STELMA SIGNAL CONDITION INDICATOR SCI-6

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1. GENERAL

1.01 This section gives the description and operating principles of the SCI-6 Stelma Signal Condition Indicator manufactured by Stelma, Incorporated, Stanford, Connecticut.

1.02 The SCI-6 is intended to be located at or near the customer-provided terminal or teletypewriter station apparatus. Its primary function is to provide a local indication when the loop becomes open or when the distortion at that point exceeds a preselected amount. The SCI-6 will operate with signals in the speed range from 40 to 150 bauds.

1.03 The unit is designed to provide both the customer and the serving test center (STC) personnel with a simple means of determining whether or not distortion of the signal as received by the station exceeds the preselected value. Test center personnel should have a thorough knowledge of the operation of the signal condition indicator as well as the various visual indications which the set will present to the customer.

1.04 The service improvement aspects that may be realized through proper use of the equipment should be brought to the customer's attention at the time of installation. Maximum benefit of the signal condition indicator can be derived only through accurate reporting by the customer. The customer's concurrence should be obtained before installing the unit.

2. PRINCIPLES OF OPERATION

2.01 The SCI-6 operates on the shortest-pulse principle. The received signal is monitored on a full time in-service basis. The set measures the shortening of element length mark and space pulses. When the shortening exceeds a preset level, an amber distortion lamp (DSTN) located on the face of the SCI-6 is lighted and will remain so for about 3 seconds. The process will be automatically repeated for succeeding shortened element length pulses.

2.02 Since the signal condition indicator looks for shortened unit elements, distortion indications cannot be obtained if the received signal does not contain unit elements. For example, with the 5-level telegraph code, signals made up exclusively of A, T, U, and W fall into this category. Distortion resulting in the lengthening of all the pulse elements (such as would be produced by a speed error) will not be recognized by the indicator.

2.03 A clear signals lamp (SIGS) is also provided on the face of the set. The presence of a signal is indicated by a blinking condition whereas a continual spacing signal or an open loop will produce a steady glow on the SIGS lamp.

2.04 The unit contains an alarm relay which can be used to give a remote indication by sending a closure back to the central office. An additional signal facility is required between the station and the STC for this feature.

2.05 The normally closed MONITOR jack on the front panel of the unit is provided as a convenient loop test point. The jack, in series with the loop, may be used to measure current or distortion present in the loop.

2.06 The SCI-6 provides an out-of-service means for testing the loop from the STC for shorts and continuity by use of a diode network connected between the LOOP and EQP terminals.

3. THEORY OF OPERATION (See Fig. 1 and 2)

Input Circuit

3.01 The SCI-6 input circuit filters the input signal to remove spurious transients which may be present. The MONITOR jack is in series with the input to allow series connection of test equipment, current meters, etc. Since the insertion of such equipment may cause a hit on the line, it should be done during a nontraffic period.

3.02 The filtered input signal is regenerated by the trigger stage to provide a square wave signal having sharp mark/space and space/mark transitions. The output of both sides of the trigger circuit (Q1 and Q2 in Fig. 2) is differentiated and coupled through the OR gate (CR2 and CR3 in Fig. 2) to the reference pulse generator (Q3 and Q4 in Fig. 2), the SIGS indicator circuit (Q10, Fig. 2) and the coincidence circuit (Q5 and Q6, Fig. 2).

Reference Pulse Generation

3.03 The negative trigger outputs from both sides of the trigger circuit are applied through the OR gate to the reference pulse generator, to initiate (at the beginning of the mark or space bit) the start of the reference timing pulse. The length of the reference pulse is adjustable by the THRESHOLD ADJ control.

Coincidence Circuit

3.04 The reference pulse that is started at the beginning of the mark or space bit being measured is applied to the coincidence circuit for the first 55 percent to 95 percent of the bit (45 percent to 5 percent distortion). When the end of the bit occurs, a negative trigger is coupled from the OR gate to the coincidence circuit if the reference pulse is still present (indicating distortion above the preset level). The trigger is coupled to the alarm circuit. However, if the reference pulse is ended, the trigger is not passed by the coincidence circuit; therefore, no alarm for excessive distortion will be caused.

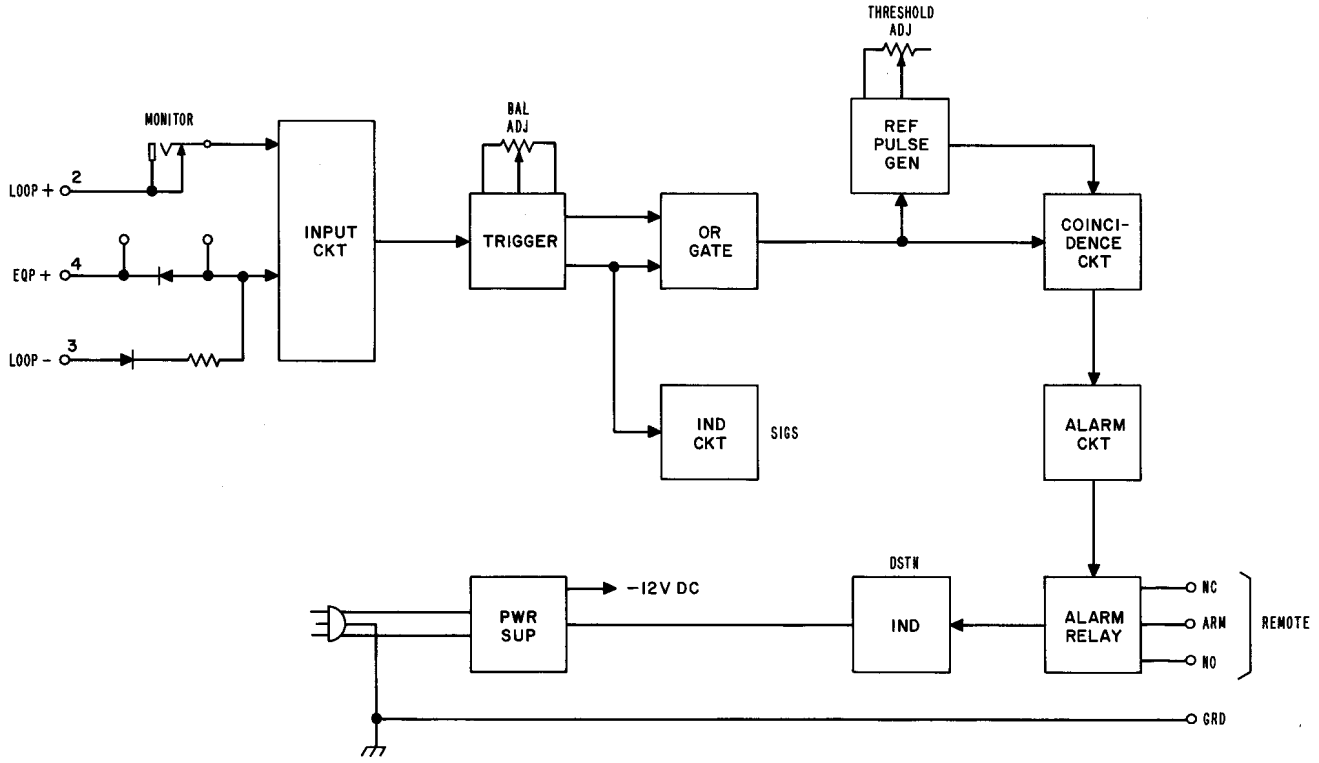
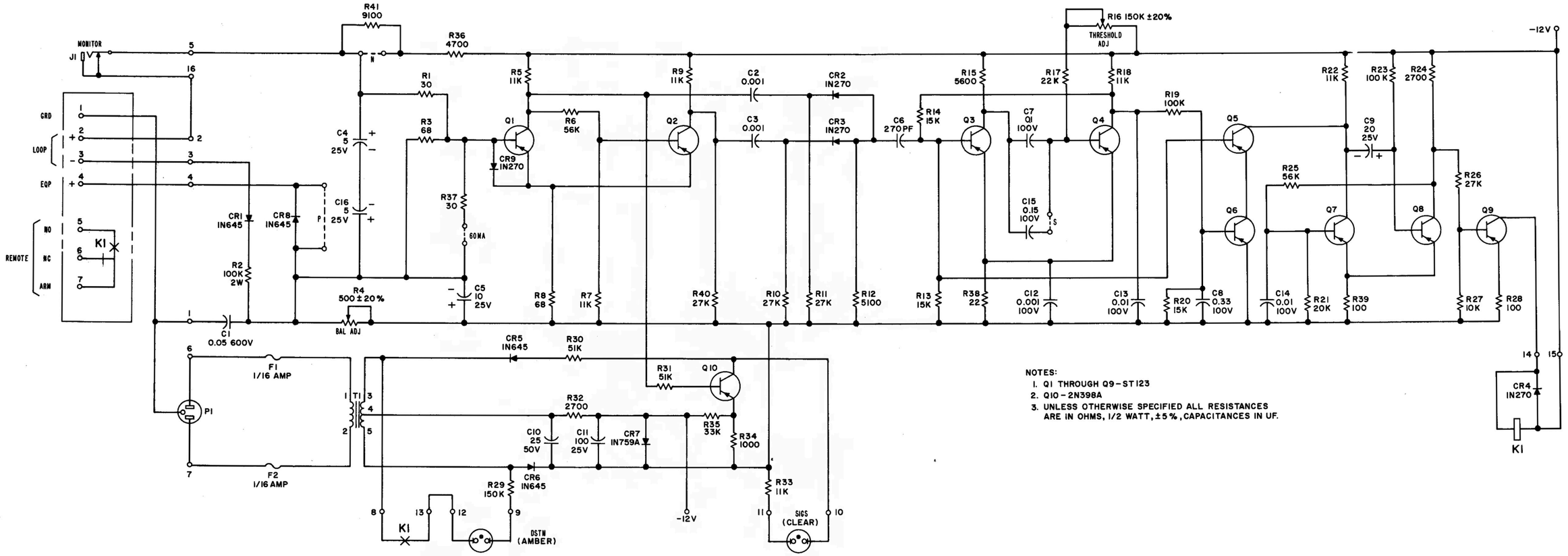


Fig. 1 — Signal Condition Indicator, SCI-6 — Block Diagram



NOTES:
1. Q1 THROUGH Q9 – ST123
2. Q10 – 2N398A
3. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE IN OHMS, 1/2 WATT, ±5%, CAPACITANCES IN UF.

Fig. 2 — Signal Condition Indicator, SCI-6 — Schematic Diagram

Alarm Circuit

3.05 When a pulse is coupled through the coincidence circuit (indicating input distortion above the preset threshold), the alarm circuit (a monostable multivibrator and a relay driver) energizes the alarm relay for approximately three seconds; the energized alarm relay causes the DSTN lamp to light and presents a relay closure (and open) to the REMOTE terminals. At the end of the 3-second alarm cycle, the relay is de-energized, causing the DSTN lamp to go out and the alarm relay to de-energize.

Loop Indicator Circuit

3.06 The SIGS indicator circuit consists of a neon lamp in series with resistor R33 across the unregulated dc power supply. With a space signal at the input terminal of the unit, Q1 is conducting and its collector voltage causes Q10 to be cut off. In this condition, the voltage across neon lamp DS1 is sufficient to fire it. When the input line goes to mark, Q1 cuts off, causing Q10 to conduct through resistor R30. This action lowers the voltage across DS1 below its firing level.

Power Supply

3.07 The power supply circuits provide the regulated —12 volts for operation of the transistor circuits as well as a higher unregulated voltage for the SIGS indicator lamp. The DSTN lamp derives power directly from the secondary of transformer T1.

4. DESCRIPTION OF EQUIPMENT

4.01 The signal condition indicator uses solid state techniques throughout. The set is illustrated in Fig. 3. Its dimensions are 1-1/2 inches by 5-1/4 inches by 6-3/4 inches over all, and its weight is 2 pounds.

4.02 The unit requires a 115-volt ac supply, 50/60 cps at 6 watts. A three conductor power cord through which the chassis of the unit can be grounded is furnished with the set. Chassis and circuit grounds are isolated.

4.03 Circuit connections to the set are made through a terminal strip on the rear of the unit. See Fig. 4 and 5.

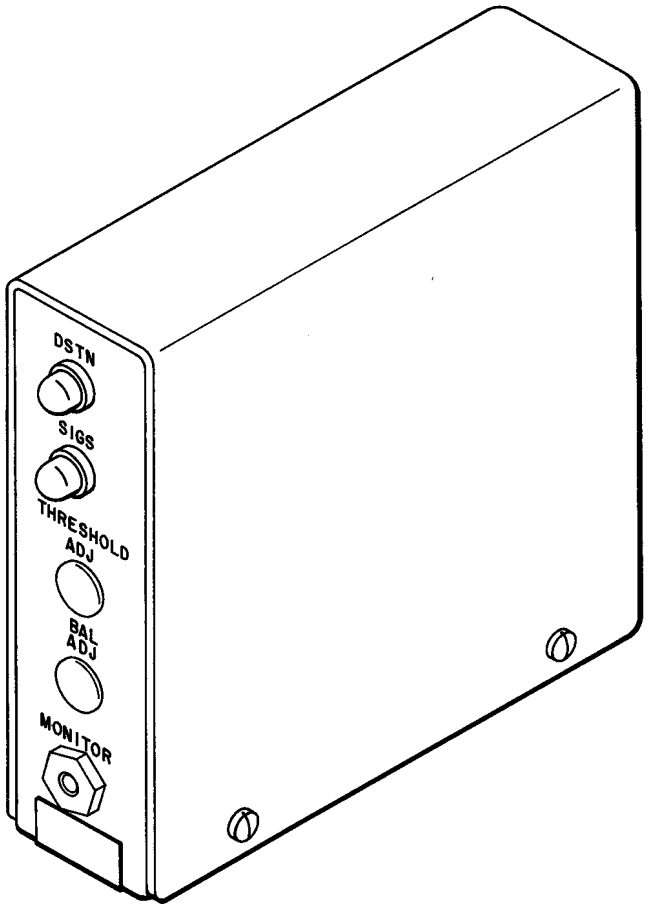


Fig. 3 — Signal Condition Indicator, SCI-6 — Front View

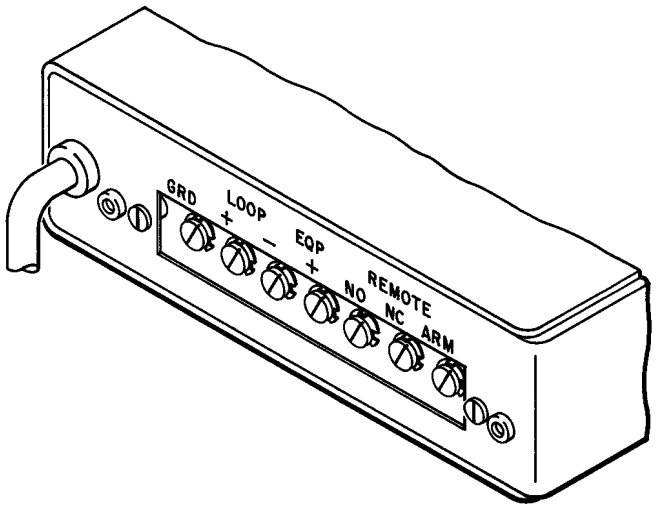


Fig. 4 — Signal Condition Indicator, SCI-6 — Rear View

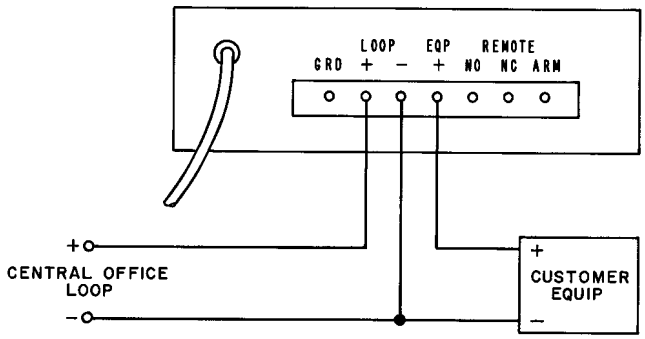


Fig. 5 — Signal Condition Indicator, SCI-6 — Installation Connections

4.04 The SCI-6 will accept neutral (20- or 60-milliampere) or polar (20/30-milliampere) signals.

4.05 The input impedance for 20-ma neutral is 98 ohms, for 60-ma neutral is 70 ohms, and for 20/30-ma polar is 98 ohms.

4.06 The input circuit is isolated from case and ground and will accept positive or negative signals with battery that is grounded or floating.

4.07 The distortion threshold ranges from 5 percent to 45 percent of marking and spacing with an accuracy of ±3 percent.

4.08 Since the SCI-6 is looking for only the amount by which element length pulses are shortened, the set is not sensitive to code format and will accept any start-stop or isochronous signal. The speed range is continuously adjustable from 40 to 150 bauds.

4.09 Refer to Table A for information on controls, indicators, and connectors of the SCI-6. Refer to Table B for strapping options. Refer to Table C for trouble indications and explanations.

TABLE A

CONTROLS, INDICATORS, CONNECTORS

NAME	TYPE	FUNCTION
SIGS	Indicator lamp, clear	Lights when input loop is in spacing (or open) condition.
DSTN	Indicator lamp, amber	Lights for approximately 3 seconds each time input signal distortion exceeds preset threshold.
MONITOR	Jack	Permits series connection of test equipment to SCI-6 input loop.
THRESHOLD ADJ	Screwdriver adjustment	Permits adjustment of SCI-6 distortion threshold.
BAL ADJ	Screwdriver adjustment	Adjusts trigger point of SCI-6 input circuit.
*REMOTE (NO, NC, ARM)	Terminal board connections	Provides screw terminals for alarm relay contact connections.
*LOOP (+, −)	Terminal board connections	Provides screw terminals for input-loop connections.
*EQP (+)	Terminal board connection	Provides screw terminal for TTY shunt connections for the line continuity verification and shorts circuit.
*GRD	Terminal board connection	Provides screw terminal for grounding case of SCI-6.

*These components are mounted on the SCI-6 rear panel.

TABLE B

STRAPPING OPTIONS ON THE CIRCUIT CARD

SIGNAL MODE	Polar	Jumper between P lugs; none between N lugs.
	Neutral	Jumper between N lugs; none between P lugs.
LOOP CURRENT	60 ma Neutral	Jumper between 60-ma lugs; none between 20-ma lugs.
	20 ma Neutral or 20/30 ma Polar	Jumper between 20-ma lugs; none between 60-ma lugs.
STATION SPEED	Less than 100 Baud	Jumper between S lugs.
	Greater than 100 Baud	No jumper between S lugs.

TABLE C

INDICATION CHART

SUBSCRIBER TROUBLE REPORT	DSTN LAMP CONDITION	SIGS LAMP CONDITION (DURING SIGNALS)	TROUBLE IN			REMARKS
			TTY	SIGNAL	LOCAL LOOP	
Garbling	On	Flashing	No	Yes	No	Excessive distortion
Garbling	Off	Flashing	Yes	No	No	Defective TTY indicated
Running open	Off	Flashing	Yes	No	No	Defective TTY indicated
Running open	Off	On	No	No	Yes	Open or short in local loop
Intermittent errors	Off, but goes on each time error is printed.	Flashing	No	Yes	No	Random distortion hits

4.10 The set may be adjusted so that a distortion indication will be produced if a single mark or space of from less than 3.7 to 23.8 milliseconds is received, and it is continuously adjustable over this range.

5. CALIBRATION OF THE SCI-6

5.01 The SCI-6 can be calibrated with a controlled distortion sending set, such as the 119C1 or equivalent or the 911-type test sentence generator prior to installation at a location.

5.02 The indicator may also be calibrated at the station, after installation, by connecting a 164C TMS or equivalent or a 911-type set to the SCI-6 MONITOR jack.

(a) Instruct the central office to send test signals with marking-bias distortion. The level of signal distortion should be adjusted at the central office until the TMS indicates that distortion is being received at the desired threshold level.

(b) Remove the cover plug from the front panel THRESHOLD ADJ control on the SCI-6 and adjust the control until the DSTN alarm lamp just begins to blink; then back off the adjustment until the DSTN alarm lamp does not light.

(c) Instruct the central office to send signals with space-bias distortion, and check that the DSTN alarm lamp just begins to blink, at approximately the same level (within ±3 percent) as was originally set for marking-bias distortion in step (a) above.

(d) Check that the remote alarm, if used, is actuated when the DSTN lamp in the SCI-6 is lighted.

(e) Replace the cover plug on the THRESHOLD ADJ control.

5.03 After installing the SCI-6, disconnect the station equipment; and test the loop from the central office in accordance with Table D. The results indicated under "Open in Station" should be obtained. Reconnect the station equipment and test as indicated in Table E (neutral loop ***only***). The results under "Loop Normal" should be obtained. Insert an unterminated patch cord into the SCI-6 MONITOR jack and repeat the tests in Table D. The results indicated under "Loop Open" should be obtained. Record the results of the tests on the back of the Station Record Card.

TABLE D

TESTS FOR OPEN NEUTRAL OR POLAR LOOPS

CENTRAL OFFICE TESTBOARD POSITION METER	METER INDICATION	
	LOOP OPEN	OPEN IN STATION
Arrange for testing shorts with —130 volts (negative potential on tip)	0	0
Change —130 volts to +130 volts (positive on tip)	0	+65v

6. MAINTENANCE

6.01 The units should be checked during routine station visits for proper calibration and operation.

TABLE E

TESTS FOR SHORTED NEUTRAL LOOPS

CENTRAL OFFICE TESTBOARD POSITION METER	METER INDICATION	
	LOOP SHORTED	LOOP NORMAL
Arrange for testing shorts with —130 volts (negative potential on tip)	Approx 130v	Approx 130v
Change —130 volts to +130 volts (positive on tip)	Approx 130v	Approx 65v

6.02 Procedures used in 5.02 and 5.03 of the calibration procedures will serve as the periodic maintenance checks.

7. ALIGNMENT

7.01 The SCI-6 is set at the factory for optimum performance and should therefore not require alignment (trigger adjustment) unless a component is replaced.

7.02 If alignment is required, the trigger circuit should be adjusted as follows:

(a) Strap the SCI-6 for 60 ma-neutral, 75-baud signals. (See Table B).

(b) Establish a test circuit consisting of a 45-, 57-, or 75-baud signal source, a neutral loop adjusted for 30 ma, and the SCI-6 to be aligned.

(c) Remove the cover plug of the SCI-6 front panel BAL ADJ control and rotate the control to its extreme counterclockwise position. Then slowly rotate the control in the clockwise direction until the SIGS lamp just lights.

(d) Replace the cover plug and disconnect the SCI-6 from the test circuit.

8. ORDERING INFORMATION

8.01 The SCI-6 signal condition indicator may be obtained in the regular manner through the Western Electric Company. Requisitions should be worded as follows: (Quantity) Indicator, Condition, Signal, Stelma, Inc., Model SCI-6.

8.02 A list of components is included in the SCI-6 Technical Manual CTM-2013 shipped with each unit.