

32 CALL CONTROL UNIT

GENERAL DESCRIPTION

AND OPERATION

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1. GENERAL

1.01 This section provides a general description and operation of the 32 call control unit. This information was formerly contained in Section 574-123-101TC, covering both the 32 and 33 call control units, which is hereby cancelled. The 33 information may now be found in Section 574-123-100TC. The circuit description covered in 574-123-101TC is now covered in 574-160-103TC.

1.02 This section describes two call control units which may be considered basic units. They are:

- (1) Call Control Unit for Circuit Switching Service
- (2) Call Control Unit for Private Wire Service

1.03 The call control unit is the electrical link which joins the various components of the set to one another and the set to the transmission facilities.

1.04 References to left, right, front or rear consider the call control unit as viewed by the operator.

2. DESCRIPTION AND OPERATION

CALL CONTROL UNIT FOR CIRCUIT SWITCHING SERVICE (Figure 1)

2.01 The call control unit for Circuit Switching Service utilizes two types of signals in its operation. Over short and intermediate length telegraph loops it operates on neutral signals; over longer loops with excessive distortion it operates on polar signals. A polar adapter attached to the call control unit enables it to operate on polar signals. Paragraphs 2.02 through 2.14 describe the neutral operation. Paragraphs 2.15 through 2.20 describe the polar operation.

A. Neutral Operation

Controls

2.02 The controls on the call control unit used to originate and handle calls consists of a set of push buttons and a dialer. In certain applications the push button designations are, from left to right, as follows: START, DIAL, LOCAL, and CONN(STOP). In other applications the pushbutton designations are, from left to right: REQUEST, CONN, LCL, and DISCONN.

Dialer

2.03 The dialer is a conventional telephone type which operates normally closed pulsing contacts. These contacts open and close to send dialing pulses during the dial run-down interval. The pulses are produced at a rate of ten per second with the contacts open for 0.061 ± 0.003 second during each pulse interval. A pair of normally open off-normal contacts close when the dial wheel is rotated from its idle position. These contacts provide a steady mark current to "blind" the selector when dialing is undertaken. This prevents the printing of spurious characters if dialing is necessary when in the connected condition as in multiaddress calling.

Start

2.04 In the idle condition, with the motor and typing unit stopped and visual indicators de-energized, there is a positive current of 0.005 ampere in the telegraph loop. When the calling station operator depresses the START pushbutton, it causes the shunting of a major portion of the loop resistance, and the loop current increases to 0.060

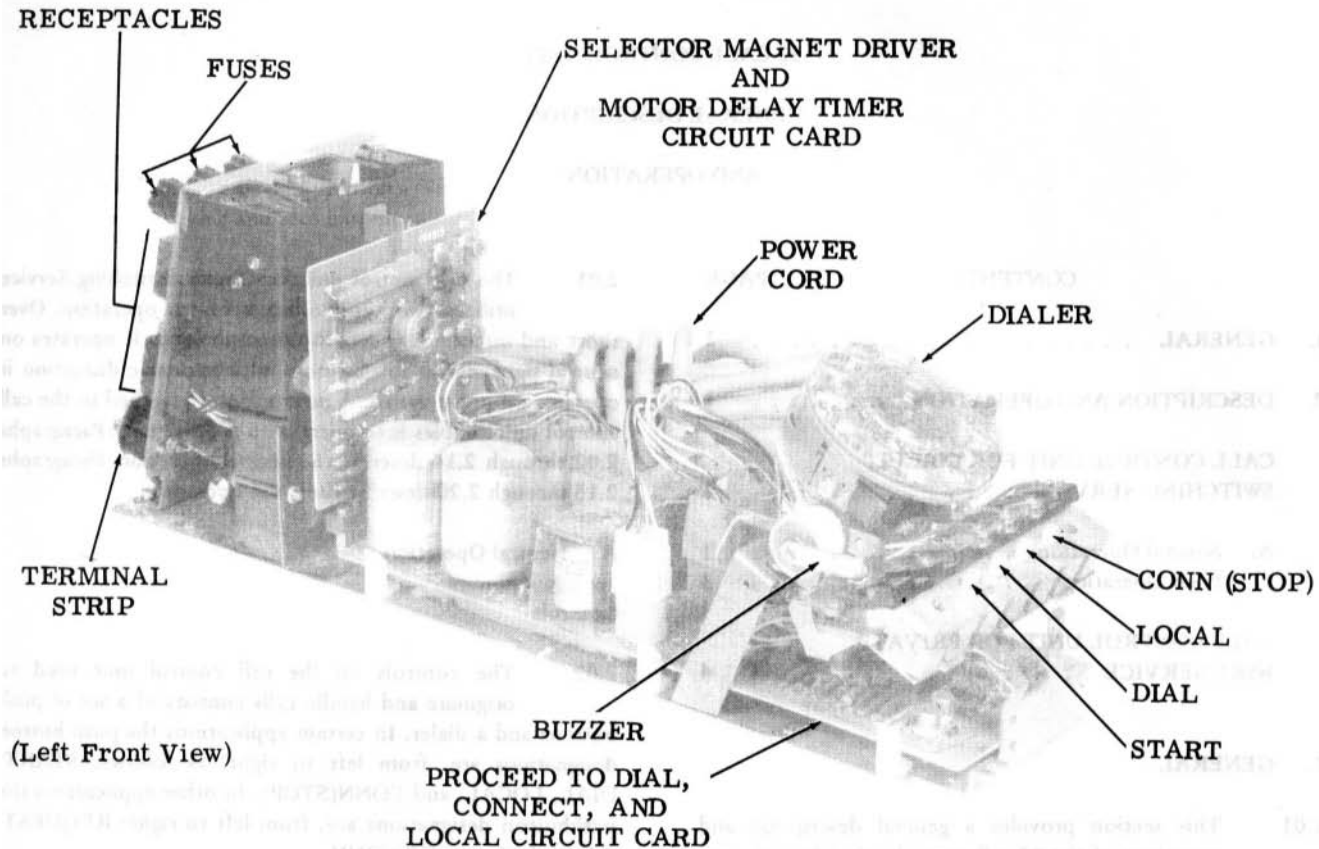


Figure 1 - Call Control Unit for Circuit Switching Service

ampere. The START pushbutton must be held in the depressed position, while switching apparatus in the telegraph exchange is made available. When the circuit is ready, the telegraph exchange interrupts the 0.060 ampere loop current for about 0.025 second. This "proceed-to-dial" signal causes the DIAL lamp to be illuminated at the calling station, and it locks in the shunt to the loop resistance so that the operator may now release the START pushbutton and proceed to dial the number of the called station. Rotation of the dial transmits signals consisting of no current for 0.06 second followed by full current (0.060 ampere) for 0.04 second during each dial pulse interval. When dialing is completed, the exchange furnishes the connection and signifies this by reversing the telegraph loop current from positive to negative which causes the typing unit motor to start and the CONN lamp to light. Message transmission can now be exchanged between the connected teletypewriters. The line signals are 0.060 ampere marking and zero current spacing.

2.05 If the distant called station is busy or disabled at the time of a call, the local telegraph exchange reverses the local loop current from positive to negative for about 0.2 second and then causes it to revert to positive

current again. This causes the local motor to start and the CONN lamp to light momentarily, but they then both turn off. The teletypewriter returns to the idle condition as the positive current is detected.

Connect

2.06 The local telegraph exchange responds to an incoming call by reversing the idle signal loop from positive to negative current. At the local station, the CONN lamp is illuminated, and the motor is turned on as the shunt to the loop resistance is applied in response to the current change. Message transmission can now take place with unattended service at the receiving station.

Stop

2.07 Following completion of traffic a disconnect can be originated from either the calling or the called station. Holding the STOP pushbutton depressed causes the line to go open (zero current). In approximately 3 seconds the local exchange causes the connection to the distant station to be broken, and it reverses the current in the local

loop so that positive current flows – limited by the local station loop resistance. This turns off the motor and extinguishes the CONN lamp. The STOP pushbutton is released after the CONN lamp goes out. The original idle condition is now restored. When a disconnect is initiated from a remote station, the local exchange recognizes the open line interval and breaks the connection. The loop current is reversed back to positive, and the local station is returned to the idle condition as stated above.

Local

2.08 Local operation is provided by depressing the LOCAL pushbutton until the LOCAL lamp is turned on. This places the teletypewriter in an off-line operating condition for copy preparation, practice, or maintenance purposes. To return to the idle condition, the STOP pushbutton is held operated until the lamp is extinguished, or a call can be initiated by depressing the START pushbutton directly. If a call is received while the teletypewriter is in the local condition, the buzzer will sound for an interval of 2.6 seconds, and the teletypewriter will automatically shift over to the call connected condition with the CONN lamp illuminated.

Fuse Protection

2.09 Three fuses protect the components in the call control unit from accidental shorts or overloads. The selector magnet driver fuse is 3/8 amp, slow blowing, protecting the SMD circuit; the typing unit motor fuse is a 3.2 amp, slow blowing; the third fuse is the ac line fuse, 3.2 amp, slow blowing.

Electrical Interconnections

2.10 There are a number of nylon terminal blocks at the rear which serve to interconnect the set components to the call control unit. Also located at the rear is a terminal strip for the signal line and ac power connections.

Circuits

2.11 There are three basic and two auxiliary circuits in the call control unit. The three basic circuits are: the proceed to dial circuit; the connect circuit; and the local circuit. The two auxiliary circuits are: the selector magnet driver circuit and the motor delay timer circuit.

2.12 The three basic circuits are essentially binaries (flip-flops) that have been modified to perform a specific function. They are protected with a diode arc suppressor against transients and voltage pulses generated by their associated relays and coils. They are protected from transient noise induced into them from leads in the cable to the dial, pushbutton keys, and lamp assembly. A low-pass

filter or delay network of the RC type is placed in the feedback loop in each binary. The delay network slows the response time of the associated binary (0.001 second in the proceed to dial circuit; 0.02 second in the connect circuit). This reduces its susceptibility to noise. The signal line inputs are filtered against spurious noise occurring on the signal line.

2.13 The selector magnet driver circuit delivers marking signals of 0.500 ampere and spacing signals of essentially 0 ampere to the typing unit selector magnet. The signals trigger the selector magnet driver circuit at about half the current level for normal (0.060 ampere mark) neutral input signals. In teletypewriters modified for polar operation, the signal is applied to polar-to-neutral converting circuits and then to the selector magnet driver. The selector magnet driver circuit thus functions as an amplifying relay which improves the margin of operation over either neutral or polar line circuit.

2.14 The motor delay timer circuit provides a means to delay motor turn-off in the teletypewriter. This allows the set to complete its printing cycle and come to rest before the motor begins to stop. This circuit is mounted on the same circuit card assembly with the selector magnet driver, but the circuit is electrically independent of it. At 25 degrees C with 390 ohm output load, the delay of the motor delay timer is from 0.475 second to 0.675 second when the supply voltages are within 3 percent of their nominal values.

B. Polar Operation

2.15 Call control units that are modified for polar operation respond to and transmit polar telegraph signals on separate receiving and sending legs extending to the telegraph exchange facilities. The operating conditions and sequence are similar to that for neutral signaling.

2.16 In the idle condition the sending and receiving legs each have from 0.015 to 0.040 ampere positive current flowing. The sending leg current is supplied by the call control unit, and the receiving leg current is supplied by the central exchange. At the local station the polar adapter interconnects the legs with the neutral signaling control and teletypewriter circuitry. Operation of the START pushbutton causes the current in the sending leg to reverse to a negative polarity with a value equal to the positive current formerly applied (0.015 to 0.040 ampere). The telegraph exchange responds by reversing the current to negative on the receiving leg for 0.025 second. This causes illumination of the DIAL lamp at which time the START pushbutton should be released. The dialing signals go out over the sending leg in polar form with each pulse interval consisting of 0.06 second of positive current followed by 0.04 second of negative current. When the connection is completed, the exchange reverses the polarity of the receiving leg from positive to negative current. After 0.08 second of this reversal, the call

control unit causes the motor to turn on, and the CONN lamp to be illuminated. Traffic can now be exchanged. Each station is arranged to record its transmitted copy. Transmitted and received signals consist of positive current for space and negative current for mark on both signal legs.

2.17 When receiving an incoming call, the local exchange reverses the receiving leg current from positive to negative. The local call control unit, after 0.08 second of negative current, turns on the motor and the CONN light and causes the sending leg current to be reversed from positive to negative.

2.18 If the distant station that is called is busy, it will result in the momentary application of negative current to the local receiving leg followed by a return to a continuous positive current. The motor may run briefly, but the teletypewriter will be quickly placed back into the idle condition.

2.19 In effecting a disconnect, operation of the STOP pushbutton causes the transmission of positive current on the sending leg. The exchange will then reverse the current on the receiving leg to positive as it breaks connection to the distant station. The call control unit detects the positive current. After 1.3 seconds it turns the motor and CONN lamp off as it applies a steady positive current to the sending leg and restores the teletypewriter to the idle condition. If the disconnect is initiated at the distant teletypewriter, the positive current disconnect signal, when applied to the local receiving leg, causes the local teletypewriter to go into the idle condition after 1.3 seconds, and the sending loop becomes positive again.

2.20 For local operation the internal conditions are the same as for neutral signaling. Externally, the signal legs remain on positive current unless a call is received. When a call is received, a negative current on the receiving leg for 0.08 second causes the buzzer to sound for 2.6 seconds. Following the buzzer sound, teletypewriter shifts to the call-connected condition.

2.21 Technical Data

Dimensions (Approximate)

- Width 5 inches
- Length 17 inches
- Height 6 inches

- Input 117 v ac + 10%, 60 Hz + 1/2%
- Polar adapter input 117 v ac ± 10%, 60 Hz

Power consumption

- Neutral operation . . . not exceeding 22.5 watts
- Polar operation not exceeding 52.5 watts

Environmental conditions 32° F to 149° F ambient temperature

CALL CONTROL UNIT FOR PRIVATE WIRE SERVICE (Figure 2)

2.22 Power for the motor, selector magnet driver, local power supply, and tape reader power pack, is supplied from fused 117 volt ac, 50 to 60 hertz power. Direct current of either 0.020 or 0.060 ampere is required for the signal line(s) and for operation in the local mode. The dc power for the signal line(s) is supplied by external facilities, while local dc current for operation in the local mode is furnished through the operation of the local power supply circuit in the call control unit. At the rear of the call control unit is a terminal strip which provides the point of entry for the ac power and the signal line(s) into the teletypewriter set.

2.23 A 3-position rotary power switch is the only manual control on the call control unit. Its three positions are: OFF, LOCAL, and LINE.

Fuse Protection

2.24 Two fuses protect the components in the call control unit from accidental shorts and overloads. The selector magnet driver fuse is 8/10 amp, slow blowing; the ac power line fuse is 2.8 amp, slow blowing.

Electrical Interconnections

2.25 Connector plugs at the rear of the call control unit serve to interconnect the set components to the call control unit. A terminal strip, also located at the rear, serves to connect the ac power to the call control unit and offers a convenient terminating area for other accessories and external connections.

Line Mode

2.26 When the switch is in the LINE position, the teletypewriter can be placed in the external signal line loop for communication with other teletypewriters. The external signal line loop is united with the selector magnet driver. With battery on the signal line, any transmission from the keyboard or tape reader, when provided, will cause the typing unit distributor to send start-stop signals to other teletypewriters in the external signal loop. Also, the local teletypewriter is able to receive, through the typing unit selector, the start-stop signals transmitted from other teletypewriters in the signal line loop.

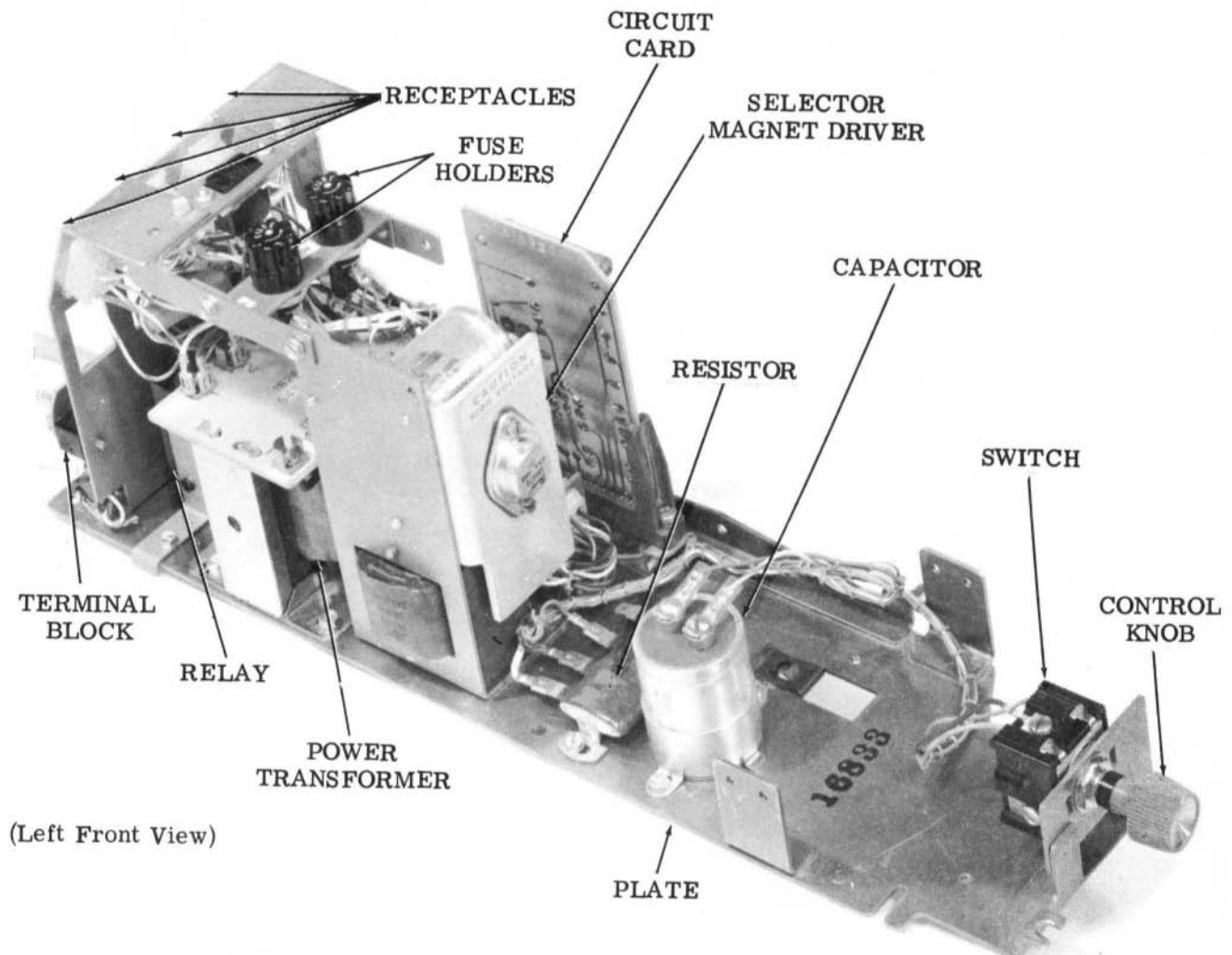


Figure 2 - Call Control Unit for Private Wire Service

Local Mode

2.27 When the switch is in the LOCAL position, (1) the local battery is supplied to the selector magnet driver and the send circuit, (2) the external signal line loop is divorced from the selector magnet driver, and (3) the external signal line loop is shunted so that other teletypewriters in that loop can communicate without being affected by the operation of the local teletypewriter.

Off Mode

2.28 When the switch is in the OFF position, the signal line is diverted around the local teletypewriter. Other teletypewriters can communicate in the signal loop

without interference. All power in the call control unit, except the ac power to the selector magnet driver, is off.

2.29 **Technical Data:**

Dimensions (Approximate)

Length 15 inches
 Width 4-½ inches
 Height 6 inches

Input 117 v ac, 60 Hz
 Environmental conditions 40° F to 110° F
 ambient temperature

