PRIVATE LINE TELEPHONE SERVICE
SC2 SELECTIVE CONTROL SYSTEM
MAIN STATION — MAINTENANCE

CONTENTS PAGE

1.00 INTRODUCTION

1.01 This section provides information for maintaining the main station equipment of the SC2 selective control system. ←

1.02 Since the signaling arrangements are common to all components of the system, maintenance information for this circuit is contained in Section 310-435-303.

1.03 This section is being reissued to include changes in the A. W. Haydon timer P-6421A-1 and to add the A. W. Haydon timer S-6402A. ↵

2.00 GENERAL

2.01 Since this equipment provides a means for remotely controlling customer-owned equipment, it is imperative that no action be taken by telephone company employees which will interfere with normal functioning of the customer's equipment.

2.02 Before starting tests or doing work of any kind on the system, telephone company employees shall obtain the customer's permission to proceed. At this time arrangements shall be made for the customer to disconnect any of his satellite station equipment which may be affected.

2.03 After the customer's equipment has been disconnected from the system, it will be necessary to connect test clips on appropriate SC2 system terminals at the satellite station involved in order to obtain the desired reply indications at the main station. ←

2.04 Most troubles, however, can probably be located by local testing. By connecting a brush pen recorder, or equivalent, to the circuit, the toll test center may quickly check the accuracy of codes being transmitted by the main station.

2.05 With the main station disconnected from the line, it will be possible to make such local tests as may be necessary to determine which unit is in trouble.

2.06 The various main station units are of the plug-in type and may easily be removed for testing and repairs.

2.07 Maintenance information on keys and relays is not covered in this practice.

3.00 FUNCTIONS

3.01 This circuit provides for:

- Transmission of coded signals via the associated signaling circuit to its satellite stations to control the customer-owned equipment. (Order signal.)

- Transmission of coded signals via the associated signaling circuit to its satellite stations to inquire of the condition of the customer-owned equipment. (Inquiry signal.)

TABLE A

SC2 SELECTIVE CONTROL SYSTEM

DEVICE INDICATING LAMPS		
Steady Light	**Indication**	**Remarks**
Green	Device deactivated.	Motor idle, valve closed, etc.
Red	Device activated.	Motor running, valve open, etc.
Amber	No reply within 12.5 seconds. No reply interval.	Will be accompanied by an audible alarm.
Green and White	Delayed answer function.	Device is being activated. When action is completed, the green and white lights will retire and the red will be lighted.
Red and White	Delayed action function.	Device is being deactivated. When action is completed, the red and white lights will retire and the green will be lighted.
Flashing Light		
Green	Order to activate has not been carried out.	
Red	Order to deactivate has not been carried out.	
Green and Audible Alarm	Unauthorized deactivate.	This would be in response to a roll call.
Red and Audible Alarm	Unauthorized activate.	This would be in response to a roll call.

- Receiving a short or long pulse signal from the satellite stations in response to orders and inquiries, and to record these indications on display lamps. (Invited pulse.)
- Receiving a short or long pulse from the satellite or monitor stations indicating a change of conditions within the system, as a means for initiating a series of inquiries for locating such changes. (Uninvited pulse.)

3.02 The display lamps provide a visual indication of the conditions at the satellite stations. These displays may also be used to diagnose trouble conditions. Table A shows the conditions indicated by the various lamps.

3.03 The main station equipment is arranged to perform a roll call operation which consists of a series of coded signals transmitted to its satellite stations, inquiring as to their condition.

3.04 The roll call is originated by the main station under the following conditions:

- Periodically under the control of a timing device.
- By operation of the MANUAL START ROLL CALL key.

- If a pulse is received from a satellite station that is not in response to an order or inquiry. This is referred to as an uninvited pulse.

3.05 If the system signal feature is provided, the first action taken by the main station equipment when a roll call is requested is to send a system signal inquiry to the monitor equipment.

3.06 The system signal is a signal which may originate at any main or satellite station requesting a shutdown of all customer-owned equipment on the system.

3.07 If the monitor replies that a system signal has been received, the main station relays this information to its satellites. This results in the over-all shut down.

3.08 If the monitor's reply indicates that no system signal has been received, the main station then sends a system signal inquiry to each of its satellites in an attempt to locate the station originating the signal. If the reply is such that a satellite has originated the system signal, the main station proceeds to signal all its satellites to shut down.

3.09 If the reply from the satellite stations indicates no system signal has been originated, the main station then proceeds with a normal roll call operation.

4.00 POWER PLANT

4.01 General maintenance of the 105D power plant is not covered in this practice. Reference should be made to Section 167-607-301 covering this equipment.

4.02 The CS-1BC Flotrol inverter converter is manufactured by the Lorain Products Corporation, 1122 F Street, Lorain, Ohio. This model is designed to supply a constant 130-volt dc plate voltage (see Fig. 1). This model normally operates from a 115-volt 60-cycle power source but contains a relay to transfer it to a built-in vibrator in case of power failure. A time delay relay delays transfer back to ac operation approximately 30 seconds after restoration of ac power. The vibrator is operated from the 48-volt battery of the 105D power plant.

4.03 Two visual alarms are provided in the filament panel. When the unit transfers to battery operation, ground on the transfer alarm lead will light the INV TRANS ALM lamp in the filament supply panel. The INV OUT ALM lamp in the filament supply panel remains lighted as long as the inverter output is available. When the output voltage is lost, release of the ***D*** relay removes ground from output alarm terminal D to extinguish the output alarm lamp.

4.04 Six taps are provided for setting the output voltage with ac operation and six taps are provided for setting the output voltage with dc operation. These taps change the output voltage in steps of about 1-1/2 volts. When a new vibrator is installed, the output voltage under dc operation will probably need to be reset. Resistors ***R1*** and ***R2*** affect the voltage regulation and should be readjusted when the rectifier has aged. To adjust these resistors proceed as follows:

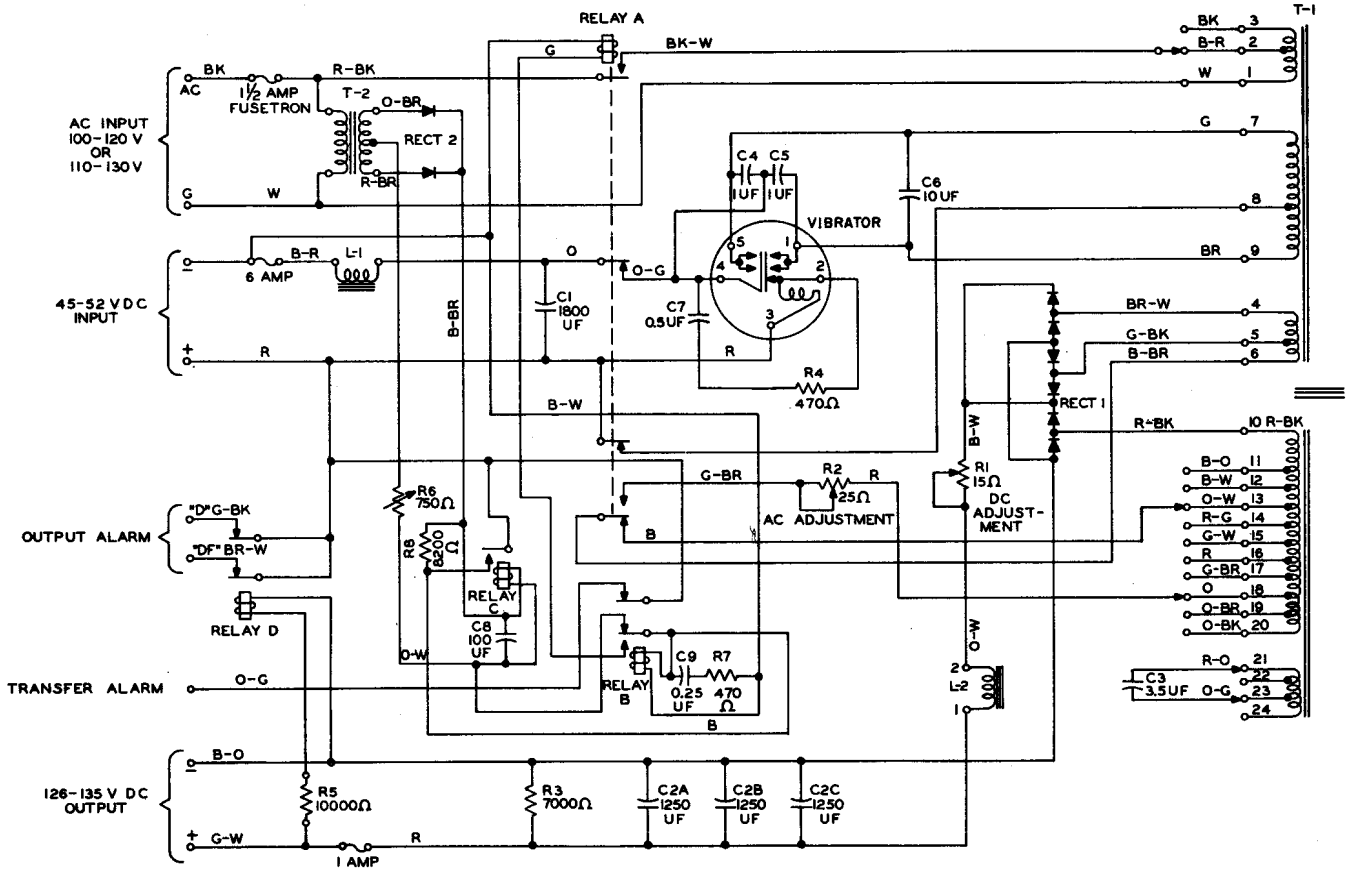
- Operate from dc (battery source) and adjust the ***R1*** resistance until output voltage at 0.5 amp load is 5 volts less than the output at 0.05-amp load. In case the output voltage oscillates at this setting, increase ***R1*** until oscillation stops.
- Operate from the ac input source and adjust ***R2*** until output voltage is 3 volts less at 0.5-amp load than at 0.05-amp load. In case output voltage oscillates at this setting, increase ***R2*** until oscillation stops.

4.05 A spare vibrator is provided in an unwired socket for easy access in case of vibrator failure.

4.06 Relays ***A*** and ***B*** are not adjustable in the field. Relays ***C*** and ***D*** are Western Electric Company 276A1 and U-1227, respectively, and are adjusted in accordance with Bell System Practices in the A and B series governing these relays.

4.07 Potentiometer ***R*** should be adjusted so that relay ***C*** will release by the time the ac line voltage drops to 85 volts.

4.08 The output of the rectifier is filtered with choke ***L2*** and capacitors ***C2A***, ***C2B***, and ***C2C***.



Note 1: ***R1*** and ***R2*** should be adjusted when rectifier has aged or when vibrator is replaced. To adjust ***R1*** and ***R2***: First, operate from 48-volt dc source and adjust ***R1*** until output voltage at 0.5-amp load is 5 volts less than the voltage at 0.05-amp load. In case output voltage oscillates at this setting, increase ***R1*** until oscillation stops; second, operate from 110-volt ac source and adjust ***R2*** until output voltage is 3 volts less at 0.5-amp load than at 0.05-amp load. In case output voltage oscillates at this setting, increase ***R2*** until oscillation stops.

Note 2: Vibrator: American Television and Radio Co., No. 5010.

Fig. 1 — Flotrol Inverter Converter

4.09 In case of a power failure or in case the ac input voltage drops below 85 volts, the voltage-sensitive relay *C* will release, dropping relay *A* which in turn disconnects the ac line from *T1* and connects battery to the vibrator. The vibrator output is connected to the same regulating transformer *T1* as was used in ac operation, and from here on the circuit functions as it did previously. The battery input is filtered with choke *L1* and capacitor *C1* which keep the vibrator noise out of the battery. On restoration of ac power, marginal relay *C* will operate, supplying power to the time delay relay *B*, which after about 1/2 minute will operate relay *A*, restoring normal operation.

5.00 TIMERS

5.01 The model UTR-52-C program instrument controls the periodic roll call feature. This timer is a product of the Stromberg Time Corporation, 109 Lafayette Street, New York 13, N. Y.

5.02 In general, only minor maintenance should be done in the field such as correcting the time of day or setting the day cutout drum. When major repairs are required, the program instrument should be returned to the manufacturer. (See Fig. 2.)

Setting the Time

5.03 The pilot dial is provided as guide.

> ***Caution:*** *Do not try to set the instrument by turning the hands. Use the setting button.*

The setting button advances the instrument one minute each time it is pressed. The time indicated by the pilot dial should exactly correspond to the time printed on the tape at the point beneath the contact fingers. Differentiate between A.M. and P.M. time.

Setting the Day Cutout

5.04 The day cutout drum, for eliminating signals during a 12- or 14-hour period, moves each 12 hours at 6:00 A.M. and 6:00 P.M. The day schedule is marked D; the night schedule is marked N. Remove the screw immediately over the desired D or N to eliminate the schedule. The outer series of screws correspond to the schedule on the outer edge of the tape. Set the drum to the proper day with the setting lever.

Perforating Tape

5.05 Signals may be at any 5-minute interval. Use the special punch provided with the instrument. Locate calibration on tape corresponding to the time a signal is desired. Hold the punch square with and directly over space between lines of calibration and punch hole.

Installing Tape

5.06 Slip tape between contact stud and contact selector, lining up time on tape with the pilot dial. Fit over pins of tape drum and thread over spools as indicated in Fig. 2, the latter being over the tension drum, which must be pressed up to allow tape to slip on.

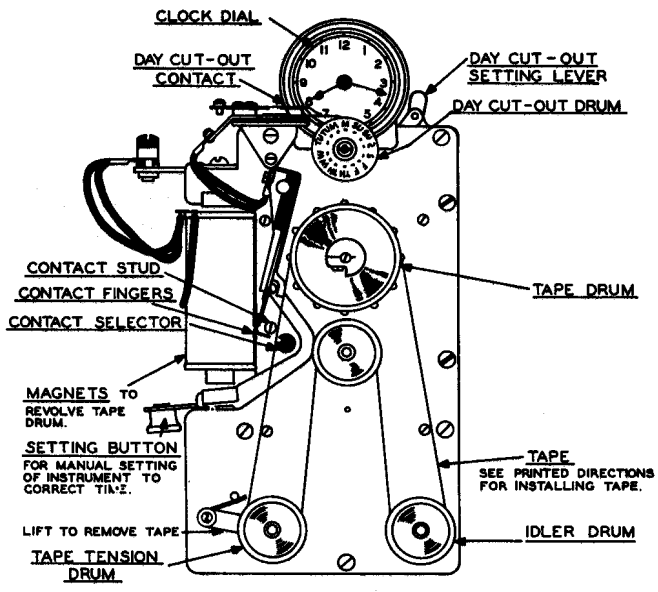


Fig. 2 — Stromberg Program Timer

5.07 The A. W. Haydon timer used in the main station for regular operation is coded P-6421A-1 time delay relay. The A. W. Haydon timer used in the main station for special (military) operation is coded S-2402A time delay relay. Fig. 3 shows a unit partially disassembled. The timer used at the monitor station has one more Micro Switch than shown in Fig. 3. Simple schematics of timers P-6421A-1 and S-6402A are shown in Fig. 4 and 5, respectively.

5.08 The operating requirements for the timer are as follows:

- P-6421A-1 time delay relay.
  1. Time delay shall be per Fig. 6 when operated on 40 to 50 volts dc.
  2. Maximum allowable variation in each time setting shall be ±1.3 seconds.
- S-6402A time delay relay.
  1. Time delay shall be per Fig. 7 when operated on 40 to 50 volts dc.
  2. Maximum allowable variation in each time setting shall be ±0.55 second.

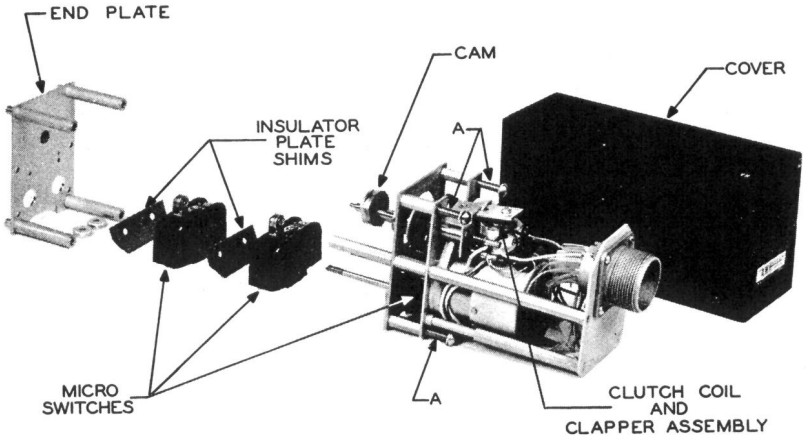


Fig. 3 — A. W. Haydon Time Delay Relay

- Clutch coil shall operate directly on the above voltages.
- Switch ratings shall be 10 amps (inductive).

Operation

5.09 When power is applied to pins A and B, the clutch coil and electromagnet attract the clapper assembly downward. This operation tightens the connecting spring which in turn pulls the alternate clutch spring tight around the hub of the release gear, locking the release gear in position. The motor pinion, mounted on the motor drive shaft, rotates the planetary gear and the pinion mounted on the delay arm assembly. The planetary pinion rides around the temporarily locked release gear, rotating the delay arm assembly and the cam until the Micro Switches are actuated.

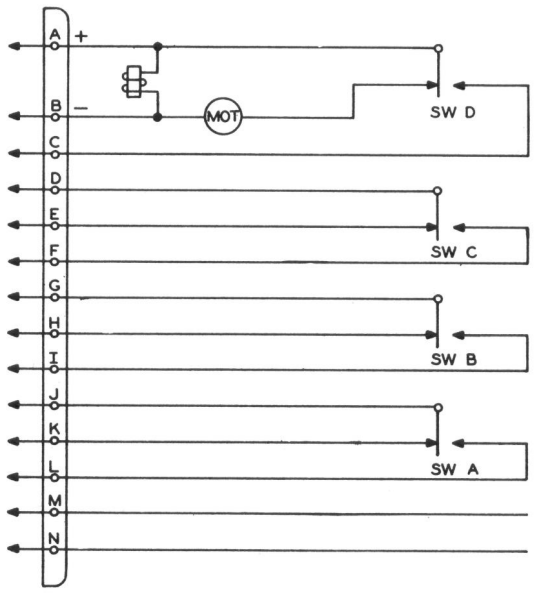


Fig. 4 — A. W. Haydon Timer, P-6421A-1 — Schematic Drawing

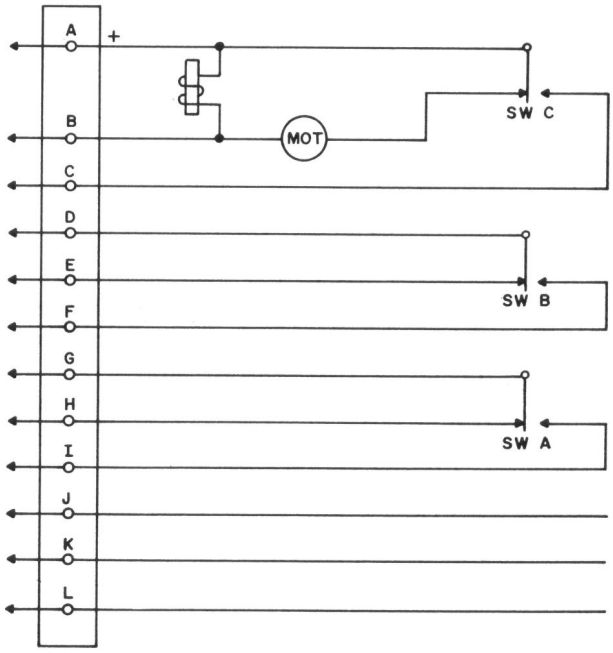


Fig. 5 — A. W. Haydon Timer, S-6402A — Schematic Drawing

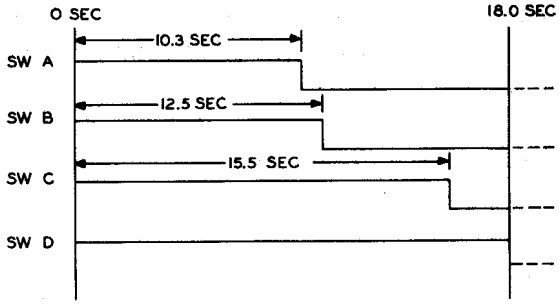


Fig. 6 — A. W. Haydon Timer, P-6421A-1 — Timing Chart

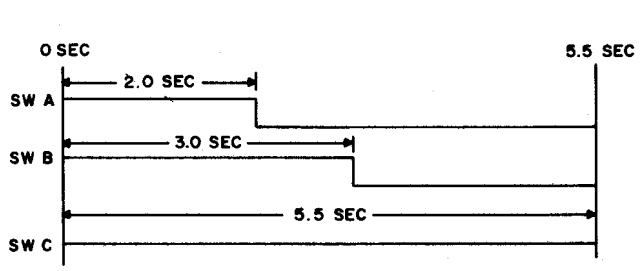


Fig. 7 — A. W. Haydon Timer, S-6402A — Timing Chart

5.10 When power to pins A and B is interrupted, the tension on the connecting spring is released. At the same time, the clapper assembly releases the tension of the clutch spring. When the clutch spring loses its tension, the clutch gear is released and the delay arm assembly and the cam are pulled back to their original setting by the delay arm return spring, allowing the Micro Switches to release. In this way, the timer resets automatically whenever the current is shut off.

Testing

5.11 The following tools are required for testing the time delay relay:

- Stop watch for checking time setting.
- Continuity test lamps or equivalent.
- Volt-ohmmeter.
- 24-ounce spring balance for testing clutch mechanism.

5.12 To test continuity of Micro Switches, connect positive battery to the common terminal on the Micro Switch. Connect a continuity test lamp in series with the negative side of this battery and the normally closed terminal on the Micro Switch. The lamp should light. Depress the actuator arm on the switch and the light should be extinguished. If these results do not occur, replace the switch.

5.13 To test the over-all effectiveness of the clutch mechanism, hold the clapper assembly against the clutch coil, rotate the delay arm assembly until it touches the actuator arm of Micro Switch No. 1, hook a spring balance under the end of the delay arm, and exert an upward pull of 16 ounces, tending to pull the delay arm back toward the return stop. If the delay arm assembly moves, replace the connecting spring. After replacing the connecting spring, repeat the test. If the delay arm assembly again moves, the alternate clutch spring should be replaced.

5.14 Remove the spring balance and release the clapper assembly. Make certain that the delay arm assembly is resting against the return stop.

Caution: Do not exert more than a 16-ounce force in this test, or damage to clutch mechanism may result.

Repairs

5.15 In general, repair of the timer by the repairman should be limited to replacement of faulty Micro Switches. For all major repairs, return the unit to the A. W. Haydon Company, 232 North Elm St., Waterbury 20, Connecticut.

5.16 The timing cams are set at the factory and their set screws sealed. Do not loosen these set screws unless it becomes absolutely necessary to change the cam settings.

5.17 If a cam is reset, its set screw should be tightened securely. Glyptal cement (a General Electric Company product) should be used on the head of the screw as a sealer.

Caution: In no case should the glyptal cement be placed in the hole ahead of the screw, as it would probably then be impossible to loosen the set screw later.

5.18 To disassemble the unit, remove the two screws from the plug end of the unit, and remove cover. (See Fig. 3.)

5.19 Remove the end plate adjacent to the Micro Switches by removing the two screws on the face of the plate plus the four screws marked A in Fig. 3.

5.20 Remove the two nuts holding the Micro Switches on their mounting shafts. Before the Micro Switches can be removed, the wires must be disconnected from the terminals on each switch.

5.21 When reassembling, make sure that insulator plate shims are installed properly.

5.22 No lubrication is required because the component parts are lubricated for life at time of manufacture.