

CENTRAL OFFICE TERMINATING UNIT FOR INTEGRATED PROTECTION SYSTEM DESCRIPTION, INSTALLATION, AND MAINTENANCE

1. GENERAL

1.01 This section provides a description of the central office terminating unit (COTU) which is an integral part of the Integrated Protection System designed for protection of power station wire communication services (Section 638-600-100). This section also provides installation, test, and maintenance procedures for the COTU.

1.02 This issue affects the Equipment Test List.

1.03 Wire communication services to power stations require special consideration and protection due to the severe electrical environment in which they must function. Protection at the central office is intended to prevent high voltage due to a power fault to ground (ground potential rise) or longitudinal induction from appearing at the terminal equipment or loop-through circuits.

1.04 The COTU provides for an orderly installation and connection of the required protective devices to the communication wire facilities serving a power station at the central office. Growth and flexibility are achieved by cross-connecting to the required protection as needed. When growth exceeds the COTU capacity, additional COTUs may be added.

1.05 The COTU shall be centrally located with respect to the vertical main distributing frame (MDF) appearances of the special service pairs so as not to exceed the wire-length restrictions imposed in 2.06.

2. DESCRIPTION

2.01 The COTU (Fig. 1) is 48 inches by 36 inches by 10 inches and weighs approximately 200 pounds. The COTU has two doors; the required

clearance for opening the doors is 18 5/8 inches. The following are provided in the COTU:

- (a) Low-voltage terminal blocks for terminating the wire facilities assigned to the power industry service and for cross-connecting these facilities to the required protection device and to the terminal equipment
- (b) Protector mountings for services requiring this type of protection
- (c) Shelves for mechanically mounting the drainage transformers when required.

2.02 An additional feature of the COTU is that the unit can be floor or wall mounted. If the unit is to be floor mounted, it must be ordered as a floor-mounted unit. When this is done, the legs for floor mounting (Fig. 1 and 2) come attached to the unit. If it is ordered as a wall-mounted unit, the legs will not come with it, but there will be wall-mounting brackets attached to the rear of the unit.

2.03 Features are provided to give protection to five types of service. The services and their protection are shown in Table A.

2.04 The COTU also provides protection for loop-through circuits in which the pairs from two power stations are to be protected at a single point. This may be done only when the wire-length restrictions of 2.06 are met. If the restrictions are not met, additional COTUs may be needed.

2.05 The COTU terminates, with the exception of loop-through circuits, up to 25 pairs and provides protection for a maximum of 16 services (types 2, 3, and 4), up to 14 services (type 1A and 1B), or a combination of these service types not to exceed 25. If COTU capacity for a specific

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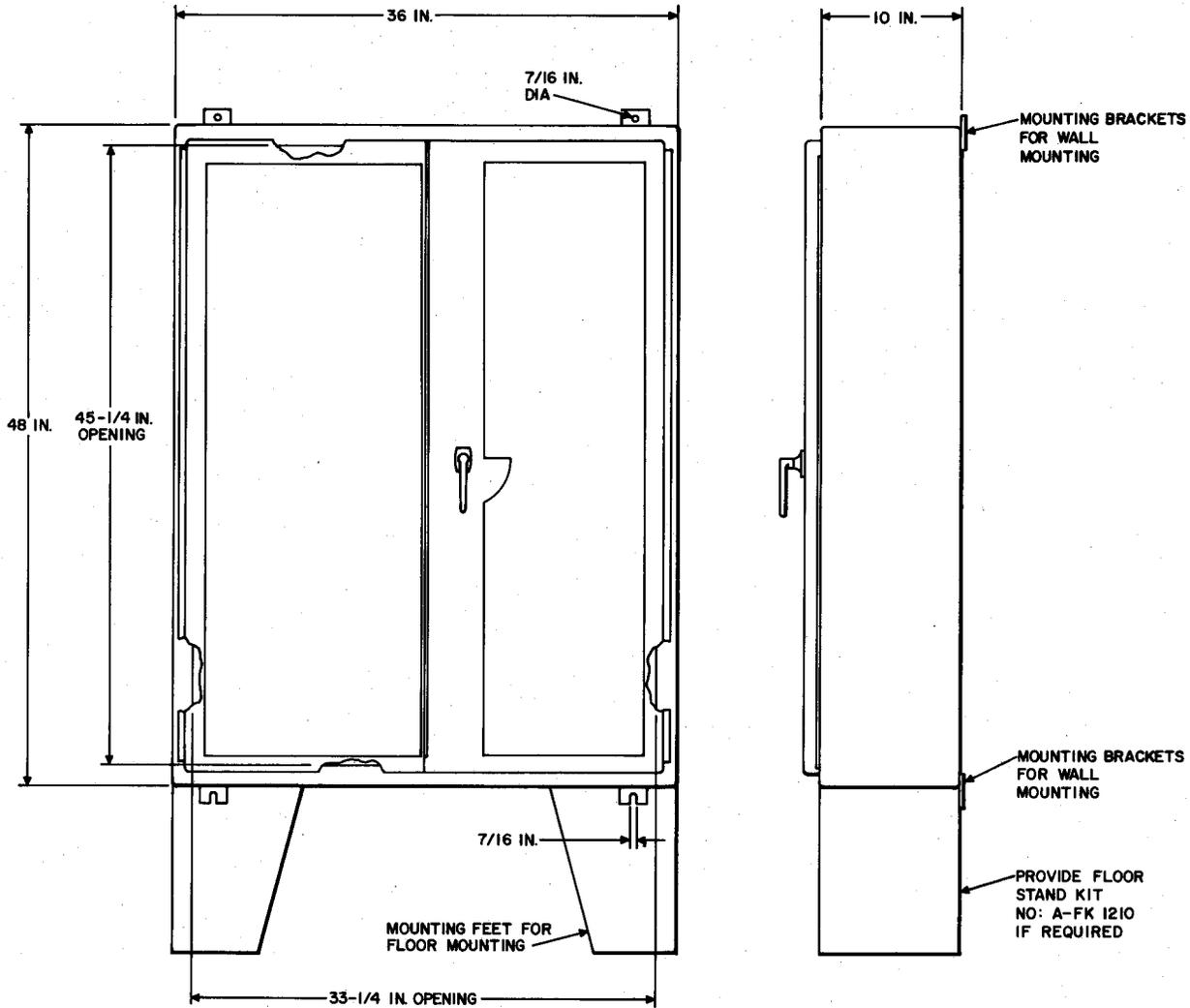


Fig. 1—Front and Side View of COTU

service type becomes exhausted, another COTU must be installed even though the existing COTU has not been filled to capacity. The COTU may terminate a greater number of pairs when loop-through circuits are to be terminated.

2.06 The COTU has one limitation, the restriction on the placement of the cabinet. These restrictions are as follows:

(a) The length of the ground wire from the vertical main frame ground to the COTU may not exceed 35 feet (based on 6 gauge or larger wire).

(b) The length of the pairs between the vertical side of the main distributing frame (VMDF) and the COTU cannot exceed 235 feet minus the length of the ground wire. For example, if the ground connection is 35 feet long, then the cable pair connectors are restricted to 200 feet in length.

SUPPLEMENTAL COTUS

2.07 Supplemental COTUs are needed in the following cases:

- If VMDF appearances are such that lead-length restrictions will be exceeded

- If the number of pairs to be terminated exceeds 25
- If the requirement for protection exceeds the capacity of the initial COTU for a specific service type.

2.08 If a supplemental COTU is to be used, the length restriction on the ground wire and wire pairs are still applicable. The ground connection of the supplemental COTU is connected to either the vertical main frame ground in the same manner as the initial COTU or the ground bus bar in the preceding COTU.

2.09 The installation, maintenance, and test requirements are the same for the supplemental COTUs.

2.10 There is no limit to the number of COTUs that may be added. The only restrictions are described in 2.06.

3. INSTALLATION PROCEDURES

3.01 List of Tools and Gauges

| CODE OR SPEC NO. | DESCRIPTION |
|------------------|---|
| TOOLS | |
| — | Drill and bits for setting 5/8-inch bolts in wall and 3/8-inch bolts in floor |
| — | B or C short-nose pliers |
| 714B | Wire inserter |
| R-1770 | 1/2-inch and 9/16-inch open double-end flat wrench (or equivalent) |
| GAUGES | |
| KS-20538 | Volt-ohmmeter (or equivalent) |

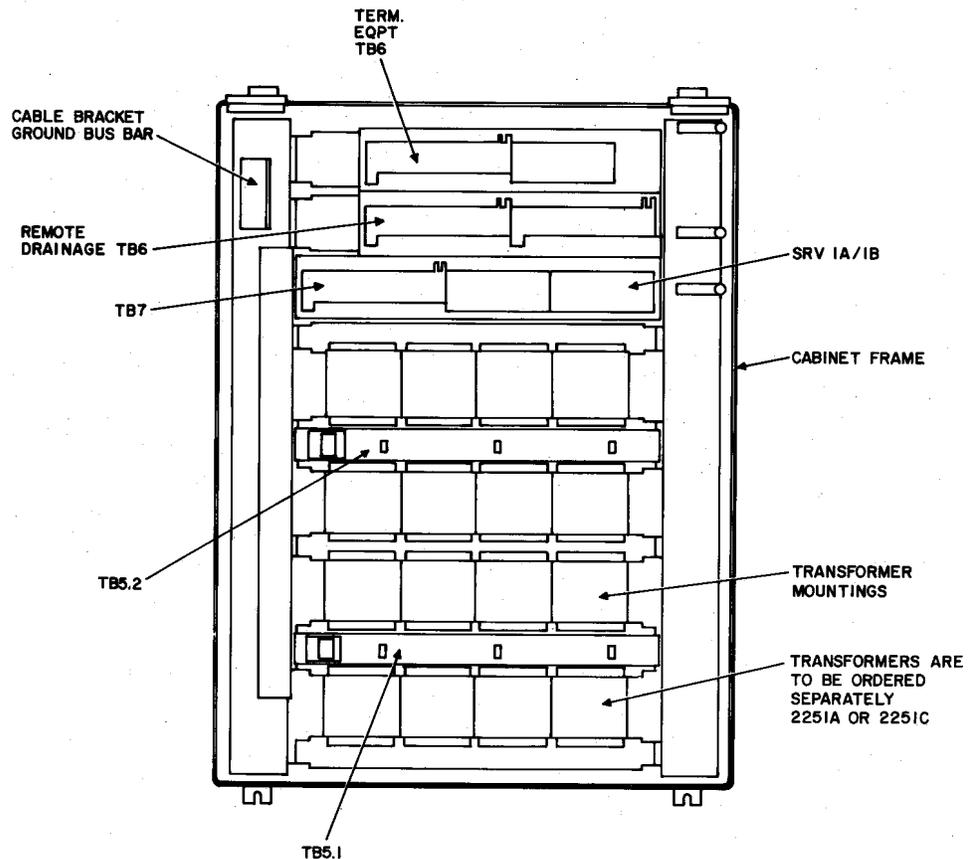


Fig. 2—Inside View of COTU

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3.02 After determining a proper location and satisfying the length restriction on the ground wire and wire pairs (2.06), the COTU can be mounted.

3.03 The number of vertical main frame connections that may be terminated in each COTU will depend on the local requirements and physical conditions. There are basically three conditions that may exist.

- (a) A central office serving a single power station
- (b) A central office serving more than one power station in which the vertical main frame appearances of the incoming cable pairs will not permit the use of common terminating units due to the length restriction on the wiring to the COTU
- (c) A central office serving more than one power station in which the vertical main frame appearances of the complements of pairs meet the length restrictions for wiring to the COTU, thereby permitting the installation of one COTU at one common point (Fig. 3).

3.04 In condition (a), all of the BH-type wire connections from a dedicated grouping block or the VMDF will terminate on the REM DRNG terminals of TB6. All of the services that fall into condition (a) will be connected to some type of central office equipment. The connection to the central office will be made with standard cross-connect

paired wire or cables. These cross-connections will terminate at TERM EQPT on TB6. The restrictions regarding the limitation of the number of pairs that may be protected in a single COTU will apply. The need for supplementary units will also be dictated by the conditions described in 2.07.

3.05 In condition (b), typical installations that may be representative would be where the incoming cable pairs from the power stations appear on the extreme ends of a long vertical main frame or on separate main frames completely. In either situation, the physical separation of the incoming cable facilities would not permit a common location to be selected for the COTUs because of the length restrictions imposed on the wire between the COTU and the main frame. Therefore, separate COTUs must be used for each group or complement of pairs appearing at the vertical main frame.

3.06 The connection to the TERM EQPT terminals in any of the terminating units installed in condition (b) will require some special consideration. Pairs appearing at the vertical main frame for any given power station location may either (1) require connection to central office equipment or (2) may be interconnected directly to pairs appearing in another terminating unit that is dedicated to the protection of facilities serving a second power station location. The facilities that require direct connection between two power stations at a common central office are defined as loop-through circuits. These circuits do not require connection to any central office equipment. Since all pairs connected

TABLE A

| SERVICE TYPE | DEFINITION | PROTECTION AT CENTRAL OFFICE |
|--------------|--------------------------------------|--|
| 1A | Telephone Loop Service | 3-MIL Carbon Block |
| 1B | DC Telemetry and Teletype | 3-MIL Carbon Block |
| 2 | Pilot Wire Relay with DC Supervision | 2251D Transformer (Drainage Reactor) with 3-MIL Blocks |
| 3 | AC Telemetry or Supervisory Control | 2251D Transformer (Drainage Reactor) with 3-MIL Blocks |
| 4 | Audio Tone Relay | 2251D Transformer (Drainage Reactor) with 3-MIL Blocks |

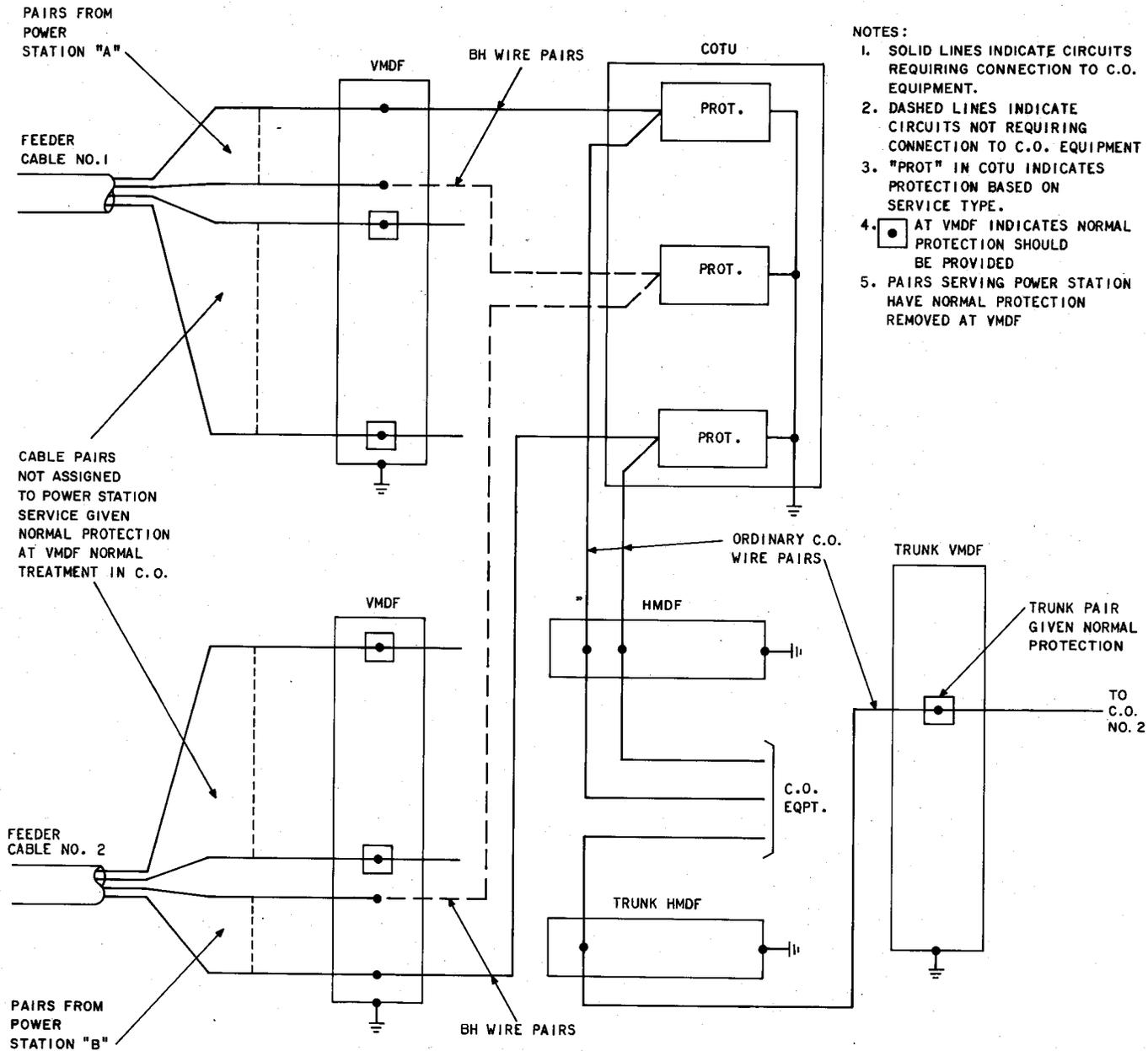


Fig. 3—Typical Wiring Arrangement for a Central Office Serving Two Power Stations Using One COTU

to the REM DRNG terminals of both COTUs are to be provided with protection devices, condition (b) installations should provide separate protection devices for the two legs of loop-through circuits.

3.07 In condition (c), the physical appearance at the vertical main frame for all circuits assigned to more than one power station are so located that

wiring length restrictions to the COTU will permit the required protection to be applied at one common COTU location. All circuits that require connection to central office equipment will be treated as if they all originate at one power station location.

3.08 For loop-through circuits in this case, it is only necessary to apply a single protection device to both legs of the circuit. The incoming

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Circuits from one power station will be connected to the REM DRNG terminal using BH-type wire. The incoming pairs from the other power station, which represents the second leg of the loop-through circuit, will terminate on assigned TERM EQPT terminals in the same unit. This wiring arrangement will permit a direct connection from each incoming pair to a common protection device.

3.09 For installation information, refer to ED-97747-50; refer also to Floor Plan Data, Section 7.3, Sheet 16 and Fig. 4.

3.10 Grounding: Connect a 6-gauge (or larger) ground wire between the cable bracket/ground bus bar in the upper left corner (Fig. 2) of the COTU and the most convenient point on the MDF ground bar.

Important: Keep length of wire to 35 feet or less.

3.11 Wiring

- (a) It is suggested that the vertical-to-COTU interconnection be made by feeding the wire from the VMDF to a dedicated grouping block on the horizontal side and then to the COTU. This helps to keep the assignments more accurate and easier to locate.
- (b) The interconnection from the central office side of the VMDF to the COTU must be made with BH-type wire.
- (c) The stripping of all BH-type wire will be made according to the guidelines given in Section 069-120-811.
- (d) All 20-gauge BH-type wire must be stripped before connecting it to the 66-type terminals.
- (e) All vertical main frame-to-COTU connections will be fed through the opening at the upper left in the specified COTU.
- (f) Feed all incoming pairs from the central office equipment into the unit through the opening at the upper right.
- (g) The terminating of all cross-connect wires on 66-type terminals will be made in accordance with Section 201-221-301.

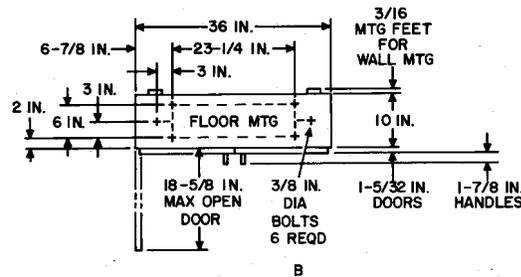
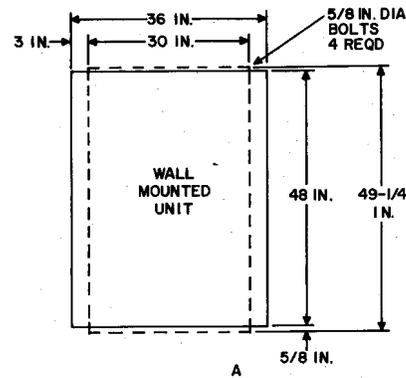


Fig. 4—Floor Plan Data

- (h) The connections to the central office equipment will be made with standard cross-connect paired wires or cables.
- (i) All record assignments must be kept accurate for identification of cable pairs.
 - (1) Remove heat coils from the main frame and replace them with dummy coils (shorts). Discard the carbon protection. Where required, install isolating devices in place of the carbon blocks.
 - (2) In accordance with the worksheet, connect BH-type wire pairs from the special service pair appearance at the VMDF (E) to the assigned REM DRNG terminals on TB6.
 - (3) In the case of a loop-through circuit in which the pairs from two power stations are to be protected by a common device in a single unit, terminate one of the pairs at the assigned REM DRNG on TB6 and the other at TERM EQPT on TB6.

- (4) Extend wire pairs from the required central office equipment into the COTU (f) and connect these wires to the assigned TERM EQPT terminals on TB6.
- (5) For each type (2, 3, or 4) service required, mount one drainage transformer (type 2251D) in the designated mounting position as indicated by the assignment chart. (Do not install carbon protection or shorting blocks at this time.)
- (6) For each pair appearing at TB6 (REM DRNG) which is assigned to a type 2, 3, or 4 service, install a pair of cross-connect wires; feed these wires to service-type 2, 3, or 4 on TB7 whose number corresponds to the mounting positions of the drainage transformers installed to protect that service.
- (7) From the same numbered tip and ring terminals [Step (6)] at TB5.1 or TB5.2, install a pair of cross-connect wires to go to the proper terminals on the drainage transformers.
- (8) Connect tip and ring on the terminal block to transformer terminals 1 and 4, respectively.
- (9) Install a cross-connect wire from G on the terminal block to terminal 5 on the transformer.
- (10) Connect a third pair of cross-connect wires at service-type 2, 3, or 4 on TB7 REM DRNG to the assigned pair of terminals at TERM EQPT on TB6.
- (11) For each pair appearing at REM DRNG which is assigned to a type 1A or type 1B service, install a pair of cross-connect wires to go to the desired pair of terminals at service-type 1A or 1B on TB7.
- (12) Install a second pair of cross-connect wires from the terminals at service type 1A and 1B on TB7 to the assigned terminals at TERM EQPT on TB6.

3.12 Installation Test and Inspection (Fig. 5)

- (a) **Continuity:** In all continuity checks, use the KS-20538 volt-ohmmeter (or equivalent).

(b) *Type 1A and 1B Services*

- (1) Check continuity for each pair used for 1A and 1B services of both tip and ring from the pair appearance at REM DRNG on TB6 to their respective protector block wells at the service 1A and 1B protectors. If an open is found, the trouble is in either the cross-connect wiring from REM DRNG TB6 to SRV 1A and 1B on TB7 or in the internal wiring from TB7 to the protector wells.

- (2) Check continuity for each pair used for 1A and 1B services of both T and R from the pair appearance at REM DRNG on TB6 to their respective pair appearance on TERM EQPT TB6. If an open is found, the trouble is in either the cross-connect wiring from the protector wells to TERM EQPT or in the wiring mentioned in 2(a).

(c) ***Type 2, 3, and 4 Services:*** Check continuity from pair appearances on REM DRNG TB6 to the proper pins on the corresponding drainage transformer using the following procedures.

- (1) Check continuity from the tip side of each wire pair at remote drainage on TB6 to pin 1 of the corresponding drainage transformer.

- (2) Check continuity from the ring side of each wire pair at REM DRNG on TB6 to pin 4 of the corresponding drainage transformer.

- (3) Check continuity from pin 5 of each drainage transformer to local ground.

Note: If an open is found (1-3), the trouble is in the cross-connect wiring from REM DRNG to the SRV 2, 3, and 4 terminals on TB7, the cross-connect wiring from TB5.1 or TB5.2 to the transformer terminal or the internal wiring from TB7 to TB5.1 and TB5.2.

- (4) Check continuity for each pair used for 2, 3, and 4 services of both T and R from the pair appearance at REM DRNG on TB6 to their respective pair appearance at TERM EQPT on TB6.

- (5) Install carbon protection or shorting blocks in the protection wells at this time.

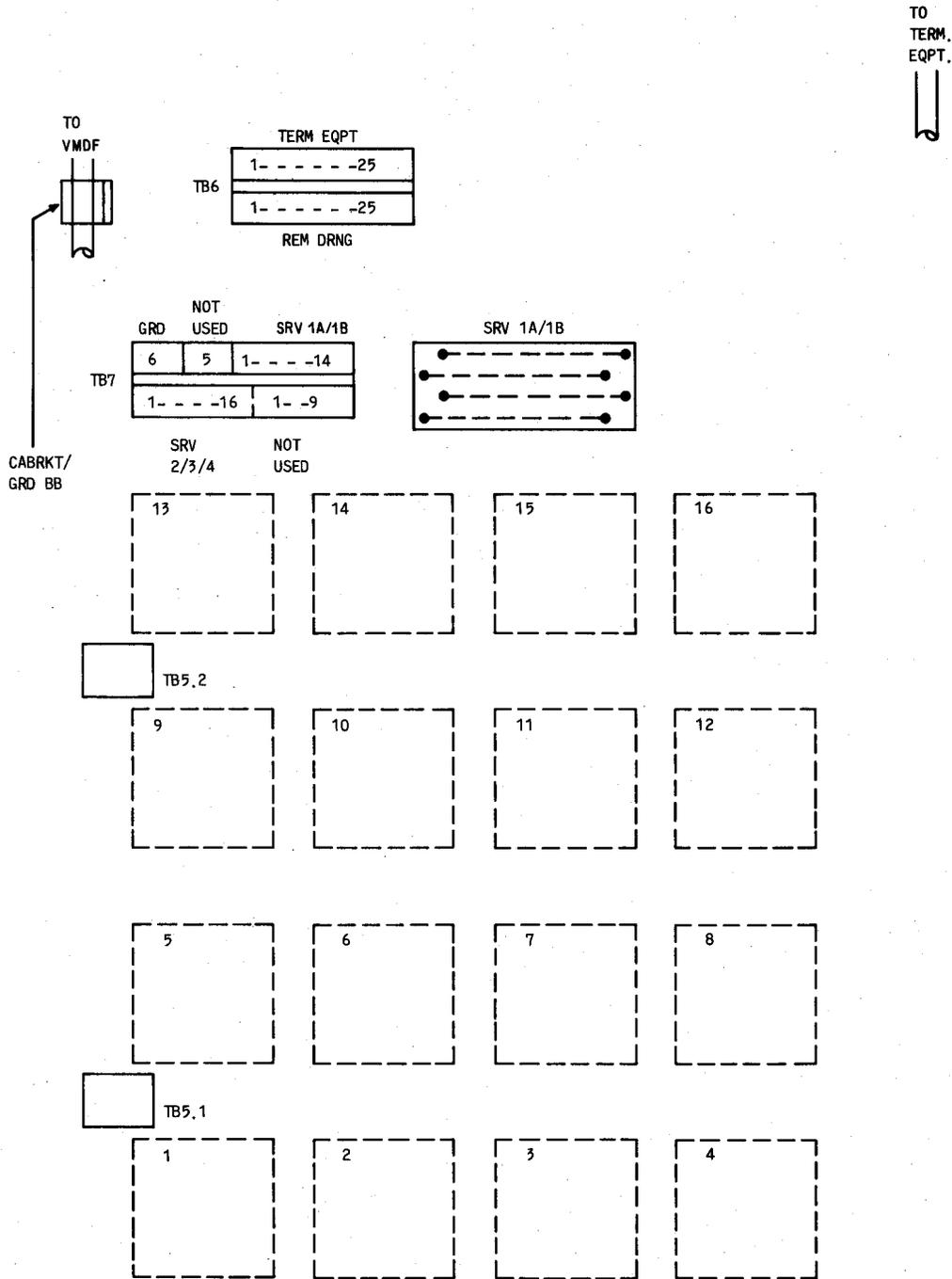


Fig. 5—Central Office Terminating Unit

3.13 Assignment Sheet

- (a) The complexity of the installation and maintenance will increase at the COTU unless accurate and efficient records are kept to show the assignment of each incoming pair, the location and type of protection applied, and assignment of the outgoing wire facility.
- (b) A record-keeping chart has been designed to alleviate installation and maintenance problems. It is recommended that the chart be filled in by the local engineer. Copies should be given to the craftsperson that makes the initial connections. The original copy should be retained by the local engineer for reference.
- (c) In the example given (Fig. 6), there are 17 entries that are identified by different codes. Additional information such as vertical main frame cable and pair count may be included in the circuit identification column, depending on local options. The remaining columns on the chart are titled the same as the stampings found on the COTU.
- (d) The numbers under the REM DRNG column refer to the numbered pairs of terminals appearing on TB6 under this heading.
- (e) The last column, TERM EQPT, permits number entries to be made opposite the assigned circuit to which the terminal equipment connection is made.
- (f) In the example it may be seen that the 4DC 0269 circuit appears on the REM DRNG terminal number 1. The protection for this circuit is made at the first set of terminals at SRV 2/3/4. Since this is known to be a type 3 circuit,

the number/entry is made under the SRV 3 column. From the first pair of terminals at SRV 2/3/4, a cross-connection is installed to the 15th pair of terminals at TERM EQPT.

4. MAINTENANCE

4.01 The following inspections and test should be performed periodically at the discretion of the local company. These operations are extremely useful in maintaining a high degree of integrity of the whole Integrated Protection System. ***Permission must be obtained from the power company before beginning the tests.***

- (a) Inspect and replace, as necessary, all carbon block protectors. If some blocks indicate many operations, these blocks should be inspected more often.
- (b) Inspect thoroughly for any evidence of:
- Tampering
 - Heat or burning
 - Loose or disturbed cross-connect wiring
 - Loose connections at the ground bracket bus bar
 - Loose connections at the MDF.
- (c) End-to-end transmission test should be conducted at the time when the system is turned down for the above inspection. This test should be conducted along with the whole Integrated Protection System (Section 638-600-300).

DATE: _____

UNIT NO. _____

PLACE: _____

| CIRCUIT IDENTIFICATION | ASSIGNMENT | | | | | | |
|------------------------|------------|-----|----|-----|---|---|------------|
| | REM DRNG | SRV | | SRV | | | TERM. EQPT |
| | | 1A | 1B | 2 | 3 | 4 | |
| | 1 | | | | | | |
| | 2 | | | | | | |
| | 3 | | | | | | |
| | 4 | | | | | | |
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Fig. 6—Central Office Terminating Circuit Assignment Chart