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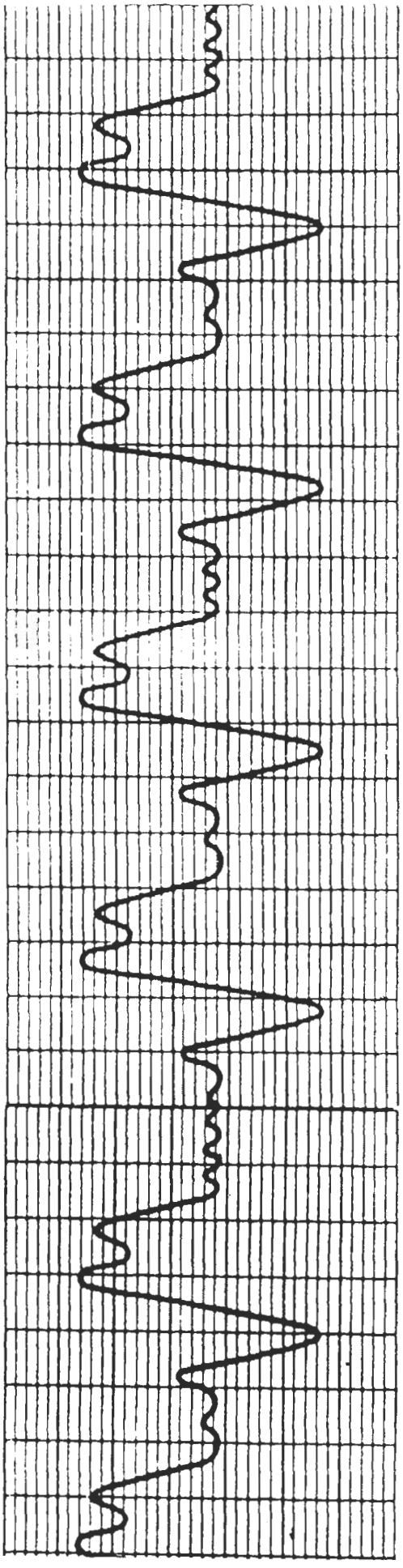

rustrak®

THERMOCOUPLE TEMPERATURE RECORDERS AND PROBES INSTRUCTION MANUAL

This Manual Covers Models -
Z-55 And Digilog-55
Probe Models 1551 and 1552

Printing History: Third Edition - June, 1994

Layout by: Trish Keefe

INDEX

WARRANTY

GRAPHIC INSTRUMENTS DIVISION (GID) GULTON INDUSTRIES INC. warrants RUSTRAK products described in this manual to be free of defects in material and workmanship under normal usage and service for a period of one year from date of purchase from the factory or authorized GID distributor. The company's obligation under this warranty is limited to repairing or replacing any instrument or component which, on examination by factory personnel, is found not to conform to the foregoing warranty. The instrument must be returned to the factory transportation prepaid. We shall not be liable for any damages, consequential or otherwise.

The foregoing warranty is exclusive and in lieu of other warranties whether expressed or implied.

This warranty does not apply to galvanometer stylus damage or damages resulting from shipping, alteration or misuse.

GID reserves the right to discontinue any model or change specifications or designs without incurring any obligation.

RECEIVING, AND INSPECTION FOR DAMAGE

Cartons with single channel recorders contain a manual, one roll of chart paper and hardware kit which contains panel mounting hardware and rubber feet.

Two wide and recorders are supplied with a handle and rubber feet. There will be no panel mounting hardware unless requested at the time of order.

Shipping damage must be reported to your carrier immediately. Do not destroy packing materials, even if they appear undamaged, until the agent has examined them.

Under U.S. shipping regulations, any damages must be claimed by the consignee. Do not return items damaged in shipping until your claim is examined and documented. See page 13 for complete shipping instructions.

PLEASE READ THE SECTION BELOW BEFORE USING THE RECORDER

WARNING All AC powered recorders must operate from a power source that does not apply more than 130 volts RMS (or 260 volts RMS) between the primary supply leads and ground. A ground connection between the exposed metal case through the grounding conductor in the power cord is essential for safe operation. Be sure that your power receptacle is properly wired. If there is a loss of ground, all accessible metal parts, including parts that look insulated, can render a FATAL electric shock.

Before loading paper please read the chart loading instructions.

Conversion to tear-off instructions and other features are described on page 5.

Signal Connections binding posts are located on the rear of the recorder. Red is the positive input.

Primary power for the instrument is via appropriate plug or cable. WARNING: be sure that you are connecting the instrument to the correct power source. This information is always on the serial plate.

When shipping the recorder long distances, it is advisable to remove the chart paper to prevent possible damage. Also be sure that the striker is in the open position. Refer to page 13 for complete shipping and handling instructions.

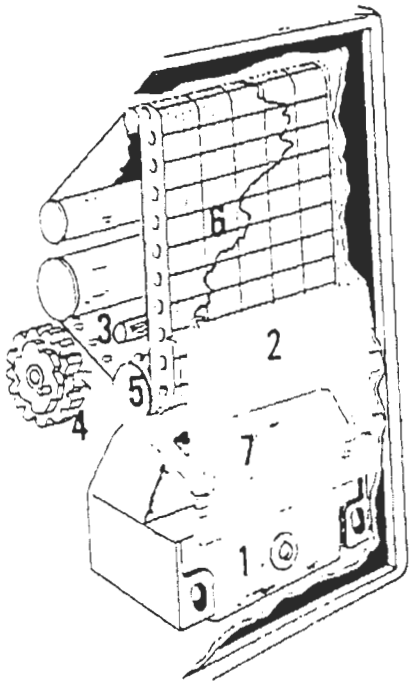

Figure 1 Recorder Operation

RECORDER OPERATION

The recorder consists of several basic elements: the galvanometer (1), spring loaded striker (2), backup bar (3), chart drive motor and cam (4), time drum (5), pressure sensitive paper (6), and gear train (not shown).

The rotating cam lifts the striker away from the galvanometer pointer (7), allowing it to swing. The cam allows the striker to fall against the pointer, pressing it against the paper. The force is absorbed by the backup bar located behind the paper. The white coating on the paper is pushed aside revealing the black base material at the point where the pointer and backup bar cross. The succession of dots gives the appearance of a continuous line.

The chart drive motor which rotates the cam also provides the movement, through a gear train to the time drum driving the paper through the recorder.

RECORDER STANDARD FEATURES MODELS Z-55, DIGILOG 55

Refer to Figure 2. Instructions apply to single, two (2W), or channel recorders.

REROLL OR TEAR-OFF CONVERSION

All recorders are supplied for internal reroll operation. To change to tear-off mode, loosen the black screw on the right hand side plate two turns. Spring the right hand sideplate to free one end of the drive belt roller. Slip the drive belts on to the drive belt roller and reinsert the drive belt roller into the side plate. Tighten the black screw. Remove the cardboard spool from the take-up roller and insert the take-up roller through the belts and reinstall the take-up roller. Follow the paper loading instructions on page 9 of this manual.

CHART ADVANCE

Push in, and roll down thumbwheel to advance chart.

QUICK REVIEW

Chart can be unrolled for analysis. Lift left retaining clip and set roller shaft into notch. Snap the clip back into place. Unroll the paper as needed. When finished, rewind the chart with the rewind gear. Unlock the clip and return the shaft to the bottom position. Be sure to re-lock the retaining clip.

INTERCHANGEABLE GEAR TRAIN

Fourteen available gear trains produce a 480/1 ratio of chart speeds. To change, remove gear spring, slide gear in direction of arrow and lift out from the top. Insert the new gear bottom first and slide into place. Replace the gear train spring. Test to be sure gear is engaged by noting zero clearance between gear train and top round tab on side plate.

ACCESS WINDOW

Slides down to provide access to chart for notes.

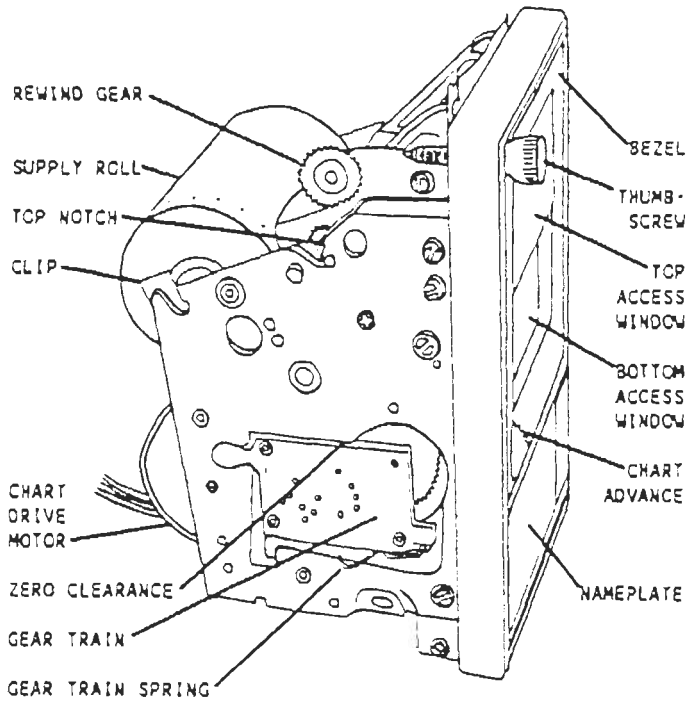

Figure 2 Basic Chart Drive With Case Removed

MODEL Z-55, DIGILOG 55, TEMPERATURE RECORDER DESCRIPTION

The standard Rustrak Model Z-55 records thermocouple temperatures on a 2.3 inch wide chart. It is also available with two channels.

The descriptions, procedures and specifications in this manual apply to any Z-55 channel regardless of the mechanical configuration of the recorder.

The complete circuit consists of several components: external thermocouple probe, cold junction temperature sensing, chopper stabilized amplifier with zero and span control, input overload protection, and regulated ±5 volt DC power supplies.

The cold junction compensation voltage is developed by the voltage divider consisting of the thermistor (14), and resistor (2). Trimmer (4) changes the excitation, (e).

Zero suppression or offset for temperature ranges that do not happen to start at zero millivolts is provided by the voltage divider consisting of (21-22), and (2).

The slide switch (18), when in the S (span) position disables both cold junction compensation and offset. In the Z (zero) position, a resistor the same value as the thermistor at 0°C is substituted. This simulates placing the cold junction in an ice bath if copper leads are substituted for the thermocouple wire. Zero offset or suppression are also enabled. This feature eliminates the need for a millivolt calibration source with temperature compensated terminals.

Switching to U (use) replaces the fixed resistor with the thermistor. When the thermocouple is connected, the voltage across resistor (2), cancels the cold junction voltage and injects the correct offset or suppression for the particular span that the recorder is calibrated for.

Zero adjustment is provided by (12), span adjustment by (13). Adjustment range is approximately ±25% of span.

Diodes (24-25-26) protect the amplifier input in the event of accidental application of more than ± 5 volts.

Power supply voltage for all circuits is provided from the 12 volt secondary of the power transformer. When DC operation is required, a voltage converter replaces the transformer. In either case, the AC secondary voltage is rectified, filtered, and regulated to provide ±5 volts for all circuits.

Digilog 55 is a Model Z-55 with LCD display. Power and signal come from the main board in the recorder.

MODEL Z-55, DIGILOG 55 GENERAL SPECIFICATIONS

Dimensions (HWD), WT.	5.62" X 3.62" X 4.31" 3-3/4 lbs
Thermocouple Types	E, J, K, R, S, T, (J-K, Standard)
System Accuracy	±2% of Span (Std ranges type J-K)
Stability Per Year	± .5% of Span
Ambient Temp. Limits	-10 to 60°C, 14 to 140°F
Cold Junction Error	±1°C (±2° F)
Max T/C Loop Resist.	1000 Ohms
T/C Break Protection	Upscale Standard
Maximum Offset	Up to ±5 Times Span
Input Connections	Binding Post, Attached Line Cord

MODEL 1551 TYPE J, 1552 TYPE K, THERMOCOUPLE PROBES

Dimensions	.187" D x 6" L and 6' Armored Cable
Time Constant	5 Seconds to 63% of Final Change
Max Temperature	480°C, 900°F

MODEL 1553 PRESSURE FITTING

Max Pressure	300 PSI

DIGILOG 55 SPECIFICATIONS

Type	3-1/2 Digit Liquid Crystal Display
Display	7 Segment Reflective
Digit Height	1/2 Inch
Sample Rate	2-1/2 Readings Per Second
Resolution	< 200 degree span .1°
	< 2000 degree span 1°
Operating Temperature	-10 to +60°C, 14 to 140°F

MODEL Z-55, DIGILOG 55 CALIBRATION PROCEDURE

EQUIPMENT NEEDED

Jewelers screwdriver.
Adjustable 115V, 230V 50/60 Hz or 12 VDC power supply.
Millivolt source 0-100mV, resolution 10uV, accuracy ±.1%.
If millivolt source has temp. compensated terminals disable the compensation.
DVM ±.5% Accuracy

STEP 1— Connecting the equipment:

See figure 3. The input voltage, temperature range and thermocouple type are indicated on the nameplate.

STEP 2—Stability with primary voltage variation:

Switch (18) to the Z position. Set the millivolt source for a recording near full scale. Vary the voltage to the limits on the chart below. Neither the recording, nor the displayed values on the LCD should change.

Nominal Voltage Noted on Nameplate	High-Low Limits
15V 50/60Hz	100 to 130V
230V 50/60 Hz	200 to 260V
12V DC	10 to 14V

STEP 3—Refer to published Thermocouple Reference Tables such as NBS MN 125 or OMEGA ENGINEERING, INC. temperature catalog to obtain the millivolt equivalents corresponding to zero, and full scale temperature for your thermocouple type. Also calculate the difference millivolts (span). Open up the recorder to get the value for e, printed on the upper right hand corner of the circuit board. Tabulate the data in the space below for future reference.

Zero Scale Temperature (Zt) _____ Millivolts (Zm)
Full Scale Temperature (Ft) _____ Millivolts (Fm)
Excitation(e) _____Span millivolts (Sm)
Proceed with calibration.

Calibration of recorder and LCD display: See Note 1.

Step	Switch position	MV input signal	Input signal leads	Adjust trimmer item	For chart recording	For LCD reading
4	S	0.00mV	copper	12 106	Zt	Zt
5	S	Sm	copper	13 101	Ft	Ft
6	redo 4, 5					
7	Z	Zm	copper	28 adjust for e mV		
8	Z	Zm	copper	12 106	Zt	Zt
9	Z	Zm	copper	13 101	Ft	Ft
10	U note 3	known temp	thermocouple	nothing	known temperature within ±2% of span	

Note 1: Item 12 is for recorder zero and item 106 is for LCD zero. Item 13 is for recorder full scale and item 101 is for LCD full scale. Make recorder adjustments before LCD in the order 12 then 106 and 13 then 101. Step 7 item 28 is adjusted for the "e" value noted on the PC board.

Example: Recalibrate Digilog 55 having a temperature range of -100°F to +400°F, type J.

Step 3: Zero Scale Temperature (Zt) -100° F Millivolts (Zm) -3.492
Full Scale Temperature (Ft) +400 °F Millivolts (Fm) +11.023
Excitation(e) .774 mv Span Millivolts (Sm) 14.515

Step	Switch position	MV input signal	Input signal leads	Adjust trimmer item	For chart recording	For LCD reading
4	S	0.000	copper	12 106	-100°F	same
5	S	14.515	copper	13 101	+400°F	same
6	redo 4, 5					
7	Z	-3.492	copper	28 adjust for -774 mV note 2		
8	Z	-3.492	copper	12 106	-100°F	same
9	Z	11.023	copper	13 101	+400°F	same
10	U note 3		type J T/C	nothing	known temp. within ±2% of span	

Note 2: If the value of item 8 gain resistor happened to be 57.6K then the value for e would be 774 millivolts.

Note 3: Switch must be in U position for all recording.

CHART LOADING RE-ROLL MODE

A stripe appears on the last three feet of each roll of paper. Use full new rolls of Rustrak paper.

1) Disconnect power.
2) Loosen thumbscrew (1).
3) Unlatch paper retaining clips.
4) Open panel to chassis latch (3).
5) Remove supply (4) and take up roller (5). Carefully slide any paper straight out. Don't pull paper backward or forward from the recorder.
6) Slip the new roll of paper on to the supply roller (4), perforated end first, all the way to the roller shoulder.
7) Unroll a foot of paper and slide the paper between the panel and side plate, sprocket holes first. Keep the paper taut and close to the drive drum to protect the pointer.
8) Engage the supply roller shaft into both notches (6).
9) Slide the cardboard sleeve from the used roll of paper on to the take up roller against the disc (5).
10) Tape the paper to the cardboard sleeve, printed side out and touching the disc. Use the disc as a guide to be sure the paper is started true, then wrap a few turns around the sleeve.
11) Place the take up roller shaft in the notches. Be sure to use the bottom notch on the left hand side.
12) Close the paper retaining clips (2), and latch (3). Use the chart advance wheel (8) to assure that the paper moves properly through the recorder.
13) Close the recorder front panel and tighten the thumbscrew.
14) Apply power and advance the paper to the correct time using the chart advance wheel.
15) Before leaving the recorder unattended, observe the operation long enough to determine that the signal is being properly recorded and that the chart movement is normal.

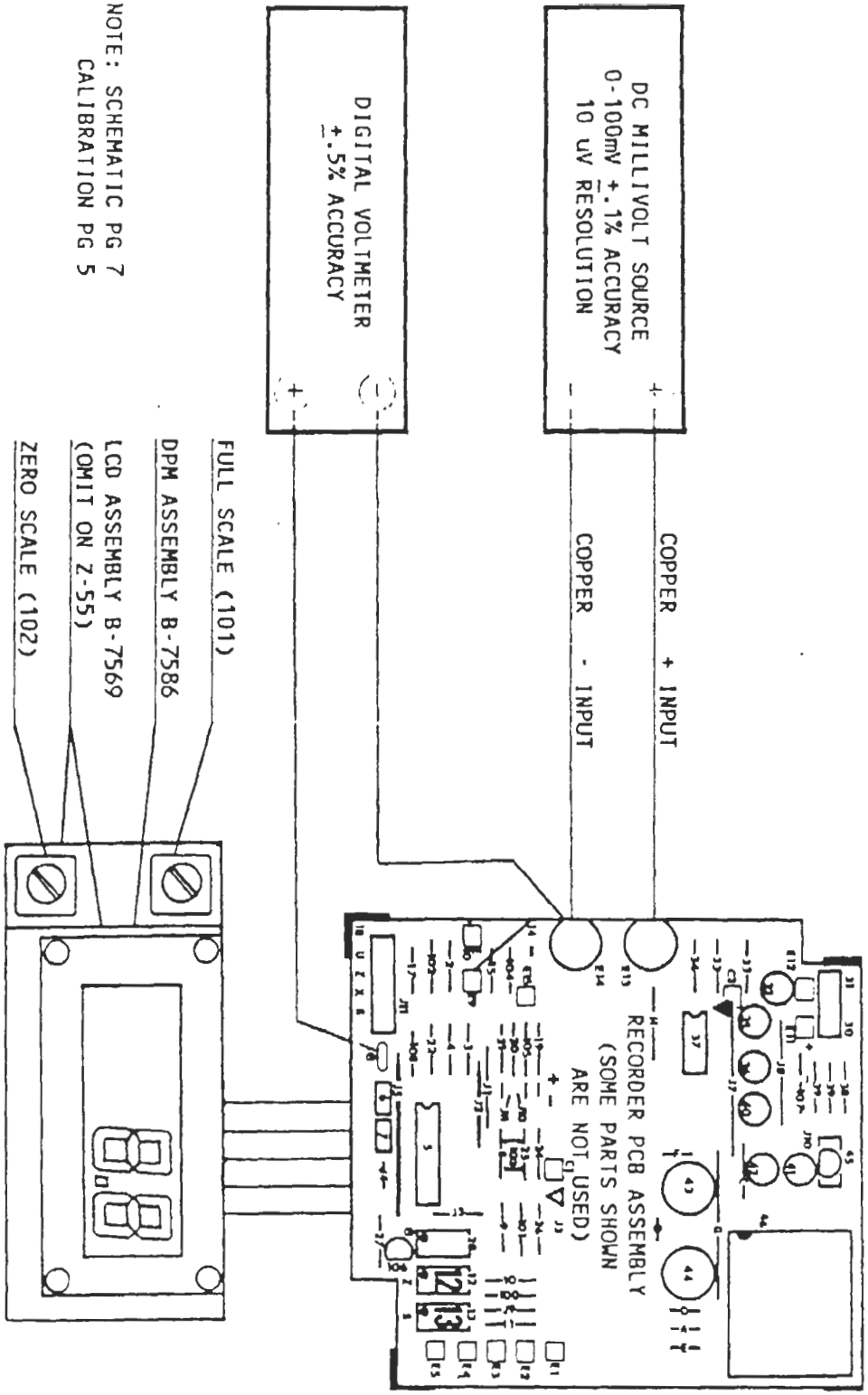

Figure 3 Model Z-55 Digilog 55 Calibration and Set-up

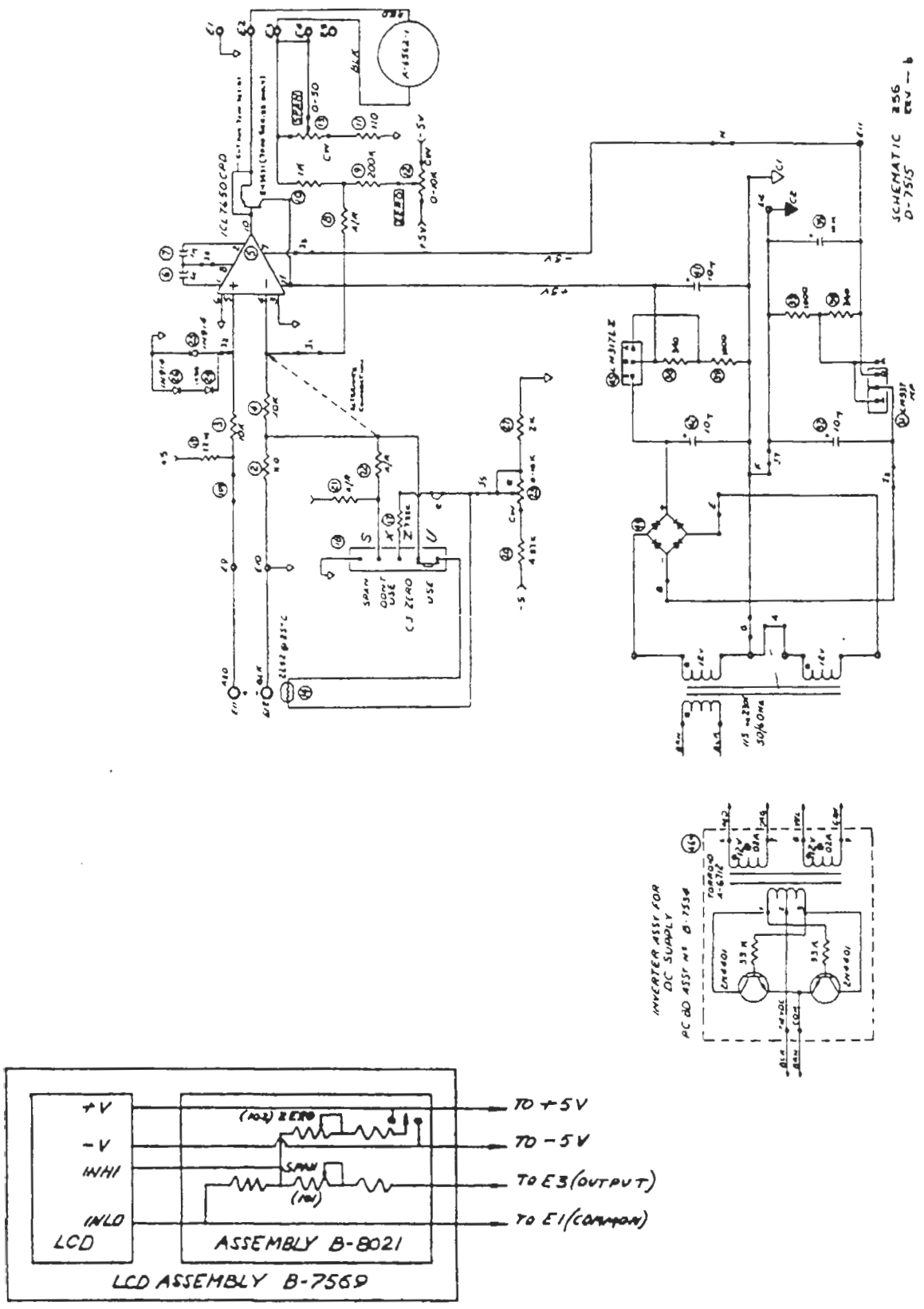

Figure 4 Schematic Model Z-55 Digilog 55

The schematic shown is for Digilog 55. For model Z-55 omit assembly B-7569.

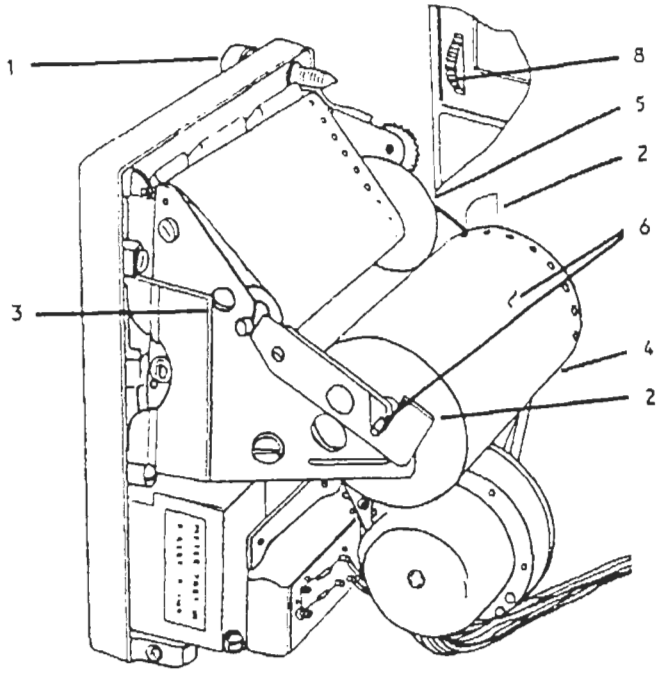

Figure 5 Single Channel Re-roll

SINGLE CHANNEL RE-ROLL

CHART LOADING, TEAR-OFF MODE

A stripe appears on the last three feet of each roll of paper. Use any length of new Rustrak paper.

1) Disconnect power.
2) Loosen thumbscrew (1)
3) Unlatch paper retaining clips (2).
4) Open panel to chassis latch (3).
5) Slide drive belts (9) from V grooves to the center of the top roller. This releases pressure on the paper.
6) Remove supply roll (4). Carefully slide any paper straight out. Do not pull paper backward or forward from the recorder.
7) Slip the new roll of paper on to the supply roller (4), perforated end first, all the way to the roller shoulder.
8) Unroll a foot of paper and slide the paper between the panel and side plate, sprocket holes first. Keep the paper taut and close to the drive drum to protect the pointer.
9) Engage the supply roller shaft into both notches (6).
10) Pull drive belts (9) back into the V grooves (10).
11) Close the paper retaining clips (2), and latch (3). Use the chart advance wheel (8) to assure that the paper moves properly through the recorder.
12) Close the recorder front panel and tighten the thumbscrew.
13) Apply power and advance the paper to the correct time using the chart advance wheel.
14) Before leaving the recorder unattended, observe the operation long enough to determine that the signal is being properly recorded and that the chart movement is normal.

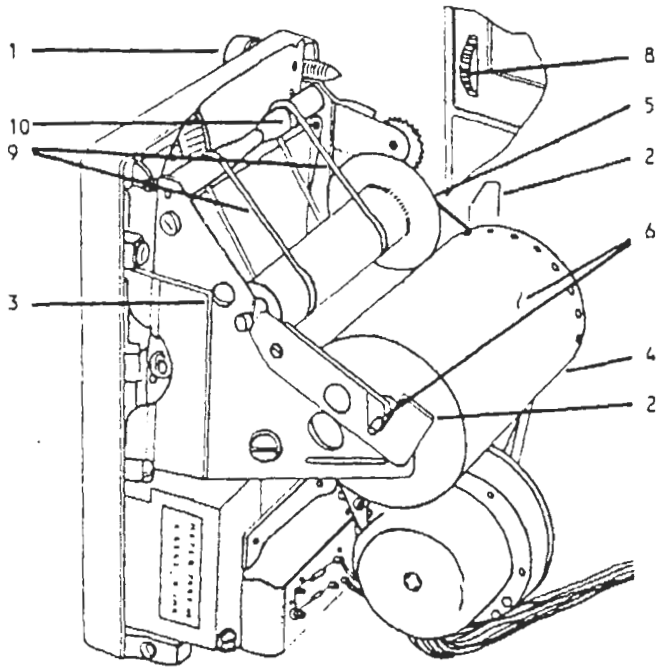

Figure 6 Single Channel Tear-off

SERVICE AND REPAIR

Distributors located in major industrial areas are staffed with qualified service representatives equipped to perform rapid service and modifications on Rustrak recording instruments.

If the instrument is in warranty, repairs must be performed at the factory unless special arrangements have been made. Rustrak is not responsible for paper drive problems unless genuine Rustrak chart paper is used.

SHIPPING THE EQUIPMENT

The equipment can be shipped in the original packing if still in good condition. In any case, seal the equipment in a clean plastic bag, surrounded with clean, soft material. The company cannot be responsible for damage resulting from poor packing.

Always remove chart paper before packing and also be sure that the striker is in the open position. This can be accomplished by disconnecting power when the striker is off of the pointer.

Observing these procedures will prevent unnecessary damage, delays, and expense to you.

If you are returning equipment to one of our distributors, call our main office listed on the back cover for the telephone number and location of your nearest distributor.

GALVANOMETRIC STRIP CHART RECORDER ADDENDUM

Installation of paper:

The galvanometric strip chart recorders utilize a striker bar that forces the pointer assembly against the paper at preset intervals to form a line on the chart.

If an attempt is made to install the paper while the striker is closed (i.e. – while the pointer is against the paper), damage to the pointer may occur.

Therefore only change the paper while the striker is open. By observing a few strikes while the unit is operating, you can clearly distinguish when the striker is open. This will be when the striker is at it's furthest distance from the paper.