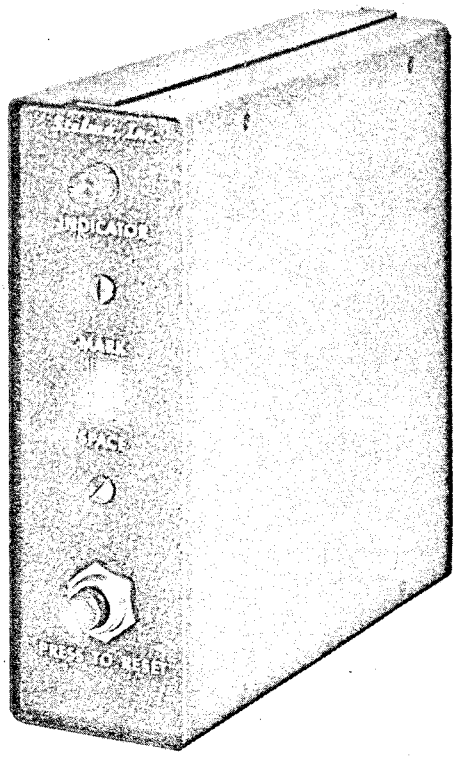


FIGURE 1.
SIGNAL CONDITION INDICATOR,
STELMA MODEL SCI-1 SERIES

3. Technical Characteristics

Table 1 lists technical characteristics of the SCI-1, -1N, and -1P.

Table 1. TECHNICAL CHARACTERISTICS

INPUT CURRENT	60-ma dc neutral signal (SCI-1, SCI-1N): 30 ma dc polar signal (SCI-1P).
INPUT IMPEDANCE	80 ohms resistance.
INPUT KEYING SPEEDS SCI-1 series - 60	60 wpm - or any 22-millisecond telegraph signal.
SCI-1 series - 75	75 wpm - or any 17.5-millisecond telegraph signal.
SCI-1 series -100	100 wpm - or any 13.5-millisecond telegraph signal.
INPUT CIRCUIT	Isolated from ground and case.
INPUT SIGNALS	May be positive or negative battery, grounded or floating.
PRESET DISTORTION THRESHOLD RANGE	10% to 40% Marking or Spacing (adjustable).
INDICATION OF SIGNAL DISTORTION	Front-panel lamp goes out when distortion exceeds preset level.
DISTORTION THRESHOLD ACCURACY	± 3%.
POWER REQUIREMENTS	115-volt ac, 50/60 cycles, 1 watt.
DIMENSIONS	1-1/2 inches by 5-3/4 inches by 5 inches over-all.
WEIGHT	2 pounds.

Chapter 2

INSTALLATION

4. Unpacking and Checking

Remove the SCI-1, 1N, or 1P from the cardboard carton, checking the outside of its case for possible damage incurred during shipment. The unit comes packaged with four wood screws, and with four machine screws and associated fiber lock-nuts, so that the equipment, which contains suitable mounting holes, may be fastened to wood or metal, respectively.

5. Mounting

The best location for mounting the SCI-1 series unit is on a teletypewriter table or console; the lamp may face upward, with the power cord extending from the bottom. Should the overhang of the table top to be too great, it may be necessary to mount the unit on its side, with the lamp facing forward. When the teletypewriter-table or console mounting is not desirable, any location permitting the attendant ready access to the indicator lamp, switch, and reset button will be satisfactory. The unit may also be mounted on the wall.

6. Connections

a. Plug the line cord into a 115-volt 50/60 cycle ac power receptacle.

b. The SCI-1 and the SCI-1N are connected in series with the telegraph loop. Since polarities must be observed when making connections, connect the negative side of the loop to the negative (-) screw terminal on the rear of the unit, and the positive side to the (+) terminal. A ground (G) terminal is also provided on the terminal board.

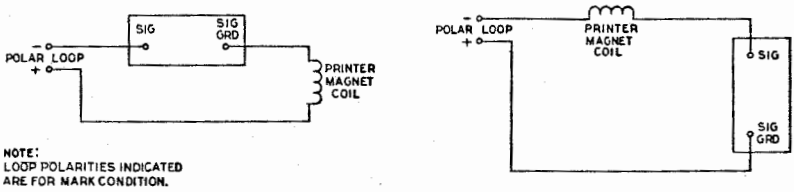


FIGURE 2. SCI-1P. POLAR LOOP CONNECTIONS

c. For the SCI-1P, which must be in series with a 30-ma polar telegraph loop, refer to figure 2 for connections. Connect the signal side of the loop to the unit's screw terminal marked SIG, and connect the ground side of the loop to the SIG GRD screw. A screw marked CASE GRD is also available and may be used to tie the SCI-1P to the common station ground system.

NOTE

Do not connect the CASE GRD terminal to the SIG GRD terminal.

7. Speed Conversion

a. Before attempting to convert a unit's speed, refer to Chapter 6 for the location of components and the techniques to be employed when removing them.

b. The speed at which an SCI-1 series unit operates is determined by the value of capacitor C3, located behind ADJ SPACE and ADJ MARK variable resistors. To change speed, replace the unit's capacitor C3 with the appropriate one of the following.

SPEED	CAPACITOR
60 wpm	0.68 ufd
75 wpm	0.56 ufd
100 wpm	0.39 ufd

NOTE

After a speed conversion, the unit must be aligned as described in Chapter 5.

Chapter 3

OPERATION

8. Controls, Indicators, Connectors

The controls, indicators, and connectors mounted on each SCI-1 series unit are described in the following table.

Table 2. CONTROLS, INDICATORS, CONNECTORS

Name	Type	Function
INDICATOR	Amber lamp	Lights once the PRESS TO RESET button is operated and released, remaining on as long as satisfactory signals are received; goes out when spacing or marking signal distortion is greater than the value for which the unit is preset.
MARK-SPACE	Slide switch	Permits monitoring of signals for either marking or spacing distortion. Always press and release the PRESS TO RESET button whenever the MARK-SPACE switch is operated.

PRESS TO RESET	Pushbutton switch	Depression and release resets indicating circuit; when held in depressed position INDICATOR lamp should light regardless of type of signal being received.
*ADJ MARK	Screwdriver adjustable variable resistor	Permits adjustment of marking-bias distortion threshold.
*ADJ SPACE	Screwdriver adjustable variable resistor	Permits adjustment of spacing-bias distortion threshold.
*60-MA NEUT LOOP (SCI-1, -1N)	Terminal Board	Contains screw terminals (for marking input loop connections) marked + and - loop) and G (case ground).
*30-MA POLAR LOOP (SCI-1P)	Terminal Board	Marked SIG GRD, SIG and CASE GRD: the polar signal is connected between SIG GRD and SIG, observing indicated polarity (See fig. 2).

*These components are mounted on unit's rear panel.

9. Operating Principles

Each of the SCI-1 series units indicates telegraph signal deterioration, by extinguishing an indicator lamp whenever

input signal distortion (marking or spacing) exceeds preset level. The SCI-1, -1N, or -1P establishes the length of a standard reference pulse, always shorter than the nominal unit pulse, extinguishing the INDICATOR lamp whenever a unit telegraph pulse: (1) is as short as or shorter in duration than the reference pulse; and (2) is shortened in the direction corresponding to that for which the MARK-SPACE switch is set. The distortion threshold at which the INDICATOR lamp goes out is adjustable by means of two variable resistors (screwdriver adjustments at the rear of the case). ADJ MARK sets the threshold for marking distortion and ADJ SPACE, for spacing distortion. Effectively, activation of the SCI-1, -1N, or -1P circuit alarm depends upon the amount by which a unit pulse is shortened. When the slide switch is set to MARK, activation of the circuit alarm depends upon the amount by which unit spacing pulses are shortened (i. e., the amount of marking distortion); when the slide switch is set to SPACE, alarm activation depends upon the amount by which the unit marking pulses are shortened (i. e., the amount of spacing distortion).

10. Operating Procedures

a. Immediately after installation as described in Chapter 2, the SCI-1, -1N, or -1P is operable at the factory-set distortion threshold of 20% (±5%). (See Chapter 5 for instructions for setting the desired distortion threshold.)

b. In operating the unit, always:

(1) Press and release the PRESS TO RESET button several times successively when the unit is first put into operation, and whenever the MARK-SPACE switch is operated.

(2) Press and hold down the PRESS TO RESET button, to check that the INDICATOR lamp lights, indicating

that the unit is receiving ac power; then release the button;

c. Normally, the unit is not used until garbled copy is reported (by the attendant at the teletype equipment). The Serving Test Center will ask the teletypewriter attendant to do the following while copy is being transmitted.

(1) Press and release, several times successively, the PRESS TO RESET button. Does the INDICATOR lamp remain On or Off after final actuation of the button?

NOTE

The PRESS TO RESET button must be operated a few times in performing this check, and the final condition of the INDICATOR must be noted; this constitutes an accurate indication of average signal distortion existing on the loop. Checking a single mark or space pulse does not give an accurate indication of average signal distortion.

(2) Operate the MARK-SPACE switch to its opposite position. Is the switch set to MARK or SPACE?

(3) Repeat step (1), above.

From this information the Service Test Center can quickly determine the general condition of received signals (see paragraph 11). Generally speaking, if the INDICATOR remains On after several successive operations of the PRESS TO RESET button, the trouble is at the receiving station. If the INDICATOR lamp goes Off, the quality of the signals being rereceived is above the preset distortion threshold; a repairman should not be dispatched, but further checks should be made of the transmission facilities.

11. Signal Condition Chart for Serving Test Center

Table 3, below illustrates how the SCI-1 series indications are to be interpreted. For an explanation of the symbols used on the chart, see page 11

Table 3 SIGNAL CONDITION CHART FOR SERVING TEST CENTER

Subscriber Reported Copy Condition	MARK-SPACE Switch Position	INDICATOR Lamp Condition	Trouble in Subscriber's		Send Repair Man	Remarks
			TTY Unit	Rec'd Signal		
1. Garbling	Space	Off. Remains off when RESET is pressed and released.	NO	YES	NO*	Predominance of spacing distortion indicated.
	Mark	On.				
2. Garbling	Space	On.	NO	YES	NO*	Predominance of marking distortion indicated.
	Mark	Off. Remains off when RESET is pressed and released.				
3. Garbling	Space	Off. Remains off when RESET is pressed and released.	NO	YES	NO*	Indicates predominance of distortion other than simple bias.
	Mark	Off. Remains off when RESET is pressed and released.				
4. Intermittent Errors	Space or Mark	Off, but goes on when RESET is pressed and released. Goes off again about same time subscriber again sees error.	NO	YES	NO	Indicates intermittent distortion hits.
5. Garbling	Space and Mark	On.	YES**	NO**	YES**	Distortion of signals is no higher than 20-25%, which a printer in good condition should accept.
6. Intermittent Errors	Space and Mark	On.	POSSIBLY#	NO#	POSSIBLY#	

Explanation of Symbols on Table 3

* After all possible checks of transmission facilities are made and no trouble is found, send a repairman to check the teletypewriter subscriber set, if one is involved.

** There could be an occasion, example 5, when a subscriber's copy may be garbling and the teletypewriter machine may not be at fault (e.g. , if the transmission tape is put in backwards at the sending end, or regenerative repeater is sending signals containing errors to the subscriber.) A monitoring printer inserted at the Serving Test Center (STC) can be used to check either possibility) a TMS cannot check either condition). If the printer copy is not garbled, it definitely indicates that the printer at the subscriber's station should be checked and adjusted by a repairman.

\# It would be best to check first with a monitoring printer at the STC. If the printer at the STC shows no errors while the customer's does and the SCI-1 alarm light remains on, a repairman should be sent out to check the subscriber's machine.

Chapter 4

THEORY OF OPERATION

12. General

The following text describes the SCI-1, -1N, and -1P circuit functions, power supply operation, and indicator lamp functions. Figure 3 (block diagram) and figure 4 (waveform diagram) are applicable to all three units; figures 5 (SCI-1), 6 (SCI-1N), and 7 (SCI-1P) are schematic diagrams.

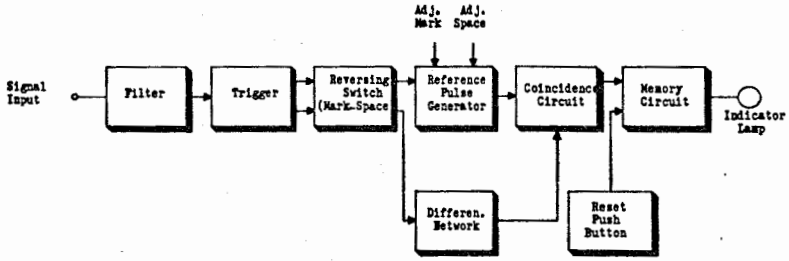


FIGURE 3. SCI-1, -1N, -1P: BLOCK DIAGRAM

13. Circuit Functions

a. INPUT CIRCUIT.

(1) The SCI-1 or SCI-1N input circuit which accepts 60-ma neutral signals (figure 4, line 1), removes any transient holes or spikes which may be present in the signal. The SCI-1P input circuit accepts 30-ma polar signals from which it removes transient holes or spikes.

(2) The shaped signal is regenerated by a trigger stage (transistors Q1 and Q2) from which two outputs are taken. In the SCI-1 or SCI-1N, the trigger stage is activated at the half-current point of the neutral input signal.

The SCI-1P trigger is biased, by two resistors, to trigger at the zero-current point. The original signal is reproduced and reshaped from Q2, to provide sharp mark-space and space-mark transitions. The output of Q1 is an inversion of the Q2 output.

b. REFERENCE PULSE GENERATION. Trigger circuit outputs from Q2 are applied, via a reversing switch (MARK-SPACE), to a differentiating circuit and to the monostable reference pulse generator (Q2 and Q4) as trigger pulses. The reversing switch permits the reference pulse to be generated on either a space-to-mark transition or mark-to-space transition of the input signal (figure 4, line 2), thereby defining either marking or spacing pulse widths. The switch reverses the polarity of the signal applied to the differentiating circuit, whose output is applied to coincidence stage Q6. The reference pulse generator, which can be adjusted for 60% to 90% of a normal pulse width, is factory adjusted at STELMA for 80% of normal width, corresponding to acceptance of signals containing up to 20% distortion.

c. COINCIDENCE CIRCUIT OPERATION. The coincidence circuit contains transistors Q5, which receives directly coupled negative output pulses from the monostable reference pulse generator, and Q6, which receives (via the reversing switch and a differentiating network) the input signal pulses from trigger Q1. The coincidence circuit produces an output only when the bases of Q5 and Q6 are simultaneously negative, a condition occurring any time that signal distortion exceeds the unit's preset level. Transistors Q5 and Q6 supply their negative output pulse (figure 4, line 4) to the memory circuit whenever:

(1) The input signal mark pulse, during spacing distortion measurement, is shorter that the negative reference pulse applied to the Q5 base (figure 4, line 2); consequently, the negative pulse produced by the differentiating network in response to the incoming signals mark-to-space transition, drives the base of Q6 negative (figure 4, line 3) while the Q5 base is negative.

(2) The input signal space pulse, during marking distortion measurement is shorter than the negative reference pulse applied to Q5 (figure 4, line 2); as a result, the differentiating circuit's negative pulse, in response to the input signal's space-to-mark transition, drives the Q6 base negative (figure 4, line 3) while the Q5 base is negative. As long as the reference pulse (figure 4, line 2) is shorter than the incoming mark or space pulse, the negative reference pulse is removed from the Q5 base before the Q6 base goes negative in response to a transition (figure 4, line 3); consequently, no output is produced by the coincidence circuit (figure 4, line 4).

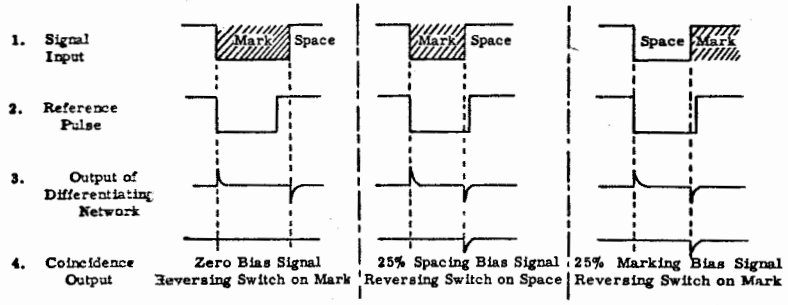


FIGURE 4. SCI-1, -1N, -1P: WAVEFORM DIAGRAM

d. SIGNAL DISTORTION INDICATIONS. The memory circuit, a bistable multivibrator (Q7 and Q8) which is placed in one of its stable states by manual depression of PRESS TO RESET pushbutton, controls the operation of transistor Q9, which, in turn, determines the condition of the INDICATOR lamp.

(1) As long as the input signal distortion level is acceptable (i.e., no output from the coincidence circuit), Q8 conducts and Q7 is cut off with Q8 conducting, its low negative collector potential keeps Q9 cut off. Because Q9 shunts the neon INDICATOR lamp, the lamp is lighted as long as Q9 is cut off, thereby indicating acceptable signals.

(2) When distortion in the signal exceeds the preset level, coincidence occurs. The output negative pulse from Q5 and Q6 causes the memory bistable to change state, cutting off Q8 so that its collector voltage goes sufficiently negative to force Q9 into conduction, causing the neon INDICATOR lamp to go off (indicating that the input signal has exceeded the preset distortion limits). The lamp remains off until the front-panel PRESS TO RESET button is depressed, which causes Q8 to conduct, Q9 to cut off, and the INDICATOR lamp to light.

14. Power Supply - SCI-1, -1N, -1P

The unit's power supply circuits provide two outputs. One half-wave, rectified, filtered output supplies a negative voltage (approximately - 20 volts) to the collector of all transistors but Q9. The other half-wave rectified, unfiltered supply (approximately - 45 volts) is for the neon indicator and for the collector of output transistor Q9.

15. INDICATOR Lamp

The SCI-1, -1N, or -1P front-panel neon lamp: (1) serves as a pilot indicator, lighting (regardless of signal distortion condition) whenever the PRESS TO RESET button is pushed and held down, thereby indicating that the equipment is properly energized; and (2) indicates the signal distortion condition (marking or spacing) that exists on the loop. Failure of the lamp to remain lighted, after resetting, denotes that distortion on the telegraph loop has exceeded the unit's preset limits. (In order to be certain that neither excessive marking nor spacing distortion exists on the loop, it is necessary to test with the MARK-SPACE switch in both positions).

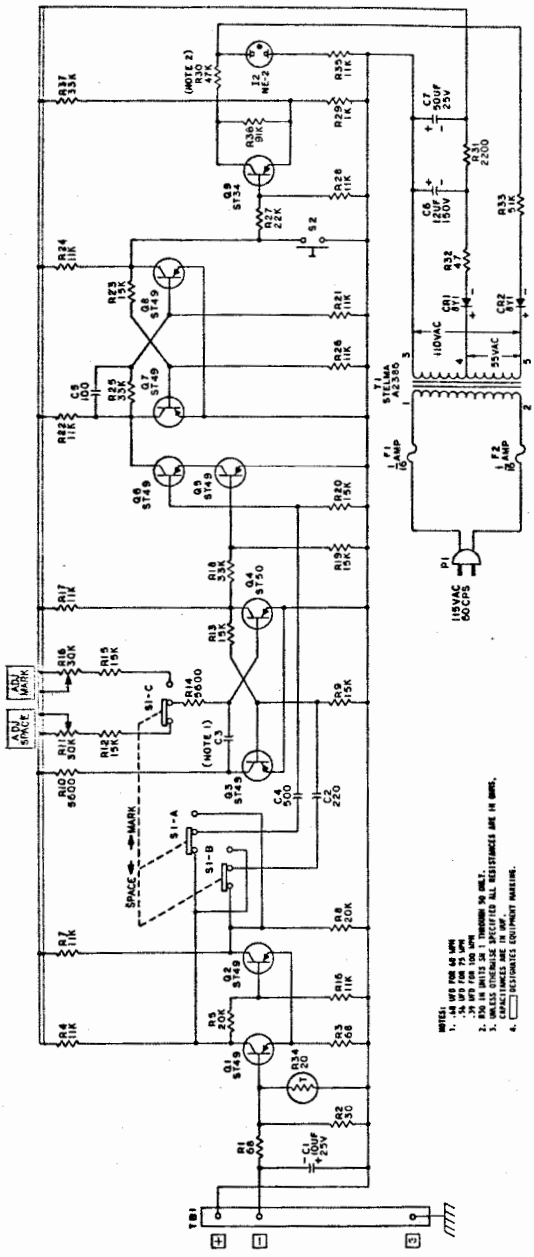
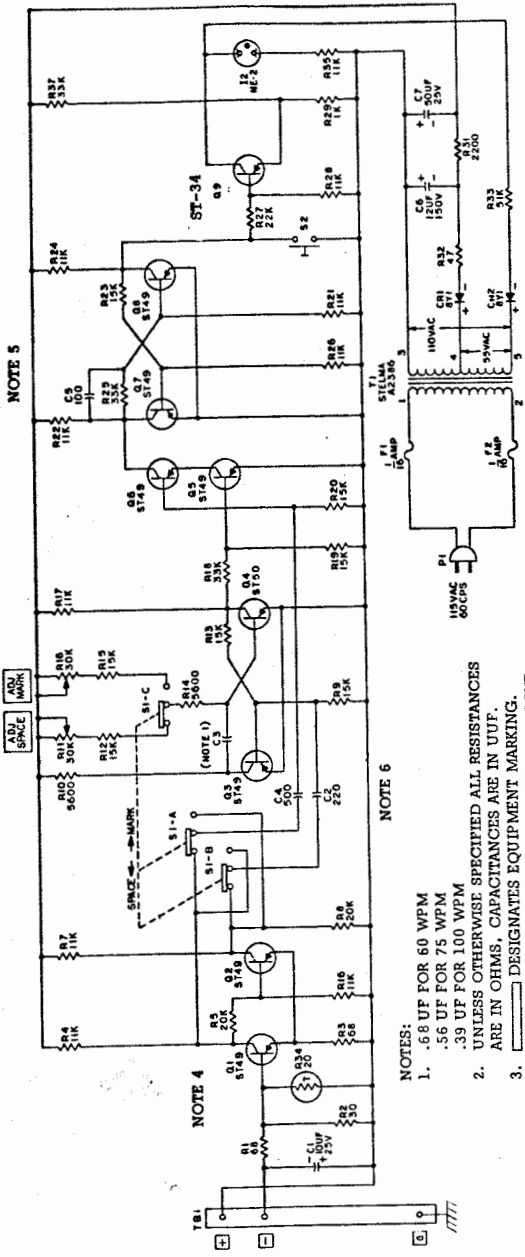
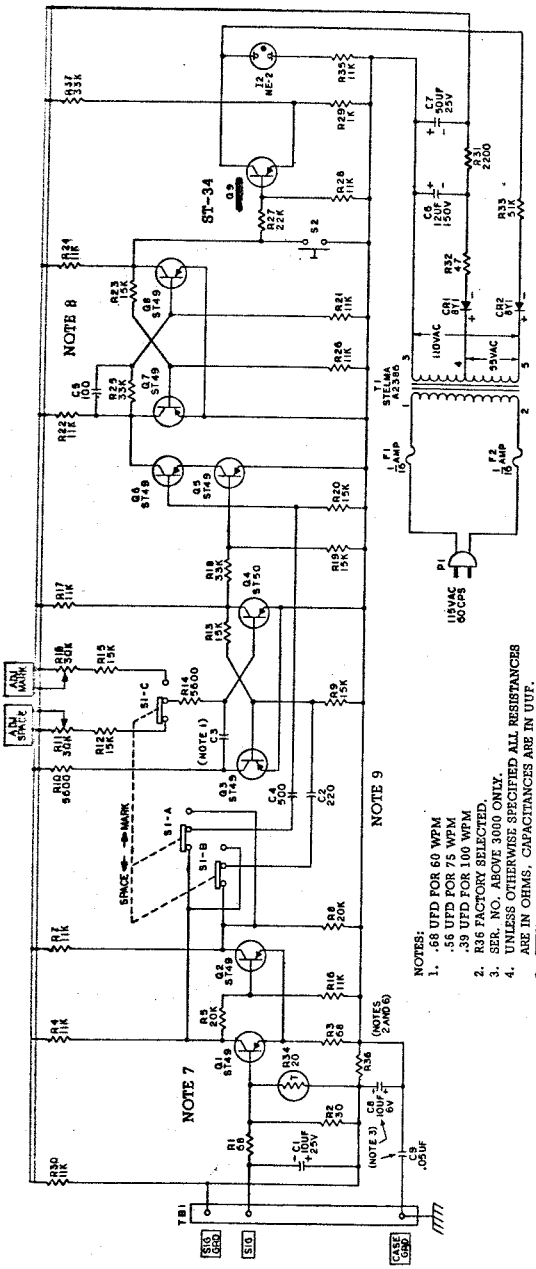


FIGURE 5. SCT-1 (8N1599 AND BELOW), SCHEMATIC DIAGRAM



NOTES:
1. .68 UF FOR 60 WPM
   .56 UF FOR 75 WPM
   .39 UF FOR 100 WPM
2. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
3. _____ DESIGNATES EQUIPMENT MARKING.
4. FOR UNITS SERIAL-NUMBERED 7274 AND ABOVE, Q1 THROUGH Q8 ARE TYPE ST-123.
5. FOR UNITS SERIAL-NUMBERED 7274 AND ABOVE, C5 IS ELIMINATED.
6. FOR UNITS SERIAL-NUMBERED 7274 AND ABOVE, C2 VALUE IS 1500.

FIGURE 6. SCI-1N (SN1600 AND ABOVE), SCHEMATIC DIAGRAM



NOTES:
1. .68 UFD FOR 60 WPM
   .56 UFD FOR 75 WPM
   .39 UFD FOR 100 WPM
2. R36 FACTORY SELECTED.
3. SER. NO. ABOVE 3000 ONLY.
4. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
5. ——— DESIGNATES EQUIPMENT MARKING.
6. R36 IS 500 OHM VARIABLE RESISTOR ON UNITS SERIAL-NUMBERED 5501 AND ABOVE.
7. FOR UNITS SERIAL-NUMBERED 7274 AND ABOVE, Q1 THROUGH Q8 ARE TYPE ST-123.
8. FOR UNITS SERIAL-NUMBERED 7274 AND ABOVE, C5 IS ELIMINATED.
9. FOR UNITS SERIAL-NUMBERED 7274 AND ABOVE, C2 VALUE IS 1500.

FIGURE 7. SCI-1P (8N1600 AND ABOVE), SCHEMATIC DIAGRAM

Chapter 5

ALIGNMENT

16. General

The SCI-1 series units may be aligned to indicate distortion (marking and spacing) above a threshold adjustable from 10% to 40%. Polar units above serial number 5500 require an additional alignment (in the input circuit) to assure that the the unit triggers symmetrically. Both adjustments should be checked periodically or whenever components of the unit are changed.

17. Alignment Setup

To adjust the triggering circuit of an SCI-1P (serial number above 5500), set up the equipment as indicated in a below; to set the distortion threshold of all SCI-1 units, setup the equipment as indicated in b below.

a. TRIGGER ADJUST SETUP.

(1) The test equipments required are:

(a) 1 dc current generator, 0 to ± 10-ma, with metered output.

(b) 1 multimeter, Simpson Model 270 or equivalent.

(2) Connect the current generator ground and ± lead to the SCI-1P SIG GRD and SIG terminals, respectively.

b. THRESHOLD ADJUST SETUP.

(1) The test equipments required are:
(a) a distorting pattern generator such

as Distorting Pattern Generator, STELMA Model PG-105 (DAC-V).

(b) a distortion analyzer such as Digital Distortion Analyzer, STELMA Model DD-5 (DAC-V), or Telegraph Distortion Analyzer, STELMA Model TDA-2, and

(c) a multimeter, Simpson Model 270 or equivalent.

(2) Connect pattern generator output (fig. 8) in series with the SCI-1 and the appropriate dummy load resistor (resistance of dummy load determined by required input current of SCI-1 under test). Connect the TDA-2 input across the dummy load resistor.

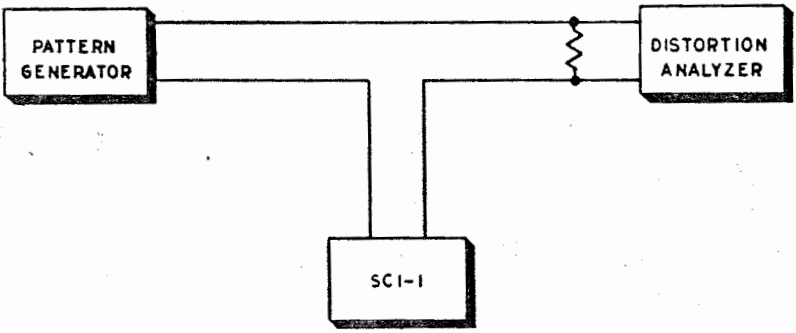


FIGURE 8. SCI-1 SERIES, ALIGNMENT SETUP

18. Alignment Procedures

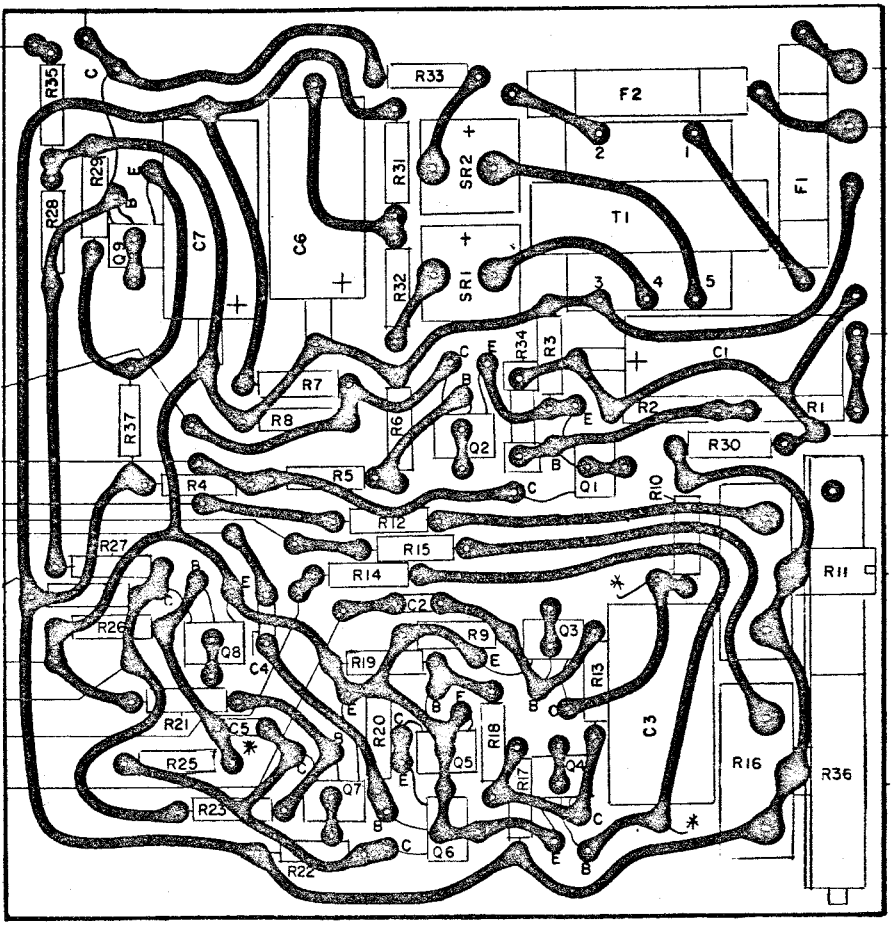
a. SYMMETRICAL TRIGGER ADJUST (POLAR UNITS ABOVE SN 5500).

NOTE

The INDICATOR lamp must be lighted during all trigger adjustments.

(1) Turn R36 completely counterclockwise.

(2) Connect a multimeter (on its 50V scale) across resistor R8 (negative lead at collector of Q2, figure 9).



*C5 eliminated in units serial-numbered 7274 and above.

FIGURE 9. SCI-1 SERIES, COMPONENT LAYOUT

(3) With 0 input current to the SCI-1, turn R36 clockwise until the meter reading changes from approximately 1 volt (lower level) to approximately 15 volts (upper level).

(4) Increase the input current in a positive direction until the meter returns to its upper level. Note the input current reading.

(5) Decrease the input current to 0, and then increase it in a negative direction until the meter returns to the lower level. Note the input current reading.

(6) Compare the meter reading noted in (4) to that noted in (5). If (5) is greater than (4), turn R36 one revolution clockwise; if (4) is greater than (5), turn R36 one revolution counterclockwise.

(7) Repeat steps (4), (5), and (6) until the readings noted in (4) and (5) are within 0.2 milliampere of each other.

b. PERCENT DISTORTION ADJUST.

(1) Set pattern generator for reversals at the speed and type of signal (30-ma polar or 60-ma neutral) for which the SCI-1 is designed.

(2) Set the TDA-2 to the speed and type of signal for which the SCI-1 is designed.

(3) Proceed as follows:

(a) Assume that the SCI-1 threshold is to be at 15% marking and spacing distortion.

(b) Set pattern generator to produce 15% marking bias as observed on the TDA-2.

(c) Set SCI-1 ADJ MARK and ADJ SPACE controls maximum clockwise.

(d) Set the SCI-1 MARK-SPACE switch to MARK.

(e) Momentarily depress SCI-1 PRESS TO RESET (the SCI-1 INDICATOR lamp should remain lighted).

(f) Turn ADJ MARK control counterclockwise until the INDICATOR lamp goes out. At this point the SCI-1 is adjusted to indicate marking distortion above a threshold of 15%.

(g) Set pattern generator to produce 15% spacing bias as observed on the TDA-2.

(h) Set the SCI-1 MARK-SPACE switch to SPACE.

(i) Momentarily depress the SCI-1 TO RESET switch (the SCI-1 INDICATOR lamp should remain on).

(j) Turn ADJ SPACE control counterclockwise until the INDICATOR lamp goes out. At this point the SCI-1 is adjusted to indicate spacing distortion above a threshold of 15%.

(k) Disconnect the test setup.

determine if there are burns or breaks in any of the components. If a burn is located, do not assume it to be the only trouble, because a component may be damaged by a short in another part of the circuit.

c. POWER SUPPLY. If the sensory examination does not reveal the fault, connect the unit's input to a signal source (PG-105(DAC-V)), apply power, and measure outputs of the rectifier circuit. These outputs should be -20 volts on the output side of R31, and -45 volts on the output side of R33 with the INDICATOR lamp on, or -5 volts with the INDICATOR lamp off. If neither supply voltage is present, check the fuse and transformer.

d. SIGNAL TRACING. A fault within an SCI-1 may be localized to a stage by tracing an input signal through the unit from transistor Q1 to Q9. To accomplish this, refer to the appropriate schematic (fig. 5, 6, or 7) for identifying the path of the signal, and to the printed-circuit layout (fig. 9) for the physical locations of the points requiring test. Once the faulty stage is determined, use the multimeter to check the components and isolate the fault. When the faulty component is located, replace if following the procedures outlined in paragraph 21.

21. Repair

a. REQUIRED EQUIPMENT.

(1) Knife
(2) Needlenose pliers
(3) 25-watt soldering iron
(4) Rosin-core solder

b. REMOVING COMPONENT.

(1) On the printed-circuit side of the card, scrape the epoxy (protective coating) from the leads of the component to be removed.