121
+15V
P3-3
+15 VOLTS
P3-19
+5V VOLTS
(1-1)
GND
(1-3)
P3-22,Z
C84
C151
C261
C281
C361
U51 7493
U61 7493
U71 7493
STEPPER-1
(1-3)
P3-17
U161A 7400
R294 1K
STEPPER COUNTER



Control Board Component Locations (670-4599-03,05,06,07).



PULSE SHAPER

CUTTER CLUTCH DRIVE

DRIVE ROLLER CLUTCH DRIVE

MOTOR CONTROL

HEATER CONTROL

U1020

INTERRUPTER

CHAIN

U145A

U342 74121

TP342

STEPPER -1 (1-3)

+30 VOLTS (1-1)

GND (1-1)

+30 VOLTS

L1022 CUTTER CLUTCH CHAIN

+30V UNFILTERED (1-1)

L1020 DRIVE ROLLER CLUTCH BELT

GEAR BOX 30:1 RATIO

B1024 TACH

MOTOR & TACH ON SAME SHAFT

B1025 MOTOR

Q1026

MOLEX CONNECTOR

CUTTER-1 (1-3)

(1-3) IDLE-0

(1-3) PAUSE-1

DRIVE ROLLER-1 (1-3)

RUN/PAUSE J1050

2X SPEED J1052

10mm/s

25 mm/s

50 mm/s

S1022 PAPER SPEED

MOTOR SPEED (1-3)

DEV. TEMP

R1020 5K

RT1020 SENSOR ON HEATER

+15 VOLTS (1-1)

+5 VOLTS (1-1)

GND (1-3)

-15 VOLTS (1-1)

SPEED

TP20

U279 MOC1005

F301 3.2A SLO

S1025

110V HR1026 HEATER

POWER LINE (1-1)

230V HR1026

115V

230V

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

EFF. BELOW SN B010294

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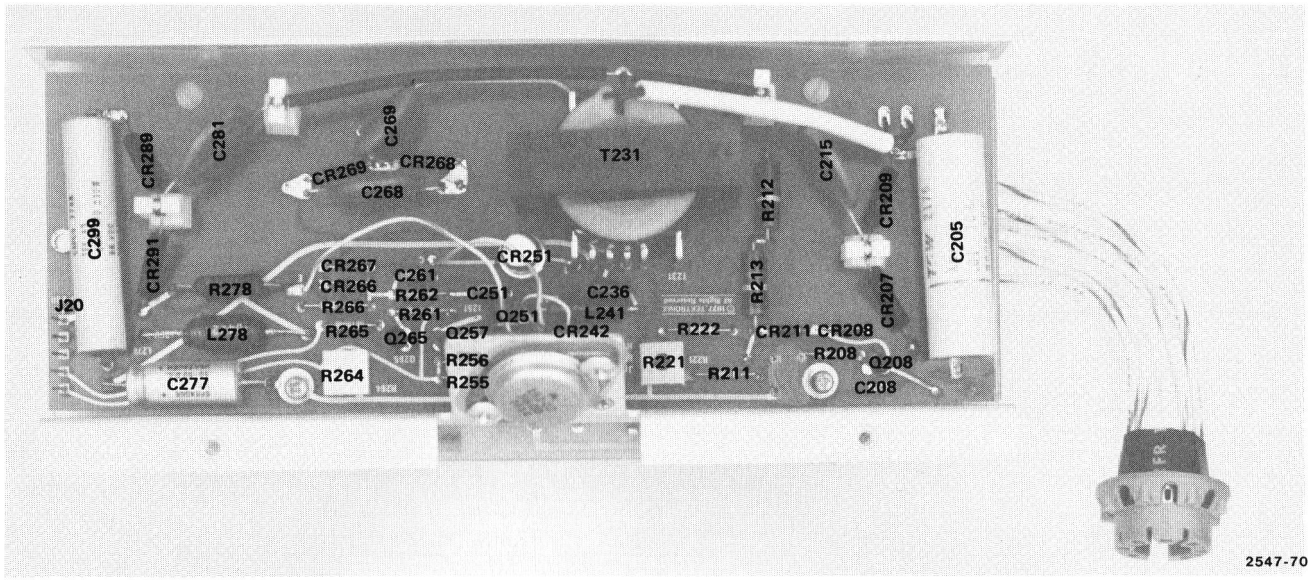
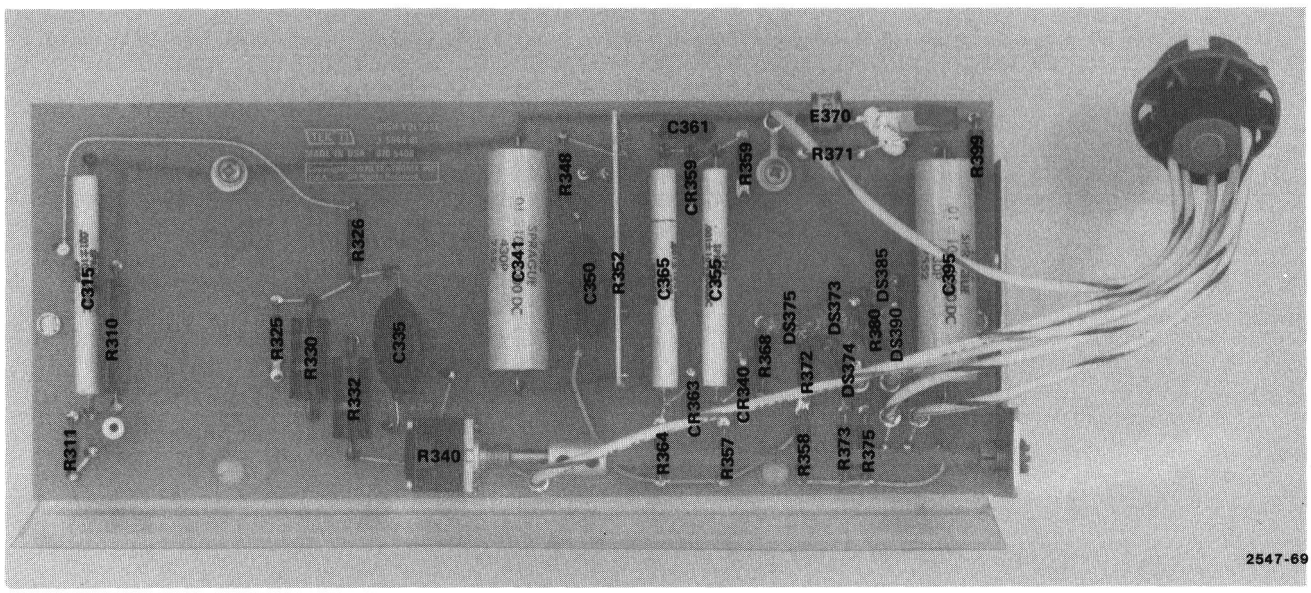
2547-6
REV B, OCT 1980

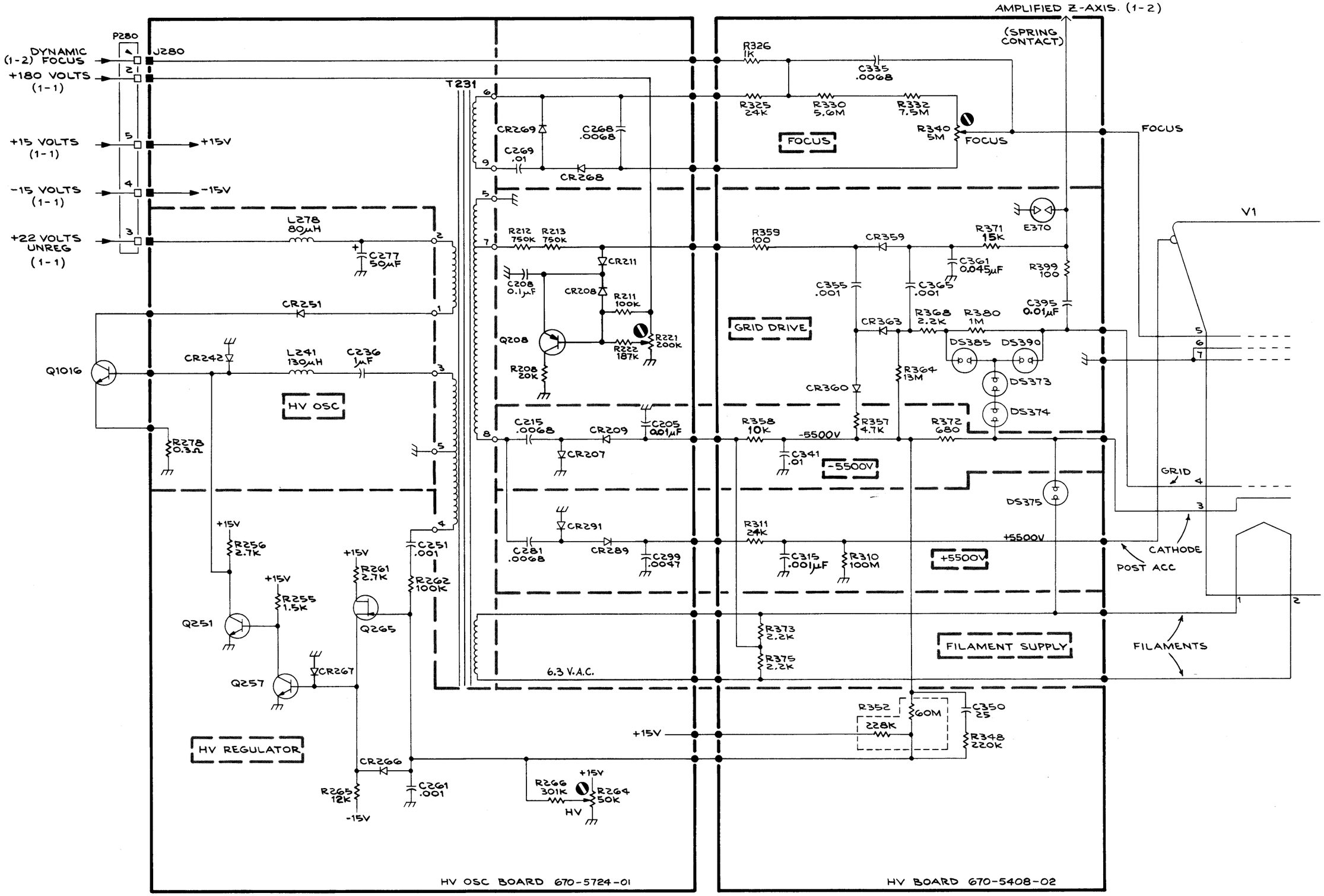
670-4599-03, 05,06,07 CONTROL BOARD 4-1



High Voltage Oscillator Component Locations (670-5724-01).



High Voltage Component Locations (670-5408-02).


AMPLIFIED Z-AXIS. (1-2)
(SPRING CONTACT)
P280
J280
DYNAMIC (1-2) FOCUS
+180 VOLTS (1-1)
+15 VOLTS (1-1)
+15V
-15 VOLTS (1-1)
-15V
+22 VOLTS UNREG (1-1)
T231
L278 80μH
C277 50μF
CR251
CR242
L241 130μH
C236 1μF
Q1016
R278 0.3Ω
HV OSC
R326 1K
C335 .0068
R325 24K
R330 5.6M
R332 7.5M
R340 5M
FOCUS
CR269
C268 .0068
C269 .01
CR268
R212 750K
R213 750K
CR211
C208 0.1μF
CR208
R211 100K
R221 200K
R222 187K
Q208
R208 20K
R359 100
CR359
R371 15K
E370
C361 0.045μF
C355 .001
C365 .001
R399 100
C395 0.01μF
GRID DRIVE
CR363
R368 2.2K
R380 1M
DS385
DS390
DS373
DS374
R364 13M
CR360
R357 4.7K
R372 680
C215 .0068
CR209
C205 0.01μF
CR207
R358 10K
-5500V
C341 .01
DS375
V1
GRID
CATHODE
POST ACC
FILAMENTS
CR291
C281 .0068
CR289
C299 .0047
R311 24K
C315 .001μF
R310 100M
+5500V
R373 2.2K
R375 2.2K
FILAMENT SUPPLY
6.3 V.A.C.
+15V
R256 2.7K
R255 1.5K
Q251
R261 2.7K
Q265
R262 100K
C251 .001
CR267
Q257
HV REGULATOR
CR266
R265 12K
C261 .001
-15V
R266 301K
R264 50K
HV
R352 228K
60M
C350 25
R348 220K
HV OSC BOARD 670-5724-01
HV BOARD 670-5408-02