2B PROCESSOR—FUNCTIONAL DESCRIPTION OF SYSTEM STATUS PANEL NO. 2B ELECTRONIC SWITCHING SYSTEM

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1. GENERAL

1.01 This section describes the system status panel (SSP) and the system status panel controller (SSPC) used in the No. 2B Electronic Switching System (ESS).

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The system status panel and controller are nonduplicated units within the 2B processor. The system status panel provides maintenance personnel with the means to monitor the status of the entire system and to control tests, alarms, which 3A Central Control (3A CC) is active, and initialization during emergency conditions. The system status panel controller is the interface between the 3A CC and the system status panel, E2A telemetry unit, and system status panel relay unit.

1.04 In addition, the system status panel supplies a number of critical indications that are transmitted via telemetry to a remote Switching Control Center (SCC). The SCC monitors these indicators and output messages from the maintenance teletypewriter (TTY). The SCC has the capability of controlling initialization, control unit switching, test and alarm functions on the system status panel.

1.05 The following definitions will be useful in understanding the contents of this section.

(a) ***Control Unit:*** The control unit is the combination of the 3A CC, the store busses, the associated main store, the 2B input/output (I/O) control circuit, and power.

(b) ***Dynamic Service Protection:*** Dynamic Service Protection is the condition where designated class A lines such as fire, police, and coin are given preference for originating calls when overload conditions are reached in emergency situations.

(c) ***Initialization:*** Initialization, also referred to as the maintenance reset function (MRF), restarts the 3A CC at a known location and condition. Initializations can be generated either manually or by the system.

(d) ***Light Emitting Diodes (LED):*** LEDs are chemically grown gallium phosphide crystals that convert direct current into a visible light output without benefit of energy-consuming filaments.

(e) ***2B Processor:*** The 2B processor is a combination of units which direct and control the operation and functions of the system. It includes the storage and processing units as well as the maintenance interface units used by the maintenance personnel.

(f) ***Start Code:*** A start code is a 3-bit code used in the 3A CC serial channels to notify a device of an I/O message and the type of I/O message, either normal or maintenance.

(g) ***Call Store:*** The call store is a part of the main store for transitory data such as the recent change areas and originating registers.

(h) ***Double Store Read:*** Double store read is the ability for the processor to initiate a new store read operation at the same address in the off-line store if a data parity is obtained in the on-line store. If the parity is good when read out of the off-line store, the processor will use the data read out of the off-line store and continue to process instructions from the on-line store without any further corrective action. The information from both read operations will later be used by the processor to indicate the faulty store circuit pack via TTY message.

2. EQUIPMENT DESCRIPTION

2.01 The system status panel and controller are housed in the upper midsection of the maintenance frame (Fig. 1). The system status panel is hinged to the side brackets of the system status panel controller and a magnetic latch on the panel keeps it securely closed. The circuit packs of the system status panel controller are easily accessed by opening the system status panel door (Fig. 2).

2.02 Three types of interconnections are used to connect the system status panel controller to the system status panel, E2A telemetry unit, and system status panel relay unit. They are:

(a) 30-gauge, 31-conductor flat ribbon cable,

(b) twisted pairs cable, and

(c) coaxial cable.

2.03 All three types of these cabling techniques are used to connect the system status panel controller to the system status panel. Twisted pairs and coaxial cable are used to connect the system status panel controller to the system status panel relay unit and to the E2A telemetry unit. Coaxial cable is used to connect the 3A CCs to the system status panel controller. All three types of cables are connected to the system status panel controller via connector and paddleboard assembly as shown in Fig. 3. Twisted pairs cable and coaxial cable are sometimes connected to the system status panel controller on the same connector and paddleboard assembly. The cables are hard wired to the system status panel and wire wrapped to the system status panel relay unit.

SYSTEM STATUS PANEL RELAY UNIT

2.04 The system status panel relay unit (Fig. 4) is mounted on a 4-inch mounting plate. The mounting plate is used to house five terminal strips, fourteen AF 10 relays and one AK 30 relay. These relays are used in the power sequencing circuit and as a buffer circuit to office alarms and monitor circuits.

SYSTEM STATUS PANEL

2.05 Status and trouble conditions in the system are indicated by visual indicators on the system status panel (Fig. 5). The system status panel consists of a plastic panel mounted to an aluminum frame along with a printed wiring board. Panel devices, supported by the printed wiring board, include the following:

(a) Lamp and light emitting diode (LED) displays which show the status of the system, including alarm conditions, control unit (CU) status, and certain peripheral equipment conditions.

(b) A display buffer made up of LEDs for displaying memory or scanner readings in manual testing (the proper message, when entered on the maintenance TTY, causes certain memory words or scanner rows to be read and displayed on the panel).

(c) Key/lamps for controlling the CUs.

(d) Key/lamps for manually selecting and initiating system initializations.

2.06 Four colors are used in the lamps or LEDs and each color has a different meaning.

(a) Red lamps indicate a trouble of major consequence which requires immediate attention.

(b) Amber lamps generally indicate a special condition or display.

(c) Green lamps are used to indicate the normal status of the equipment and to indicate whether requested tests have passed.

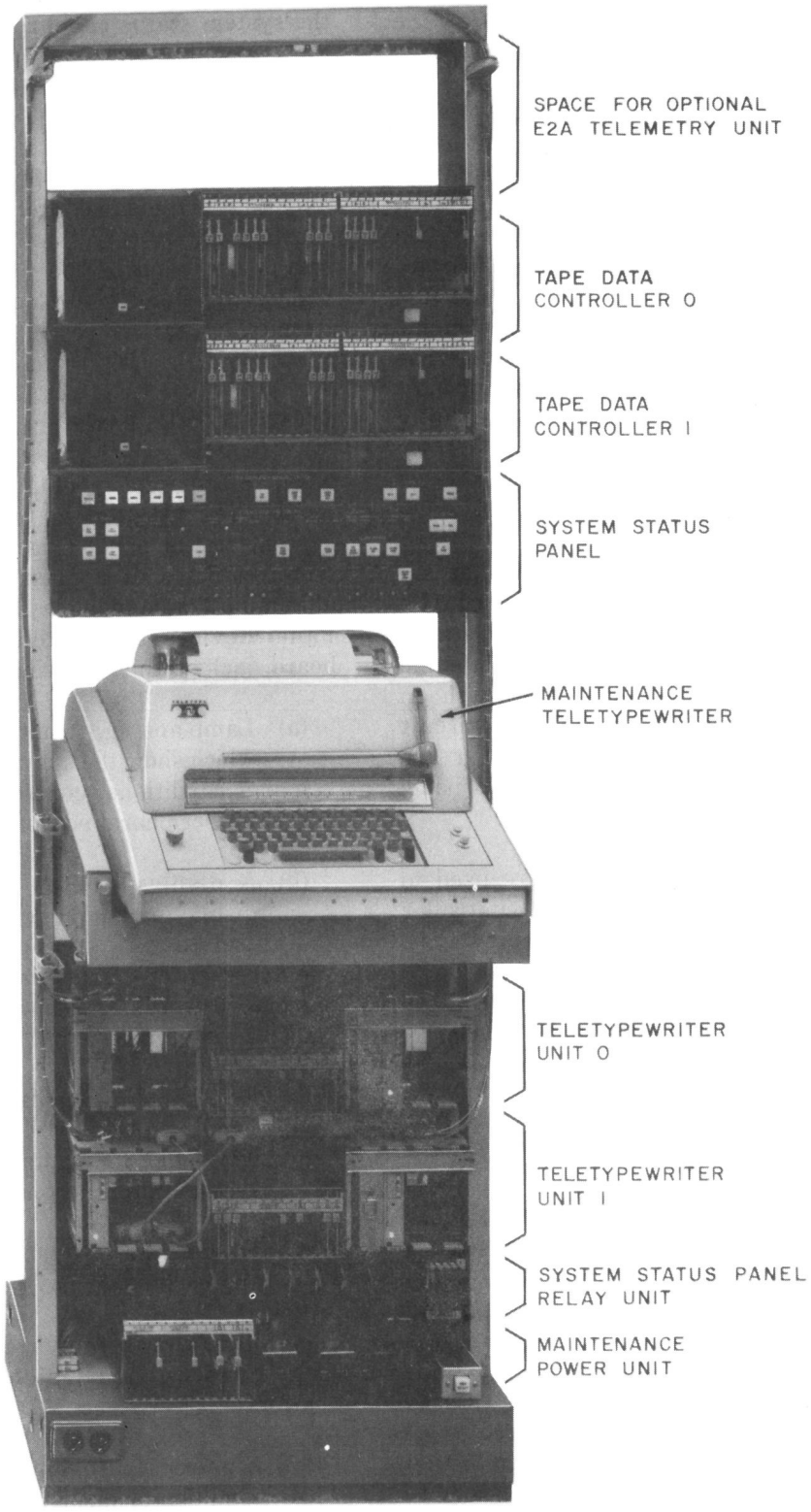

Fig. 1—No. 2B ESS Maintenance Center Frame

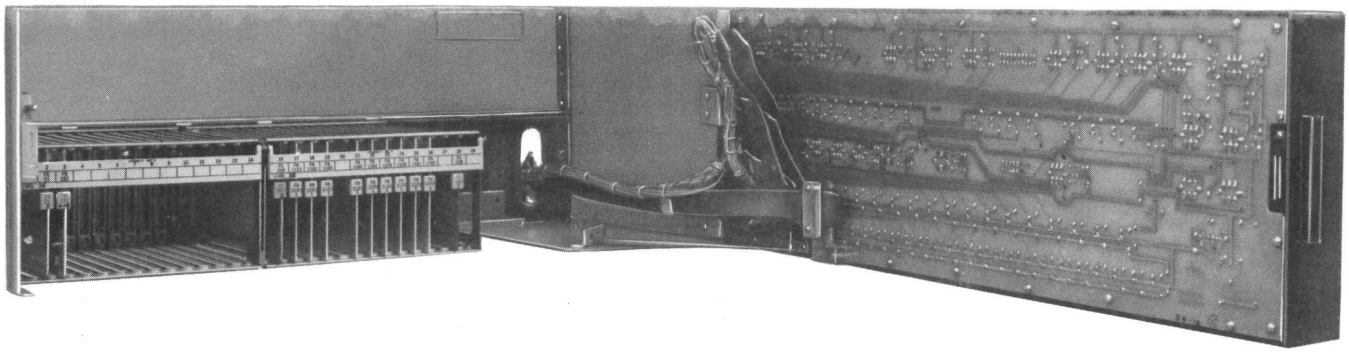

Fig. 2—System Status Panel and Controller

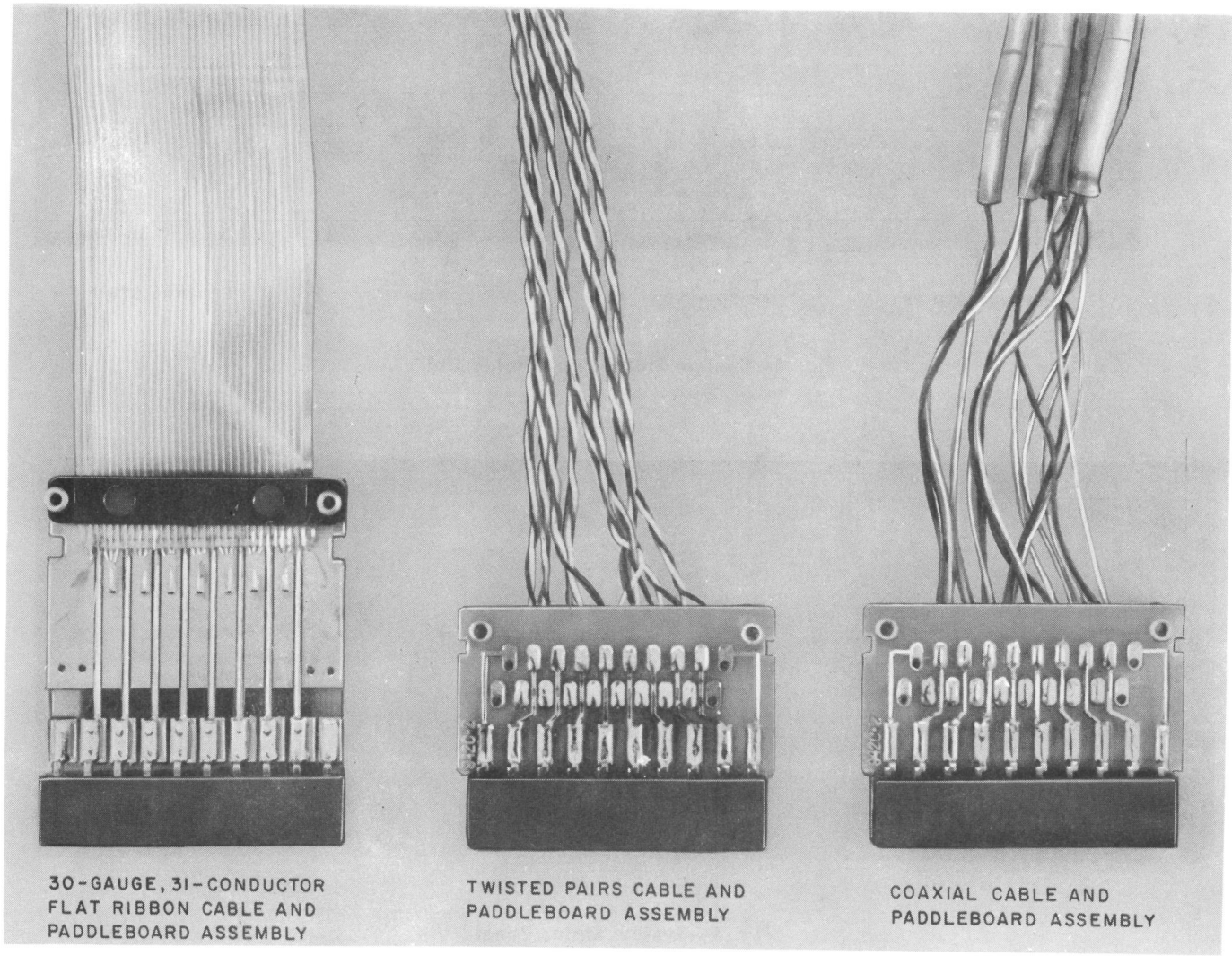

Fig. 3—Types of Interconnections

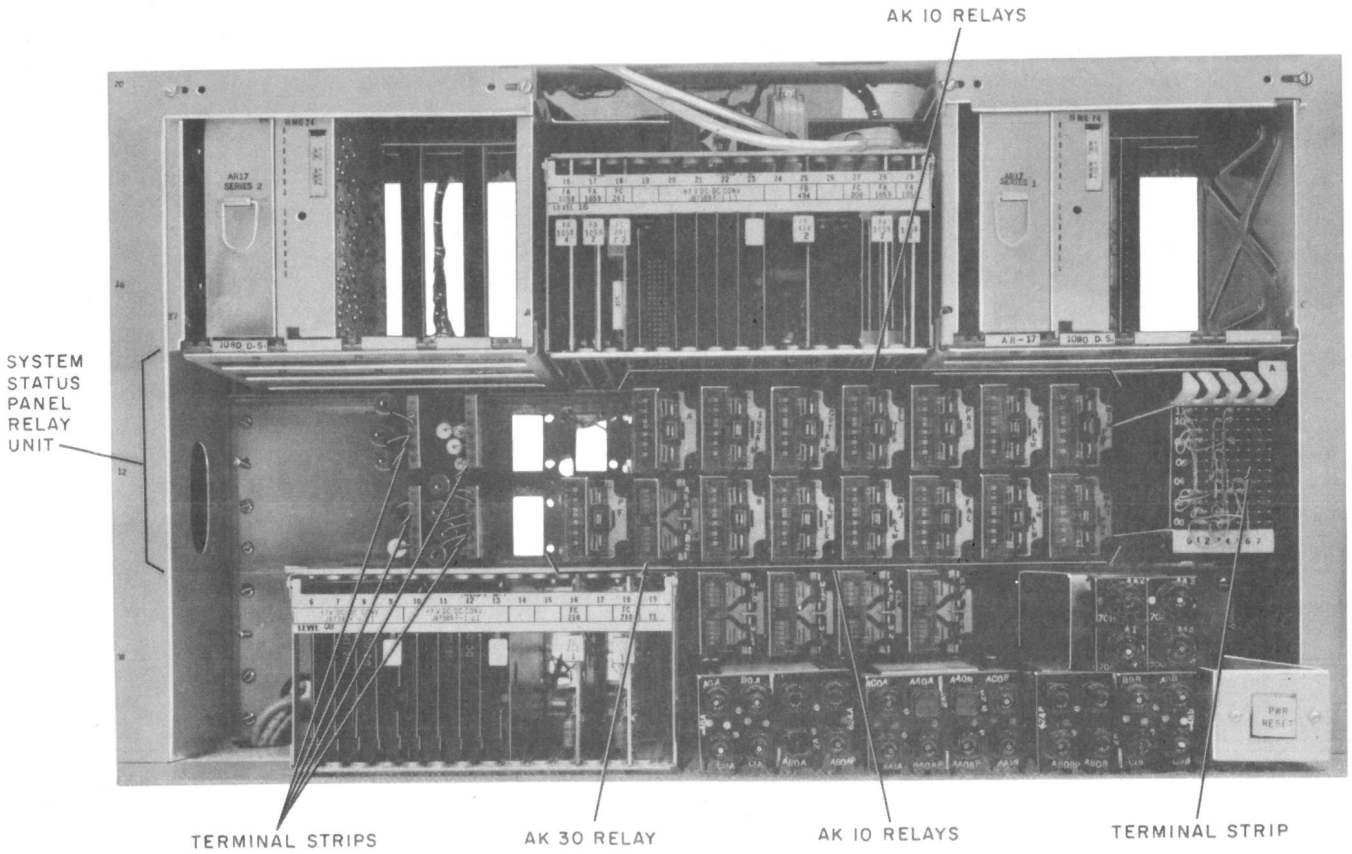

Fig. 4—System Status Panel Relay Unit

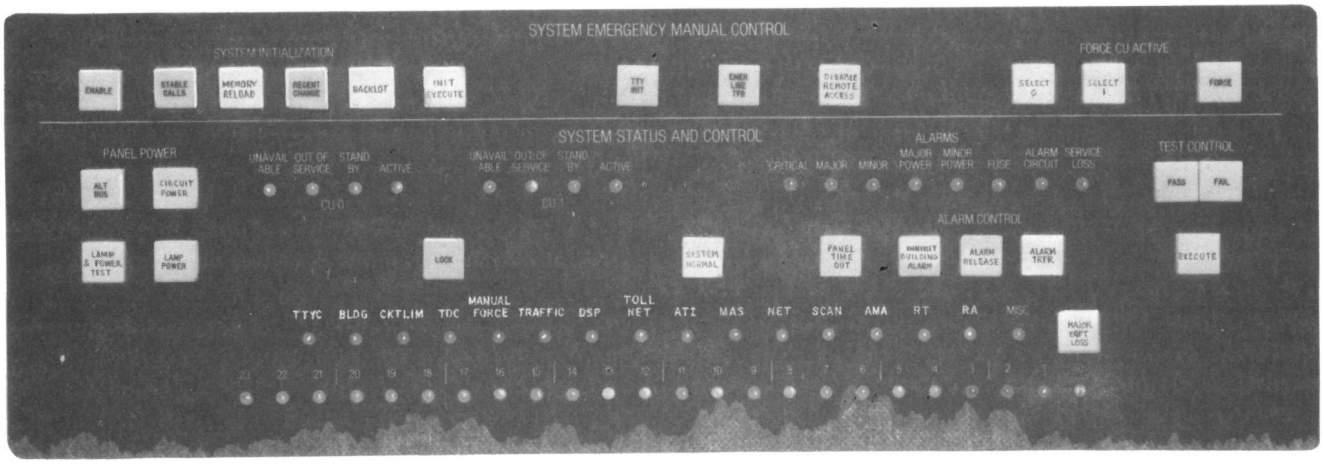

Fig. 5—System Status Panel

(d) White lamps indicate an active condition or the selection of a particular key.

2.07 In general, all logic function keys are alternate-action (push to set, push to release). The exceptions to the alternate-action keys are the following keys:

(a) ALT BUS, and

(b) LAMP & POWER TEST.

2.08 The system status panel is broken down into two major areas: SYSTEM STATUS AND CONTROL area and EMERGENCY MANUAL CONTROL area. The SYSTEM STATUS AND CONTROL reflects the general system condition and the SYSTEM EMERGENCY MANUAL CONTROL is used to initialize the system via manual intervention during an emergency situation.

2.09 The SYSTEM STATUS AND CONTROL is primarily a display of the system's health. Generally, each display reflects the state of a corresponding flip-flop in the system status panel controller. These flip-flops are usually controlled and in all cases are readable via I/O messages from the 3A CCs. The only lamps or key/lamps not associated with a flip-flop are CIRCUIT POWER, LAMP & POWER TEST, and LAMP POWER.

2.10 The SYSTEM EMERGENCY MANUAL CONTROL is a means of manually restoring the system to a healthy state under serious trouble conditions. Its operation is more complex than that of the SYSTEM STATUS AND CONTROL since several functions require interaction of various keys and circuit logic.

SYSTEM STATUS PANEL CONTROLLER

2.11 The system status panel controller circuit pack arrangement is shown in Fig. 6. A 4-inch mounting plate provides the necessary structure for mounting two 80A apparatus housings required for packaging discrete and ceramic circuit packs. As shown in Fig. 6, the system status panel controller is made up of 13 FA, FB, and FC circuit packs.

2.12 The FA and FC circuit packs are 4 by 7-3/4 by 1/2 inches in size with an 82-pin connector. Three packs, FA 1101, FA 1102, and FC 208 make up the maintenance unit I/O interface. Three FA 1103 packs provide the circuitry to interface with the E2A telemetry unit. Four FA 1100 circuit packs are required to interface with the system status panel. The system status panel controller power is supplied by FC 21 (+3 volts regulator), FC 152 (+12 volts reference), and FC 209 relay driver circuit. Figure 7 shows a block diagram of the system status panel controller and its relationship to the system.

SWITCHING CONTROL CENTER

2.13 When remote control of an office is provided, the E2A telemetry is used to transmit a number of critical indicators to a Switching Control Center. The Switching Control Center monitors these critical indicators as well as output messages from the maintenance TTY channel for various alarm conditions. When remote control of an office is provided, the Switching Control Center can connect to the system status panel and control the various key functions via E2A telemetry as well as monitor the displays available.

3. SYSTEM EMERGENCY MANUAL CONTROL AREA

3.01 The SYSTEM EMERGENCY MANUAL CONTROL area (Fig. 8) provides the maintenance personnel a means of controlling the processor which may be extremely useful during system trouble conditions. Functions such as manual initialization of the system and forcing a CU on-line can be executed by either local or remote maintenance personnel.

SYSTEM INITIALIZATION

3.02 To perform system initialization the following system initialization keys must be operated:

(a) ENABLE (Red)

(b) Any one or a combination of the following keys:

STABLE CALLS (Red)

MEMORY RELOAD (Red)

RECENT CHANGE (Red)

BACKDT (Red)

(c) INIT EXECUTE (Red)

3.03 Each of the keys are depressed to activate. The system takes no action until the INIT EXECUTE key is depressed. If a key is depressed accidentally before the INIT EXECUTE key is depressed, the key can be released by depressing it again.

3.04 The designated keys listed under b of 3.02 control the level of the initialization. The action taken by the system when the ENABLE key, initialization key(s), and INIT EXECUTE key are depressed is provided in 3.05 through 3.09.

STABLE CALLS

3.05 The stable calls initialization provides for clearing all stable and transient data in the call store, initializing the physical equipment, and disconnecting all calls. When the stable calls initialization is initiated, the system does the following:

- Clears all of call store except recent change area
- Idles all trunks and service circuits
- Restores all idle line ferrods after resumption of call processing
- Causes traffic monitor to print out on the traffic TTY that all traffic, plant, and performance measurements have been lost.

MEMORY RELOAD

3.06 The memory reload initialization will clear all transient calls and "bootstrap" from tape into main memory the copy of the generic program and the copy of the office data. The generic program is on a nonwritable track of the tape and should normally agree with memory. The copy of the office data is updated from memory on manual request using recent change update procedures. The MEMORY RELOAD lamp is extinguished by the program when the initialization action has been completed.

RECENT CHANGE

3.07 The recent change initialization provides the maintenance personnel a means of clearing changes placed in call store whose data may be causing trouble. When the recent change initialization is initiated the system does the following:

Note: The time required for a recent change clear initialization varies depending on traffic and office size.

- Clears recent change data such as service orders, customer originated changes to custom calling features (speed dialing lists, call forwarding list), traffic and plant measurements
- Knocks down calls in transient state causing an emergency audit procedure to take place
- Clears all transient calls.

Note: A backup paper tape of service order information should be available when a recent change procedure is initiated to restore customer service order information in the call store.

BACKDT

3.08 The backdate office data initialization will reload main memory as described in 3.06, clear all recent changes placed in call store, and backdate the office translation data to the state existing immediately prior to the last recent change update. To force this level of initialization manually, both the BACKDT key ***and*** the MEMORY RELOAD key must be depressed. The backdating of main memory is accomplished via a system "bootstrap" followed by overwrites to the office translation data from the backdate (BACDT) tape file. The BACKDT light will remain lighted after the initialization to provide a visual reminder that the office data in memory is out-of-date. The BACKDT light has an associated bit that will be used to inform any future automatically generated "bootstrap" initialization level that it should also perform the backdate function. The lamp should extinguish via program after the copy of the office data has been updated from memory.

3.09 Any combination of initialization keys can be depressed. If none of the keys are depressed, an emergency audit maintenance reset function (MRF) will be performed when the ENABLE and INIT EXECUTE keys are depressed in sequence. If the ENABLE and INIT EXECUTE keys are depressed again in approximately two seconds a transient clear will be performed.

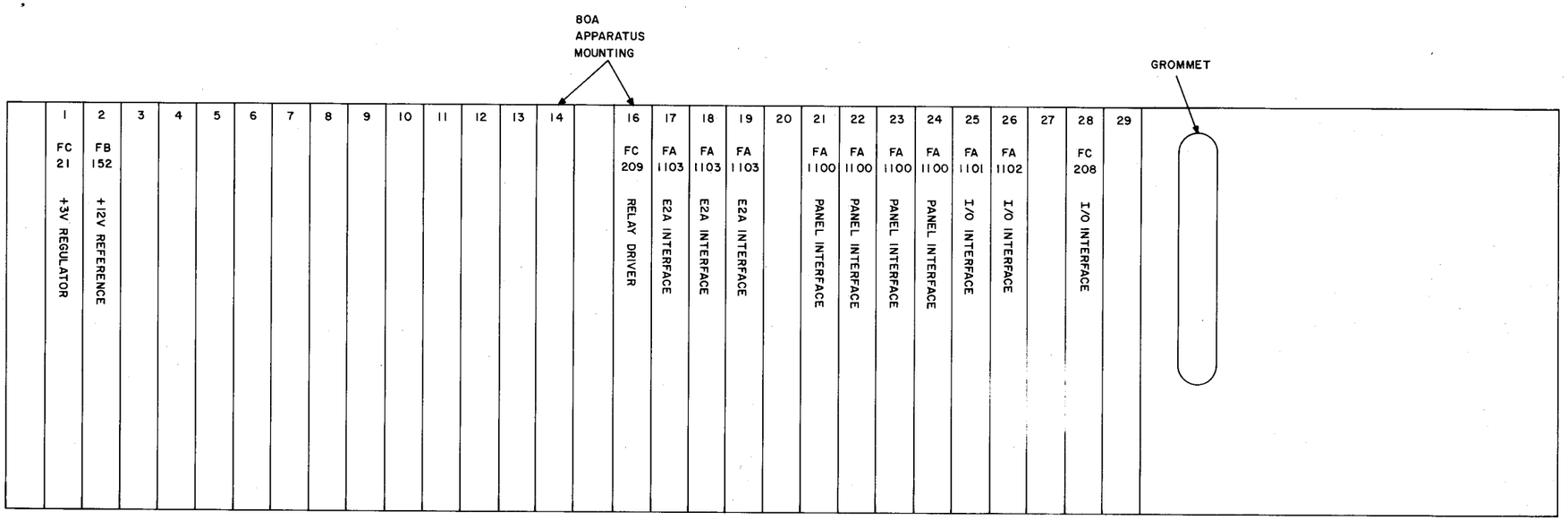

Fig. 6—System Status Panel Controller

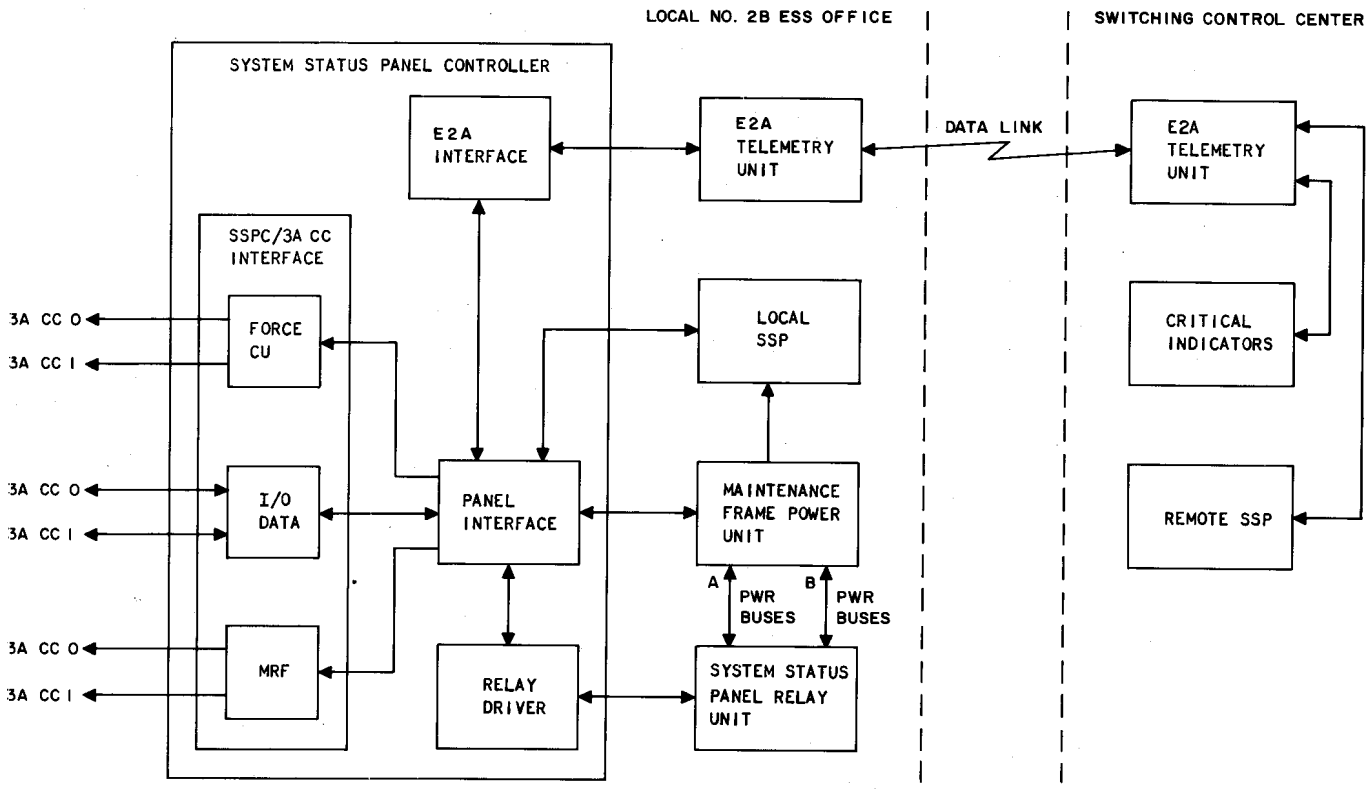

Fig. 7—System Status Panel Controller and Its Relationship to Other Units

3.10 When the INIT EXECUTE key is depressed, the ENABLE lamp is extinguished and a single initialization signal (MRF pulse) is generated and sent to both control units. The initialization program interrogates the states of the other system initialization bits to determine the initialization level. The INIT EXECUTE lamp is extinguished via the initialization program.

TTY INIT

3.11 The TTY INIT key is used when the TTY program is suspected of being in trouble and the office still indicates call processing is taking place. The TTY INIT lamp (Red) will light momentarily when the key is depressed.

Caution: The TTY INIT key is not to be used to stop undesired printouts, as TTYs other than the maintenance TTY are affected by the operation of the TTY INIT key.

The TTY INIT does the following:

- Zeros all waiting list slots
- Zeros the message forming area
- Zeros the TTY program control words
- Initializes all equipped TTYs and attempts to use the appropriate mate TTY controller, 0 or 1 for the local and remote maintenance TTY
- Shuts off all tape punches
- Properly turns off all linked output messages
- Prints out on all equipped TTYs that a manual clear has been performed.

EMER LINE TRFR

3.12 The emergency line transfer key is used to provide manual telephone service for certain

designated customers if an emergency occurs which prevents call processing in the No. 2B ESS office. This feature is not part of the program but is activated and deactivated manually from the panel key. When the EMER LINE TRFR key (Red) is set it operates a relay that provides contact closure from the designated customer's line to an operator circuit in another office.

DISABLE REMOTE ACCESS

3.13 When the DISABLE REMOTE ACCESS key is operated (Red), all control is disabled at the Switching Control Center. The Switching Control Center still gets a visual display of the system status but does not exercise control.

3.14 When the DISABLE REMOTE ACCESS key is in the released condition, the related flip-flop remains cleared. The program continually attempts to set this flip-flop but is able to actually do so only when the DISABLE REMOTE ACCESS key is operated. The contacts of the key actually perform the disabling function; the output of the bit only lights the panel lamp.

FORCE CU ACTIVE

3.15 Either CU may be forced on-line by use of the SELECT 0 key (Red) or SELECT 1 key (Red) and the FORCE key (Red). The SELECT 0 and SELECT 1 functions are mutually exclusive via hardware circuit interlocks. When either SELECT 0 or SELECT 1 key and the FORCE key are operated, a steady stream of pulses is sent to each CU forcing the selected CU active and locking the other CU off-line. If the previously active CU was selected, the system is merely locked to the existing state. If the off-line CU is selected, a switch is forced and various levels of initialization will occur depending upon the effect of the switch and upon the system initialization keys operated on the panel. To retire the force function, any of the three FORCE CU ACTIVE keys may be depressed, but to retire the selected CU lamp, the lighted select key must be depressed.

4. SYSTEM STATUS AND CONTROL AREA

4.01 The SYSTEM STATUS AND CONTROL area (Fig. 8) provides information which may be of assistance to the maintenance personnel. Functions such as locking a CU on-line and checking the visual display of the system status may be performed by both local and remote maintenance personnel. The areas included in STATUS PANEL AND CONTROL are as follows:

- PANEL POWER
- CU 0
- CU 1
- ALARMS
- TEST CONTROL
- ALARM CONTROL
- PANEL TIME OUT
- SYSTEM NORMAL
- Peripheral Status Display
- Display Buffer

PANEL POWER

4.02 Two busses, −48 volt A and +24 volt A provide voltage inputs from the maintenance frame power unit to the system status relay unit. Under normal conditions, the +24 volt A bus and −48 volt A bus are the primary voltage busses. If the unit is not able to function off both of the primary voltage busses, it will switch to the alternate busses (+24 volt B and −48 volt B) and the ALT BUS lamp (Red) will light. When the primary voltage busses are restored, recovery to the primary voltage busses is automatic and the ALT BUS lamp will extinguish. Normally, power from the A bus is used to operate the system status panel, system status panel controller, and system status panel relay unit. The +24 volt B bus normally provides power for the maintenance frame power unit alarm circuit only.

4.03 The ALT BUS key provides a means of testing the operation of the alternate bus. When ALT BUS key is depressed, the ALT BUS lamp should light and a switch from the primary busses to the alternate busses should occur. All lamps and LEDs which were not already lighted should momentarily light except the PANEL POWER lamps. Failure of the lamps and LEDs to light momentarily indicates a switch did not occur. Failure to reconfigure to an operating mode

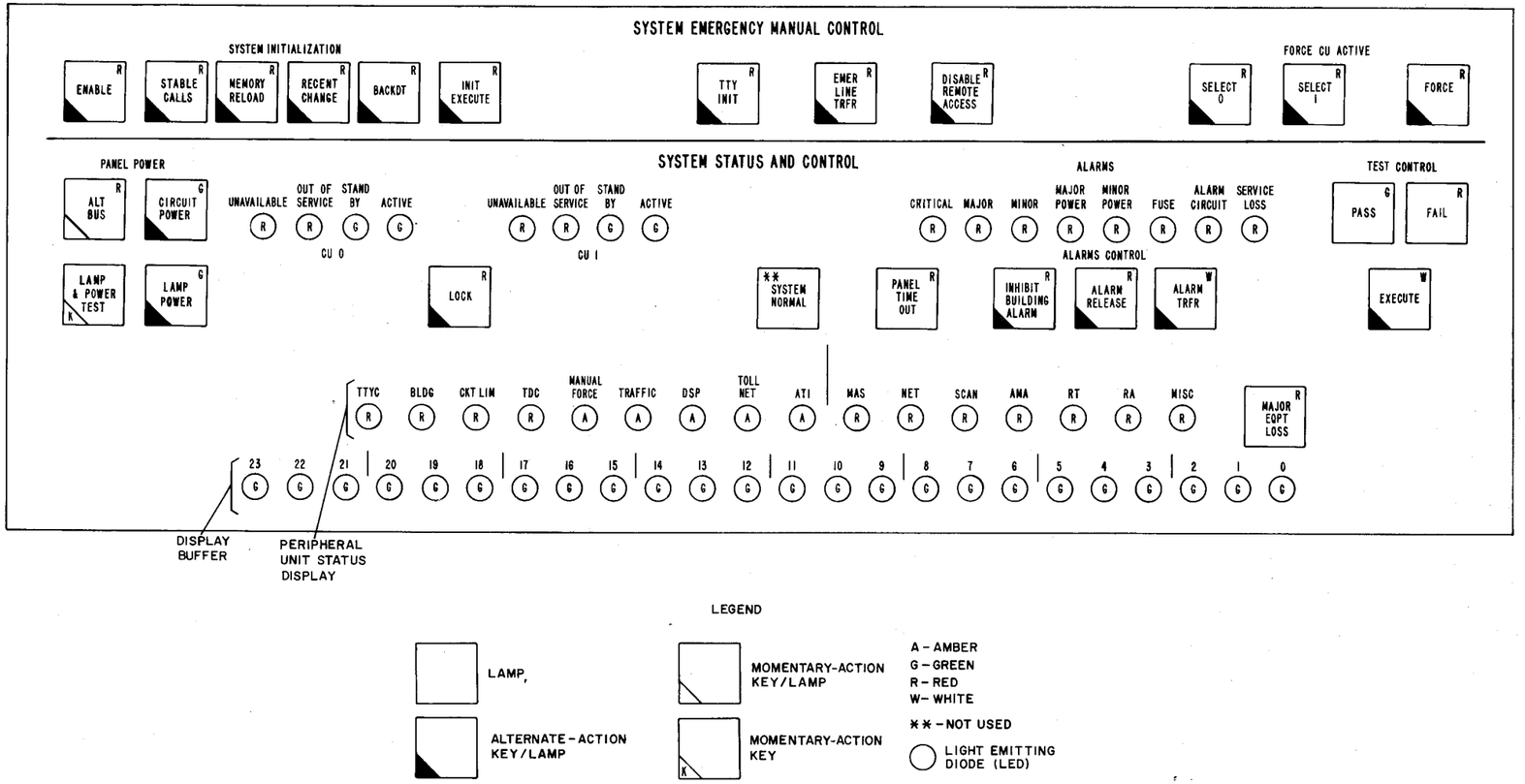

Fig. 8—System Status Panel Lamps, Keys, and LEDs

would be recognizable by the lamps and LEDs remaining lighted. After observing proper configuration, the primary bus should be restored by releasing the ALT BUS key and the ALT BUS lamp should be extinguished when the ALT BUS key is released.

4.04 Table A describes the key/lamp functions of the PANEL POWER circuitry. Three of the keys, CIRCUIT POWER, LAMP & POWER TEST, and LAMP POWER, are unique in that they are not associated with a flip-flop memory element.

TABLE A

PANEL POWER KEY/LAMP FUNCTION

KEY/LAMP DESIGNATION	LAMP COLOR	FUNCTION
ALT BUS (Key/Lamp)	Red	Provides a means of testing the alternate power bus.
CIRCUIT POWER (Key/Lamp)	Green	When operated, power (+3V) is applied to logic packs associated with system status panel.
LAMP POWER (Key/Lamp)	Green	Controls the +24 VDC to system status panel. Because of telemetry requirements, +24 VDC power is not completely removed. The voltage is reduced to a level that will not light lamps and LEDS.
LAMP & POWER (Key) TEST		When operated, causes all lamps and LEDS on the system status panel to light.

CU 0 AND CU 1 LEDS

4.05 The function of the CU status circuitry is to give a visual indication of the status of both CU 0 and CU 1. Each CU has associated with it four LEDs representing the four possible CU states. Table B describes each CU state.

TABLE B

CU 1 AND CU 1 LED INDICATIONS

LED DESIGNATION	LAMP COLOR	INDICATION
ACTIVE (LED)	Green	Gives visual indication that the associated CU is on-line and processing.
STANDBY (LED)	Green	Gives visual indication that the associated CU is off-line and capable of being switched on-line (circuits working and call store up-to-date).
OUT OF SERVICE (LED)	Red	Gives visual indication that the associated CU is off-line for some maintenance or diagnostic purpose. The CU can be switched on-line, but only under emergency conditions. (Call store is not up-to-date).
UNAVAILABLE (LED)	Red	Gives visual indication that the CU is off-line and cannot be switched on-line without manual intervention.

LOCK FUNCTION

4.06 The LOCK function is used to prevent the off-line CU from placing itself on-line or the on-line CU from placing itself off-line. When the LOCK key is set, the select bit of the on-line CU is set. The force bit is also set preventing the CUs from switching. When the lock function is being used the LOCK lamp (Red) is lighted.

ALARM LEDS

4.07 Alarm indications are based on a 2-level alarm structure composed of MAJOR and MINOR alarms. All alarm reports will activate one of these alarm levels. The following is a description of each alarm level. Table C further describes each of the eight alarms.

TABLE C

ALARMS LED INDICATIONS

LED DESIGNATION	LAMP COLOR	INDICATION
CRITICAL	Red	Panel timeout is activated.
MAJOR	Red	Partial loss of system capability. *Immediate response required.*
MINOR	Red	Minor loss of system capability. *Attention required.*
MAJOR POWER	Red	Major failure in power equipment. *Immediate response required.*
MINOR POWER	Red	Minor failure in power equipment. *Attention required.*
FUSE	Red	Blown fuse. *Attention required.*
ALARM CIRCUIT	Red	Power failure in the alarm circuit. *Attention required.*
SERVICE LOSS	Red	Initialization sequence-flashes during initialization and remains lighted after MRF if the level is emergency audit or hugher. *Analyze printout.*

CRITICAL Alarm

4.08 A critical alarm is indicated visually by the CRITICAL LED (Red) being lighted and audibly by a gong sounding at 1-1/2 second intervals. This alarm is set by hardware whenever PANEL TIME OUT (4.21) is set and only when PANEL TIME OUT is set.

4.09 The critical alarm is reset by clearing the trouble causing the PANEL TIME OUT and depressing the ALARM RELEASE.

MAJOR Alarm

4.10 A major alarm is indicated visually by the MAJOR LED (Red) being lighted and audibly by a gong sounding at 1-1/2 second intervals. This alarm is set whenever MAJOR POWER, SERVICE LOSS BLDG, or MAJOR EQPT LOSS is set. ***Immediate response is required.***

4.11 The major alarm is reset by depressing the ALARM RELEASE. If the ALARM TRFR is set, the alarm will automatically be reset after a 30-second period.

MINOR Alarm

4.12 A minor alarm is indicated visually by the MINOR LED (Red) being lighted and audibly by a bell sounding. The alarm is activated whenever any one of the following LEDs is lighted: MINOR POWER, FUSE, ALARM CIRCUIT, CKT LIM, TTY, BACK UP TAPE, DSP, or TOLL NET. It is also set if a minor alarm is reported, whenever there is a minor loss of system capability, or some condition occurs requiring the attention of maintenance personnel.

4.13 The minor alarm is reset by depressing the ALARM RELEASE key. If the ALARM TRFR is set, the alarm will automatically be reset after a 30-second period. If the ALARM TRFR is ***not*** set, the audible alarm will be reset automatically

after a 30-second delay period ***unless*** MINOR POWER is also set.

TEST CONTROL AREA

4.14 The system status panel lamps associated with the TEST CONTROL are PASS, FAIL, and EXECUTE. When a diagnostic test sequence is requested by a TTY input message to be run in either the "step" or "repeat" mode, the results of the test are indicated by setting either the pass or fail bit which in turn lights either the PASS (Green) or FAIL (Red) lamp. The execute bit lights the EXECUTE lamp (White) and may be set and reset manually from the system status panel by depressing the EXECUTE key. Duplicated EXECUTE key/lamp and PASS and FAIL lamps are mounted on the peripheral control frames and perform the same function.

4.15 In the "step" mode, the diagnostic test is executed each time the EXECUTE key is depressed. The EXECUTE bit is reset by the program upon completion of the test. The PASS or FAIL lamp will indicate the outcome of the test.

4.16 In the "repeat" mode, the EXECUTE key serves as a stop and go indicator. When the EXECUTE bit is set by depressing the EXECUTE key, the EXECUTE lamp will light and the diagnostic test is executed repeatedly until the EXECUTE key is depressed again. The EXECUTE bit will then be reset and the EXECUTE lamp will be extinguished.

ALARM CONTROL AREA

4.17 The system status panel key/lamps associated with ALARM CONTROL area are the following:

- INHIBIT BUILDING ALARM
- ALARM RELEASE
- ALARM TRFR

INHIBIT BUILDING ALARM Key/Lamp

4.18 The INHIBIT BUILDING ALARM (Red) function inhibits all building alarms when it is set.

ALARM RELEASE Key/Lamp

4.19 The ALARM RELEASE (Red) is set via software whenever an alarm occurs. When reset manually from the system status panel, the alarm release requests that the critical, major and minor alarms, both visual and audible be released.

ALARM TRFR Key/Lamp

4.20 The ALARM TRFR (White) is set and reset manually from the system status panel. When the ALARM TRFR key is operated, the critical, major, and minor alarms, both visual and audible, will be automatically released 30 seconds after the alarm occurs. When the ALARM TRFR key is operated, the alarms are assumed to be monitored remotely. A TTY output message will follow the operation of the ALARM TRFR key to indicate whether alarms are transferred or not. The ALARM TRFR can also be set or reset via TTY input messages.

PANEL TIME-OUT

4.21 The PANEL TIME OUT lamp (Red) will light if the processor does not send a special message at least every two seconds. The lamp monitors the output of an autonomous hardware timer located in the system status panel controller which must be reset by program to prevent a time-out from occurring. When PANEL TIME OUT lamp is lighted, it indicates that the system is not functioning correctly and is incapable of resetting the panel timer. When a PANEL TIME OUT occurs, the SYSTEM NORMAL lamp should extinguish and a CRITICAL ALARM should occur.

PERIPHERAL UNIT STATUS DISPLAY

4.22 Peripheral Unit (i.e., not part of the central processor) status is monitored at the system status panel (Fig. 4) using LEDs. Seven of these indicators are considered major equipment status. This includes MAS, NET, SCAN, AMA, RT, RA, and MISC. When any of these bits are set the associated LED will be lighted and the MAJOR EQPT LOSS lamp (Red) will light. The following is a functional breakdown of major equipment status.

(a) MAS (Red)—When the MAS LED is lighted, it indicates that the Double Store Read circuit is being used to keep the system on the air.

The MAS LED will remain lighted until the error list (DSRE-RBUF) is cleared.

(b) NET (Red)—When the NET LED is lighted, it indicates that a switching network trouble exists.

(c) SCAN (Red)—When the SCAN LED is lighted, it indicates that at least one master scanner, trunk scanner, or line scanner has malfunctioned.

(d) AMA (Red)—When the AMA LED is lighted, it indicates that an automatic message accounting trouble exists.

(e) RT (Red)—When the RT LED is lighted, it indicates that a ringing or tone source has malfunctioned.

(f) RA (Red)—When the RA LED is lighted, it indicates that one or more recorded announcement voice channels are not operating properly.

(g) MISC (Red)—When the MISC LED is lighted, it indicates that a miscellaneous trouble exists somewhere in the system such as a trouble in the centrex data link frame, input/output control circuit (including central pulse distributor troubles), supplementary central pulse distributor frame, and automatic identify outward dial frame.

4.23 The remaining peripheral unit status is monitored by nine additional LEDs. The following list provides the functions of each of the additional status monitors.

(a) TTYC (Red)—When the TTYC LED is lighted, it indicates that at least one maintenance TTY controller is out of service.

(b) BLDG (Red)—When the BLDG LED is lighted, it indicates that a major alarm in the miscellaneous alarm field is active.

(c) CKT LIM (Red)—When the CKT LIM LED is lighted, it indicates that the number of trunks or service circuits removed from service in any trunk group has reached or surpassed the number of trunks which may be removed automatically from that trunk group.

(d) TDC (Red)—When the TDC LED is lighted, it indicates that at least one tape data controller to on or both control units is out of service.

(e) MANUAL FORCE (Amber)—When the MANUAL FORCE LED is lighted, it indicates that the maintenance personnel has ***manually*** forced an abnormal condition, such as either control units power or test mode key operated, or the on-line control units manual key is operated, or the off-line control unit is locked or forced unavailable via the system status panel.

(f) TRAFFIC (Amber)—When the TRAFFIC LED is lighted, it indicates that an office traffic overload condition exist.

(g) DSP (Amber)—When the DSP LED is lighted, it indicates that dynamic service protection has been invoked.

(h) TOLL NET (Amber)—When the TOLL NET LED is lighted, it indicates that toll network protection has been manually invoked.

(i) ATI (Automatic Test Inhibit) (Amber)—When the ATI is lighted, it indicates that the time monitor is inhibited, control unit detection is now allowed, a MRF sequence has occurred, a long term period exercise is not allowed, printout is inhibited, or any multiscan function is inhibited via TTY request. This LED is controlled by program only.

DISPLAY BUFFER

4.24 The DISPLAY BUFFER (Fig. 8) consists of the bottom row of 24 LEDs on the system status panel. These LEDs can be used in conjunction with trouble shooting by means of utility TTY input messages. This function is performed by monitoring on the DISPLAY BUFFER a store word, register, or row of ferrod sensors.

5. SWITCHING CONTROL CENTER

5.01 If the No. 2B ESS is being monitored by a Switching Control Center (SCC), a critical indicator panel will be located at the SCC which will continuously display the following indicators:

- ON-LINE
- MESSAGE

- AUD-OFF
- CRITICAL
- MAJOR
- MINOR
- BLDG/PWR
- TELEM
- SYS EMER
- CU
- NET
- SCAN
- AMA
- MAS
- MISC
- CKT LIM
- FORCED
- BLDG INH
- TRAFFIC
- NONDESIGNATED

5.02 Four of these critical indicators are generated locally at the SCC. They are ON LINE, AUD OFF, TELEM, and MESSAGE. The other 16 indicators are sent to the SCC via telemetry from the system status panel at the No. 2B ESS. The following is a list of functions for each of the 16 critical indicators.

(a) CRITICAL—The critical indicator is activated via the interface circuitry when the CRITICAL lamp is lighted on the No. 2B ESS system status panel or a panel time-out has occurred.

(b) MAJOR—The major indicator is activated via the interface circuitry when the MAJOR lamp is lighted on the No. 2B ESS system status panel. A major alarm TTY message is printed out at the maintenance TTY at the time the MAJOR lamp is lighted.

(c) MINOR—The minor indicator is activated via the interface circuitry when the MINOR lamp is lighted on the No. 2 ESS system status panel. A minor alarm TTY message is printed out at the maintenance TTY at the time the MINOR lamp is lighted.

(d) BLDG/PWR—The building alarm indicator will light when a serious building alarm condition occurs. Serious building alarms are chosen by the TELCo. However, they usually include commercial power failures, fires, loss of air conditioning, and loss of air circulation. The BLDG lamp will be lighted when a ferrod is saturated in a major alarm row designated by the TELCo.

(e) SYS EMER—The system emergency indicator will be lighted whenever a manual or automatic service affecting system initialization is in progress or when a serious loss of call processing capability has been detected. The system emergency indicator is connected via the interface circuitry to the SERVICE LOSS lamp and the panel time-out lamp via an oring arrangement on the No. 2B ESS system status panel.

(f) CU—The CU indicator will be lighted when the off-line CU ***cannot*** take over immediately.

(g) NET—The network indicator will be lighted when a network trouble has been detected or a network controller has been removed from service. The network controller can be removed from service by the program or SCC or central office maintenance personnel.

(h) SCAN—The scanner indicator will be lighted whenever a scanner controller is removed from service or a trouble has been detected in a scanner.

(i) AMA—The automatic message accounting indicator will be lighted whenever an AMA tape transport is out-of-service.

(j) MAS—The MAS indicator will be lighted when the Double Store Read circuit is being used to keep the system on the air. It will remain lighted until the error list (DSRERBUF) is cleared.

(k) MISC—The miscellaneous indicator will be lighted when the RA, RT or MISC lamps on the system status panel lighted.

(l) CKT LIM—The circuit limit indicator will be lighted when a group of engineered circuits reaches the limit beyond which these circuits cannot be automatically removed from service by the No. 2B ESS. The circuits include both trunk and service circuits.

(m) FORCED—The force indicator will be lighted when a CU is forced on-line either by software when various tests are performed or manually by such functions as lock, force, or test mode reversal. The forced indicator is connected via the interface circuitry to the ATI lamp and the MANUAL FORCED lamp via an oring arrangement on the No. 2B ESS system status panel.

(n) BLG INH—The inhibit building alarm indicator will be lighted whenever important central office building alarms are inhibited.

(o) TRAFFIC—The traffic indicator will be lighted when a significant or unusual traffic condition is detected. The traffic indicator is connected via interface circuitry to the TRAFFIC lamp on the No. 2B ESS system status panel.

6. POWER

6.01 Power for the system status panel and controller is obtained from the maintenance frame power unit. The system status panel requires +24 volts input for the lamps and LEDs. The system status panel controller requires +3 volts for the 1A logic. The FB-152 circuit pack located in the system status panel controller and labelled +12 V REFERENCE converts +24 volts to +12 volts which is used by the maintenance frame power unit to supply +3 volts.

6.02 All power and ground to individual packs is supplied by multilayer printed wiring boards located in the maintenance frame power unit. These boards are comprised of alternate layers of expoxy-glass and copper claddings. Besides providing uniform power and ground distribution, the boards aid in positioning the connectors and aligning the terminals for machine wire-wrap connections.

7. MAINTENANCE

MAINTENANCE PHILOSOPHY

7.01 The system status panel and controller are not involved in providing call processing service for customers. Therefore, the system status panel and controller are nonduplicated units. If a failure occurs in either unit, either or both can be taken out of service without affecting the telephone service provided by the office. However, if the system status panel and/or system status panel controller are out of service, maintenance personnel lose the means of control and assistance provided by these units. The system can be monitored by other means, such as the TTY, but the following services are not available to maintenance personnel:

(a) Some of the remote maintenance capability

(b) Visual display of system status or trouble conditions

(c) Means for manually initializing the system.

Since these are important from the maintenance standpoint, the system status panel and/or system status panel controller should be repaired as soon as possible.

ERROR DETECTION

7.02 Whenever the system status panel controller receives an I/O message from the 3A CC, the start code and parity of the message are checked for correctness. If incorrect parity or a wrong start code is received, the system status panel controller automatically transmits to both 3A CCs the message just received with a maintenance start code.

7.03 If the message sent by the 3A CC contains a write command for the system status panel controller flip-flops, the information is written into the addressed flip-flop and then read out and transmitted back to the 3A CC for comparison.

7.04 All information sent from the system status panel controller to the 3A CC is checked by the 3A CC for correct parity and start code. If incorrect parity or start code is received, the appropriate bit in the 3A CC error register is set.

DIAGNOSTICS

7.05 Diagnostics of the system status panel are performed during the CU diagnostic tests. The first segment of the test checking the system status panel is performed by the on-line processor to ensure that the on-line processor has access to the system status panel. A single I/O order is sent to the system status panel and the I/O should respond with a normal start code.

7.06 The following diagnostic segments are run by the off-line processor.

(a) The flip-flops in all 12 addressable 8-bit groups in the system status panel are initialized to 0 and an attempt is made to set all the bits in these registers to 1s. A check is made to ensure that all bits which have complete program access are set to 1. Several bits are intentionally omitted from the test because it would be dangerous to test them (e.g., EXECUTE in emergency control area). Since some bits in some groups have limited or no program access, a mask is used so that these bits will be ignored during the check.

(b) An attempt is made to set all the bits in all 12 addressable groups to 0s. A check is made to ensure that all bits which have complete program access are set to 0. Those bits which have limited or no program access are ignored as described in part (a) of this paragraph.

(c) The processor sends logic level 1s to each bit with a read-only op-code. A check is made to ensure that all bits which have complete program access are set to 0. This ensures that a read-only operation does not cause a write to any bit. Those bits which have limited or no program access is ignored as described in part (a) of this paragraph.

(d) All possible two-out-of-six address codes are sent to the system status panel. Since the address codes for the system status panel are three-out-of-six codes, the two-out-of-six codes are invalid. These invalid codes are sent with all 1s data. If there are no faults, the 1s will not be loaded into the registers.

7.07 The PANEL TIME OUT is tested by a functional diagnostic. The off-line processor will monitor the PANEL TIME OUT to ensure it does time out while no reset signal is being sent to the system status panel. The timer is then cleared immediately so that the switching control center will not detect this intentional time-out.