

SECURITY CHANNEL UNITS—STATION END AND OFFICE END
CHANNEL UNIT DESCRIPTION
D4 CHANNEL BANK
DIGITAL TRANSMISSION SYSTEMS

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1. GENERAL

- 1.01 This section provides a detailed description of the security channel units, station end and office end, used with D4 channel banks. The drawing numbers and faceplate codes are shown in Table A. Typical channel units are shown in Fig. 1.
- 1.02 Whenever this section is reissued, the reason for reissue will be given in this paragraph.
- 1.03 This section provides a functional description of the channel unit(s) at a block diagram level. The signaling paths and circuits that characterize the unit(s) are described herein. Circuit parameters and signaling options are given on the circuit layout record card (CLRC). The procedures for making the settings and adjustments are covered in Section 365-170-000 (TOP) Issue 4.

2. CHANNEL UNIT DESCRIPTION

A. Application

- 2.01 The security channel units, station end (SEC MC S) and office end (SEC MC O), provide a cost effective method for directly interfacing McCulloh loops of a security alarm system to a T-carrier via D4 channel banks rather than metallic pairs. See Fig. 2. Typical alarm services provided are holdup alarms, automatic and manual fire alarms, sprinkler system supervision, and industrial process supervision.
- 2.02 The station end security channel unit detects coded alarm signals from a McCulloh transmitter and sends the information through the T-carrier to the office end security channel unit. The office end channel unit then regenerates the coded alarm signal and transmits the signal to a McCulloh receiver.
- 2.03 The main problem with transmitting important signals through carrier systems is carrier outages. Short term outages of a duration less than the time required to operate the carrier group alarm (CGA) (less than 2 seconds) occur frequently. Medium term outages lasting up to 20 seconds can occur occasionally and carrier failures do occur although infrequently. Security channel units will retain alarm loop continuity during short and medium term outages to prevent transmission of false alarms due to carrier failures. Service can be protected during these temporary outages if the alarm signals are transmitted simultaneously through both an alternate carrier and the main carrier as shown in Fig. 3.
- 2.04 The use of security channel units does not require any additional common equipment in the D4 channel bank.

**Reprinted to comply with modified final judgment.

B. Signaling Paths

2.05 For signaling purposes, the security channel units pass loop closures and loop grounds from the alarm transmitter to the alarm receiver and loopback test and double battery conditions from the alarm receiver to the alarm transmitter. The station end unit has two transmitting signaling circuits which recognize loop closures and loop grounds. Two signaling receivers produce loop closures and loop grounds at the office end. The office end unit has two transmitting signaling circuits that produce double battery conditions and loopback test at the office end. Two signaling receivers regenerate double battery conditions and loopback test at the station end.

Station End Security Channel Unit

2.06 Figure 4 is a block diagram of the station end security channel unit. The line feed circuit supplies current to the loop by applying -48V battery to the ring (R) lead and ground to the Tip (T) lead. Normally the alarm transmitter keeps the loop closed with a normally closed contact between T and R. The transmitter in an alarm condition opens, recloses and grounds the loop, then returns it to its normal condition. The resulting three-part signal is repeated several times in a time coded sequence which identifies a particular transmitter in the loop.

2.07 Four current sensors in the line feed circuit sense the presence or absence of loop/ground current and send the information to the encoder in digital form. The output of the encoder is the loop closure (LC) and ground (GRD) signals which connect to the 10-ms delay circuits. The delayed LC and GRD signals from the delay circuits go to the routing logic and optical line driving circuits.

2.08 The optical line driving circuit either sends signals through the T1 and R1 leads if the channel unit is a master unit (main carrier circuit) or receives signals from these leads if the channel unit is a slave unit (alternate carrier circuit). The master/slave condition is programmed by the M/S option. See Table B.

2.09 The output of the routing logic circuit is the delayed LC and GRD signals from the delay circuits if the channel unit is a master unit or from the optical line driving circuit if the channel unit is a slave unit. The optical line driving circuit of a slave unit would receive delayed LC and GRD signals from

a master unit through the T1 and R1 leads. The delayed LC and GRD signals from the routing logic circuit go to the transmitting logic circuit.

2.10 The transmitting logic circuit uses signals TSP and TSQ to create signals TNEN, TA, and TB. Signals TA and TB are the time multiplexed equivalent of LC and GRD respectively. Signal TNEN notifies the D4 channel bank common equipment that a channel unit is plugged into a channel unit slot.

2.11 If a carrier outage lasting more than 2 seconds occurs, the carrier status (-48 SP) signal from the common circuitry provides an indication that the channel unit has gone into a trunk processing condition. When the master channel unit goes into a trunk processing condition, if the diversity (DIV) switch is in the ON position, it will cause the alternate carrier facility to be utilized. The channel unit will then accept signals from the alternate carrier.

2.12 The alternate carrier (ALT CAR) switch is a test switch which forces the channel unit to accept signals from the alternate carrier for test purposes.

2.13 Receiving signals RSP, RSQ, and RWD are used by the receive logic circuit to pick off the time multiplexed channel A and channel B receive signaling bits. Signals RFA and RSAB contain information comprising signaling bit A and signals RFB and RSAB contain information comprising signaling bit B. The receive logic circuit decodes the received signals into double battery (DB) and loopback (LB). The DB and LB signals then go to the optical line driving and routing logic circuits.

2.14 The optical line driving circuit sends the DB and LB signals to a slave channel unit or receives them from a master channel unit depending on the setting of the M/S switch.

2.15 The DB signal from the routing logic is used by the line feed circuit to change the battery feed from battery and ground to battery and battery feed. The LB signal from the routing logic circuit turns on the TST relay which provides a closure between T and R and connects R to ground within the channel unit for test purposes.

2.16 The TST switch allows manual operation of the TST relay for manual testing and troubleshooting.

Office End Security Channel Unit

- 2.17** Figure 5 is a block diagram of the office end security channel unit.
- 2.18** The TST switch is a manually operated switch used to short the T and R leads and connect the R lead to ground for troubleshooting purposes.
- 2.19** The resistance at the T and R leads for the office end unit can be adjusted to 700, 2.7K or 4.7K ohms, by setting switches in the build-out resistance (BOR) circuit. See Table B.
- 2.20** The 1.3-ms clock is the timing source for the 3-second delay in the double battery (DB) signal from the monitor circuit, for the 10-ms symmetrical delays which turn on and off the LC and GRD relays, and for the 30-second delay that turns off the LC relay when a carrier failure occurs.
- 2.21** An optical detector in the R lead maintains loop current and indicates the presence or absence of loop current to the 3-second delay circuit. If loop current disappears for longer than 3 seconds the output of the 3-second delay circuit sends a signal indicating an open to the transmitting logic circuit and through the optical line driving circuit to the slave unit if the office end channel unit is a master unit.
- 2.22** The loopback (LB) switch is a manual switch used to generate an LB signal which is transmitted to the station end channel unit. The station end channel unit then loops the signal back to test the carrier transmission in both directions.
- 2.23** The transmitting logic circuit receives the LB signal from the LB switch and the DB signal from the monitor circuit when the channel unit is a master unit. If the channel unit is a slave unit, it receives these signals from the optical line driving circuit. The master/slave function is set by the M/S switch. See Table B.
- 2.24** Signals TSP and TSQ are used to create signals TNEN, TA, and TB. Signal TNEN notifies the common equipment that a channel unit is plugged into a channel unit slot. Signals TA and TB are the time multiplexed equivalent of signals DB and LB respectively.
- 2.25** Signals RSP, RSQ, and RWD are used by the receiving logic circuit to extract time multi-

plexed channel A and channel B receive signaling bits from the bit stream. Signals RSAB and RFA contain information for signaling bit A and signals RSAB and RFB contain information for signaling bit B. The receiving logic circuit then transfers signals A and B to the decoder circuit and optical line driving circuit if the channel unit is a master unit. If the channel unit is a slave unit, the optical line driving circuit receives the signaling bits from a master unit and sends them to the decoder circuit. The decoder circuit accepts signals from the receive logic circuit or from the slave unit through the optical line driving circuit depending on the presence or absence of the -48 SP signal. If the -48 SP signal is absent for 30 seconds, the 30-second delay circuit causes the decoder to force the LC relay off which indicates a fault rather than an alarm condition.

- 2.26** The diversity (DIV) switch when set to the closed position allows the decoder to process signals from the alternate carrier if the main carrier experiences an outage. The alternate carrier (ALT CAR) switch allows manual selection of the alternate carrier circuit for troubleshooting purposes.

3. CIRCUIT INDICATORS, TEST SWITCHES, TEST JACKS, AND CIRCUIT OPTIONS**Circuit Indicators**

- 3.01** Two indicator light emitting diodes (LEDs), ground (GRD) and loop closure (LC), are located on the faceplate of the security channel units. See Fig. 1. The GRD LED indicates the presence or absence of a ground signal. The GRD LED is on when a ground signal is present in the transmitter loop or when the channel unit is in the test state and there is a closure of the test relay.

- 3.02** The LC LED indicates the status of the LC signaling sent from the far end channel unit. The LC LED is on when there is a closure of the transmitter loop from the far end or when the test relay at the far end is operated in a test condition.

Test Switches and Test Jacks

- 3.03** *Station End Security Channel Unit:* Two test switches and three test jacks on the faceplate of the station end security channel unit provide manual access for test purposes. The switches are designated TEST and ALT CAR. The test jacks are designated T, R, and GRD. The TEST switch allows

manual operation of the test relay for manual testing and troubleshooting. The ALT CAR switch is used in association with a station end security channel unit operating in the master mode with the diversity option. This switch forces the channel unit to accept signals from the alternate carrier for test purposes. The T, R, and GRD jacks can be used to monitor the T and R leads or can be used in conjunction with the TEST and ALT CAR switches to provide manual access to the T and R leads for test purposes.

3.04 Office End Security Channel Unit: Three test switches and three test jacks on the faceplate of the office end security channel unit provide manual access for test purposes. The switches are designated T/R TEST, LB, and ALT CAR. The test jacks are designated T, R, and GRD. The T/R TEST switch allows manual operation of the test relay for manual testing and troubleshooting. The LB switch allows manual operation of the loopback signal being sent to the station end security channel unit. The ALT CAR switch is used in association with an office end security channel unit operating in the master mode with the diversity option. This switch forces the channel unit to accept signals from the alternate carrier for test purposes. The T, R, and GRD jacks can be used to monitor the T and R leads or can be used

in conjunction with the TEST, LB, and ALT CAR switches to provide manual access to the T and R leads for test purposes.

Circuit Options

3.05 The circuit options for the security channel units are described in Table B. The options are selected by means of socket and plug combinations:

4. REFERENCES

4.01 The following is a list of sections associated with the D4 security channel units.

| SECTION | TITLE |
|-------------|---|
| 365-170-000 | D4 Channel Bank—TOP |
| 365-170-100 | D4 Channel Bank—Description |
| 365-170-101 | D4 Channel Bank—Channel Unit Description |
| 855-351-105 | D4 Channel Units—Application Engineering. |

TABLE A

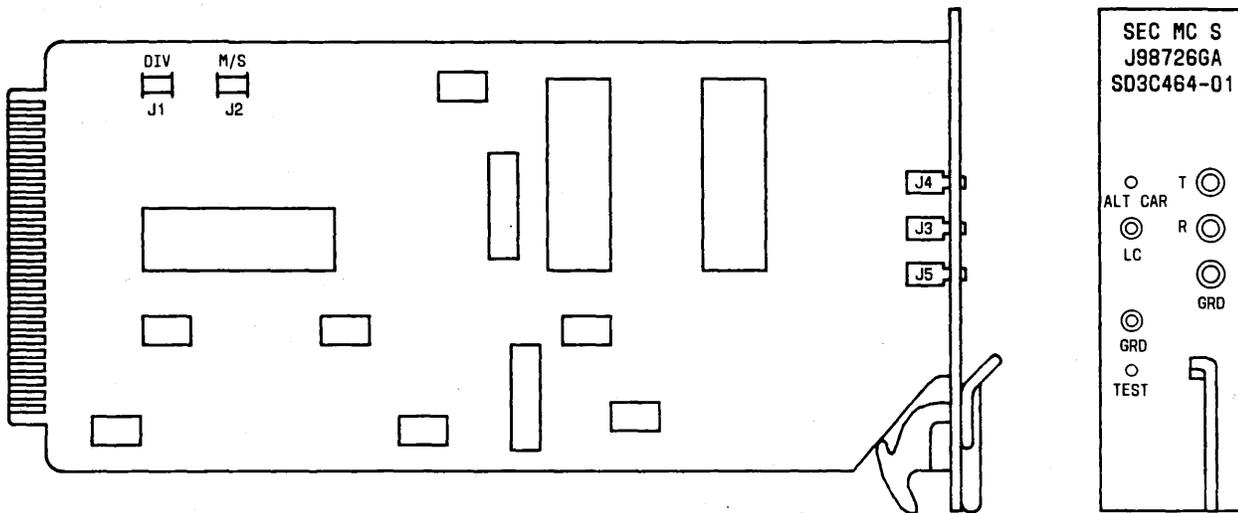
CHANNEL UNIT IDENTIFICATION

| J98726() | SD/CD | CHANNEL UNIT TYPE | FACEPLATE MARKING |
|-----------|----------|------------------------------|-------------------|
| GA | 3C464-0- | Security Circuit Station End | SEC MC S |
| GB | 3C465-0- | Security Circuit Office End | SEC MC O |

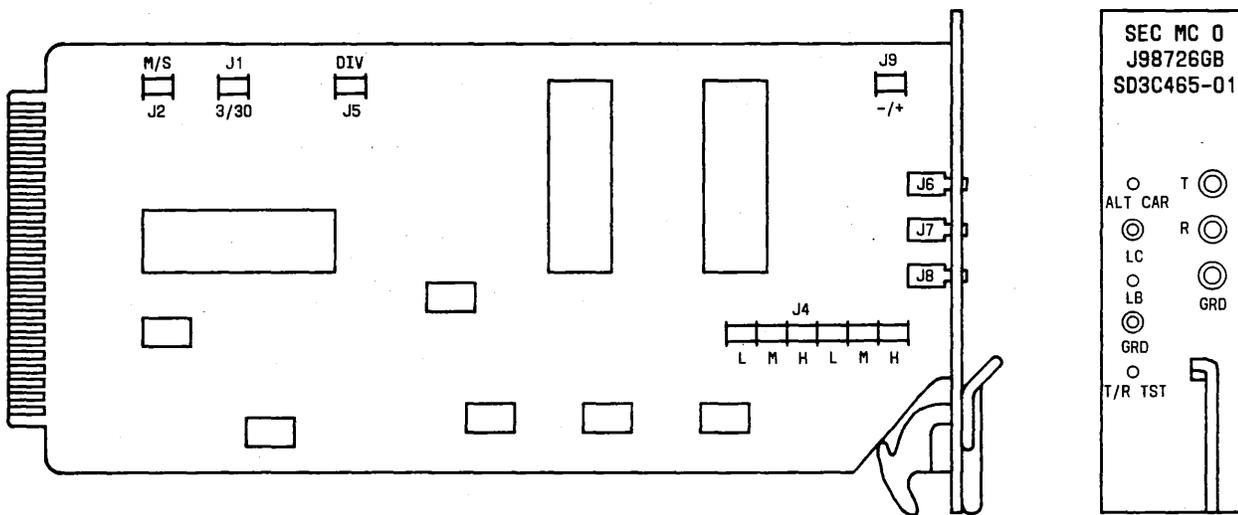
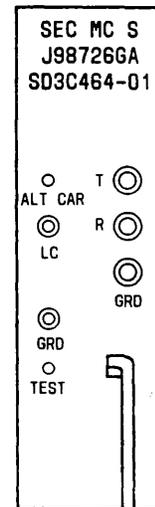
TABLE B

CHANNEL UNIT OPTIONS

| CHANNEL UNIT MARKING | OPTION | FUNCTION |
|------------------------------------|------------------------|---|
| SEC MC S J98726GA SD3C464-01 | M/S | Set to master (M) position when the channel unit is utilized in the main carrier link. Set to slave (S) position when the channel unit is utilized in the alternate carrier link. |
| | DIV | Diversity (DIV) is set to white showing for the channel units in both the main and alternate carrier links when an alternate carrier link is in the system. If the system has a main link only, the DIV is set to black showing. |
| SEC MC O J98726GB SD3C465-01 | M/S | Set to master (M) position when the channel unit is utilized in the main carrier link. Set to slave (S) position when the channel unit is utilized in the alternate carrier link. |
| | DIV | Diversity (DIV) is set to white showing for the channel units in both the main and alternate carrier links when an alternate carrier link is in the system. If the system has a main link only, the DIV is set to black showing. |
| | 3/30 | Set to position 3 if it is desired to send an open condition to the alarm company 3 seconds after a carrier failure. Set to position 30 if it is desired to send an open condition to the alarm company 30 seconds after a carrier failure. |
| | -/+ | Set to - for negative loop voltage; set to + for positive loop voltage. |
| | HML (Double Switch) | Set to high (H), medium (M), or low (L) position to build out the channel unit resistance to 4.7K, 2.7K, or 700 ohms respectively. Both sides of switch should be set in unison. |



STATION-END SECURITY CHANNEL UNIT



OFFICE-END SECURITY CHANNEL UNIT

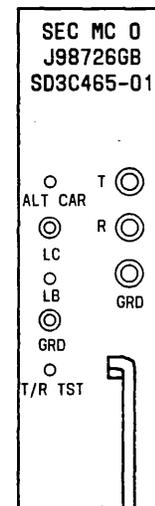


Fig. 1—Typical Security Channel Units

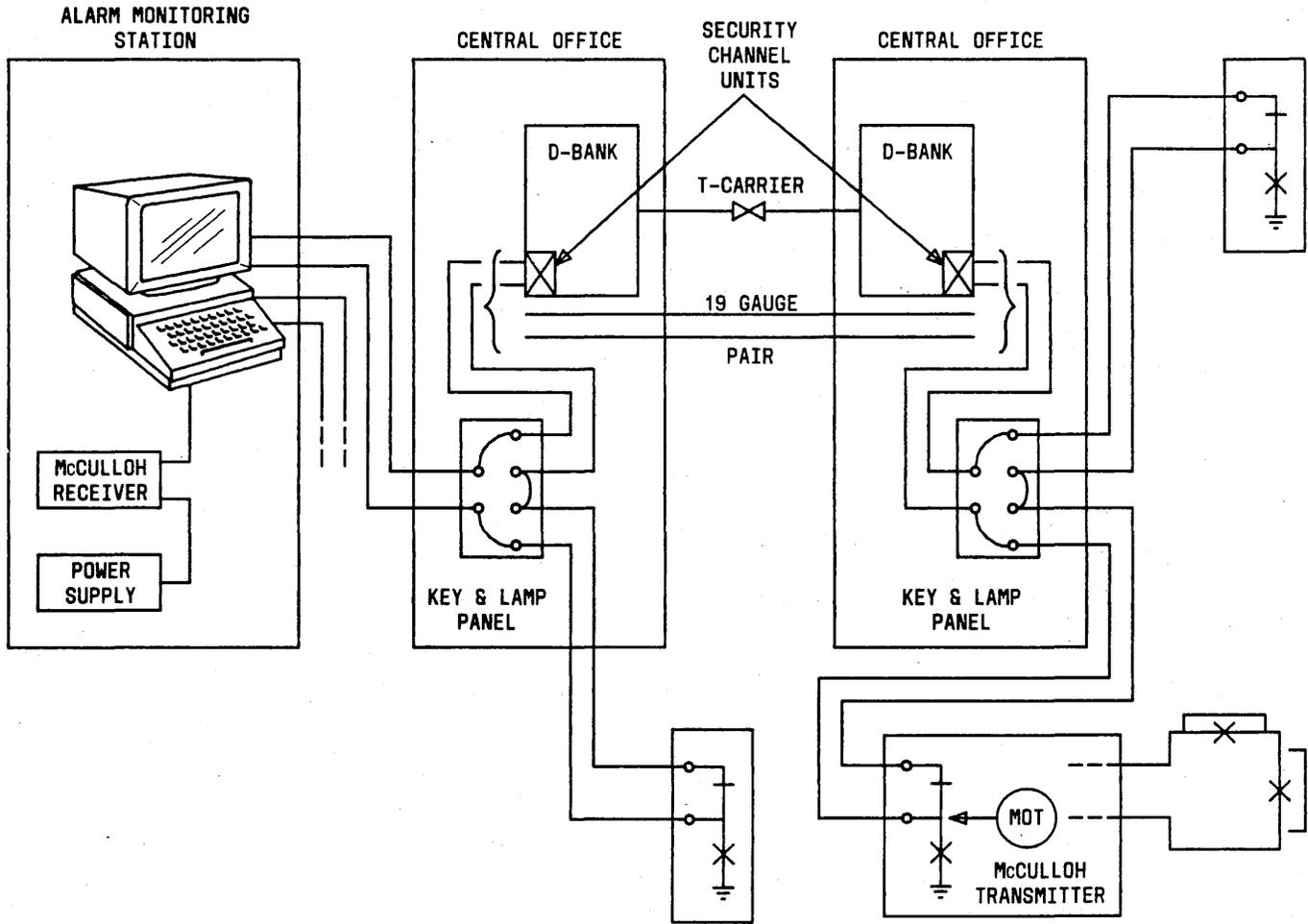


Fig. 2—Alarm System Utilizing Security Channel Units and T-Carrier to Replace Metallic Pairs

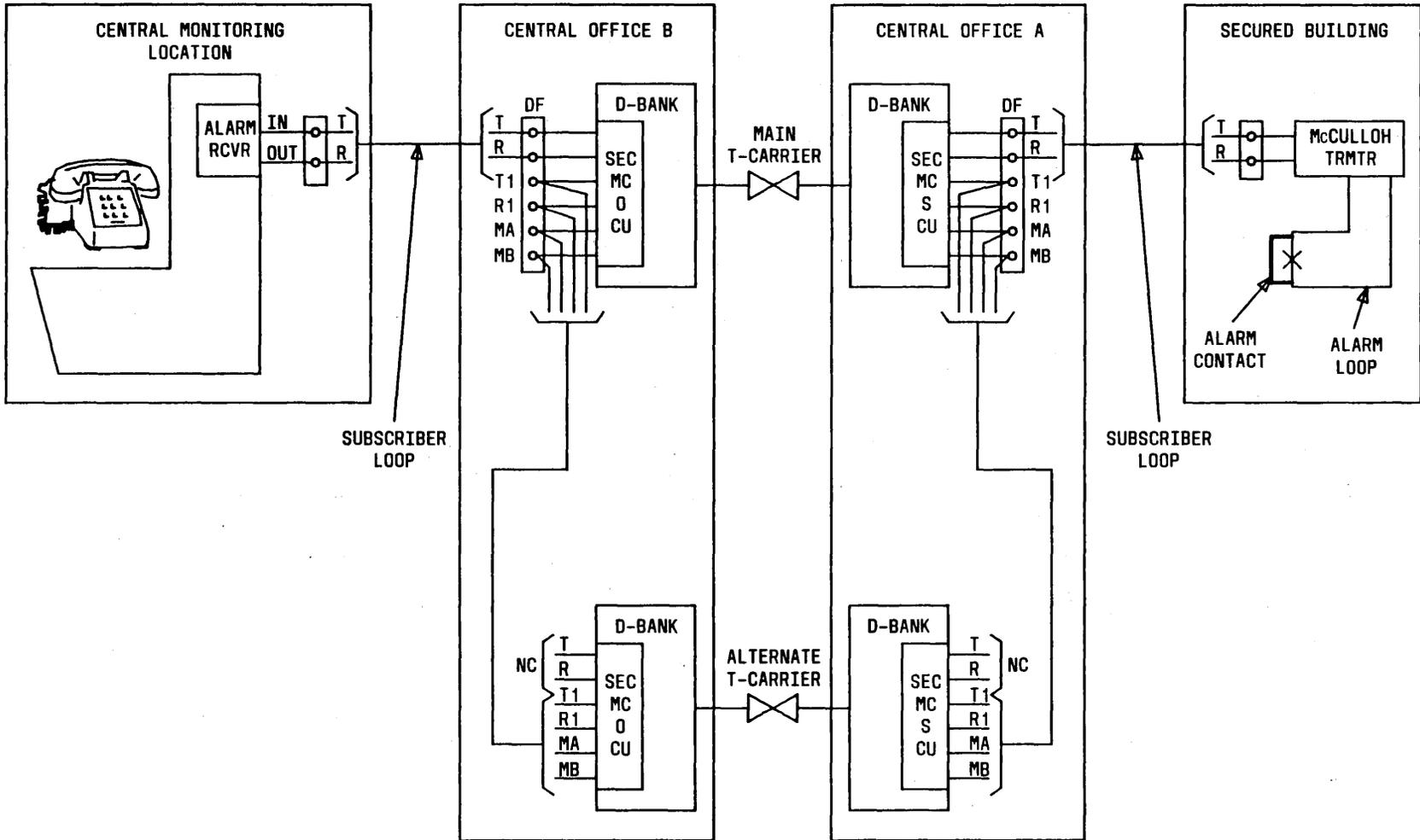


Fig. 3—Typical Application for Security Channel Units Utilizing Main and Alternate Carrier Facilities

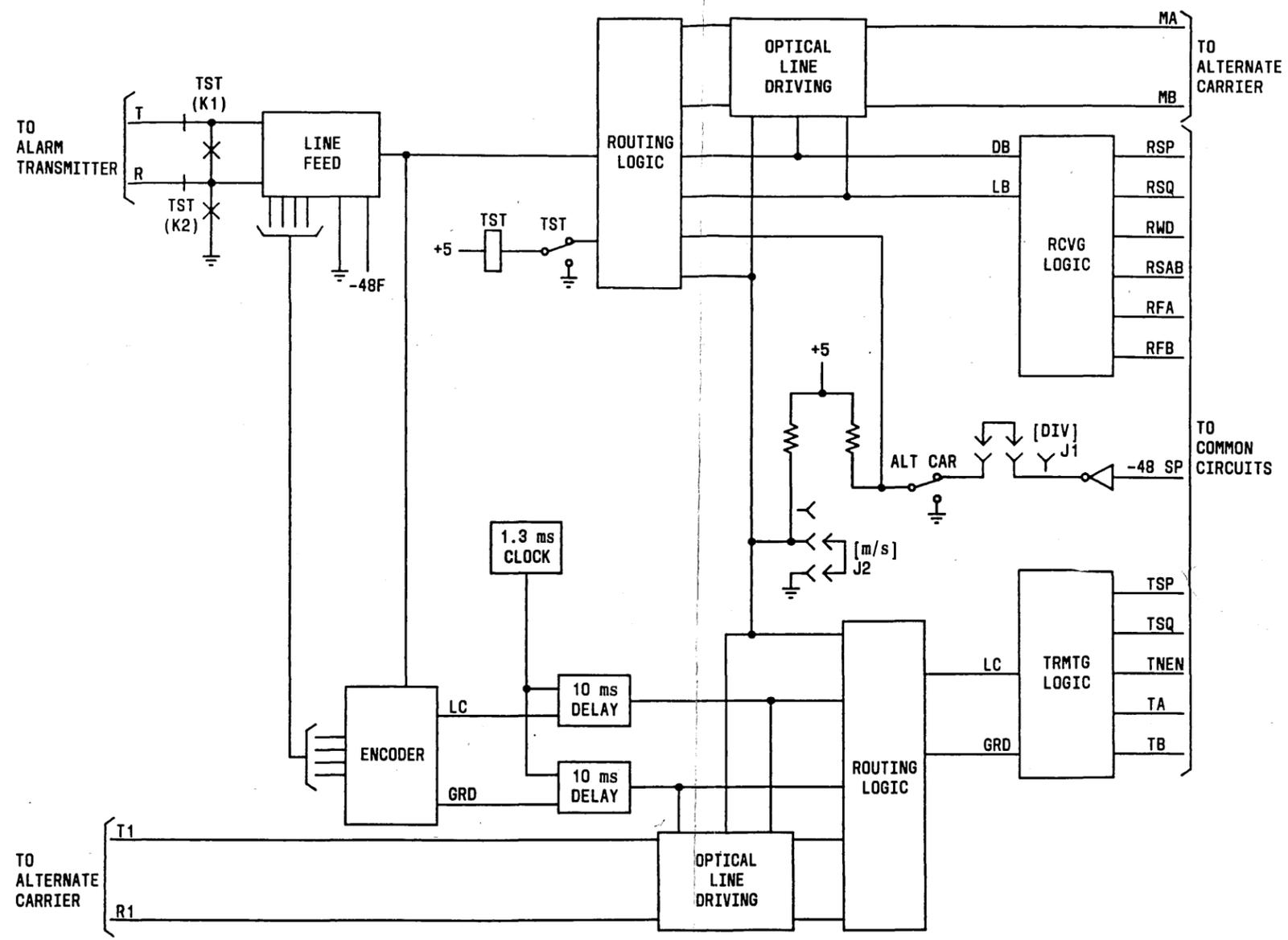


Fig. 4—Block Diagram—Station End Security Channel Unit

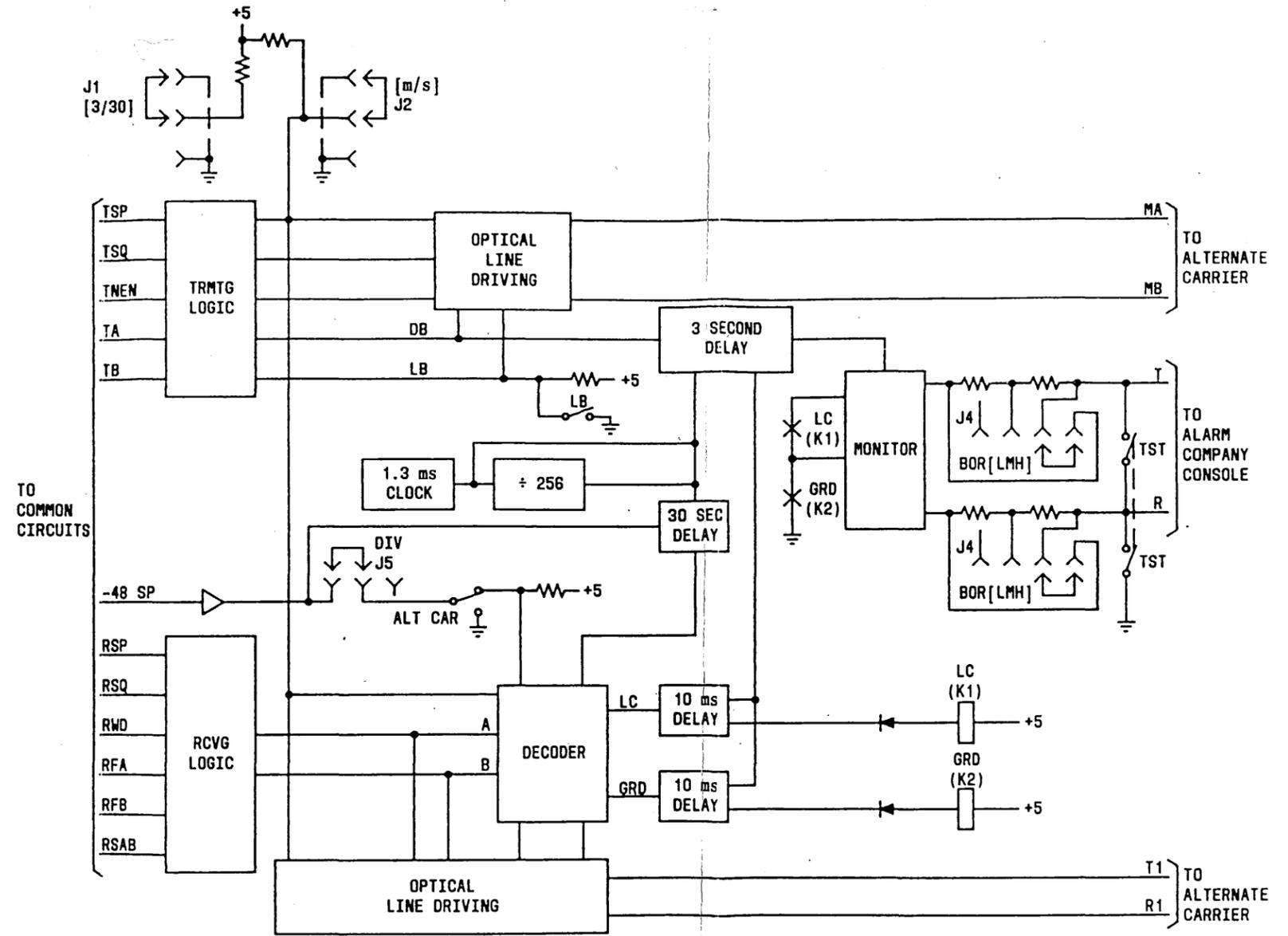


Fig. 5—Block Diagram—Office End Security Channel Unit