INSTRUCTIONS FOR MAINTENANCE AND INSPECTION OF G.R.S. HOT BOX DETECTOR (WITH FIELD READOUT)

Clean scanner mirror surface with a soft cloth attached to a long-handled stencil brush through shutter lid opening every two weeks. Extreme care should be used to prevent scratching the mirror surface.

Recorder tapes should be replaced approximately once each week and sent to the Office of Signal Supervisor for review.

Weekly inspection will include the following:

(a) Inspect approach and gating wheel detectors to insure cable plug couplers are tightly connected.

(b) Inspect scanners and other track fittings to see if properly secured to bridge timbers and no external damage visible. If scanner bridge timbers or rail is pumping, contact section gang for repairs.

(c) Measure Amplifier Gate Logic input voltages with scope. If input voltage is 1.0 VDC +/- 0.2 volt, no adjustment is necessary.

(d) Confirm that rotating lights at scanner location operate properly.

Monthly inspections will include the following:

(a) Using a Model 260 Simpson meter, check supply voltages and enter in log book. Voltage readings failing to meet the following requirements should be adjusted and recorded in log book:

26-VDC Unregulated +/- 1.0V
20-VDC Regulated +/- 0.2V
115-VAC Unregulated +/- 5.0V

(b) Use a pyrometer to measure the ambient sensor temperature, then remove scanner lid and measure temperature on target heater; record both in log book. Target heat should be approximately 100 degrees over the ambient +/- 5 per cent. During moderate season, adjust climatic resistor (R2) in scanner lid to correct temperatures which do not meet specifications.

Note: During the winter season, climatic resistor (R 2) should be jumpered out between Terminals 7 and 8 in scanner lid. This will permit maximum lid heat during inclement weather, and jumper should be removed in the spring.

(c) Measure Amplifier Gate Logic voltages with a scope, recording the results in log book:

1.0 V input to amplifier ± 0.2 volt (positive going pulse)
1.8 V output from amplifier ± 0.2 volt (negative going pulse)

ATTENTION: Do not measure amplifier input voltages unless shutter lids have been closed for several minutes. This will permit automatic gain control and target heaters to stabilize. If radiometer's signal to noise ratio exceeds 0.2 volt P-P, investigate and correct.

(d) Calibrate recorder so that 1.8 Volts D C input will deflect pen stylus 9 millimeters (0.2 Volt equals 1 m m).

(e) Check aerial cables for cross and ground using standard 22-Volt battery and "281" meter or equivalent.

Quarterly inspection will require assistance from signal inspector and/or adjoinins maintainer:

NOTE: Calibrate recorders before proceeding with Quarterly Tests.

(a) Check scanner optical alignment with track-mount G R S Fixture No. 2 3 4 7 1 - 3 and test Fixture 2 9 0 0 3 - 4 G R - 1, per A-170 through A-170-3, Instructions for G R S Scanner Optical Alignment.

(b) Check the absolute/differential alarm boards to confirm that absolute alarms on 18 millimeters and differential alarms on 9 millimeters deflection on each rail. Use Instructions for Adjustment Absolute/Differential Alarm Levels, A-180 through A-180-3.

(c) Check 531 Harmon Carrier levels using a Simpson 260 meter on the A.C. output scale.

1. With transmitter either "OFF" or disconnected from the line, plug voltmeter leads into + and - pin jack leads in front panel of relay amplifier. Adjust squelch relay (RY3) control until the relay closes. Meter should read approximately 5.5 volts when the relay closes. Adjust control slowly counterclockwise to 0 volts.

   NOTE: If squelch relay closes solely due to interference on the line, it may be necessary to cautiously reduce the squelch control setting.

2. If not previously done, have transmitter keyed on. Reconnect transmitter to line.

3. Check each receiver meter limiter "lim" position for indication of strength of received signal. Full scale on this meter position is 0 to 1.5 volts. If limiter is above 0.2 volts, proceed to next step. If both receiver limiter readings are below 0.2 volts, it probably indicates high line transmission losses, which will require increasing transmitter "cxr" output levels. A single receiver low limiter could indicate several possible conditions: transmitter oscillator not tuned to frequency, faulty transmitter, line dips, at the particular frequency, or a faulty receiver. Try increasing the transmitter ("cxr") output level. If above 0.2 volt limiter can be obtained, proceed to next step.

   If unable to attain 0.2 volt limiter, and transmitter meter readings and connections appear normal, the possibility of a line clip loss at the particular frequency should be investigated prior to assuming a faulty receiver. (It may be necessary to change this frequency.) In any event, try next step to see if some limiter can be obtained. Contact Signal Supervisor, describing conditions encountered, if satisfactory limiter levels cannot be obtained.

4. Check each receiver discriminator ("disc") meter reading for 0 volts to determine whether transmitter oscillator is tuned to correct receiver frequency. Meter full scale reading on this position is 0 to $\pm$ 15 volts. Check the transmitter oscillator tuning by having each trans-

mitter "osc" slug adjusted while watching the corresponding receiver "disc" meter. Have slug turned so as to pass through a zero reading on either the plus or minus side, then reverse the direction of tuning for a 0 volt reading.

NOTE: The discriminator 0 volts may vary slightly from day to day. These variations are normal, and the designed equipment safety factor will compensate for these variations.

5. Using the manual shift switch on each transmitter, key Ry1, noting the receiver discriminator for between plus 4 volts and plus 6 volts. Key Ry2 and not discriminator for between negative 4 and negative 6 volts. Normally the Ry1 and Ry2 controls can be left fully clockwise. These settings can be checked and adjusted to insure that the respective relay closes at 1/2 to 2/3 the previously noted discriminator voltages by holding the respective manual shift switch and shifting the frequency slowly with the transmitter "osc" tuning slug. If this is done, return transmitter "osc" frequency to 0 volts on the discriminator at completion of relay shift test. When the respective relay is actuated, the corresponding receiver meter relay voltage should be approximately 12 volts, and 0 volts when the relay is not actuated. On the transmitter Ry1 and Ry2 meter positions, the voltage should be 0 volts when actuated.

6. All meter readings should be recorded for future routine maintenance reference. However, none of the readings are critical and frequent minor adjustments are not necessary.

7. Connect meter to receiver side of 20db pad (at locator), and adjust receive level to 0.8 volt +/- 0.1 volt for each frequency by adjusting output of transmitter. Use A-133 to record Harmon Carrier test information.

(d) Alarm locators and transmit wheel count to all counters including dragging equipment for accurate count, and observe that locator alarm lights illuminate.

(e) Clean or replace blower filters and measure voltage across terminals "D" and "N" in scanner housing to insure that 24 volts +/- 1.0 volt is being applied to blower motor.

(f) Confirm that all hot box detector alarm lights indicate to the dispatcher.

531 HARMON CARRIER TEST

	EAST	WEST
TRACK 1	R Y 3 _____ P U _____ D A _____	R Y 3 _____ P U _____ D A _____
CHANNEL 1	LIM. _____	LIM. _____
4.0 K H z	DISC. US _____ CF _____ DS _____	DISC. US _____ CF _____ DS _____
	12 V D C _____	12 V D C _____
	TRANS. OUTPUT _____	
CHANNEL 2	R Y 3 _____ P U _____ D A _____	R Y 3 _____ P U _____ D A _____
3.3 K H z	LIM. _____	LIM. _____
	DISC. US _____ CF _____ DS _____	DISC. US _____ CF _____ DS _____
READ ON LINE	TRANS. OUTPUT _____	
	TRANS. OUTPUT CH. - 1 and CH. - 2 _____	

	EAST	WEST
TRACK 2	R Y 3 _____ P U _____ D A _____	R Y 3 _____ P U _____ D A _____
CHANNEL 1	LIM. _____	LIM. _____
' 0 K H z	DISC. US _____ CF _____ DS _____	DISC. US _____ CF _____ DS _____
	12 V D C _____	12 V D C _____
	TRANS. OUTPUT _____	
CHANNEL 2	R Y 3 _____ P U _____ D A _____	R Y 3 _____ P U _____ D A _____
3.3 K H z	LIM. _____	LIM. _____
	DISC. US _____ CF _____ DS _____	DISC. US _____ CF _____ DS _____
READ ON LINE	TRANS. OUTPUT _____	
	TRANS. OUTPUT CH. -1 and CH. -2 _____	

REMARKS: _____

_____

_____

TESTED BY _____

HARMON METER SCALE DISC. 15 V., LIM. 1.5 V., RY. 15 V.
DS DENOTES DOWN SHIFT
CF DENOTES CENTER FREQUENCY
US DENOTES UP SHIFT

INSTRUCTIONS FOR MAINTENANCE AND INSPECTION OF G R S HOTBOX DETECTORS WITH M A - 1 (MINI-ANALYZER)

I. WEEKLY INSPECTIONS AND TESTS PERFORMED BY SIGNAL MAINTAINER:

A. Inspect approach and gating wheel detectors to insure cable plug coupler and mounting bolts are secure.

B. Inspect scanners and other track fittings to see if properly secured to bridge timber and no external damage visible. If bridge timbers or rail is pumping, or if there is cross level problem, contact section gang for repair.

C. Clean scanner mirror survace with soft cloth. Extreme care should be used to prevemt scratching the mirror surface.

D. Measure amp gate logic input voltage (refer to Section II. -D. which follows for procedure).

E. Change recorder tape (as required) and send tapes and M A - 1 printouts to Signal Inspector's Office for their review.

F. Verify that radio will transmit and that Mars light and indication circuits are operational:

1. Drop short track relay (C T R).
2. Push Test 3 on direction unit (Eastbound).
3. Push test gate on gate generator or turn on test gater.
4. Drop H B P relay.
5. Stop pushing test gate or turn off test gater.
6. Verify Mars light is on and D S got indication.
7. Pick H B P relay.
8. Pick C T R.
9. Listen on truck radio and verify that system is transmitting.

II. MONTHLY INSPECTION AND TESTS PERFORMED BY SIGNAL MAINTAINER:

A. Perform all weekly tests.

B. Using Model 2 6 0 Simpson, or Fluke 8 0 2 4 B meter, check supply voltages and enter in log book.

(Note: Voltages below normal should be readjusted):

1. 2 8 V D C Unregulated for 13 cell lead, 28.6 V $\pm$ 0.2 V
2. 2 4 V D C Regulated (note the 24 V regulator is non-adjustable and can be read on the mother board at G - D 1 4 or on the A A R terminal on top of rack on J 4 E 1 and J 5 E 1.

3. 2 0 V D C Regulated, read on test jack on front of regulator card and should be 20 V $\pm$0.2 V. If not in tolerance, adjust pot on regulator to obtain 20 V D C. If it cannot be adjusted to spec, change out card.

4. 1 1 5 V A C unregulated $\pm$5.0 Volts.

5. Devtronics Power Supplies:

   (a) Read the 5- and 12-volt logic power supply on the front on the Devtronics mother board on test points +5, +12 and Common.

   Note: +5 must be 5 Volts - 0 to +0.2 Volts and is adjustable in red pot on power supply marked "5 V Adj." +12 Volts is adjusted at 15 $\pm$0.2 V and is adjustable on power supply in red pot marked "12 V Adj."

   (b) Read 12 Volt relay drive and input power supply on terminals T B 1 - 4 1 and 4 2 on back of M A - 1 (note T B 1 - 4 1 is positive and T B 1 - 4 2 is negative) should be 12 V $\pm$ 0.2 V.

   (c) Read output of inverter on A C buss on rack.

C. Check target temperature:

1. Read ambient temperature with Fluke 8 0 2 4 B meter and temperature probe, and record ambient temperature. Take reading under scanner, near ambient sensor probe.
2. Read target temperature with temperature probe on underside of outside edge of heater.
3. Target temperature should be 100^{o} above ambient temperature. If not, adjust pot on ambient sensor to achieve 100^{o} above ambient temperature.

   Note: Allow target temperature to stabilize after each adjustment is made.

D. Measure input and output voltages on the amplifier gate logic card.

1. Input voltage is positive and J 1 jack on the amp gate logic card, and place the other side of scope, or 8 0 2 4 B Meter, into the common jack.
2. Insert meter and hold fast count button on amp gate logic card.
3. Input pulse should be $0.8\ V \pm 0.2\ V$

   (Note: In hot weather, readings should be taken early in the morning when temperature is 75^{o}.)
4. If input is out of range, adjust pot in test unit to adjust input level.

   (Note: Top pot in test unit is "A" rail or North rail. Bottom pot is "B" rail or South rail.)

5. The same procedure should be used for both amp gate logic cards.
6. Record both input and output levels on Standard form.
7. Output is negative voltage and J 2 jack on the amp gate logic card with other side of scope, or Fluke 8 0 2 4 B Meter, in common jack.
8. Level should be 2 V D C $\pm$ 0.2 V.

E. Calibrate recorder:

1. Set tension on analog pens at 2 grams.
2. Turn on recorder and push fast count button on "A" rail amp gate logic card. Recorder deflection should be 0.2 V per m m, that is

1 . 8 V is 9 m m

2 . 0 V is 10 m m

2 . 2 V is 11 m m

3. Calibrate "B" rail the same as in E. -2, above.
4. Adjust pedestals (with pots on amp gate logic cards) to 2 m m on each channel.
5. Turn record control knob back to "remote" and set time and date on recorder and (M A - 1) mini-analyzer.

F. Check aerial cable for cross and grounds.

(Note: Both batteries "B 2 8" and "B" will read to ground because "B 2 8" is grounded on the G R S rack and "N" is grounded on the Harmon Recorder.)

G. Check polarity of gating transducers:

1. Drop short track circuit (C T R).
2. Push Test 3 on direction unit (Eastbound).
3. Push and release test gate several times.
4. Let system time-out and scanner doors close.
5. Test eastbound gating transducer (No. 1):
   (a) Using large piece of metal (rail anchor or spike) slowly enter No. 1 Transducer from directly above until it is setting on transducer.
   (b) System should open doors as metal approaches transducer.
   (c) To make sure you did not bounce the metal when you approached the transducer, let system again time out and doors close, and then remove the metal from transducer pulling it straight up.
   (d) System should not start up when metal is removed. If it does, perform Steps 5.(a) to 5.(c) again to verify you did it properly. If you verify it is operating wrong, change polarity of wires on No. 1 Transducer and, again, do Test 5.(a) to 5.(c) to insure problem is corrected.
   (e) Again, let system time out and swing metal through No. 2 Transducer and verify that system will not start
   (f) Pick C T R and let system time out.

6. Test Westbound gating transducer (No. 2):

(a) Drop C T R relay.

(b) Push Test 4 on direction unit (Westbound).

(c) Push and release testgate several times.

(d) Let system time out.

(e) Test No. 2 Transducer the same as No. 1 tested to Steps 5.(a) to 5.(d).

(f) Again, if gating is backwards, change polarity of transducer wires.

(g) Test No. 1 Transducer for reverse move cutout as in Test 5.(e).

(h) Pick C T R and let system time out.

H. Measure transducer resistance.

III. QUARTERLY INSPECTION AND TESTS PERFORMED BY SIGNAL INSPECTOR AND SIGNAL MAINTAINER:

A. All weekly and monthly tests should be performed before continuing with quarterly test.

B. Check calibration of M A - 1 (Mini-analyzer).

1. Activate "A" to "D" Converter Display by putting Option Switch B I N 2 - 8 on the switch input card to the "ON" position.

2. Push the reset button on the front left side of M A - 1. The clock display will time out and go to all zeros.

3. Push and release test gate button on gate generator.

4. The right four digits of clock will display the peak hold A/D converter output in Base 16 (hexa-decimal):

   (a) The right two digits (nominally, the "minutes" display) are for the "A" rail (North).

   (b) The next two digits to the left (nominally, the "hours" display) are for the "B" rail (South).

   (c) These numbers will be in Base 16 (hexa-decimal): to convert to m m, first convert the Base 16 number to Base 10 and, then divide by five. Example:

   Display is 37_{16}

   Convert to Base 10

   3 x 16 = 48

   + 7 = 55

   : 5 = 11 m m

   (d) Again, read output from amp gate logic cards, as in II.-D. Refer to following chart or convert per III.-B-4.(c):

Output from Amp Gate Logic Card	Recorder Deflection	M A - 1 A/D Display
2 . 0 V	1 0 m m	32_{16}
2 . 1 V	1 0 . 5 m m	34_{16}
2 . 2 V	1 1 m m	37_{16}

(e) If Devtronics M A - 1 (A / D) Display doesn't agree with G R S Amp Gate Logic Card output, adjust Pots (R 5) and (R 6) on Heat Processor and Approach Board in the Devtronics Cabinet.

(1) R 6 will control "A" rail and R 5 will control "B" rail.

(Note: The pots and the display are set inverted from each other: that is, (R 5) is on the right, but controls the left display; and, (R 6) is on the left and controls the right display.)

(2) Push and release test gate: If display is not correct, continue turning (R 5) and (R 6) after each gate pulse until proper calibration level is achieved per Table in III. -B.-4.(d).

(f) When proper level is seen, put Switch B I N 2 - 8 back to the "OFF" position and, again, push RESET.

C. Check scanner optical alignment with track mount G R S fixture No. 2 3 4 7 1 - 3 per Instructions A - 1 7 0, Instructions for G R S Scanner Optical Alignment.

D. Check absolute, differential and defective car alarms and dragging equipment detector:

1. With alignment fixture on track, on Rail "A", drop C T R and push Test 3 on direction unit.
2. Turn on test gate and adjust alignment fixture until 18 m m of heat is seen.
3. Turn off test gate and pick C T R.
4. Drop C T R, push Test 3 on direction unit.
5. Have text fixture light shielded and push test gate to simulate car wheel spacing.
6. Remove shield from test fixture when an alarm is desired.
7. Continue process to determine that "absolute" fires at 18 m m

   (Note: Once maximum alarms are exceeded, M A - 1 will no longer alarm.)
8. Do Steps D. -1. through D. -7. again with heat level now at 11 m m (with 2 m m pedestal) to determine that "differential" fires at 9 m m.
9. Do Steps D. -1. through D. -7. again with heat level now at 15 m m to determine that defective car alarms.

   (Note: To alarm on defective car, you must have four, or more, alarms above 15 m m, and must be in car sync. To maintain car sync, you must pulse test gate like a car would; i. e., two pulses - - a pause - -and two pulses.
10. Repeat Steps D. -1 through D. -9 with alignment fixture on Rail "B"

11. Drop C T R, push Test 3, and turn on test gate. Push D E D, turn off test gate, and pick C T R. Verify D E D alarm and count.

12. Devtronics Test Set:

(a) The test set, if available, can be used for all of the above tests, and the following procedure should be followed:

(1) Plug in A C to test set and attach test set to No. 3 Panel of the Devtronics equipment.

(2) Turn on power switches.

(3) Select desired test from Section 3 of Devtronics Manual.

(4) Drop C T R and push start button on set.

(5) At end of train pick C T R.

(6) Observe recorder, speaker readout and printer for proper operation.

(7) Note: You must adjust the heat level output controls to give desired level output for alarms you are checking.

(8) Note: When checking count of alarms with test set, remember our standard is "count from head of train;" test set Instructions show "count from rear of train" and you must convert.

E. Determine that traffic and alarms are correct:

1. (a) Drop C T R and pulse Eastbound advance transducer (No. 3) at the transducer and then run some gate and pick C T R.

   (b) Verify that recorder and M A - 1 print Eastbound traffic.

2. (a) Drop C T R and pulse westbound advance transducer (No. 4) at transducer and then run same gate and pick C T R.

   (b) Verify that recorder and M A - 1 prints Westbound traffic.

3. (a) Remove white wire at J 4 G 1 (door control, North rail.

   (b) Set elevated axle (B C D 6) down to 4.0. This will change defective car alarm to 8 m m.

   (c) Drop C T R, push TEST 3 on direction unit. Pulse test gate two pulses - - a pause - - and two pulses.

   (d) Pick C T R:

      (1) Harmon Recorder should show heat on TOP trace (North rail).

      (2) M A - 1 should print out defective car alarm with heat on left side.

   (e) Drop C T R, Push TEST 4 on direction unit pulse test gate two pulses - - a pause - - and two pulses.

(f) Pick C T R:

(1) Harmon Recorder should show heat on TOP trace (North rail).

(2) M A - 1 should print out defective car alarm with heat on <u>right</u> side.

(g) Replace J 4 G 1 and remove J 5 G 1 (door control for South rail).

(h) Drop C T R, push <u>TEST 3</u> on direction unit, pulse test gate two pulses - - a pause - - and two pulses.

(i) Pick C T R:

(1) Harmon Recorder should show heat on BOTTOM trace (South rail).

(2) M A - 1 should print out defective car alarm with heat on <u>right</u> side.

(j) Drop C T R, Push <u>TEST 4</u> on direction unit, pulse test gate two pulses - - a pause - - and two pulses.

(k) Pick C T R:

(1) Harmon Recorder should show heat on BOTTOM trace (South rail).

(2) M A - 1 should print out defective car alarm with heat on <u>left</u> side.

(l) Set elevated axle (B C D 6) back to "7.5". This will put defective car alarm back to 15 m m, and push RESET. This will cause M A - 1 to print out. Check that all alarm levels are set correctly.

(m) Replace wire on J 5 G 1.

F. Check analog gate and wheel pulse:

1. Put scope on 10 V scale and 10 M S Sweep
2. Put shield on COMMON and probe on 12 Buss.

   (Note: Put extender card in spare Slot 12 and cound up from the bottom to the 12th position.)
3. Turn on test gate and determine width of pulse. Should be 24 M S or two and one-half divisions on 10 M S Sweep scale.
4. Put probe on 11 Buss or wheel pulse on gate generator and determine width of pulse. Should be 6 M S or one-half division on 10 M S Sweep.
5. Turn off test gate.
6. If wheel gate is not in range of four to eight M S, investigate and correct problem.

Attachment

Office of Assistant Chief Engineer-Signals

Topeka, Kansas

Dated: 31 October 1985

INSTRUCTIONS FOR G R S SCANNER OPTICAL ALIGNMENT USING FIXTURE 23471-3

1. Connect jumper between the lower tip jack (output of the amplifier gate board associatedd with Scanner "A" and "signal test terminal" on top of G R S rack. Connect the negative meter lead of Simpson 260 to signal test terminal and positive meter lead to (+) common in the wayside scanner junction box. To increase amplifier output during scanner alignment, de-energize track relay, then push test button on gate generator board which will open up shutter lid. Hold "A" scanner shutter lid open and permit system to shut down. Then, energize track relay which will let Automatic Gain Control start to step up. Let amplifier increase to its maximum then de-energize track relay to lock in amplifier's AGC.

   NOTE: During the test, even when the cell is not looking at the lamp as a heat source, there will be a small deflection on the VOM as a result of the pedestal voltage.

2. Place a 6-volt lantern battery in the battery box on the alignment fixture (see Page A-170-3), and check that the lamp illuminates. (Replacement lamp is G E 2 1 9, or equivalent.)

3. Place a mark on top of the rail equidistant between the two wheel detectors for scanner centerline (or 3-1/2 inches from either wheel detector center).

4. To find the centerline of scanner on far rail from wheel detectors use steel tape and triangulate from centerline of near rail scanner.

5. Place the alignment fixture across the rails with the alignment slot centered over the centerline mark on top of the rail.

   CAUTION: Use insulating tape around the end of alignment fixture to prevent shorting the track circuit.

6. Adjust lamp bulb on alignment Fixture 2 3 4 7 1 - 3 to 11 inches above top of rail to the center of filament in the bulb, and 2-3/4" from gauge to center of filament in bulb; adjust "0" on scale to this point (See Page A-170-3).

7. Connect the clip leads from gating test fixture No. 2 9 0 0 3 - 4 G R - 1 to the proper scanner gating wheel detector terminals. These connections may be picked up across the lightning arresters (red clip lead to ground) on terminal board or in wayside scanner junction box.

8. To adjust the horizontal scanner beam, proceed as follows:

   (a) Turn on the target shutter motor, gating switches and alignment fixture lamp.

   (b) Turn Hand Wheels "A" and "B" so that a maximum deflection is observed on the meter. Note the "A" scale reading on alignment fixture.

   (c) Turn Hand Wheel "A" clockwise until the signal drops to half value on Simpson meter. Note the "A" scale reading on alignment fixture.

   (d) Turn Hand Wheel "A" counterclockwise, passing through the point of maximum signal, until the signal again drops to half value. Again note the "A" scale reading on alignment fixture.

   (e) The center of the beam (point of maximum deflection) should be the midpoint of the two half signal level readings. This indicates where the center of the beam is in relationship to the zero setting. If the center of the beam is not at the zero setting on the "A" scale, then, move the scanner housing toward the zero setting a distance equal to the difference between the midpoint reading and zero.

   (f) Repeat steps (b) through (e) to ensure that the center of the beam is at a reading of zero on the "A" scale of the fixture.

   (g) Secure the scanner housing so that its horizontal position cannot change.

9. To adjust the vertical scanner beam, proceed as follows:

   (a) Turn Hand Wheel "B" to move the test light as far away from the gauge line (in the direction of the scanner) as possible.

   (b) Turn Hand Wheel "B" in the opposite direction (moving the light back toward the gauge line) passing through the point of maximum signal, until the signal drops to half value. Note the "B" scale reading on alignment fixture.

   (c) Turn Hand Wheel "B" in the opposite direction, again passing through the point of maximu signal, until the signal again drops to half value. Again note "B" scale reading.

(d) The center of the vertical beam (point of maximum deflection) should be the midpoint of the two half signal level readings which should be 2-3/4 inches from gauge of rail. If the "B" scale pJointer is not 2-3/4 inches from gauge of rail, raise or lower the read end of scanner plate to obtain precise adjustment.

NOTE: The housing may be adjusted as required by means of rear shock mounting Rods 5, Figure 38. Loosen the elastic stop nuts and turn threaded Rods 5 in the desired direction. Be careful to adjust both rear rods the number of turns to avoid changing the horizontal adjustment of the scanner. A useful tool for this adjustment is a Snap-On Socket A 1 3 8.

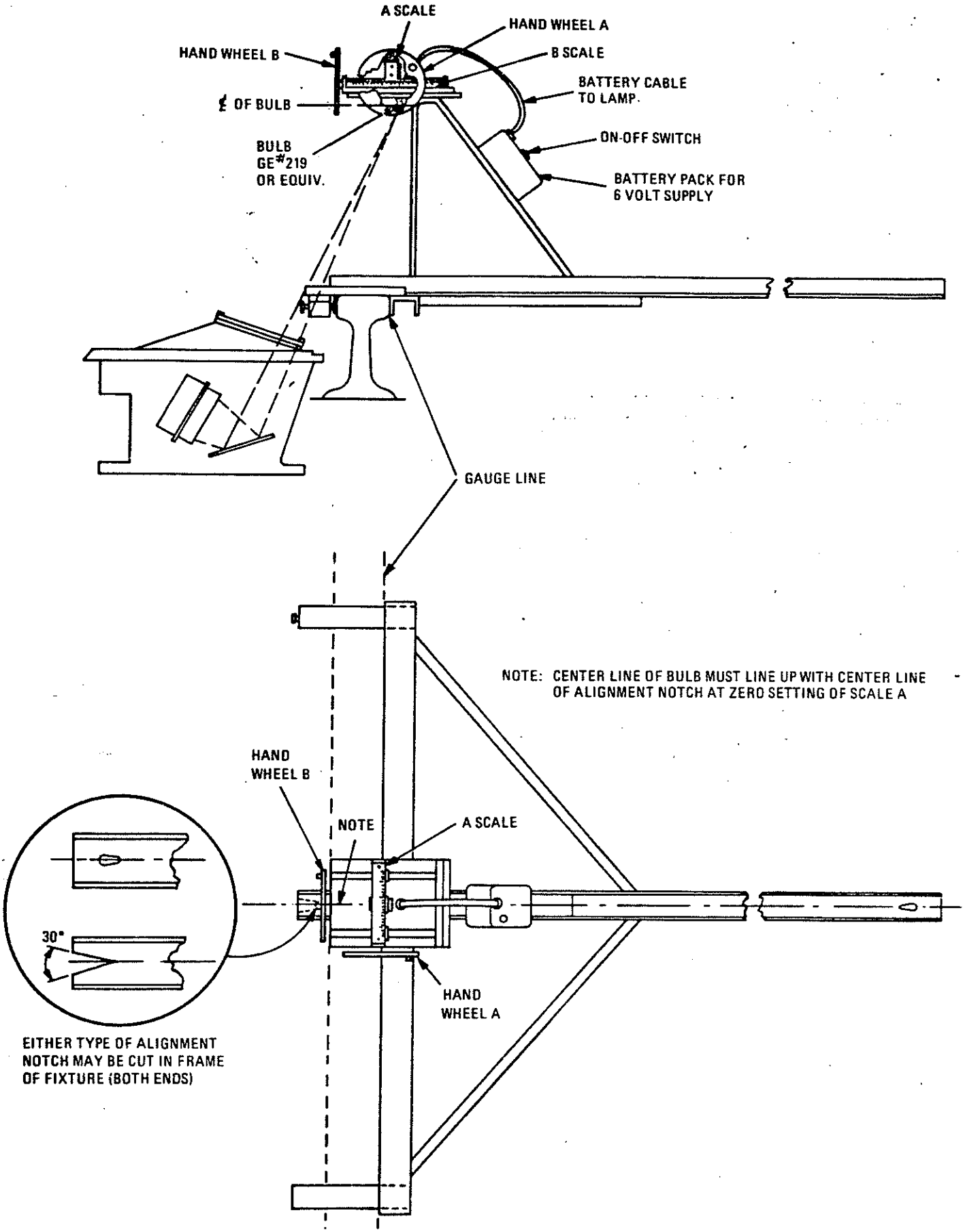
(e) Repeat Step 8 to check that the horizontal adjustment has not changed.

10. Rotate the alignment fixture 180 degrees and align the fixture with the scribed alignment mark on the rail.

11. Move the jumper between the lower tip jack (output) of the amplifier gate board associated with Scanner "A" to lower tip jack of Scanner "B".

12. Align Scanner "B" by repeating Steps 8 and 9.

13. After completing align tests, remove jumper, test fixture and energize track relay.



Scanner optical alignment using fixture 23471-3 with test fixture 29003-4 Gr. 1.

USE OF FLUKE 8 0 2 4 B METER TO READ INPUT AND OUTPUT OF G R S AMPLIFIER GATE LOGIC BOARD.

I. Input:

(A) Put meter on 2 V D C Scale

(B) Put Black Lead in Common; Red Lead in J 1 (Input on Amp Gate Logic Card).

(C) Push Peak Hold Switch on Fluke 8024 B Meter.

(D) Push Test Switch on Amp Gate Logic Card.

(E) Meter will display input voltage:

1. If increase in voltage is needed, no further adjustment is needed to meter; just hold Test Switch on Amp Gate Logic and turn pot on Test Unit until voltage is increased to desired level.
2. If decrease in voltage is needed, the Peak Hold Switch must be turned off to dump memory and turned back on for each reading.

II. Output:

(A) Put meter on 20 V D C Scale.

(B) Put Red Lead in Common; Black Lead in J 2 (output on Amp Gate Logic Card).

(C) Use Steps I. (C) through I. (E), above.

Office of Assistant Chief Engineer-Signals

Dated: 31 October 1985

INSTRUCTIONS FOR ADJUSTING ABSOLUTE/DIFFERENTIAL ALARM LEVELS

Caution: The absolute/differential board common at the junction of VR2 and VR3, Figures 33d and 33e, pages **A-180-2, & -3,** is not the same as the common for the 20-volt D.C. energy supply. DO NOT tie the two common together, which could occur when using two ground leads from the same test instrument; otherwise, the board will be damaged.

Note: Restoring 24-volt D.C. power to G R S equipment will require several minutes for system to stabilize before any adjustments can be made.

Input Stage Adjustment:

1. Turn off the 24-volt D.C. power supply before removing absolute/differential boards. Insert into extender board, then insert extender board into equipment rack. Restore the 24-volt power supply to equipment.

2. The pedestal resistor mounted on the end of amplifier gate logic board should be adjusted for 2 millimeters with system gated.

3. Plug the negative lead of the Simpson 260 into Jack J201 and place the positive lead onto Capacitor C703, per Figures 33d and 33e, pages **A-180-2 & A-180-3.**

4. Rotate Resistor R701 counterclockwise until zero volts is obtained. Move the positive lead to Capacitor C101. Rotate Resistor R101 counterclockwise until zero volts is read. Now, the outputs of "1C1" and "1C7" are at zero volts.

5. Using the alignment fixture as a heat source, mount fixture over Scanner A and gate system with test fixture No. 29003-4 GR-1. Adjust alignment fixture heat to deflect recorder pen stylus "A" (north rail) 11 millimeters against 2 millimeters on pen stylus "B" (south rail) providing a differential of 9 millimeters.

6. With the negative Simpson 260 meter lead in "J201" and the positive lead connected to the junction of "IC4-10", "R407" or "R501", the reading should be between (-) 7.5 and 9.5 volts D.C. Rotate "R403" slowly counterclockwise until the meter needle pulsates intermittently, indicating that the differential Channel A is in adjustment.

7. Move the light source on alignment fixture to the desired point. Should produce 18 m m deflection on pen stylus "A".

8. Move the positive meter lead into "J201" and the negative lead connected to junction of "IC9-10", "R907" or "R1001". The reading should be between (+) 7.5 and 9.5 volts. Rotate "R903" slowly counterclockwise until the meter needle pulsates intermittently, indicating that the absolute of Channel A is in adjustment. The alarm levels for "A" channel has been completed.

9. Repeat Steps 1 through 8 to adjust absolute/differential board for "B" scanner.

NOTE 1:- ALL RESISTORS ARE 1/4 W ± 5% UNLESS OTHERWISE SPECIFIED.
NOTE 2:- ALL DIODES ARE IN4148.
NOTE 3:- ALL REGULATORS ARE IN4733 [±1%].

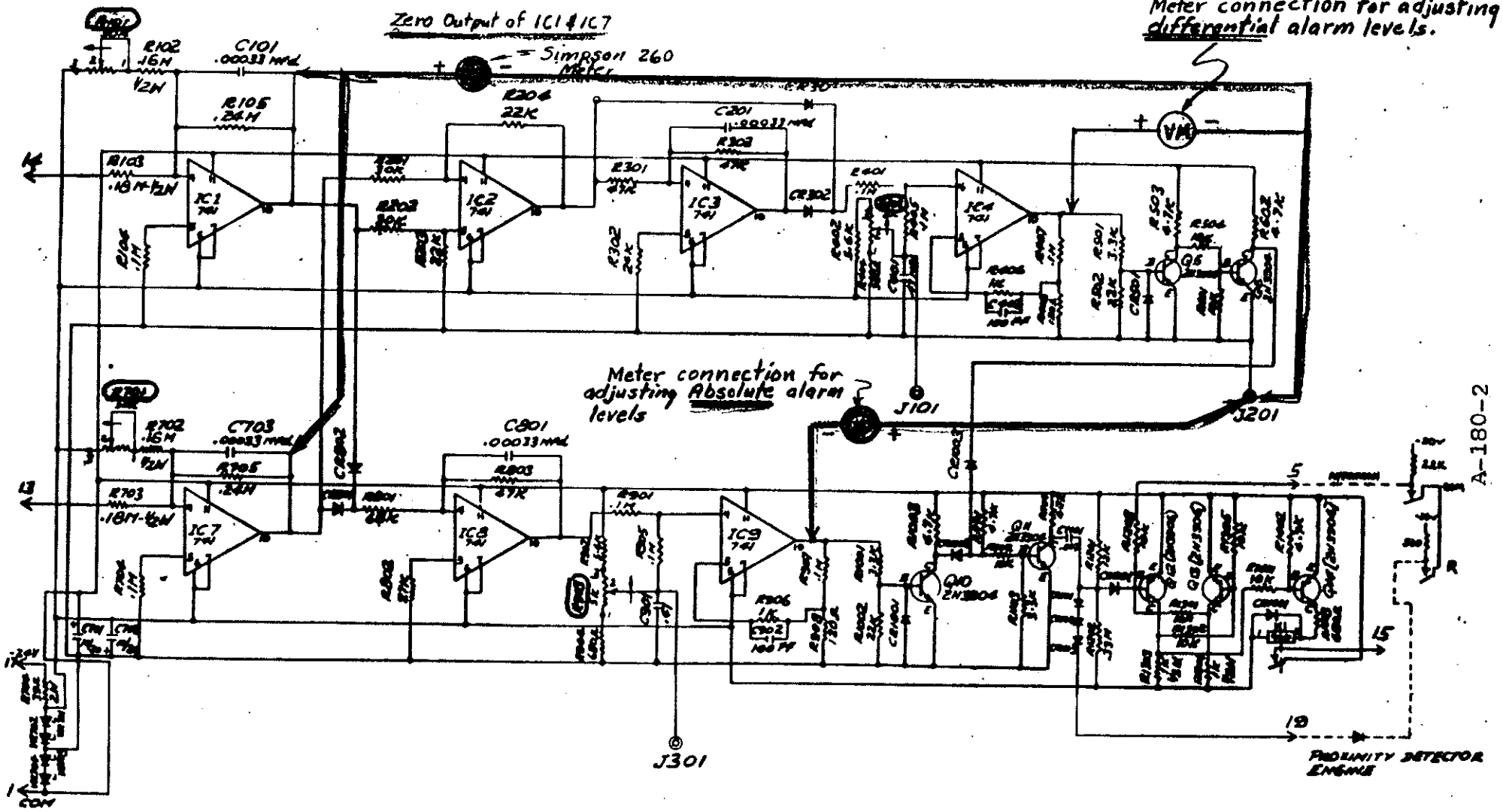


Figure 33d. Absolute/differential alarm circuit.

METER CONNECTIONS FOR SETTING ALARM LEVELS
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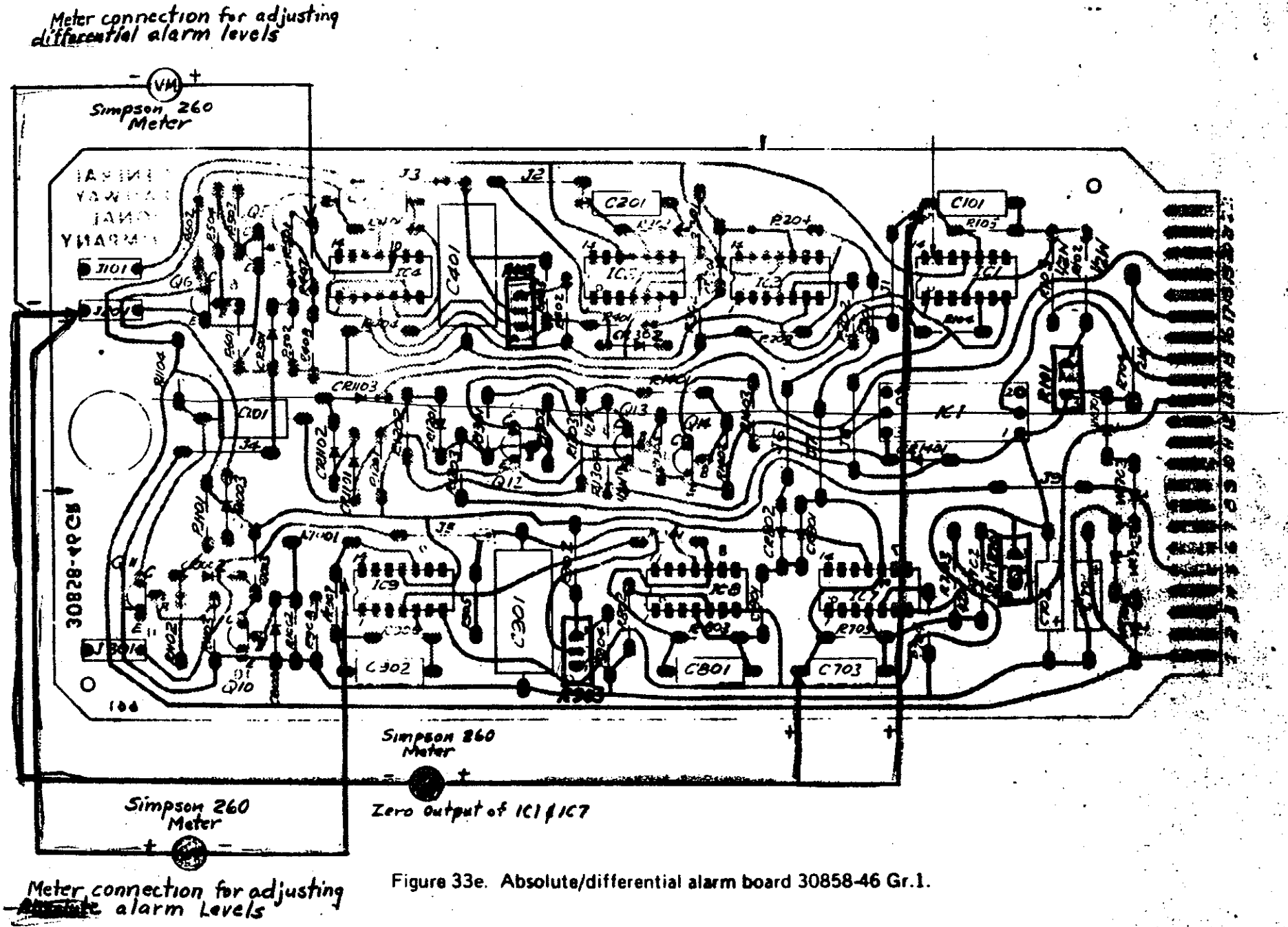

Figure 33e. Absolute/differential alarm board 30858-46 Gr.1.