8A RANGE EXTENDER

COIN REG

DESCRIPTION, OPERATION, AND INSTALLATION

(DLXR810MAA)

1. GENERAL

1.01 This section describes the 8A Coin Range Extender with Gain (8A Coin REG) which aids signaling and transmission range extension on H88 loaded coin loops. The Coin REGs are designed for use on coin first (CF) or dial-tone-first (DTF) coin loops with resistances ranging from 1050 to 2800 ohms. The Coin REG replaces the SD-96592-01 coin dial long line (DLL) circuit and the NS-02517-01 signaling range extender (SRE) which are used in conjunction with E6 or equivalent repeaters. The 8A is less expensive than either of the preceding two options and is the first coin range extender which is fully compatible with the standard Bell System long route design procedures.

1.02 When this section is reissued, the reason for reissue will be given in this paragraph.

1.03 The 8A Coin REG has been developed to provide convenient and economical range-extended coin telephone service for step-by-step (SXS), crossbar (XBAR), and electronic switching system (ESS), and 10A remote switching system (RSS) offices out to 2800 ohms. No manual gain or build-out adjustments are necessary with the 8A.

1.04 The 8A Coin REG incorporates the following design advantages:

● Requires fewer main-frame cross connections

● Requires no adjustments to make it conform to the loop being served

● Assignable by the normal procedures used with long route design (LRD) program (ie,

does not require engineering in the processing of a service order)

- Provides repeat coil isolation from power line induction during talking and dialing (which the SRE and general trade offerings do not)

- Requires no special tests or procedures for installation

- Compatible with per-line and CREG applications.

2. DESCRIPTION

A. General

2.01 The 8A Coin REG shown in Fig. 1 is a single plug-in unit consisting of a printed wiring board and associated electronic components housed in a die-cast aluminum frame. The unit, which measures 1.7 inches wide, 8 inches high, and 11 inches deep, is compatible with existing J98625 REG mounting arrangements (SD-97722-02) and J98631A mini-REG bay arrangement (SD-97762-01). Power for operation of the 8A Coin REG except the 8A repeater (see paragraph 2.05), is derived from -48 Vdc office battery.

2.02 A light emitting diode (LED), located on the front panel of the 8A, indicates when the connecting coin loop of the 8A is busy.

2.03 A block diagram of the 8A Coin REG is shown in Fig. 2. The principal parts of the 8A are as follows:

(a) Voice frequency (VF) repeater

(b) Line feed

(c) Microcomputer

(d) Repeat coil, relay, and detectors.

B. Voice Frequency (VF) Repeater

2.04 The 8A repeater circuit is a bidirectional amplifier which provides gain for both directions of voice frequency (VF) transmission and extends the office range to 2800-ohms conductor loop resistance. The repeater circuit is dynamically controlled by the microcomputer (see paragraph 2.09) which detects the resistance of the subscriber loop and automatically adjusts the 8A repeater to the proper VF gain.

2.05 Power for the 8A repeater is derived from the supervisory circuit. A polarity guard ensures that the 8A amplifiers are always powered with voltage of the correct polarity.

2.06 The 8A repeater incorporates a universal line build-out (LBO) network that allows it to interface with H88 loaded 19-, 22-, 24- or 26-gauge cable or a combination of these cables. The LBO network functions to build out the central office (CO) end section to an electrical equivalent of 6000 ft. The LBO in the 8A is fixed and cannot be adjusted. The repeater also includes impedance matching and high-frequency compensators which do not require adjustment.

C. Line Feed

2.07 Boosted battery of -78 Vdc or -100 Vdc received from a 71A2 (-100 Vdc), a 71A1 (-78 Vdc) or a 71A3 (-78 Vdc) power unit by the Coin REG is regulated to ensure sufficient line feed loop current of the proper magnitude and polarity to operate TOUCH-TONE® dial, totalizer, and station set transmitter out to 2800 ohms.

2.08 The 8A line feed has a floating output which reduces loop message-circuit noise even with a coin ground, and gives the loop current detector high longitudinal immunity. Loop current and resistance are detected through the line feed circuit.

D. Microcomputer

2.09 The 8A microcomputer is a single 4-bit P-channel metal oxidized semiconductor chip in a 28-pin DIP package. The microcomputer is programmed to control the relays, repeater gain, and line feed appropriately and to monitor the detectors which provide data to the microcomputer. The internal program of the microcomputer performs the following functions:

- Bypass state monitoring

- Loop-start and ground-start

- Repeater gain control
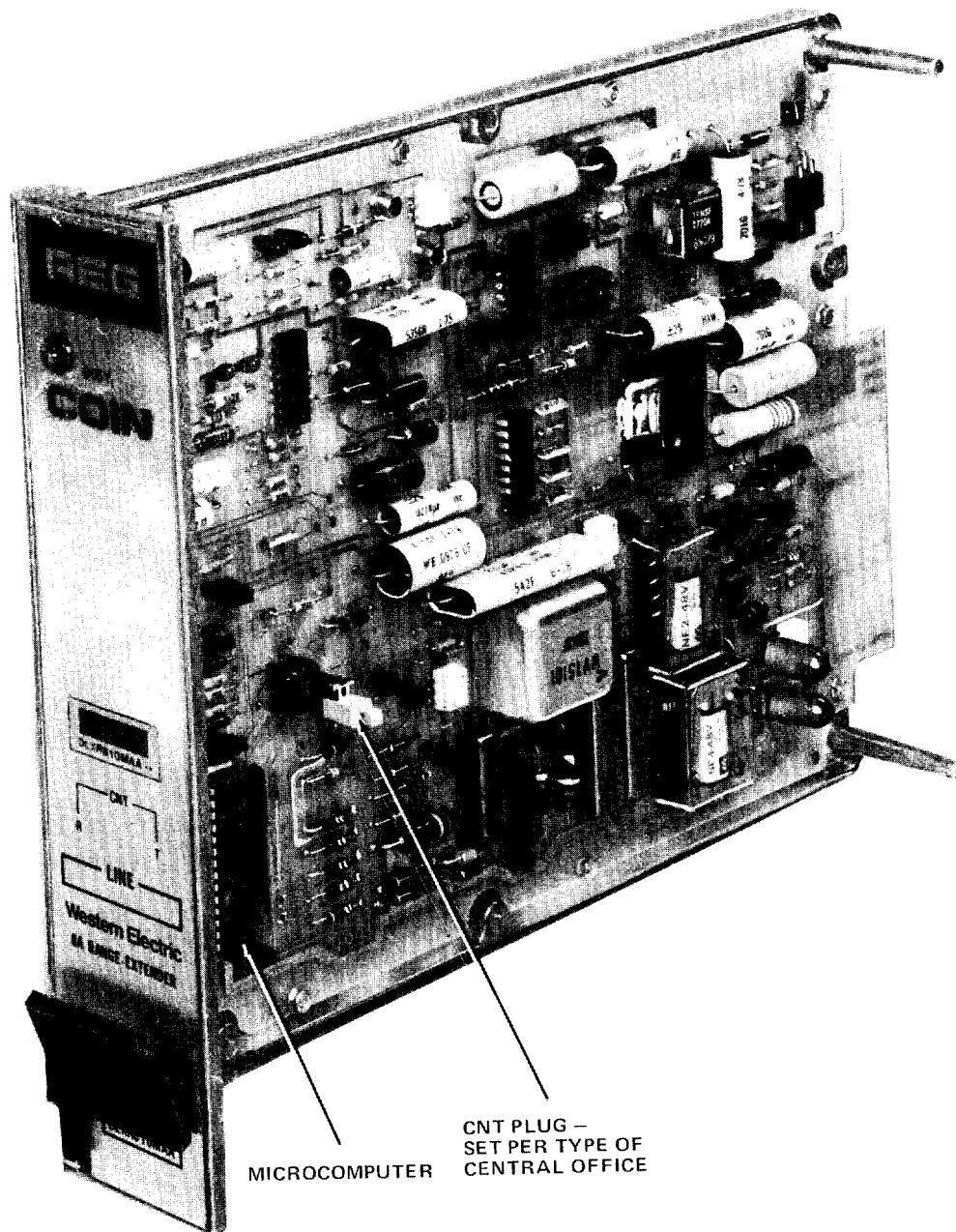
- Active state monitoring

CNT PLUG —
SET PER TYPE OF
CENTRAL OFFICE

MICROCOMPUTER

Fig. 1—Component Layout of the 8A Coin REG

• Dial pulsing.

E. Repeat Coil, Relays, and Detectors

2.10 Voice frequency signals are passed through
a repeat coil (shown in Fig. 2) which interfaces
between the 8A repeater and the coin loop. The

repeat coil (transformer) provides longitudinal
isolation from loop noise.

2.11 Operation of the 8A REG involves five
detectors and five main relays as shown in
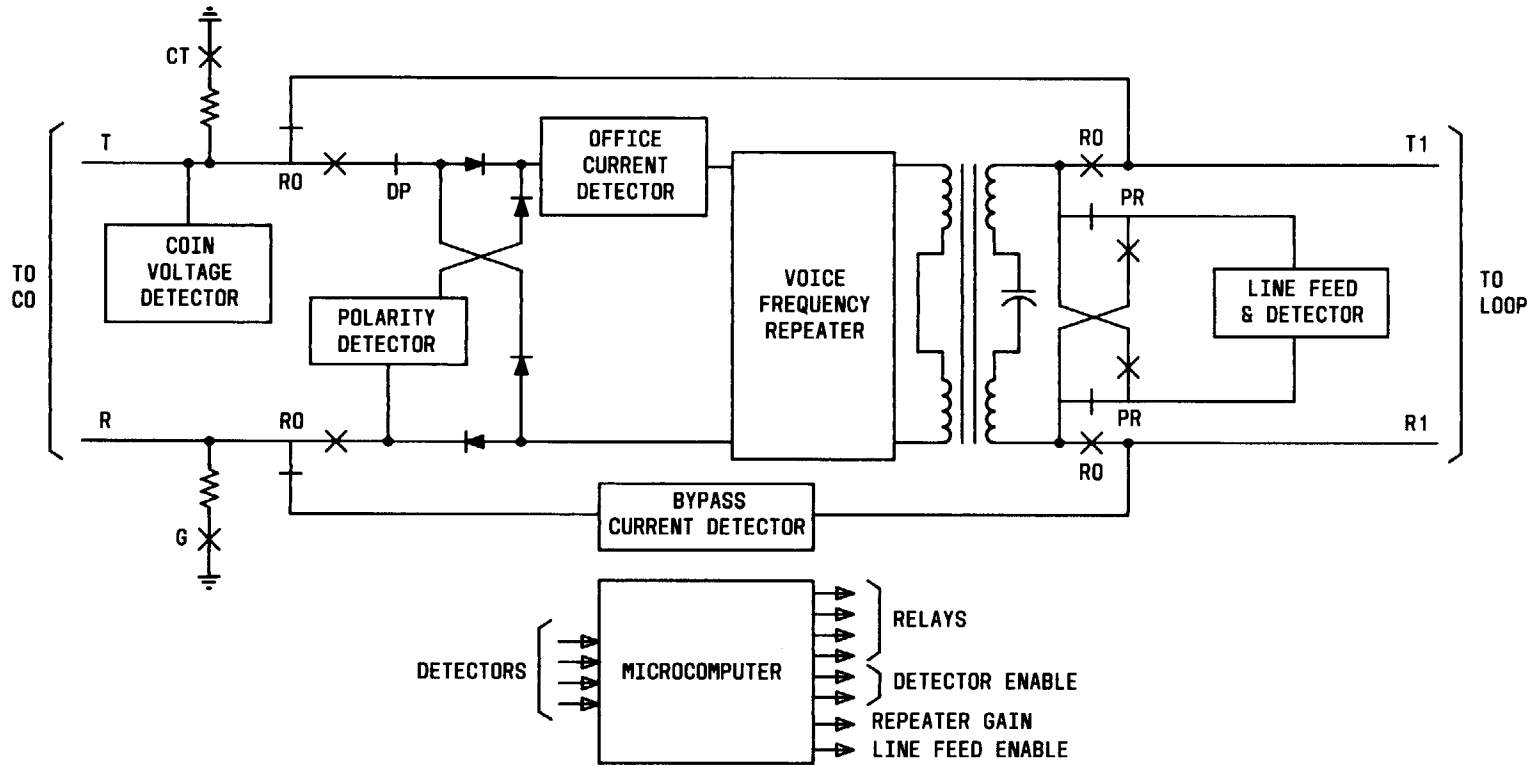Fig. 2. The 8A microcomputer is programmed to

Fig. 2—8A Coin REG Block Diagram

monitor the detectors and to control the relays. The functions of the detectors are as follows:

- Bypass Current Detector—senses current in the ring conductor during the bypass state

- Polarity Detector—senses reversals in CO loop current in the active state

- Office Current Detector—senses CO loop current in the active state

- Coin Voltage Detector—senses coin voltage potential of either polarity applied to the CO tip conductor in both the bypass and active state

- Loop Current and Voltage Detector—works in conjunction with line feed circuit in the active state.

The five main relays and their functions are as follows:

- DP relay—repeats rotary dial pulses

- PR relay—reverses loop polarity

- G relay—aids ground start and ring trip

- RO relay—connects the 8A repeater and line feed into loop (in the active state)

- CT relay—aids coin tests.

3. FUNCTIONS

3.01 The 8A Coin REG is designed to perform the following functions:

- Provides range extension for either coin first or dial-tone first operation in step-by-step, crossbar, ESS, and 10A RSS offices.

- Provides VF gain, equalization and line build-out with floating repeat coil isolation during VF transmission and dial pulsing. Repeater gain is automatically set to 3 dB for loops shorter than 2000 ohms and 6 dB for loops longer than 2000 ohms.

- Permits testing via SD-1C297-01 coin station test line circuit, local or remote test desks and manual coin-station test sets.

- Provides proper termination to CO for loop or ground-start supervision, and ring trip.

- Shapes and repeats rotary dial pulses to eliminate distortion, hits, split pulses and transients (TOUCH-TONE signals are amplified).

- Amplifies inband coin deposit signals.

- Aids coin presence tests over the ring or tip conductor (see Part 6).

- Provides current of proper magnitude and polarity to operate the carbon transmitter, TOUCH-TONE dial, and totaizer of CF and DTF coin telephone sets.

- Connects loop through to the CO in the idle state for loop testing, ringing, and coin disposal.

4. OPERATION

A. General

4.01 Dynamic operation of the Coin REG involves five detectors and five relays. The 8A microcomputer is programmed to monitor the detectors and to control the relays. The detectors function to sense coin control voltages, bypass ring conductor current, CO current, CO polarity, loop current, and loop resistance.

4.02 Functionally, the 8A REG has two basic states; bypass and active. In the bypass state, the circuit is a simple metallic connection of input to output. In the active state, the circuit input is connected to the output through the 8A repeater and repeat coil (see Fig. 2).

B. Bypass State

4.03 When the line is idle (station set on-hook), the RO relay is released and the 8A repeater is bypassed. The line feed is turned off. In this mode, the coin voltage detector and bypass current detector are continuously monitored by the microcomputer.

4.04 During the bypass state, ringing, coin control and test voltages can be applied directly to the coin loop.

C. Active State

4.05 When the line becomes active (station set off-hook), the ring conductor bypass current detector signals a program start to the microcomputer provided there is no coin voltage present. The microcomputer reads and stores the state of the CNT switch. The RO and DP relays are operated by the microcomputer to connect the 8A repeater, repeat coil and line feed (now on) into the telephone circuit. The ring conductor is grounded momentarily by the G relay which aids ground start until presence of CO loop current is verified by the CO current detector (grounding of the G relay also aids ring trip when ringing voltage is being applied on the coin loop). The microcomputer reads loop resistance (see note) from data provided by the loop current and resistance detectors, and automatically adjusts the 8A repeater to the following VF gain:

Resistance (Ω)	GAIN (dB)
1000-2000	3
2000-2800	6

Relay PR operates to reverse loop polarity if reverse CO polarity is detected. During the active state office and loop current are continuously monitored.

> *Note:* Conductor loop resistance is the resistance between the main distributing frame (MDF) and the customer distribution terminal. Total external circuit resistance includes the customer drop and station set resistances. The customer drop and station set resistances have been taken into account in the 8A by assuming that they total 280 ohms.

4.06 Dial pulses, switch hoop flashes and other short breaks in loop current are sensed by the microcomputer and repeated by the DP relay which is controlled by the microcomputer. The 8A returns to the bypass state if a break in loop current lasts longer than 100 ms.

4.07 During off-hook coin operations and CO open intervals relay RO releases and the repeater and line feed are momentarily bypassed. Relay CT operates if no collect or return coin voltage is sensed (see note). When the CNT switch is set to the T position and bypass current is detected during coin operations, the 8A returns directly to the active state. However, if the CNT switch is set to the R position, the 8A goes to the bypass state and restarts (see paragraph 4.05).

> *Note:* According to the setting of the CNT switch, either the tip (CT relay) or ring (G relay) conductor is grounded to aid coin presence test. The CNT is normally set in the T position (see Part 6).

5. APPLICATIONS

5.01 The 8A Coin REG is designed to extend the signaling range and to insert VF gain on H88 loaded coin loop facilities which have been planned according to subscriber long route design (LRD) or concentrated REG (CREG) rules. The 8A has been designed to serve both dial-tone-first and coin-first lines in SXS, ESS, crossbar offices, and 10A remote switching system (RSS) offices. The 8A coin REG is not compatible with dial post-pay service.

5.02 The Coin REG does not boost coin control voltages. Therefore, those step-by-step and No. 1 crossbar offices which have 100-volt coin batteries will require an increase to 130 volts to operate 41 mA coin relays on a full 2800-ohm range (see notes). A 100-volt coin battery permits a range of only 1900 ohms.

> *Note 1:* A 116-volt coin battery will allow a 2800-ohm range providing earth potential does not exceed 1 volt.

> *Note 2:* The 41 mA relays are standard in 1C/2C/1D/2D—type coin station sets. All single or multi-slot CF or DTF coin telephone sets may be used.

5.03 The Coin REG is compatible with automatic coin box accounting (ACBA), automatic coin toll system (ACTS), local coin overtime (LCOT), and stuck coin administration.

6. INSTALLATION AND MAINTENANCE

A. General

6.01 The 8A Coin REG is designed to be installed in the serving/primary office serving coin loops. The 8A can be installed into any J98625 type shelves without wiring changes and is compatible with all versions of the 71A power unit. For administrative, convenience, one or more shelves can be assigned to coin range extension units while other shelves may contain L1, L2, L3 or 5A REGs. Mounting and power arrangements for the coin REG are the same as for earlier type REG units described in Section 801-407-155.

CAUTION: The 8A Coin REG should not be installed in a tandem arrangement with other range extenders or repeaters.

6.02 Up to 24 coin REGs can be installed in mini-REG bays equipped with the J98631A, L7 dual REG shelf (see Section 801-407-160).

B. Installation

6.03 The 8A Coin REG is supplied with a coin test (CNT) switch which is inserted into one position of a two-position socket module located in the lower left quadrant of the 8A printed wiring board (see Fig. 3). Depending on the position of the CNT plug, the tip (CT relay) or ring (G relay) conductor is grounded to aid coin tests. The position of the CNT plug in the jack depends on the type of CO the 8A Coin REG is installed in.

6.04 When the 8A is installed in a step-by-step (SXS) office, the CNT plug is installed in the R position (shown in Fig. 3A) to perform coin presence tests on the ring conductor.

6.05 Electronic switching system offices and crossbar offices require that the CNT plug be set in the T position as shown in Fig. 3B. The Coin REG is normally supplied with the CNT plug in the T position.

6.06 In No. 1/1A ESS offices, activation of the REG feature shown in Table A is recommended to avoid a no-dial-tone malfunction (2800-ohm loop) if the office is not using REG circuits or is using the L1 or 7A REG. If the No. 1/1A ESS office is using L2, L3 or 5A REGs on non-coin REG circuits, the REG feature normally has been activated.

6.07 When installing the 8A Coin REG in coin-first ESS offices serving areas that experience high power line induction, it is recommended that "Auxiliary" or "Noise Immunity" line circuits be used. In No. 1, 2, and 3 ESS offices these circuits are SD-1A160-01, SD-2H143-01, and SD-3H208-1, respectively.

6.08 The front panel of the Coin REG is labeled with letters T and R as shown in Fig. 1. After the 8A is installed, the position of the CNT plug may be recorded by marking (circling) either the T or R on the front panel.

C. Maintenance

6.09 There is no routine maintenance for the 8A Coin REG. When trouble occurs on a coin circuit, the problem should first be localized. If a REG unit is determined to be faulty, it is removed from service and replaced by a good spare. The defective unit is then sent to the Western Electric Service Center for repair.

7. TESTING

7.01 The KS-21940 handset adapter in conjunction with a 1014-type handset can be used to provide general maintenance and testing for existing 8A Coin REG installations. Complete operation and setup for the KS-21940 can be found in Section 103-107-120.

7.02 Various tests on coin loops can be conducted from the local test desk (LTD) (see Section 662-510-500) without activating the 8A. Access for loop testing conducted at the 8A Coin REG shelf position may be accomplished by using the J98625TB plug-in unit.

7.03 Loop testing and maintenance of the 8A Coin REG and coin loop concerning the coin operation can be found in Section 662-510-500 (Local Test Desks and Local Test Cabinets, Testing Customer Lines Equipped With Range Extender) and Section 506-900-503 (Coin Maintenance Check).
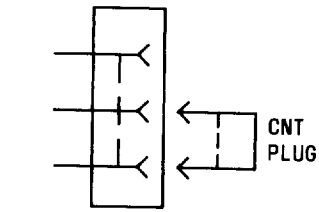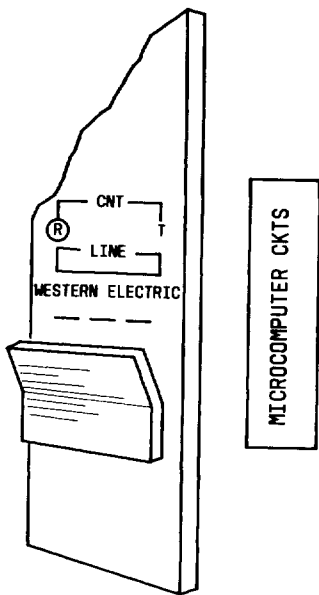
A. R POSITION (S X S)

CAUTION:
    THE CNT PLUG WHICH FUNCTIONS AS
    A SWITCH MUST BE POSITIONED IN
    ACCORDANCE WITH PRESCRIBED REQUIRE-
    MENTS. IMPROPER POSITIONING OF THE
    CNT PLUG MAY RESULT IN MALFUNCTIONS
    OF THE COIN LOOP SUCH AS LOSS OF DIAL
    TONE.
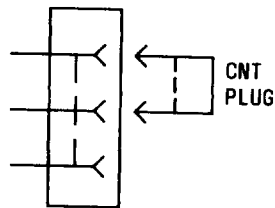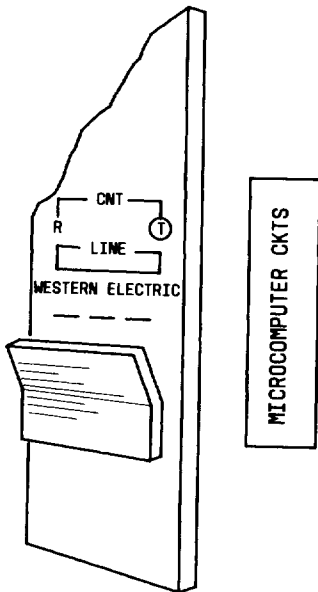
B. T POSITION (ESS/XBAR)

Fig. 3—Two Positions of CNT Plug

TABLE A

ACTIVATION OF NO. 1/1A ESS
REG FEATURE

GENERIC PROGRAM	PROCEDURE
1E4	Set bit 22 of location 0 (1105665) to 1
1E5	Set n = 1 on REGAIN set card in parameters
1AE4	Obtain overwrite from No. 1A ESS PECC
1AE5	Apply FR 71456 and set n = 1 on REGAIN set card in parameters. (Prior to SCP 18 obtain overwrite from No. 1A ESS PECC.)

8. REFERENCES

8.01 The following references contain additional information:

SECTION	TITLE
506-900-503	Coin Maintenance Check
103-107-120	KS-21940, L1 Handset Adapter Use and Application With REGS
662-510-500	LTD and Local TEST Cabinets Testing Customer Lines Equipped With Range Extender
902-215-121	Subscriber Long Route Design
680-800-011	Resistance Zoning of Exchange Services for Subscriber Long Route Design Implementation Guidelines
CD-96592-01	Common Systems - Coin DLL Circuit for Use on Prepay Coin Lines Arranged for Coin-First Operation or Coinless Access to Operators and Free Codes
852-200-105	Introduction to Subscriber Long Route Design
APS-843217	8A Range Extender Unit (Coin REG) Circuit