

**BASIC
SWITCHING CONTROL CENTER
COMMON EQUIPMENT
DESCRIPTION**

	CONTENTS	PAGE
1.	GENERAL	1
2.	EQUIPMENT DESCRIPTION	3
	COMMON EQUIPMENT CABINETS	3
	A CABINET	3
	B CABINET	4
	TELETYPEWRITERS	5
	CRITICAL INDICATOR PANEL	6
	E2A TELEMETRY	7
	WORK STATION	7
3.	FUNCTIONAL DESCRIPTION	7
	STATUS MONITORING	7
	CENTRAL OFFICE ALARMS	13
	TTY OPERATIONS	13
	WORK STATION INTERVENTION	15
	WORK STATION OPERATION	15
4.	MAINTENANCE	15
5.	REFERENCE	16

1. GENERAL

1.01 This section describes the *Basic Switching Control Center (SCC)* both physically and functionally. Since the SCC is capable of servicing different types of *Central Offices (COs)*, the

documentation is divided into two areas (common systems equipment and equipment unique per type CO). This section describes the entire SCC in general terms with a detailed description of the common systems equipment. For a description of the SCC equipment unique per type CO, refer to the appropriate section.

1.02 The SCC can assume one of two configurations. The basic SCC has manual capabilities to provide remote monitoring and control of the CO TTYs and maintenance center. The automated SCC provides remote manual monitoring and control capabilities as in the basic SCC. In addition, a minicomputer with an associated *cathode-ray tube (CRT)* and keyboard collects and analyzes CO TTY printouts. These SCC versions are compatible in that growth is available from the basic to the automated version.

1.03 The basic SCC provides a centralized facility for control of several COs. Administrative, operational, and maintenance functions for these offices can be controlled at the SCC. The SCC equipment is composed of five functional areas (Fig. 1).

- A *critical indicator panel (CIP)* area enables continuous status monitoring of each serviced CO.
- A *teletypewriter (TTY)* area provides full TTY service for all COs from the SCC.
- An audible alarm system indicates alarm conditions which may occur at either the COs or the SCC.
- A work station area allows remote manual monitoring and control of each CO via that CO's maintenance center.

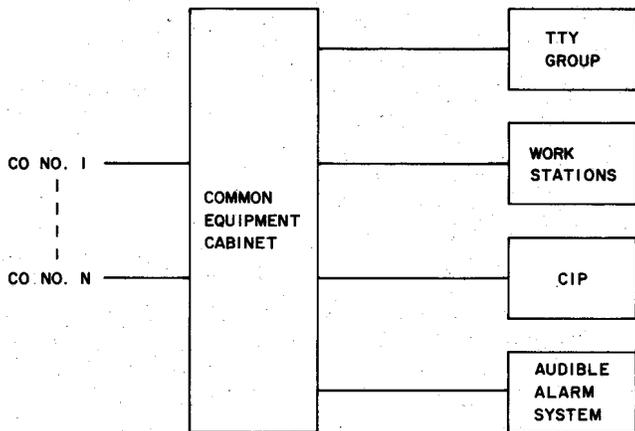


Fig. 1—Basic Switching Control Center—Simplified Block Diagram

- Common equipment cabinets provide the interface internal to the SCC and between the SCC and the COs.

1.04 During normal operations status of each CO is constantly being displayed by the CIPs (Fig. 2). Overall status indications are provided by these panels. The status indications are dependent on the type CO monitored. When an alarm condition exists at a CO or at the SCC, an audible alarm is initiated by the audible alarm system. The alarms are either self-retiring or require manual release. Manual release is initiated from a work station. When manual access to a CO is required, a work station is used. Each work station consists of a *Central Office Select Unit (COSU)*, call director, work station TTY, SCC control console, and an optional dc voltmeter. The COSU accesses the desired CO; the console and TTY are used to monitor and control the CO via that CO's maintenance center. The call director is independent of CO status and enables voice communications to the CO whenever required. The dc voltmeter is used with the work station TTY to test trunks from the SCC. This is an optional feature of the SCC. The console is the only element of the work station unique per type CO. However, the work station operation is closely related to the CO type. As a result, the detailed description of work station equipment is contained in sections associated with each CO type. The TTYs are designated special tasks to support SCC operations. These TTYs include the following:

- Primary history TTY

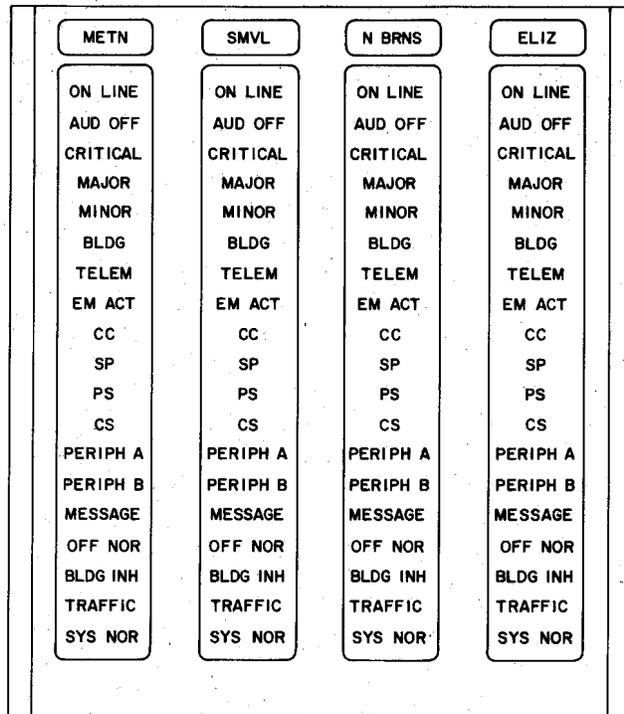


Fig. 2—No. 1 ESS Critical Indicator Panel—Example

- Secondary history TTY
- Trunk maintenance TTY
- Shared TTY
- Auxiliary TTY
- Work station TTY.

The TTYs service COs via three dedicated TTY channels. These channels include:

- Primary maintenance channel (required)
- Secondary maintenance channel (recommended)
- Trunk maintenance channel (optional).

Note that the Common Equipment Cabinets contain all necessary data sets except for DDD data sets.

1.05 The maximum capacity for a basic SCC is as follows:

16 COs serviced

12 work stations

36 dedicated TTY channels (16 primary channels and 20 secondary and/or trunk channels)

9 *direct distance dialing (DDD)* channels (6 two-way channels and 3 send only channel to PECC).

Any addition to this capacity requires a second common equipment cabinet A and B.

2. EQUIPMENT DESCRIPTION

COMMON EQUIPMENT CABINETS

2.01 A pair of common equipment cabinets are required per SCC. This pair includes an A cabinet and a B cabinet (Figures 3 and 4). The A cabinet contains the data sets, CI interface, and telemetry circuitry, while the B cabinet contains control circuitry, crossbar switches, and power supplies.

A CABINET

2.02 Included in the A cabinet are the E2A telemetry critical indicator central (E2A CI Central), a primary interface unit, secondary units, data set-TTY driver units and a circuit package housing for DDD data set drivers (Fig. 3). The E2A central is the main controlling element in the E2A telemetry. As a result, this unit is discussed in E2A telemetry Section 201-653-102. One primary unit is required per SCC independent of system size. This unit contains from 9 to 11 cards depending on system size. These cards (from left to right) are:

- Address buffer card
- Data buffer Card (a second card is required for 9 or more offices)
- Audible control critical alarm card
- Audible control major alarm card
- Audible control minor alarm card
- Alarm interrupt card
- Memory card

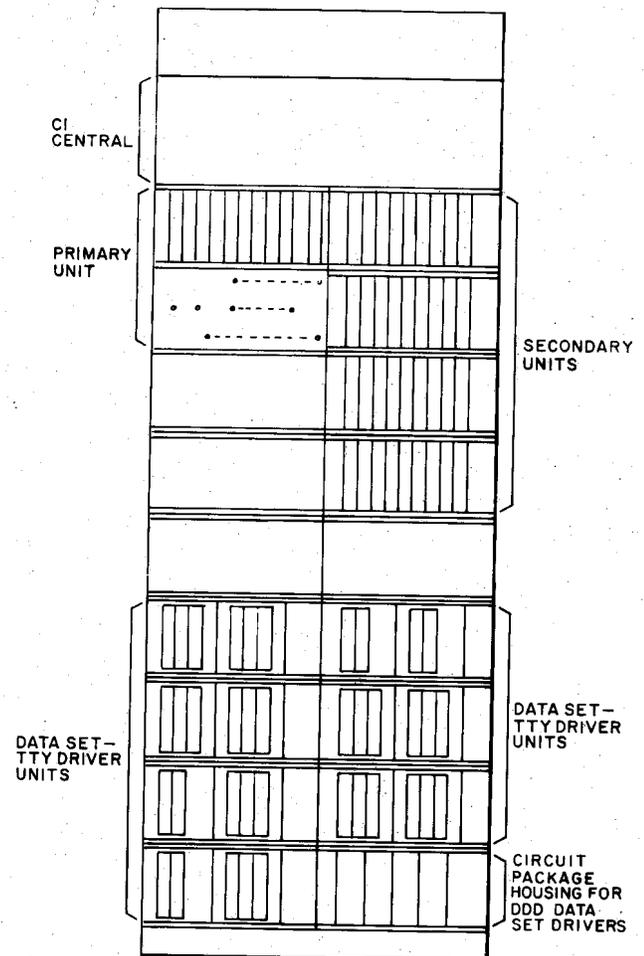


Fig. 3—Common Equipment Cabinet "A"

- Lamp tracker card (a second card is required for 9 or more offices)
- Audible control telemetry alarm card.

Below the cards is an arrangement of 18 toggle switches (part of primary unit). Sixteen switches are audible alarm inhibits (inhibits audible alarms at the SCC only). The other two are AIN (inhibits local equipment alarm) and master clear. A maximum configuration of secondary units is four. Each of these units service 4 COs. Each unit contains from 3 to 10 cards depending on the system size. These cards include:

- Receiver card (maximum of 4 cards per unit, one card per CO)

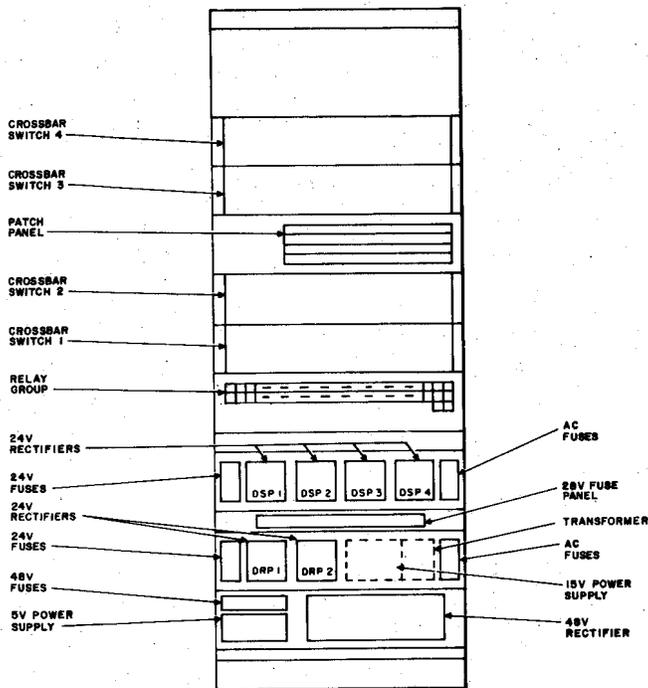


Fig. 4—Common Equipment Cabinet "B"

- Lamp tracker card (maximum of 2 cards per unit, one card per 2 COs)
- Memory card (maximum of 4 cards per unit, one card per CO).

2.03 Cabinet A can accommodate a maximum of 7 data set-TTY driver units. These units service the private line TTY connections between the SCC and COs. Each unit contains a maximum of six 108E data sets and two TTY driver cards. Three of the data sets service primary maintenance channels, while the other three service secondary maintenance channels. A maximum configuration of 16 primary channels and 20 secondary channels are allowed. Each driver card contains three driver circuits to service three data sets. Three toggle switches, located on the front of each driver card, provide test circuits for the associated data sets. A fourth toggle switch may be provided for the transfer of basic SCC operations to the automated SCC.

2.04 The circuit package housing located in the bottom of cabinet A provides DDD connections for TTYs to external locations, eg, *Product Engineering Control Center (PECC)*. Three send only connections are provided to PECC while 6 send/receive channels provide access to the external locations. The connections provided are between the DDD appearances on the patch panel in the B cabinet and associated 103A data sets located external to the SCC equipment. The circuit package housing contains three driver cards, one resistor card, and the plug connectors to the external data sets. These cards are the same type driver cards used with the 108E data sets.

B CABINET

2.05 This cabinet (Fig. 4) contains four CF3 miniature crossbar switches, a patch panel, control relays, power supplies, and a transformer. The crossbar switches provide for the transfer of information to and from a central office from any work stations. The patch panel enables full flexibility of patching the following combinations:

- Any CO to PECC (send only to PECC)
- A TTY in parallel with a work station and a history TTY
- DDD data sets to replace dedicated data sets
- A TTY to backup history TTYs.

The relay group performs the following functions:

- Prepare the selection of crosspoints on the crossbar switches
- Prevent multiple send/receive connections to the same CO by the history TTYs and the work stations
- Transfer signals associated with on-line and alarm conditions.

The power supplies and transformer provide the power requirements for the common equipment cabinets and CIPs.

2.06 Each CF3 miniature crossbar switch (Fig. 4) provides a 20 by 12 switching matrix. Each switch provides the following switching function.

- Switch No. 1 provides telemetry interface switching between CO1 through CO8 and work stations 1 through 12.
- Switch No. 2 provides telemetry interface switching between CO9 through CO16 and work stations 1 through 12.
- Switch No. 3 provides TTY interface switching between 16 primary history TTYs and the 12 work stations. At the same time, this switch provides interface switching of CIP data between the 12 work stations and the CIPs.
- Switch No. 4 provides TTY interface switching between 20 secondary history/trunk maintenance TTYs and 12 work stations.

The full switching capabilities are not used in switches No. 1, 2, and 3. Each of these three switches uses a 16 by 12 matrix of the 20 by 12 provided.

2.07 The patch panel (Fig. 5) provides the following terminations.

- All TTY channels
- REIA termination for all TTYs to allow TTY patching to DDD
- REIA terminations for DDD receive only
- Current loop terminations for DDD send/receive
- Send only terminations for PECC.

The patch panel plugs and cords are designed so that no erroneous connection can be made between any two outputs.

2.08 The relay group (34 relays) (Fig. 6) are organized in the following manner.

- TN0 through TN3 relays accept the tens digit (for the desired channel) specified by the COSU. These relays connect the proper unit leads to the vertical to be selected in the crossbar switch.
- RL1/WS1 through RL12/WS12 are controlled by work stations one through twelve. These relays prepare selection of crosspoints on the crossbar switch. They also prevent send capabilities to a CO from more than one work station at a time.
- RTS1 through RTS16 are *request to send (RTS)* relays. These relays lock out work station access of TTY and telemetry channels when a primary history TTY has access to the TTY channel.
- The FIP/FIS relay accepts a failure indication due to a power, carrier, or telemetry failure. As a result, the relay enables the local equipment alarm to sound.
- The MJ/CR relay accepts a failure indication due to a major or critical alarm. As a result, the relay enables the respective alarm to sound.

2.09 The power supplies and the transformer are located in the bottom of cabinet "B" (Fig. 4). A maximum configuration of six ± 24 -volt (V) rectifiers supply power to data sets, drivers, TTYs, etc. Data Set Primary (DSP) 1 through 4 supply power to primary channel data sets and drivers in cabinet "A". Driver Primary (DRP) 5 and 6 supply power to the drivers used with the DDD data sets. The ± 15 V and 5V power supplies service the CI central in cabinet "A". The 5V supply also provides the power required for the primary and secondary units in cabinet "A". The -48 V power supplies provide power to the electromechanical equipment in the crossbar switching network and relay group. The 28V transformer is used to light the CIP display. Also included are all the fuses required for the power supply group.

TELETYPEWRITERS

2.10 Sprocket feed TTYs are used in the SCC. When a KSR TTY with no paper tape is required, a *Universal Service Order Code (USOC)* HOPPF TTY is used. It is equipped with an NTFN2 modification kit and an 8QXKS answer

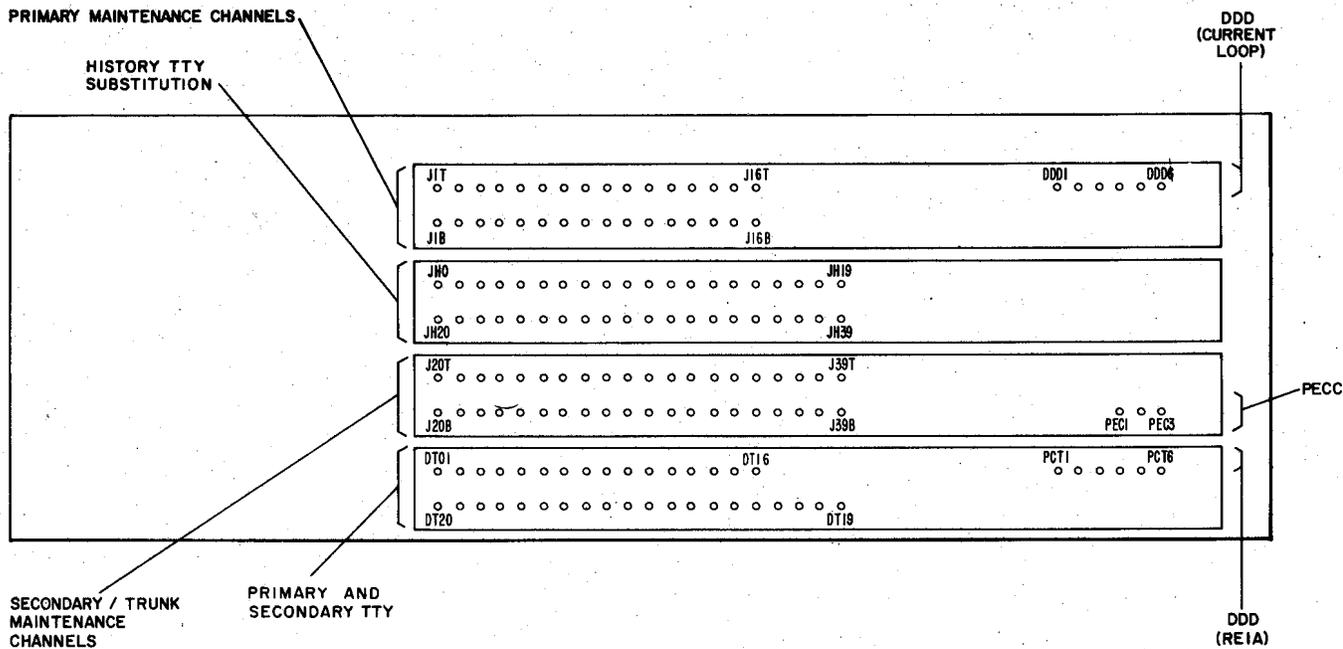


Fig. 5—Patch Panel

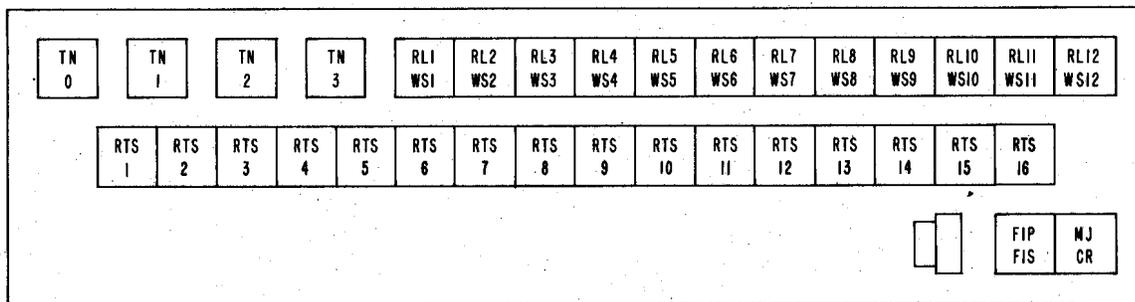


Fig. 6—Relay Group

back unit. When a RO TTY with no paper tape is required a USOC code HODPF TTY is used. It is equipped with an NTFN2 modification kit and an 8QXRO answer back unit. When paper tape is required, a USOC HOLPF TTY is used. This TTY is equipped with an NTFN4 modification kit and an 8QXAS answer back unit.

CRITICAL INDICATOR PANEL

2.11 Wall mounted *Critical Indicator Panels (CIPs)* are illuminated display panels located in easy view of all work stations. Each panel

accommodates status displays for four COs (Fig. 2). Therefore, a maximum configuration of four CIPs are possible. Each CO display has the name of the CO at the top of the column with a maximum of 20 status indications listed below. The specific indicator is dependent on the type CO serviced. A lamp test toggle switch is located on the bottom center of each CIP. This switch enables easy testing of all lamps on the CIP. The occasion may arise when a telephone company desires a duplicate set of CIPs for a nearby supervisor's complex, conference area, etc. As a result, one optional duplicate set of CIPs is provided as required.

E2A TELEMETRY

2.12 The E2A telemetry consists of E2A centrals in the SCC and an E2A remote in each CO. One E2A central is constantly monitoring all COs not being serviced by a work station. This unit (CI central) is located in the common equipment cabinet (CEC) A (Fig. 3). Each work station control console has a separate central (console central). This central controls interface activities between the individual work station and maintenance center being accessed. Refer to Section 201-653-102 for a description of the E2A telemetry.

WORK STATION

2.13 The work station equipment required is determined by the job assignment and the type CO serviced. Following is the general organization of a typical work station. Refer to the section describing SCC application per a specific type CO for detailed information.

- Control console is mounted on a mobile stand. The control console has a display panel and keyboard which are a functional equivalent of the associated CO maintenance center.
- Work station TTY provides send/receive TTY access to private line channels. This TTY is described in 2.10.
- Office desk with the following table top items:
 - COSU is a dial and push button unit which provides quick CO access and audible alarm release.
 - Call director is a common telephone providing voice communications.
 - A dc voltmeter is a remote trunk testing unit with DDD access to the COs (may require a separate work station for dedicated trunk testing).
- **Cable Junction Unit (CJU)** is a connector unit mounted on the side of each work station desk. This unit provides a connectorized terminal for the work station TTY, COSU, and control console (Fig. 7).

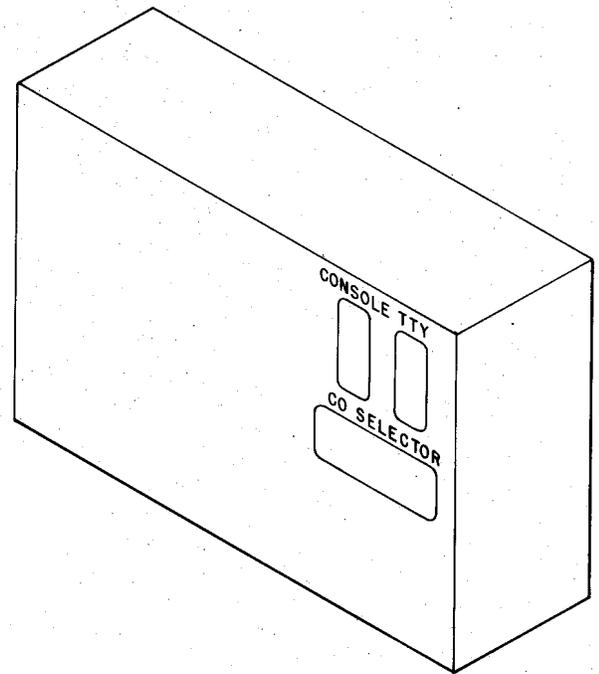


Fig. 7—Cable Junction Unit

3. FUNCTIONAL DESCRIPTION

3.01 The primary functional operations of the SCC include:

- Status monitoring
- CO alarms
- TTY operations
- Work station intervention and operation
- Trunk testing.

These tasks are described in the following paragraphs with the description keyed to Figures 8 through 11.

STATUS MONITORING

3.02 During normal operations the SCC cycles through all COs and obtains overall status information for each. Status acquisition from each CO is initiated by the CI central (Fig. 10). The central sends a request to the multiport bridge. The multiport bridge is part of a private line multiport data network designed and engineered

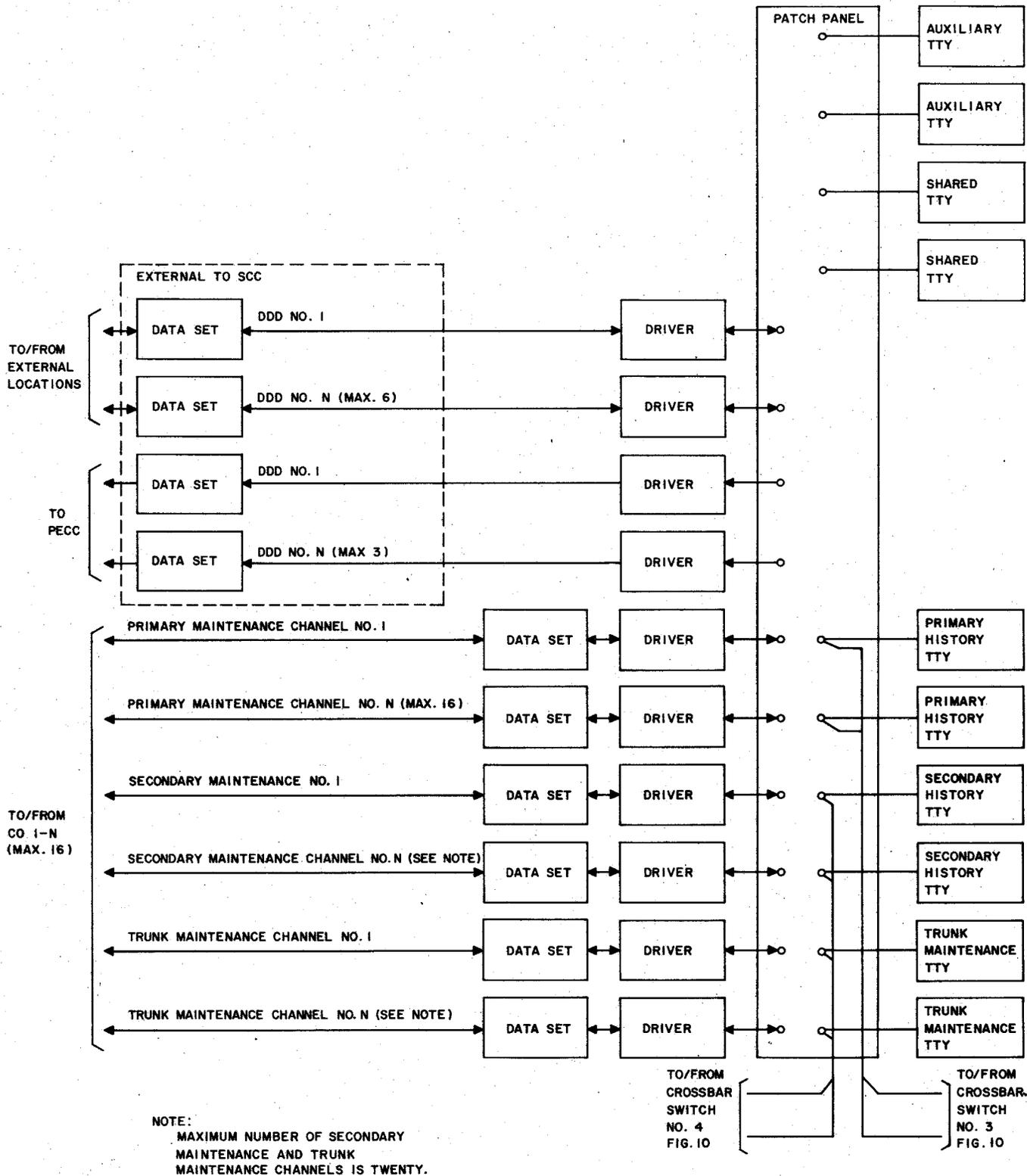


Fig. 8—Teletypewriters And Associated Channels

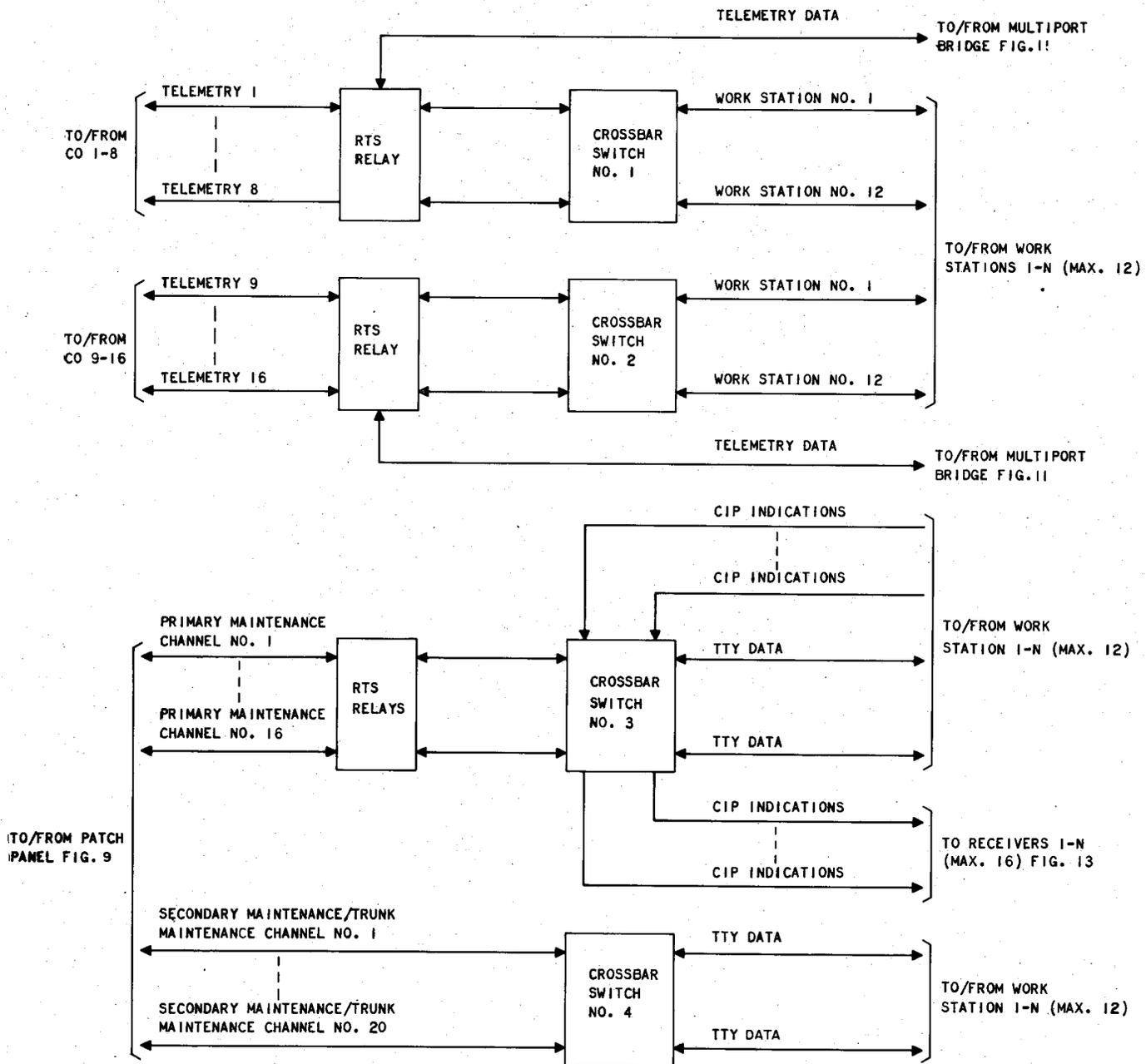


Fig. 9—Switching Control Center Switching Network

by the individual telephone company. The request is sent through RTS relays (Fig. 9) and the transmission media to the addressed CO. The E2A remote in that CO performs the desired task and returns the results to the CI central (Fig. 10). The return path is the same as the one used by the request. The status data obtained is sent to the CI interface and display circuit (Fig. 11). After the central has completed its task per that CO, it

initiates a request to sample the next CO and repeats the request-receive cycle.

3.03 The CI interface and display circuit prepares status data for display on the CIP (Fig. 11). The status display data can be received from two sources. As noted earlier, one of these sources is the CI central. The other source (a console central) inputs data (via crossbar switch No. 3) only when

SECTION 201-400-101

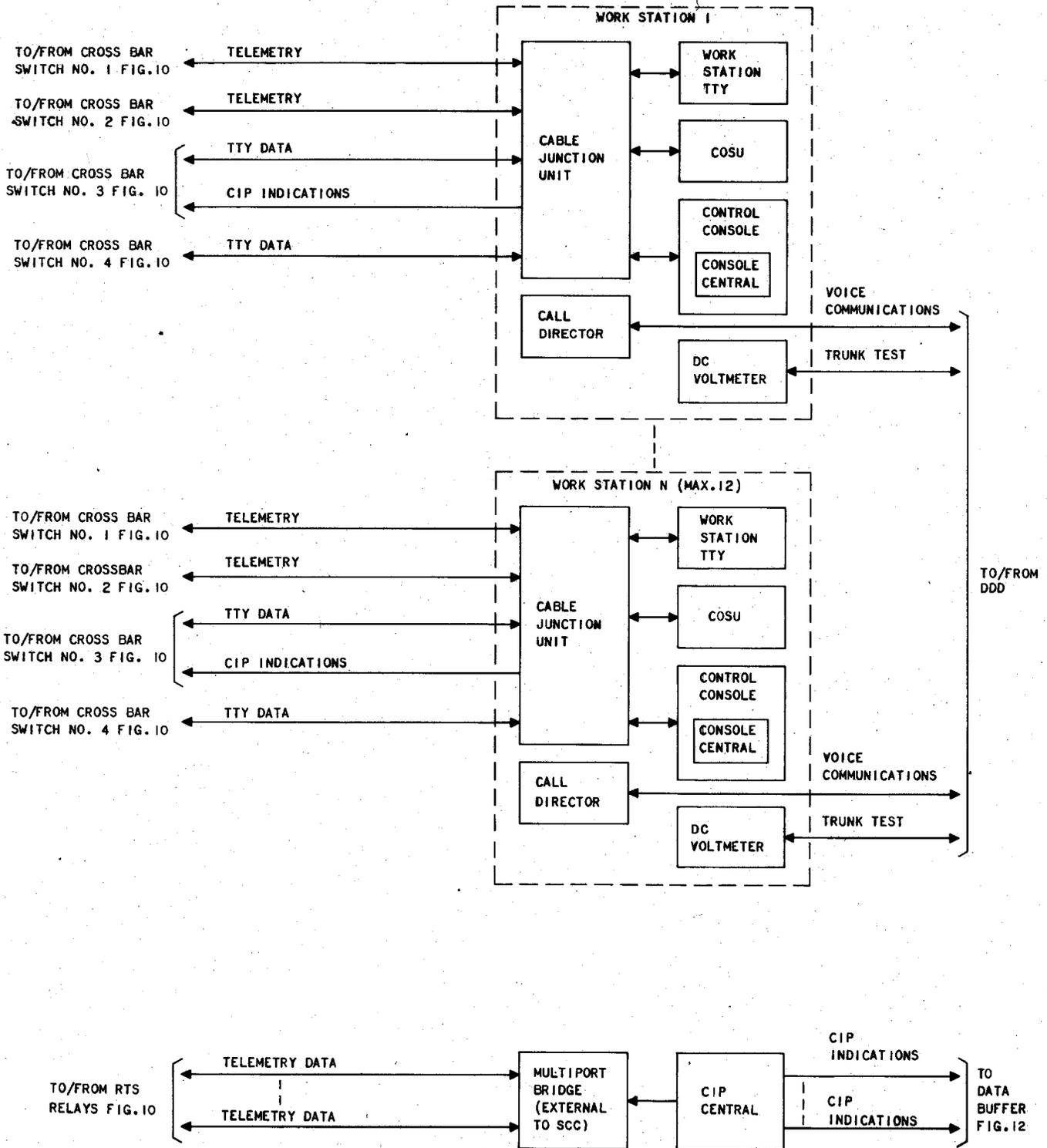


Fig. 10—Work Stations And Critical Indicator Panel Central

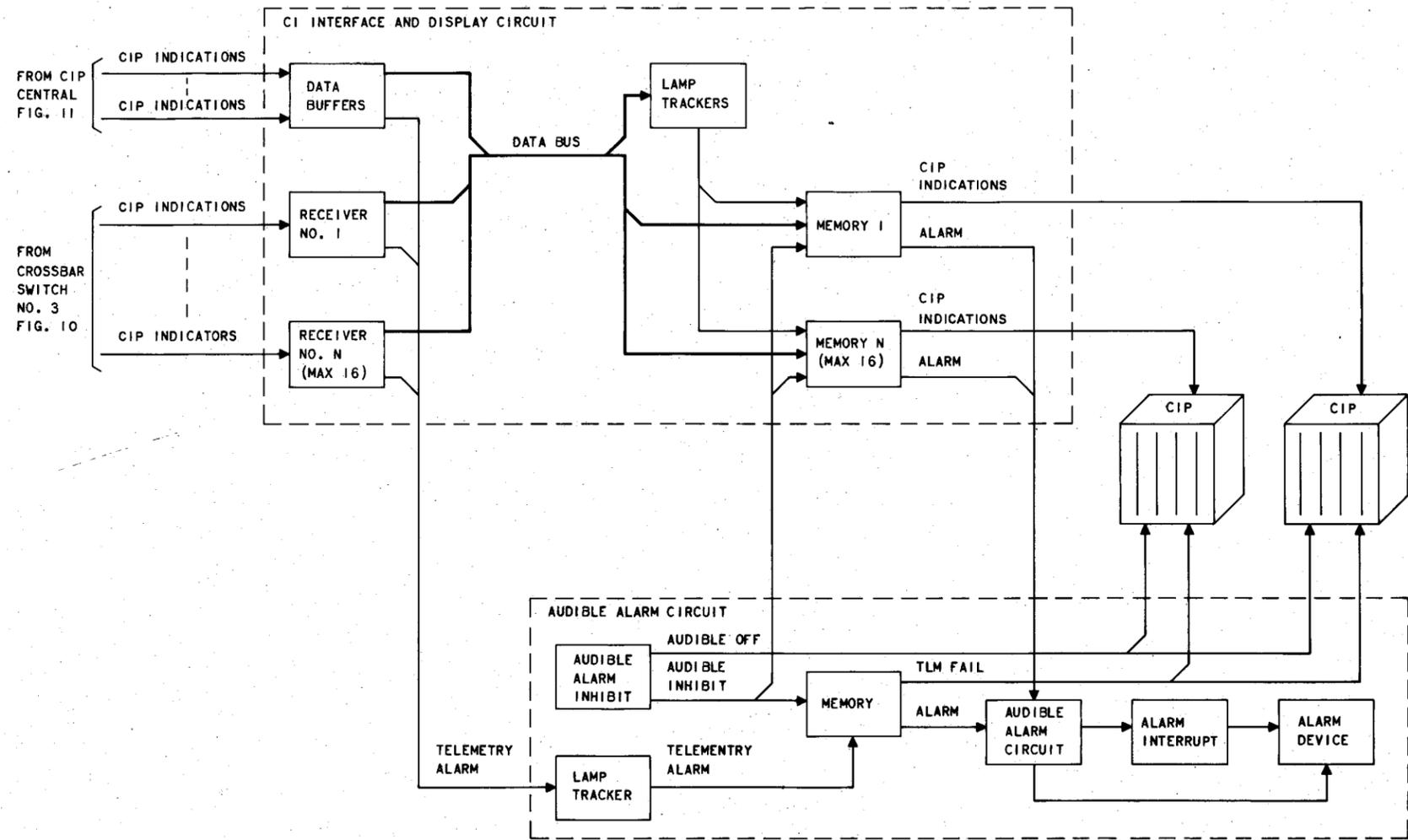


Fig. 11—Critical Indicator Panel, Critical Indicator Interface And Display Circuit, And Audible Alarm Circuit

a work station is accessing a CO (refer to 3.18). These two sources combine to input overall status (CI indications) from all serviced COs. The receivers accept the data and transfer it via data bus or telemetry alarm paths to lamp trackers or memory units. Status data is transferred via the bus. The lamp trackers detect and hold momentary status indications. As a result, their output to memory units is maintained after the initial indications terminate. The memories store status indications for each CO to provide the CIPs with input to drive required indications. Each CIP contains status indications for four COs. These indicators provide the visual indications for overall status stored in the memory units.

CENTRAL OFFICE ALARMS

3.04 An audible alarm circuit (Fig. 11) is used in conjunction with the CI interface circuit. This alarm system functions on a three-level alarm basis.

- A critical alarm indicates that a service affecting condition has occurred and requires immediate attention (modified 120 interruptions per minute).
- A major alarm indicates that a potentially service affecting condition exists (30 interruptions per minute).
- A minor alarm indicates that an error has occurred but that it is not service affecting (continuous tone and self-retiring).

A fourth alarm (local equipment alarm, 120 interruptions per minute) indicates failures in the SCC equipment or telemetry. This alarm is the same as the minor alarm but with a faster repetition rate. The audible alarm circuit monitors the memory units in the CI interface circuit. When an alarm condition is detected, the audible alarm circuit generates the appropriate alarm control. If the alarm is not a continuous tone, the signal is passed through the alarm interrupt to establish the desired repetition rate. The resulting signal drives the alarm device required to sound the alarm. Also included in the audible alarm circuit is an audible alarm inhibit. When manually activated, this inhibit prevents generation of audible alarms in the SCC on a per CO basis. An alarm inhibit signal prevents the audible alarm circuit from monitoring alarm indications for a specific CO.

At the same time, an audible off signal drives a lamp on the CIP indicating that the audible alarms for that CO are inhibited.

TTY OPERATIONS

3.05 TTYs play a key role in the SCC's operation (Fig. 8). Interface between these TTYs and the serviced COs (or PECC) is provided by private line channels and DDD channels. The primary maintenance channel is the basic TTY link between the SCC and its associated COs. One channel is required per CO (max 16). This channel is continually connected to a dedicated TTY (primary history TTY).

3.06 The secondary maintenance channel has a dual role in SCC operations. First, it serves as a back-up channel for the primary maintenance channel. As a result, the same input/output capabilities exist for both. Ease of transfer is provided between the primary and secondary channels in case of emergency. To insure continuity, the primary history TTY is capable of being connected to the secondary as well as the primary maintenance channels. The other role of the secondary maintenance channel is to assume part of the load for the primary channel. When assuming this load, the secondary channel should accept the messages associated with long term analysis. Those messages requiring more immediate attention or continuous monitoring should be on the primary channel. A dedicated TTY can optionally be supplied for history purposes on the secondary maintenance channel. This TTY is referred to as the secondary history TTY. If it is not installed, a shared TTY must be available to the secondary maintenance channel on a part-time basis. This channel may be used in conjunction with a dc voltmeter to perform centralized trunk testing.

3.07 The trunk maintenance channel (Fig. 8) is restricted to trunk maintenance operations only. A dedicated TTY (trunk maintenance TTY) can be optionally provided for connection to the trunk maintenance channel. A maximum of 20 secondary and trunk maintenance channels are allowed.

3.08 The three preceding TTY channels enter the SCC via data sets and drivers. A data set is dedicated to each channel. The driver circuit works with the data set to enable current loop

SECTION 201-400-101

receive capabilities for up to 14 TTYs operating in parallel.

3.09 All TTY channels pass through a patch panel (Fig. 8). This panel enables manual reconfiguration of the TTYs with a minimum of effort. The patch panel is arranged so that any channel can be plugged into any switchable connection. Terminations appearing on the patch panel include:

- All private line TTY channels
- Primary history TTY
- Secondary history TTY
- Trunk maintenance TTY
- Shared TTY
- Auxiliary TTY
- TTY DDD channels send/receive (max 6)
- TTY DDD channels PECC send only (max 3)
- Crossbar switch No. 3
- Crossbar switch No. 4.

Under normal circumstances all private line TTY channels are connected to the associated history TTY or trunk maintenance TTY and the switching system. The DDD network is connected to the auxiliary TTYs.

3.10 The PECC interface and other external interfaces requiring dial-up capabilities are maintained by DDD channels (Fig. 8). A maximum of 9 of these channels are possible with 6 being send/receive and 3 being send only. Any one of the send/receive channels can be substituted for any of the 36 private line channels on the patch panel. The 3 send only channels can be patched into any two way DDD channel or private line channel for monitoring. These 3 channels supply PECC with TTY information. Data sets associated with the DDD channels are located external to the SCC. These data sets are transmit only for PECC interface and two way for send/receive channels. Since dial-up connections can be used to input TTY messages to the associated CO. Security is provided by some COs to prevent unauthorized use of these channels.

3.11 Six unique TTY functions are required (refer to 1.04). The tasks required and the number of TTYs to fulfill each task are dependent on the needs of each SCC facility.

3.12 A dedicated primary history TTY (Fig. 8) is assigned to monitor each CO. This TTY is continuously connected to the primary maintenance channel. As a result, a continuous printout is received of all TTY outputs per CO. A *receive only (RO)* or KSR TTY can be used depending on whether output capabilities are required from this TTY. Dual copy output is recommended. One copy is dedicated for immediate analysis, while the second copy is maintained for a continuous record of each CO's output.

3.13 The main function of the secondary history TTY is to back up the primary history TTY. As a result, it is continuously connected to the secondary maintenance channel. It is an RO TTY and handles only long term messages. The volume of TTY output messages determine whether this TTY is required for the system. Like the primary history TTY printouts, two copies of all output messages are recommended.

3.14 The trunk maintenance TTY is an option for the trunk maintenance channel. It is dedicated to the trunk maintenance channel and requires receive only capabilities. Send-receive option may be used if requested. Two copies of all output messages are recommended.

3.15 The primary function of the shared TTYs is to service the secondary maintenance channel and to serve as a spare for any failing TTYs. When a dedicated secondary history TTY is not warranted for the secondary maintenance channel, several shared TTYs are available on an as-required basis. Shared TTYs are also used for DDD appearances.

3.16 The main function of the auxiliary TTY is to automatically receive communications from external sources via DDD. In addition, the auxiliary TTY is easily patched to serve as a replacement for failing TTYs on a temporary basis and is used to add punched paper tape capabilities to the primary maintenance channel. The auxiliary TTY can both read and cut new paper tapes. This added capability enables it to better service external communications and to provide the primary maintenance channel with translation updates and similar tasks.

3.17 A *keyboard send-receive (KSR)* TTY is located at each work station. Its primary characteristic is the ability to be switched to channels accessing any one of the serviced central offices.

WORK STATION INTERVENTION

3.18 Manual intervention into a CO from the SCC is provided from the work station (Fig. 10). The work station—CO interface is established by the COSU through the switching network, telemetry, and TTY channels. The COSU is used to manually select the TTY channel leading to the desired CO. Depending on the user's need, either read only or full access to the CO is obtained. Read only enables the work station TTY to print all TTY output messages received on the selected channel. Full access provides both TTY and control console access. The work station TTY has send/receive capability to the selected TTY channel during full access. The control console has send/receive capability to the associated CO's maintenance center.

3.19 The TTY channel work station interface is enabled through crossbar switches No. 3 and No. 4 (Fig. 9). The COSU controls these switches. As a result, after CO selection the crossbar switches connect the requesting work station to the desired channel. Switch No. 3 provides access to the primary TTY channels (max 16). Switch No. 4 enables work station access to the secondary and trunk maintenance channels (max 20). When full access is required, the RTS relays associated with switch No. 3 play a key role. These relays prevent work station TTYs from sending to a CO that is receiving TTY input from a primary history TTY. When a primary history TTY requests send capabilities to a CO, the relay associated with that CO completes the TTY-CO interface path. At the same time, the same relay inhibits any work station from gaining send access to that CO. Normally, data is transferred through the relay to the switch.

3.20 Full access enables work station access to a CO maintenance center via the E2A telemetry and TTY channel. Status monitoring of that CO by the CI central is discontinued. All service to the CO is transferred to the console central located in the work station control console (Fig. 10). The console central now controls the telemetry interface for both the console and CIP. Upon work station

intervention, the RTS relay for the selected CO discontinues the CI central interface with that CO. At the same time, the relay connects the selected CO to the crossbar switches. The switch (controlled by the COSU) connects the CO to the requesting work station. Crossbar switch No. 3 not only handles TTY switching but also work station—CI switching. In the full access mode, the crosspoint (in switch No. 3) associated with the primary channel work station interface is activated. This same crosspoint provides a path for overall status transfer between the operating work station and the CIP associated with the serviced CO. The work station transfers overall status data through switch No. 3 to the CIP interface circuit. The CIP interface circuit discussed in 3.03 prepares the data for display.

WORK STATION OPERATION

3.21 After read only or full access has been established, the work station is ready for operation. CO functions performed at the work station include:

- Remote operation of CO TTYs
- Remote monitoring and control of the CO maintenance center
- Voice communications with the CO via the Call Director and DDD
- Trunk testing via the dc voltmeter, DDD, and the work station TTY.

4. MAINTENANCE

The SCC contains selected trouble prevention and detection features. One of the audible alarms in the SCC alarm system is the local equipment alarm. This alarm notes errors due to carrier fail on data sets, fuse alarms, and telemetry failure. In addition, the central telemetry units have an indicator mounted on each unit that indicates selected telemetry central failures. Telemetry failures are also noted by indications on the CIP and control consoles. An indicator on the front of each TTY data set indicates carrier failures in the TTY channel.

5. REFERENCE

SECTION	TITLE	SECTION	TITLE
201-400-100	SCC—Overall Description	201-403-100	SCC—Description for No. 1 ESS
201-400-110	Automated SCC Common Equipment Description		