3A PROCESSOR POWER SYSTEM
DESCRIPTION AND THEORY OF OPERATION
COMMON SYSTEMS

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1. GENERAL

1.01 This section contains a description and theory of operation of the 3A Processor power system and related alarms.

1.02 When this section is reissued, this paragraph will contain the reason for reissue.

CHARACTERISTICS

1.03 The 3A Processor power input consists of dedicated, fused -48, +24, and protected 120 volt 60 Hz power (Fig. 1). The following frames form the 3A Processor:

- Processor
- Maintenance
- Programmed magnetic tape system
- Supplementary main store

Each frame contains its own fuses and alarm generating circuitry for use within (and external to) the frame.

2. PHYSICAL DESCRIPTION

PROCESSOR FRAME

2.01 The processor frame is divided into two bays (0, 1), each of which contains identical equipment (Fig. 2). Controlled and protected (fused) power is obtained from the processor power unit of each bay and distributed to:

- 3A Central Control (3A CC)
- Main store

The collector diffusion isolation to transistor-transistor logic interface/power unit (CTI/power unit) contains its own fuse protection.

MAINTENANCE FRAME

2.02 The maintenance frame (Fig. 3) contains:

- E2A telemetry unit (optional)
- Tape data controller units 0, 1
- System status panel and system status panel controller
- Teletypewriter
- Teletypewriter controller units 0, 1
- System status panel relay unit
- Maintenance frame power unit.

2.03 The optional E2A telemetry unit contains a power converter for E2A circuit use only.

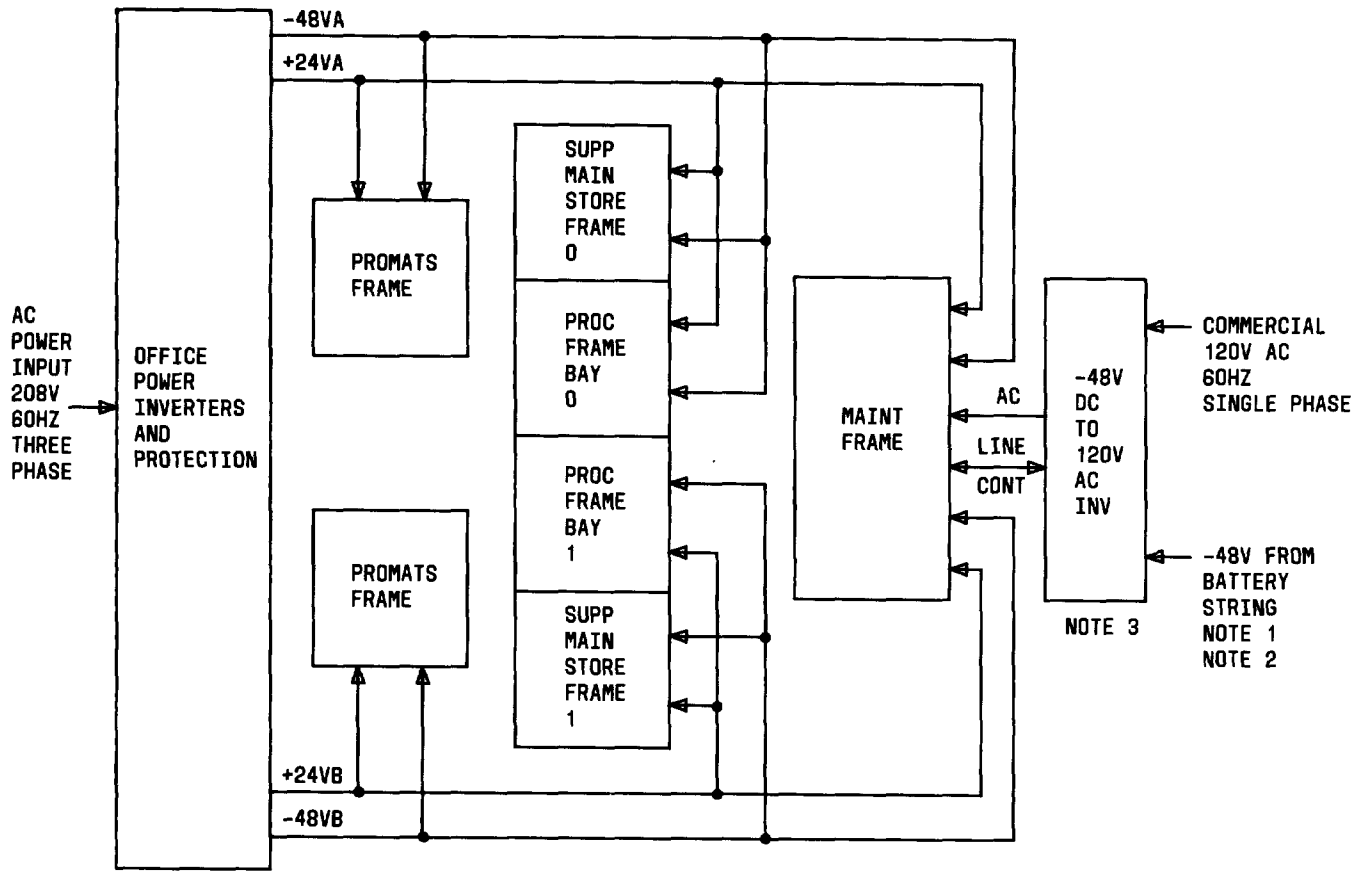
2.04 Tape data controller units 0, 1 each contain two (J87421A) power converters, alarm, and power control circuitry.

2.05 The system status panel (SSP) and system status panel controller (SSPC) contain power control and alarm circuitry.

2.06 The TTY power is wired to, but not fused or controlled in, the maintenance frame.

2.07 Teletypewriter controller (TTYC) units (J1C054) 0, 1 each contain two power converters, voltage reference, alarm, and power control circuitry.

2.08 The system status panel relay unit (SSPRU) J1C056 contains power-control, test, and alarm circuitry.



NOTE 1 -48V BATTERY USED ONLY DURING LOSS OF COMMERCIAL POWER

NOTE 2 BATTERY STRING NOT SHOWN

NOTE 3 INVERTER LOCATION DEPENDANT ON OFFICE CONFIGURATION

NOTE 4 FRAME LOCATINS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY

Fig. 1—3A Processor Power Frame Requirements

2.09 The maintenance frame power unit contains fuses, two J87389F power converters, alarm, and control circuitry.

PROMATS FRAME

2.10 The programmed magnetic tape system (PROMATS) frame (Fig. 4) contains:

- Programmable controller (PROCON) units
- Logic unit
- Input/output (I/O) unit
- Tape transport
- Power converter (tape transport).

2.11 The PROCON unit assembly contains a 132AB power converter, power control, and power converter alarm circuitry. The converter supplies power to all logic circuitry in the frame.

2.12 The logic unit circuit packs are powered by +5 volt power but contain no alarm generating circuitry.

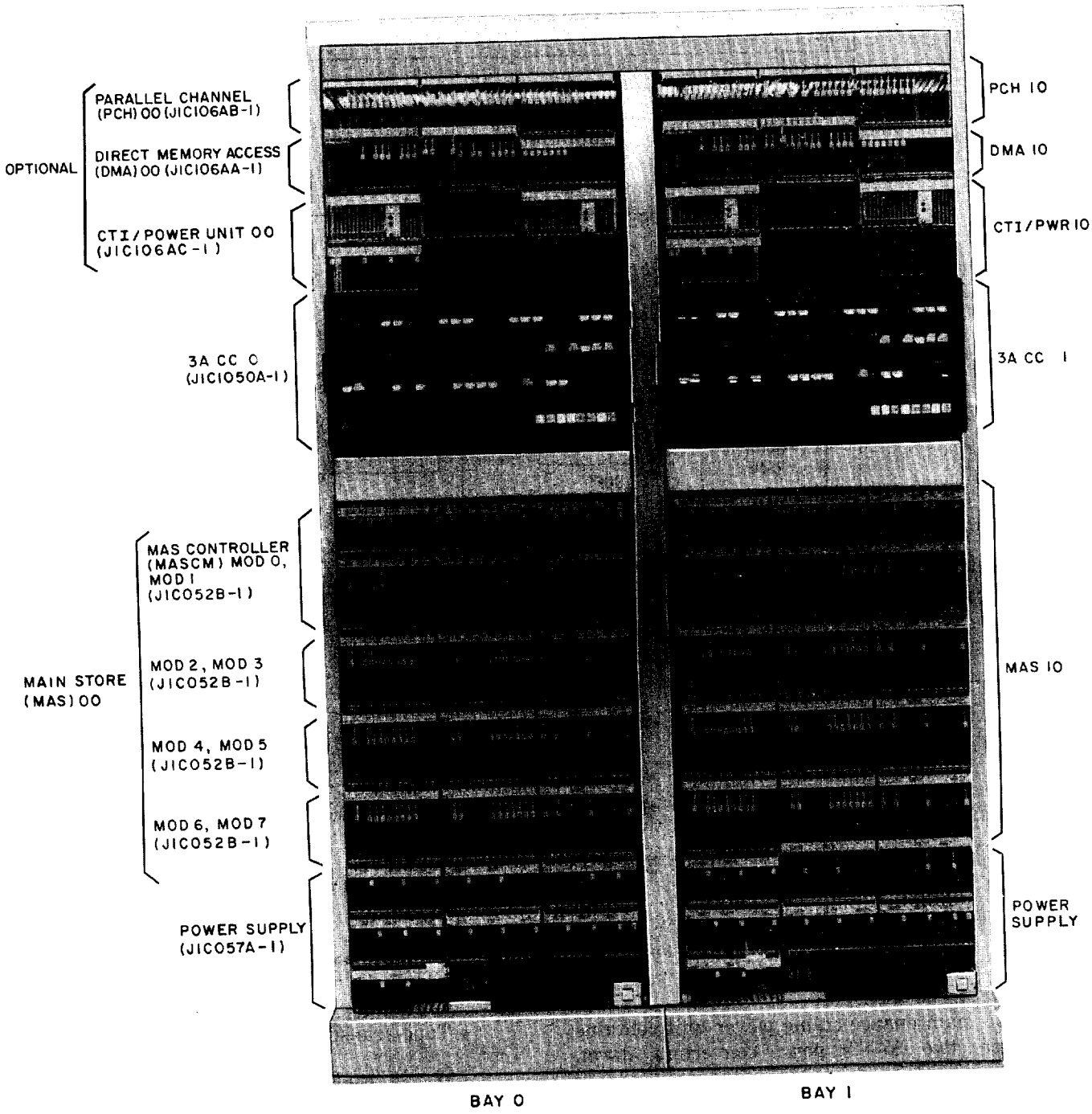


Fig. 2—Typical Processor Frame

2.13 The I/O unit contains a fuse and a duplex bus selector (DBS). The DBS contains input power control circuitry for the 132AB converter.

2.14 The KS-20571 tape transport power requirements are provided by a (companion) KS-21104 power converter. The tape transport generates a power related alarm for its power converters use only.

2.15 The KS-21104 tape transport power converter contains control, internal alarm, and protective circuitry.

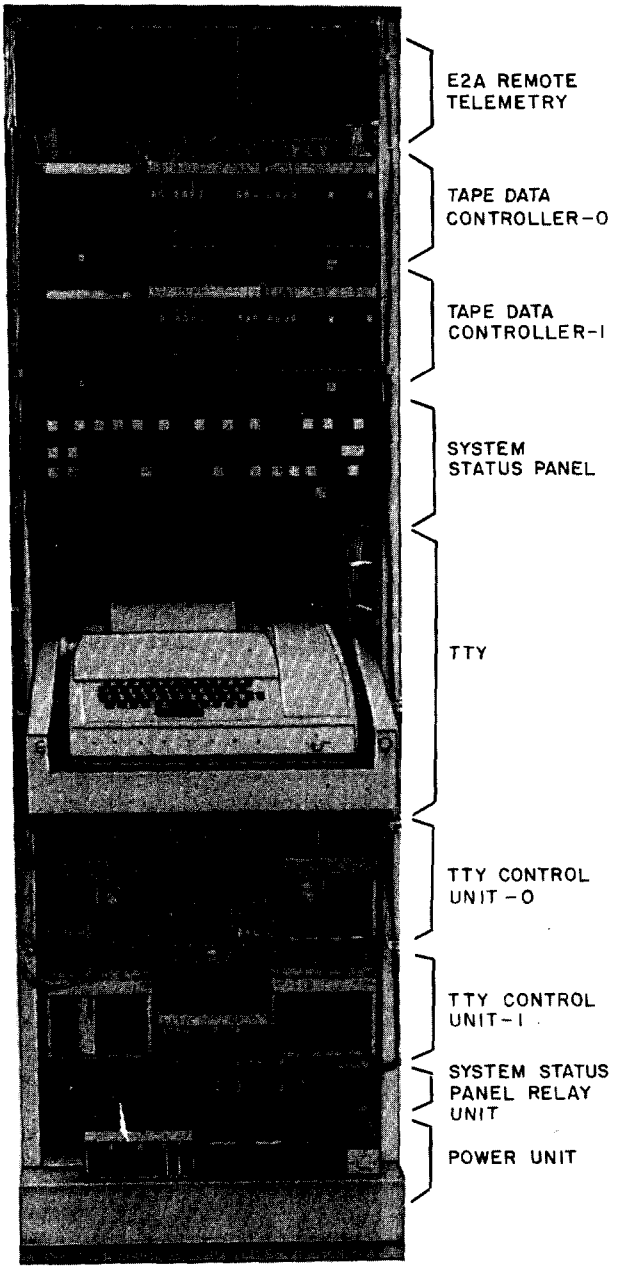


Fig. 3—Common Systems Maintenance Frame

SUPPLEMENTARY MAIN STORE FRAME

2.16 Supplementary main store frames (SMAS) (Fig. 5) are added in pairs and contain:

- Supplementary store power unit
- Main store(s)

Each supplementary main store power unit (SMASPU) contains fuses, a J87421A-1 power converter and optional (growth) J87421A-2 power converter, alarm, and power control circuitry for up to three main stores.

2.17 Each main store (MAS) in an SMAS frame contains a minimum of 6 and a maximum of 12 power converters in addition to the alarm and power control circuitry.

3. THEORY OF OPERATION

POWER INPUT REQUIREMENTS

3.01 Protected +24 volt and -48 volt power from office distribution frames are required for each frame of the 3A Processor with the exception of the PROMATS frame which requires only -48 volt power. Input frame voltage tolerances for +24 volts is +20.75 to +26.25 volts and -42.75 to -52.50 volts for -48 volt power. Power control and alarms for each frame of the 3A Processor will be discussed in the order listed in paragraph 1.03.

PROCESSOR FRAME

3.02 The individually fused +24 volt and -48 volt sources of power to the processor frame are:

BAY 0	BAY 1
+24V A	+24V B
-48V A	-48V B

No other source of power is required for the frame.

FILTERING

3.03 Each bay contains dedicated wiring for input power and provides capacitive filtering (bottom of bay) for +24 volt power (Fig. 6). A 1100 μF capacitor paralleled by a 3300-ohm resistor, protects processor circuitry from input noise and voltage transients.

FUSING

3.04 Each bay contains an identical processor frame power unit (PFPU) which provides power control and fuse protection (Fig. 7). Processor

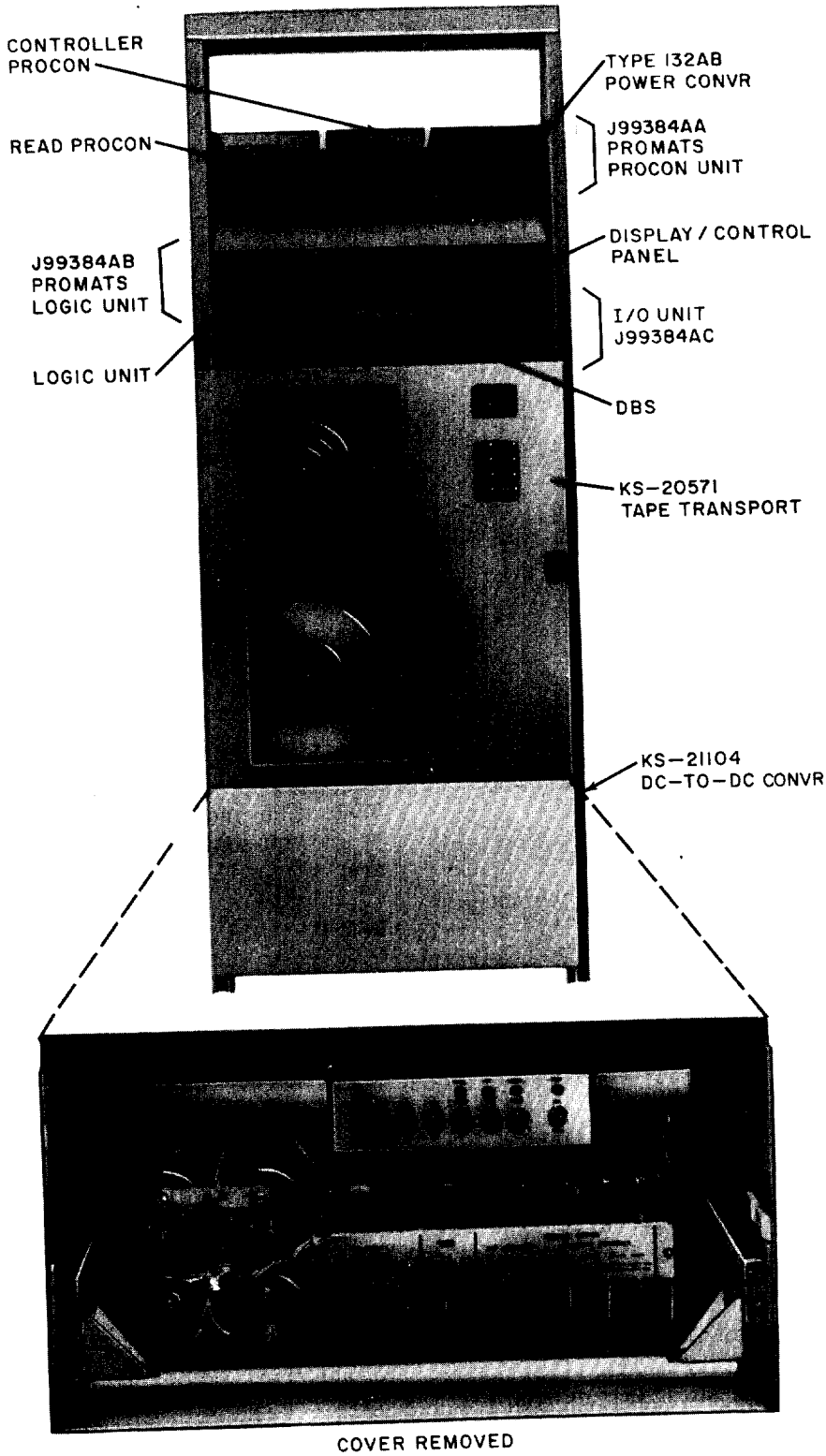
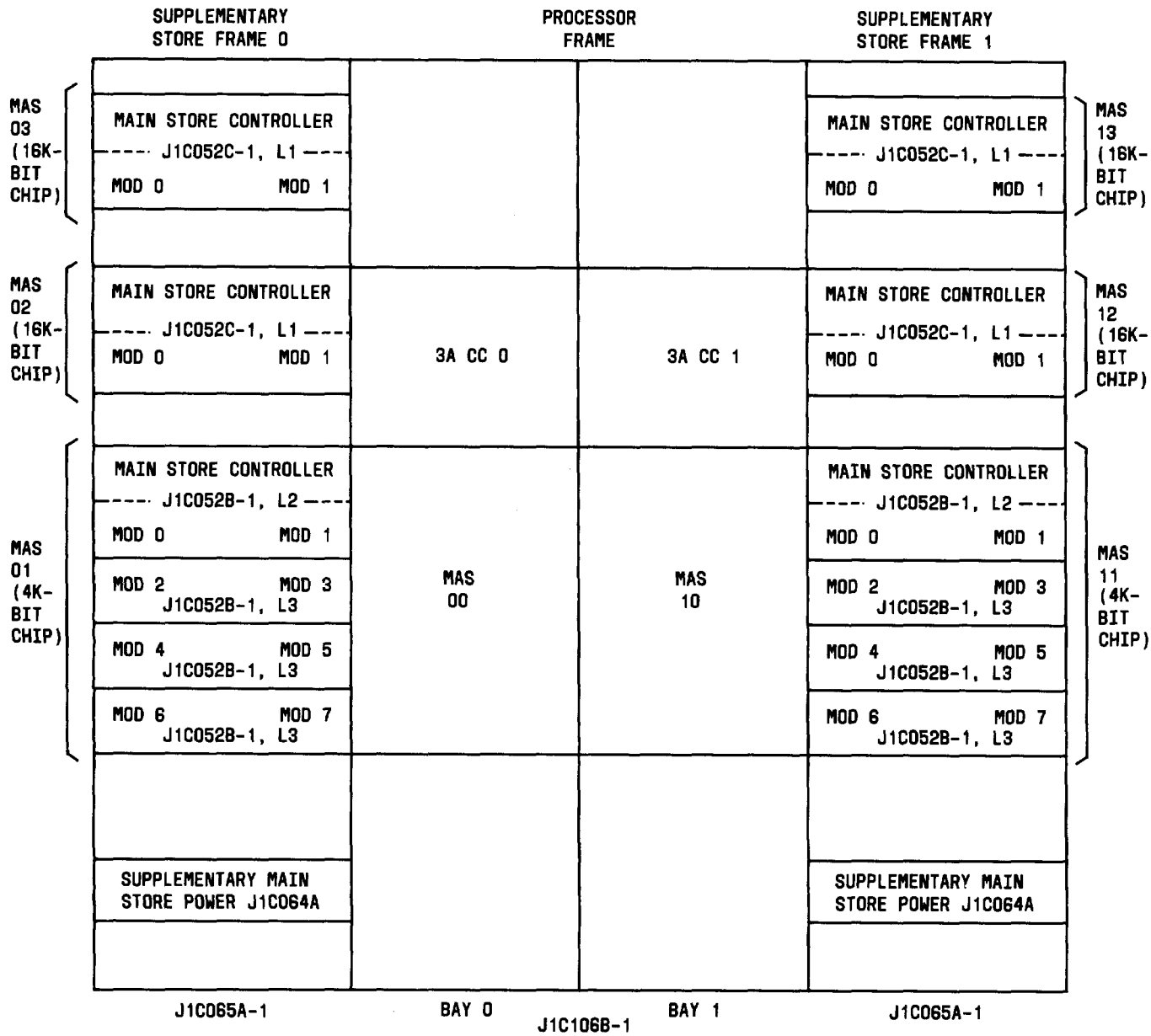


Fig. 4—Programmable Magnetic Tape System



NOTE 1: WHEN MASs 00 AND 01 ARE 4K-BIT CHIP CONFIGURATION, ADDITIONAL MAS PAIRS MAY BE EITHER 4K OR 16K-BIT CONFIGURATION. WHEN MASs 03 AND 13 ARE ADDED, MASs 02 AND 12 MUST ALSO BE 16K-BIT CHIP CONFIGURATION.

NOTE 2: WHEN MASs 00 AND 01 ARE 16K-BIT CHIP CONFIGURATION, ADDITIONAL MASs MUST BE 16K-BIT CHIP CONFIGURATION

Fig. 5—Supplementary Main Store Arrangement

frame circuitry requiring a -48 volt fuse rating of more than 3/4 ampere (A) requires a dedicated pilot fuse. A pilot fuse parallels the main fuse and is provided to perform visual and electrical alarm functions. The main fuse contains no alarm devices and is a fast-blow type. A pilot fuse blows immediately after the main fuse, due to the total load flowing through it, and closes an internal contact to connect either -48 volts or +24 volts on a -48 volt fuse alarm bus (-FA) or +24 volt (+FA) bus circuit, respectively. A single fuse circuit provides its own -FA or +FA alarm circuitry.

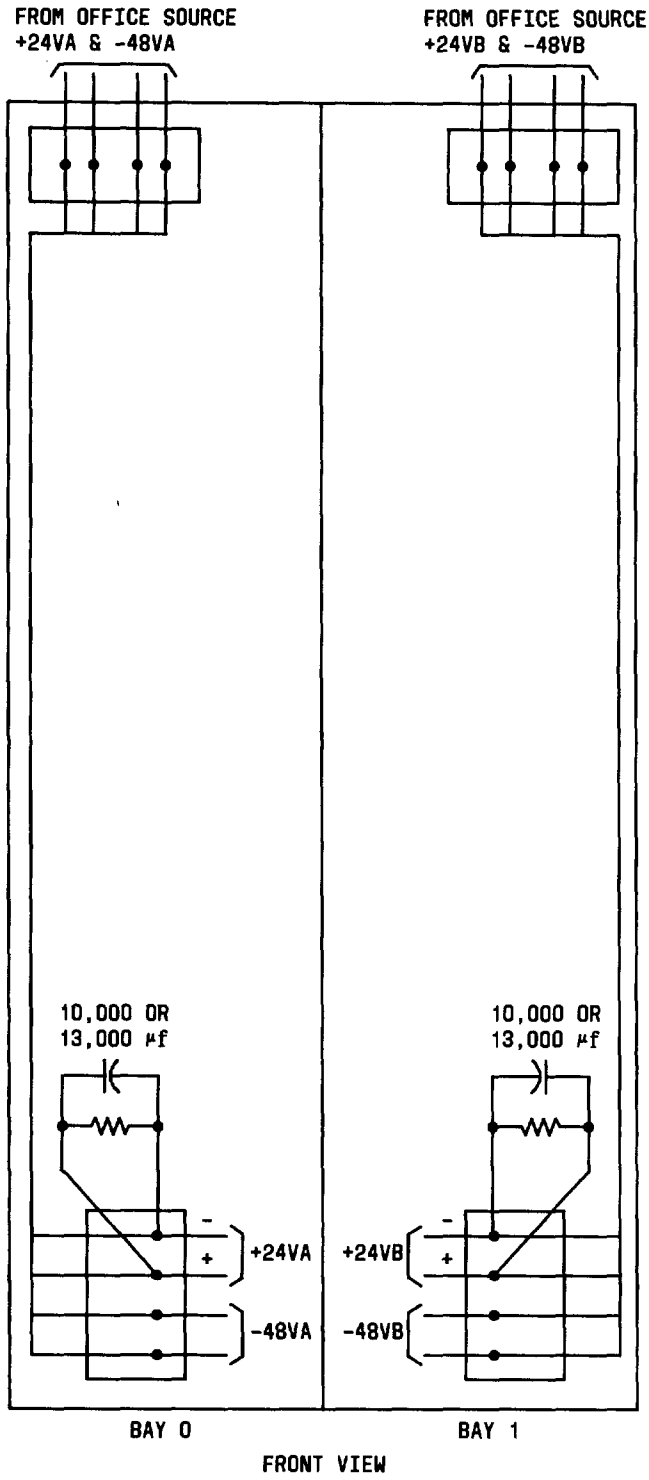


Fig. 6—Typical 3A Processor Frame—Power Input and Filter

The number and type (-48, +24) fuses required in the PFPU is dependent on the size of the 3A CC microstore, MAS, and number of I/O channels.

POWER CONTROL

3.05 A PFPU contains control circuitry to ensure that power is applied to bay circuitry in the proper sequence. Control is via the application of +24 volt start A (STA) and start B (STB) signals (Fig. 8). Start signals are fused and applied to the power converters in a sequence (STA then STB) which ensures the protection of logic and memory circuitry. One STA and three STB relays are contained on the PFPU. An alternate action (OFF-ON) POWER switch, on the 3A CC control panel, is operated to apply +24 volts to energize the STA relay. Contacts of STA relay close to provide fused +24 volt (STA) signals to +3 volt converters in PFPU and MAS, +5 volt converters in the MAS, and a +5 volt converter in the PFPU. These converters require a start voltage to enable converter circuitry. Circuit pack FC210 (PFPU) contains circuitry which delays energizing the STB0, STB1, and STB2 relays from 500 ms to 2 seconds. This delay allows certain logic and memory circuitry to stabilize prior to energizing I/O circuitry thereby preventing erroneous inputs to the 3A CC. Delaying STB also provides time for the MAS +3 and +5 volt power converters to stabilize. The 3A CC controlled "power-up" signal to the PFPU is active only when the 3A CC is in an off-line state. This control prevents inadvertently interfering with the on-line 3A CC. Relay circuitry in the PFPU protects against inadvertent power removal when the 3A CC is on-line. Fuse alarms (FAs) generated by fuses and power converters cause a major (MJ) alarm. Should an MJ alarm exist during power "turn-on", STA is not applied and none of the power converters are activated to produce an output. Circuit pack FC210 contains two other control circuits, B and C (Fig. 9). Circuit B controls MJ and minor (MN) relays; circuit C controls the power alarm test (PAT) and no power alarm (NPA) relays. When a failure occurs such as an FA (MJ alarm), STB is removed before STA (Fig. 8). This provides for an orderly removal of power which protects logic and memory circuitry and minimizes random signals from the I/O circuitry. A normal (off-line) power-off condition also removes STB before STA. A loss of STA, STB, or a major power alarm causes 3A Processor control to be switched to the standby 3A CC and its associated circuitry.

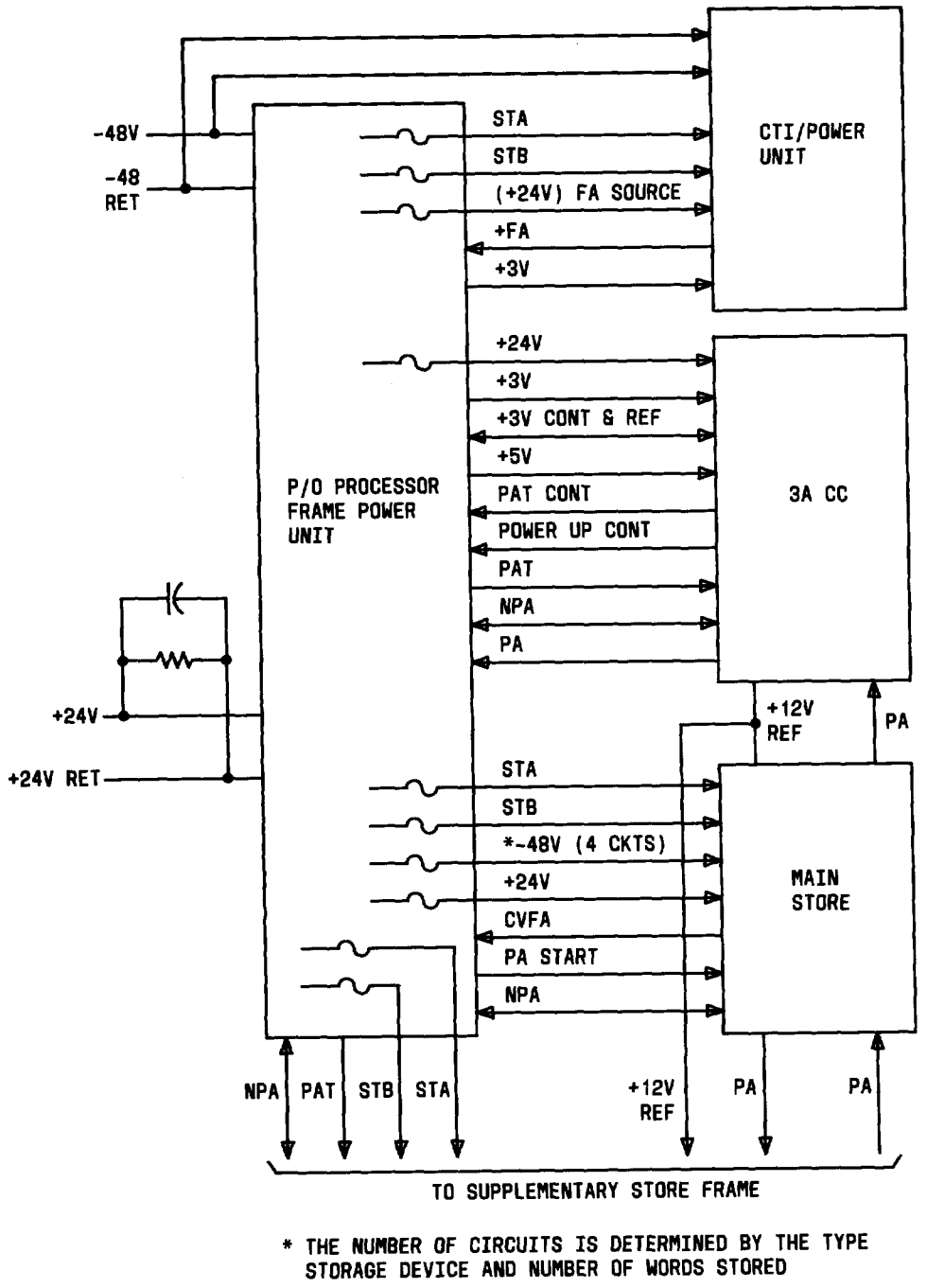


Fig. 7—Processor Frame Power Unit Interfaces

3.06 Circuit packs FB152, FC21, and FC262 contain control circuitry necessary to power-up and maintain a power-on condition. Circuit pack FB152 (in 3A CC) receives +24 volts and generates a +12 volt reference voltage necessary for FC21 and all +3 volt power converters in the bay. FB152 contains a light emitting diode (LED) to indicate a marginal reference voltage condition; it also contains alarm generating circuitry. Circuit pack FC21 (Fig. 10) is used in the 3A CC, MAS, and CTI power unit. This pack receives +12 volt reference and provides a +3 volt reference, and

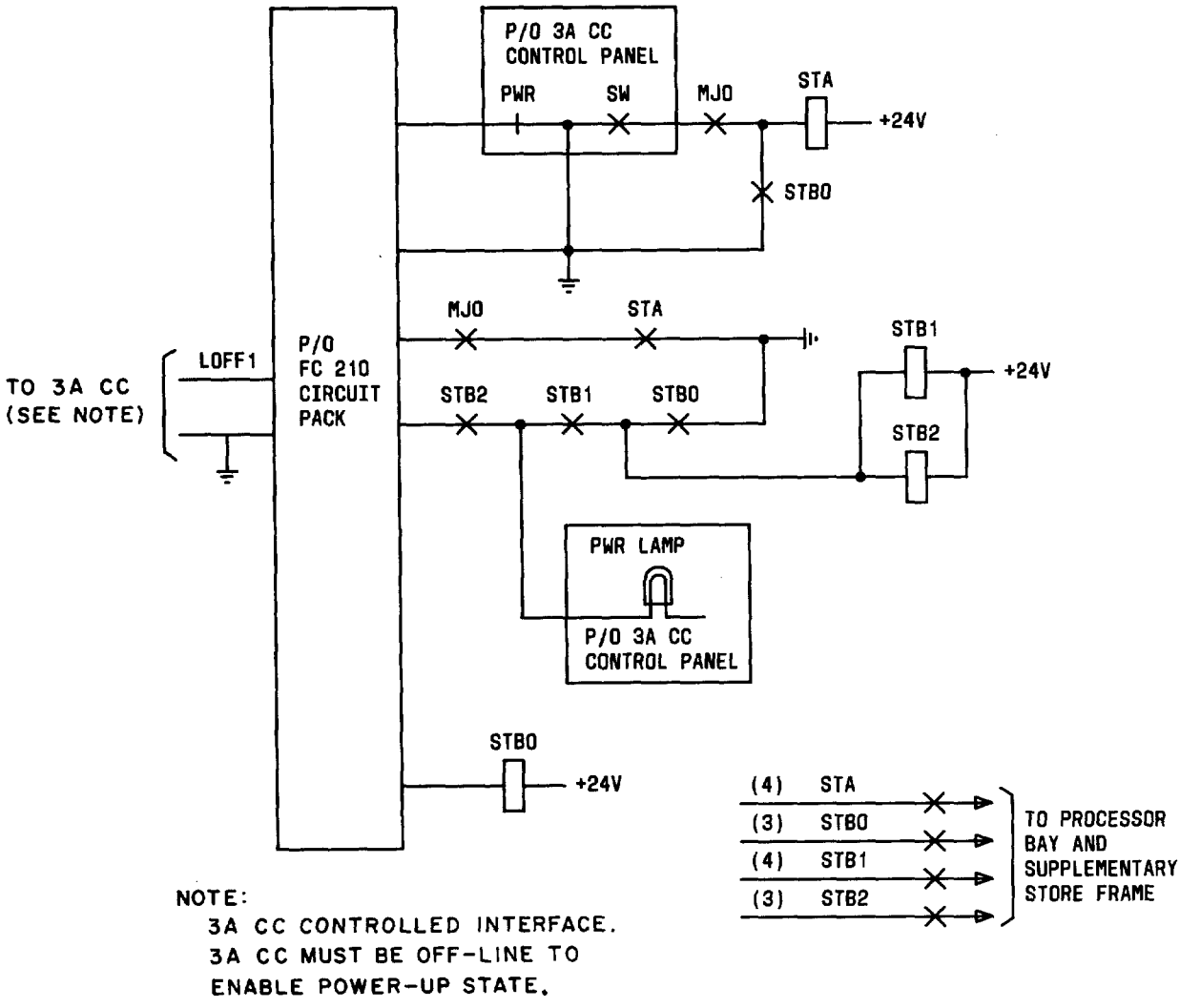


Fig. 8—Processor Frame—Bay Power Control

remote voltage monitoring for two +3 volt power converters. It also provides output filtering for two +3 volt power converters. The two +3 volt references are obtained through a resistive voltage divider. Circuit pack FC262 in the main store controller (MASC) (Fig. 11) determines that each +3 volt converter is providing an output, that a +5 volt converter (in PFPU) is providing an output, and that all the resistor termination boards (959B) in the MAS are connected to provide a continuous loop to FC262. When the conditions of FC262 are met, STB is applied to the +12, -5 volt power converter assigned to each 64K of MAS storage.

COLLECTOR DIFFUSION ISOLATION TO TRANSISTOR-TRANSISTOR LOGIC INTERFACE/POWER UNIT

3.07 The CTI/power unit (Fig. 12) contains up to three 132M power converters. It also contains fuses to protect -48 volt input and +5 volt outputs. An STA signal energizes relay STLP when contacts open a -48 volt shut-down circuit to each 132M which allows the converters to produce a +5 volt output. Each installed parallel channel (PCH) unit has a dedicated power converter. The direct memory access (DMA) unit when installed also has its dedicated 132M power converter. Sets

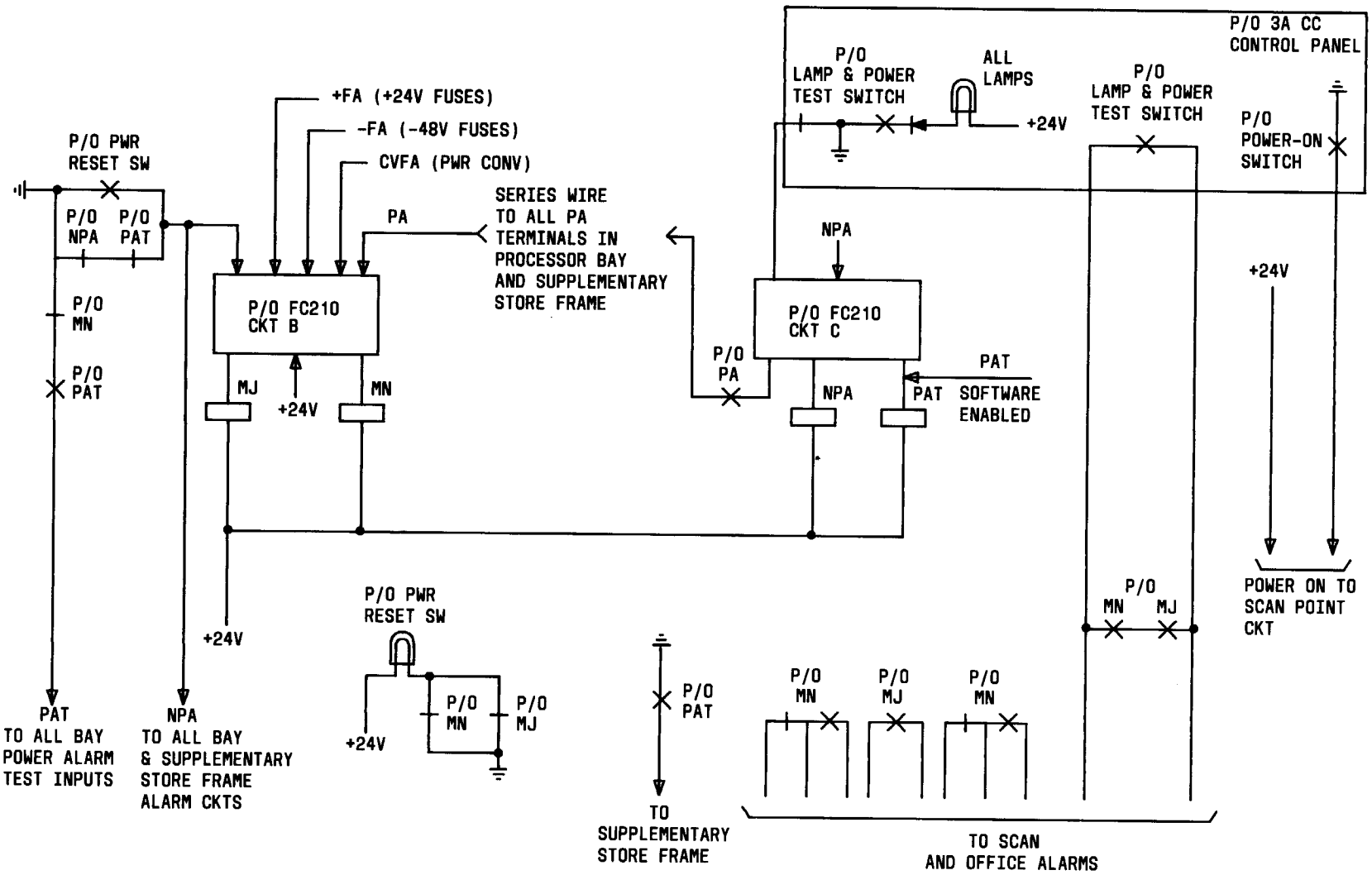


Fig. 9—Processor Frame Power Circuit—Power and Power Alarm Test

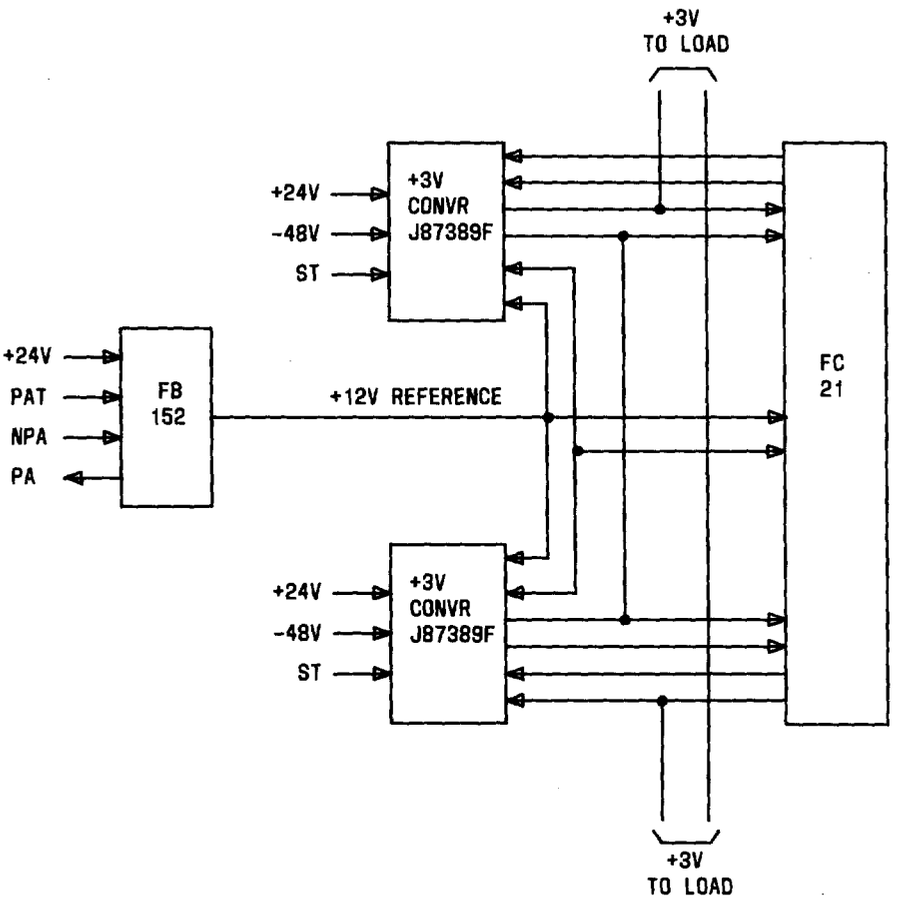


Fig. 10—Typical FC21 Circuit Pack Application

of fuses (Table A) protect the +5 volt output from each converter. Relay STBP is energized by STB and its make contacts provide a delayed +5 volt path to the I/O (bus) circuitry of the PCH and DMA units. Only the 0.5A (70G type) fuses in the CTI/power unit are capable of generating a fuse alarm. Circuit pack FC403 contains alarm relays, +3V (PFPU) power converter output filtering and circuitry which provides +3 volt reference (from +12V) to the dedicated PFPU power converter. In addition FC403 provides a remote voltage sensing (resistive) network for the +3 volt converter. The relays will be discussed in the alarms portion of the processor frame. The CTI portion of the CTI/power unit contains the FC403 and logic level conversion (FA) circuit packs. The FA circuit packs require +3 volts and +5 volts. The +5 volt power is obtained from the 132M (when equipped) dedicated to a DMA. When the DMA is not equipped, the 132M dedicated to PCH0 is used.

PARALLEL CHANNEL UNIT

3.08 Each parallel channel unit power protection is provided via its power converters voltage and current shut-down circuitry.

DIRECT MEMORY ACCESS UNIT

3.09 Direct memory access unit power protection is provided via the power converters voltage and current shut-down circuitry.

POWER CONVERTERS

3.10 Each processor frame bay contains the following type power converters:

- +3 volt J87389F-2
- +5 volt J87389J-2

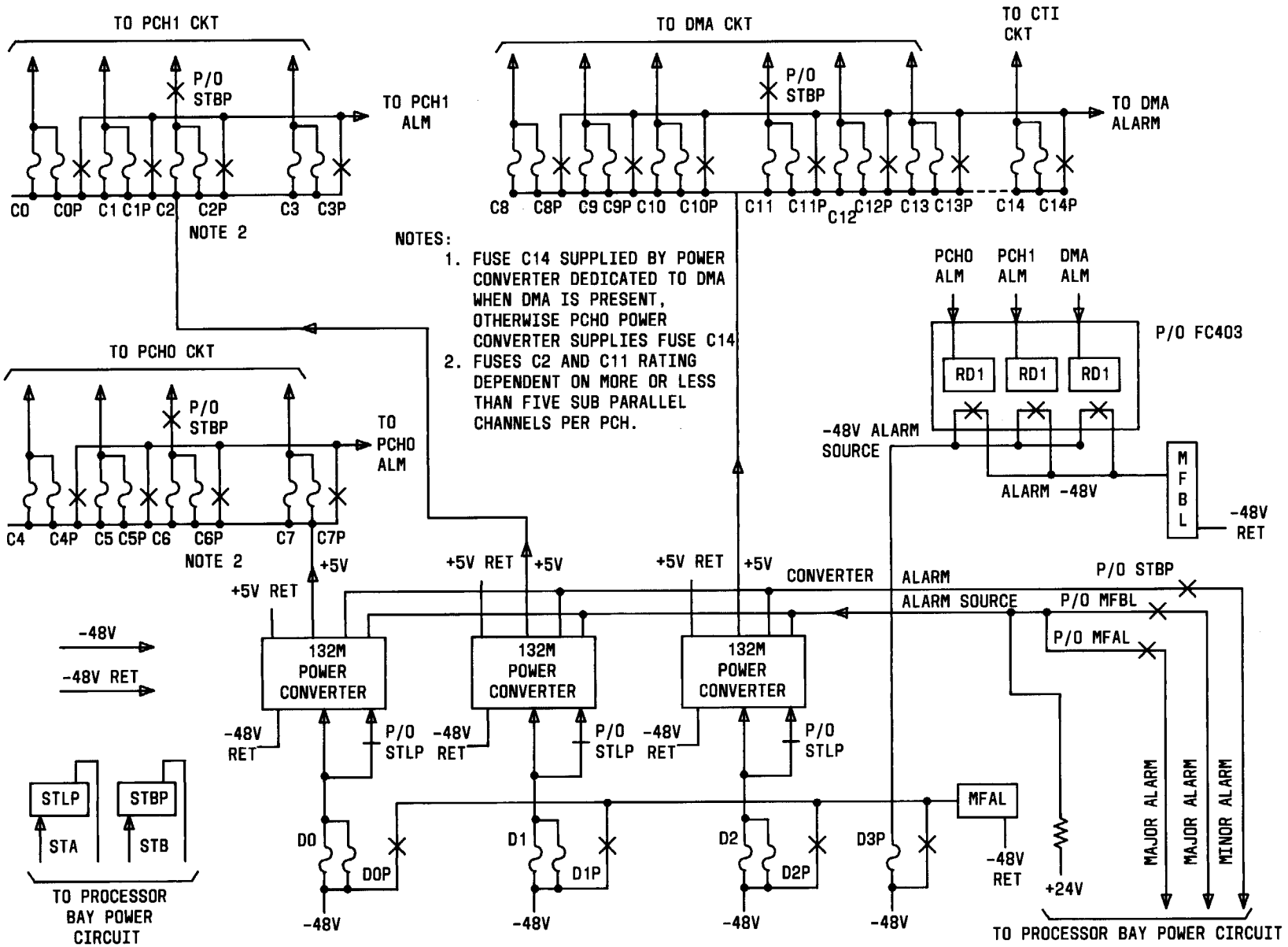


Fig. 12—CTI/Power Unit—Power and Power Alarms

TABLE A

CTI/POWER UNIT FUSES

FUSE DESIGNATION	AMPERAGE	VOLTAGE	UNIT SUPPLIED
D0/D0P	3A/0.5A	−48V	132M Power Converter
D1/D1P	3A/0.5A	−48V	132M Power Converter
D2/D2P	3A/0.5A	−48V	132M Power Converter
C0/C0P	5A/0.5A	+5V	PCH 1 Logic
C1/C1P	5A/0.5A	+5V	PCH 1 Logic
C2/C2P*	5A/0.5A	+5V	PCH 1 Bus
C3/C3P	5A/0.5A	+5V	PCH 1 Logic
C4/C4P	5A/0.5A	+5V	PCH 0 Logic
C5/C5P	5A/0.5A	+5V	PCH 0 Logic
C6/C6P*	5A/0.5A	+5V	PCH 0 Bus
C7/C7P	5A/0.5A	+5V	PCH 0 Logic
C8/C8P	5A/0.5A	+5V	DMA Logic
C9/C9P	5A/0.5A	+5V	DMA Logic
C10/C10P	5A/0.5A	+5V	DMA Logic
C11/C11P	5A/0.5A	+5V	DMA Bus
C12/C12P	5A/0.5A	+5V	DMA Logic
C13/C13P	5A/0.5A	+5V	DMA Logic
C14/C14P†	5A/0.5A	+5V	CTI Logic
D3P	0.5A	−48V	132M Power Converter Alarm Power

* Fuse value increases to 10A when subparallel channels exceed four.

† Fuse C14/C14P fed by DMA converter when equipped, otherwise PCH 0 power converter supplies voltage.

- +5 volt J87389P-1
- +5 volt J87421A-1
- +5 volt J87421A-2
- +12, -5 volt J87422B-1
- +5 volt 132M.

3.11 The +3 volt J87389F-2 power converter requires -48 volt, +24 volt input power and a +24 volt start signal. In addition +12 volt and +3 volt references are required to provide a stable output. Remote sensing of the output voltage (at the load) is provided by a resistive network on FC21 or FC403.

3.12 The +5 volt J87421A-1 and -2 power converters require -48 volt and +24 volt power, and a +24 volt start signal. No external reference is required.

3.13 A +5 volt J87389J-2 power converter (bottom left corner of PFPU) provides power to the MAS 959B resistor termination boards and 3A CC microstore circuitry. This converter and the J87389P-1 require -48 volt and +24 volt power, and a +24 volt start (STA) signal. This converter contains an internal voltage reference.

3.14 The +12, -5 volt J87422B-1 power converter requires -48 volt and +24 volt power, and a +24 volt start (STB) signal. A +5 volt reference (from J87421A-1) is required to maintain an output. Each J87422B-1 converter provides power to 64K words of memory.

3.15 The +5 volt 132M power converter requires only a -48 volt power input. A power on-off switch is mounted on the front panel of the converter. The 132M is prevented from producing an output (when power switch is on) by a -48 volt shut-down voltage via contacts of relay STLP. When the bay is "powered-up", relay STLP is energized and removes the shut-down signal voltage, allowing the converter to produce an output.

ALARMS

3.16 There are two power related alarms in the 3A Processor:

- Minor
- Major.

3.17 On the PFPU, circuit B of circuit pack FC210 (Fig. 9) receives fuse alarms (+FA and -FA), power control circuits and power converter (CVFA), and power converter power alarms (PA). When -48 volt and +24 volt power is applied to the processor frame (bay) relays MJ0 and MN are energized under the control of FC210. Should a fuse alarm occur, the POWER RESET lamp/switch will be lighted as a result of the MJ relay deenergizing. This also prevents the 3A CC control panel POWER switch from applying a ground to the start A (STA0) relay, thus preventing the powering-up of logic circuitry in the bay.

FUSE ALARMS

3.18 Fuse alarms are monitored by the 3A CC and office alarm system as an MJ alarm as a result of the MJ alarm (PFPU) relay dropping out. Circuit B of FC210 receives three types of fuse alarms:

- +FA
- -FA
- CVFA

Each fuse protecting +24 volt power in the bay has contacts to connect +24 volts (via a resistor) to the +FA alarm bus terminating in FC210. The voltage at FC210 is approximately +20 volts during an alarm. Pilot fuses of a lower rating are used in parallel with fuses which are of the "fast-blow" type. Fast blowing 3AG type fuses are not equipped with contacts to indicate that the fuse has blown. In addition to FAs generated as a result of blown fuses, power converters generate an FA when their output voltage and current exceed limits which would be damaging to the logic circuitry being supplied. Circuit pack FC262 (in MASC) also generates an FA when power conditions justify. Circuit pack FC262 monitors the following inputs and generates an FA when any are missing:

- +5 volt power converter (supplies 959B resistor termination boards)
- +3 volt outputs from MAS power converters
- Continuity loop through all 959B termination boards in an MAS

- Power alarm lead from +5 volt converters in MAS and +5 volt converter (location 0205) in PFPC unit

Should the +3 volt output from a J87389F-2 MAS converter not be monitored, or one of the resistor termination boards not be plugged in, or a PA be received from designated +5 volt converters, the FC262 generates an FA (approximately 20 volts) and removes STB from the +12, -5 volt converters (J87422B-1) in the MAS. In addition, the FA is sent to the FC210 in the PFPU to cause the MJ relay to drop out. The FC262 FA output circuit also monitors any of the other converter FA signals generated in the bay. Upon sensing an external FA, the FC262 removes (MAS) STB signals in the bay. Each power converter (132M) in the CTI/power unit contains an internal relay whose contacts close to supply a +20 volt minor alarm signal to the PFPU minor alarm monitoring circuit pack (Fig. 12).

3.19 A -FA is received, at FC210, on the -FA alarm bus. This bus is active when a pilot fuse "blows" and places -48 volts (through a resistor) on the bus. A -FA causes the MJ relay to deenergize and signal a major alarm condition.

POWER ALARMS

3.20 Each of the power converters in the processor bay (except 132M) generates a power alarm (PA) (Fig. 9). The 132M generates a low voltage alarm which is treated as a power alarm. With the exception of a J87389J-2 power converter (+5 volt) associated with the MAS and J87421A-1 +5 volt power converters in the MAS, all other power converters PA is connected to the FC210. An alarm condition (PA) causes the MN relay to drop out and generates a minor alarm.

FAULT INDICATORS

3.21 Each of the power converters, circuit pack FB152, and circuit pack FC262 contain an LED which lights to indicate a power fault. The PFPU unit contains a POWER RESET switch (lamp-switch) which is lighted when a major or minor alarm condition exists. Each pilot type fuse contains a captive plastic rod which projects through a hole in the fuse cap when the fuse is blown. This allows the craftsperson to see at a glance which fuses are blown.

POWER MAINTENANCE

3.22 Should a power converter in the processor bay (except 132M) produce a PA, an LED on the converter is lighted, a minor alarm is generated, and the incandescent lamp in the PFPU POWER RESET switch is lighted. The 132M low voltage alarm is treated as a PA and produces the same result. When the alarm is generated by a transient condition, the alarm and visual indicators may be retired by momentarily depressing POWER RESET switch on the PFPU. This action places a momentary ground on the input of FC210 alarm circuitry which resets the minor alarm relay to its normally energized state. A ground is also applied to the NPA lead of all power alarm circuits to extinguish the LEDs. Should a power converter or power type circuit pack generate a fuse alarm, circuit pack FC210 senses the alarm and deenergizes the MJ relay creating an MJ alarm condition. The power converter causing the alarm will have its LED lighted. Should a fuse be the reason for the alarm, the fuse or its pilot will display a visual indicator through the center of the fuse cap. In either event, POWER RESET lamp will light. When the fault has been cleared, the bay must be "powered-up" in the OFF-LINE (3A CC controlled) state. A major alarm causes the loss of STA and STB signals to power converters and control circuits. When a 3A CC and dedicated circuitry are "ON-LINE" the POWER switch cannot turn power off (Fig. 8). This prevents an accidental removal of power and possible loss of service.

POWER ALARM TEST

3.23 A power alarm test (PAT) condition is created in the processor bay by depressing and holding LAMP & POWER TEST switch (Fig. 9). A PAT tests the alarm circuitry for each converter and power control circuit pack equipped with an LED, and causes all the "lamps" of the 3A CC control panel to be illuminated. A normally grounded lead from LAMP & POWER TEST switch is opened during test and causes circuit C of FC210 (PFPC) to deenergize the NPA relay and energize the PAT relay. Several actions take place simultaneously during the test. A make contact on the PAT relay applies a positive voltage (approximately +20 volts from FC210) to the power alarm lead of all power converters (except 132M) and power control circuit packs equipped with a power alarm circuit. The power alarm terminals are in series from one assembly to another

and terminate in the PA input (circuit B) of the FC210. A minor alarm is generated by relay MN deenergizing, but is not recognized by the 3A CC due to a set of contacts on the LAMP & POWER TEST switch preventing the external alarm. Relay contacts on the energized PAT relay in series with contacts on the deenergized MN relay apply a ground to the PAT terminal of each power converter (except 132M) and power control circuit packs containing LED alarm circuitry. The PAT ground causes the alarm circuitry to be exercised, however internal (to each unit) circuitry prevents the unit from shutting down. The NPA lead from each power converter and power control circuit pack is tied to FC210 alarm clearing circuitry (circuit B). When all LEDs have been visually checked, the LAMP & POWER TEST switch is released. Five simultaneous actions occur at this time.

- Ground return is removed from all 3A CC control panel lamps
- Ground is applied to circuit C of FC210 which deenergizes the PAT relay and energizes the NPA relay
- +20 volts is removed from PA network
- Ground is removed from the PAT network
- Relay NPA is delayed (by a capacitor) from energizing and momentarily applies a ground to the NPA network which extinguishes the alarm LEDs
- The delayed NPA relay contacts also apply a momentary ground to circuit C of FB210 to reset the minor alarm circuitry thus allowing the MN relay to reenergize. When the MN relay energizes, the POWER RESET lamp (on PFPU) ground return is opened to extinguish the lamp.

SOFTWARE POWER ALARM TEST

3.24 A PAT is performed under 3A CC control. When this occurs, the software (diagnostics) control energizes PAT relay. This test may also be initiated from the TTY. Since the 3A CC initiates the test, LED and lamp indications are of no concern. Only the normally closed minor alarm terminals are checked for an open condition, indicating an alarm condition. When the 3A CC controlled test is ended, the 3A CC checks the alarm contacts for a closed condition.

OFFICE ALARMS

3.25 Normally open and normally closed alarm relay contacts (on the PFPU) provide major and minor power alarm indicators to the office alarm system. Both open and closed contacts are provided for office alarm system flexibility.

SUPPLEMENTARY MAIN STORE FRAMES

3.26 Each main store may have added storage capability via the addition of two supplementary main store frames (SMASFs). Power control and alarms are under control of the processor frame (bay 0 or bay 1) power and alarm control circuitry. This interface and SMAS will be discussed in the SMASF portion of this section.

MAINTENANCE FRAME

3.27 Duplicate and independent sets of -48 volt and +24 volt power (-48A, +24A and -48B, +24B) enter the maintenance frame on separate terminal boards (Fig. 1) at the top of the frame. Each set is wired to a filter assembly and the maintenance frame power unit. Filtering for +24 volt power is supplied by a 10,000 μF capacitor across the +24 volt input leads. The capacitor filters noise and voltage transients, preventing them from reaching logic and control circuitry. Duplicate power sources provide TTYC and tape data controller (TDC) units with a separate (either A or B) source of power (Fig. 13). In addition, the SSPC and SSPR units are designed such that either set of voltages (A or B) will provide power to SSP, SSPC, and SSPR units. A constant source of +24 and -48 volt power is available to an optional E2A telemetry unit.

TELETYPE

3.28 The maintenance TTY receives 120 volt 60 Hz protected power from a dedicated convenience outlet on the maintenance frame, adjacent to the TTY. Protected power is obtained from commercial power. Should that fail, the office battery supplies -48 volts to a DC to AC inverter, which supplies the TTY until commercial power is available. Protected power control, fusing, and alarms are external to the maintenance frame and provided by the office.

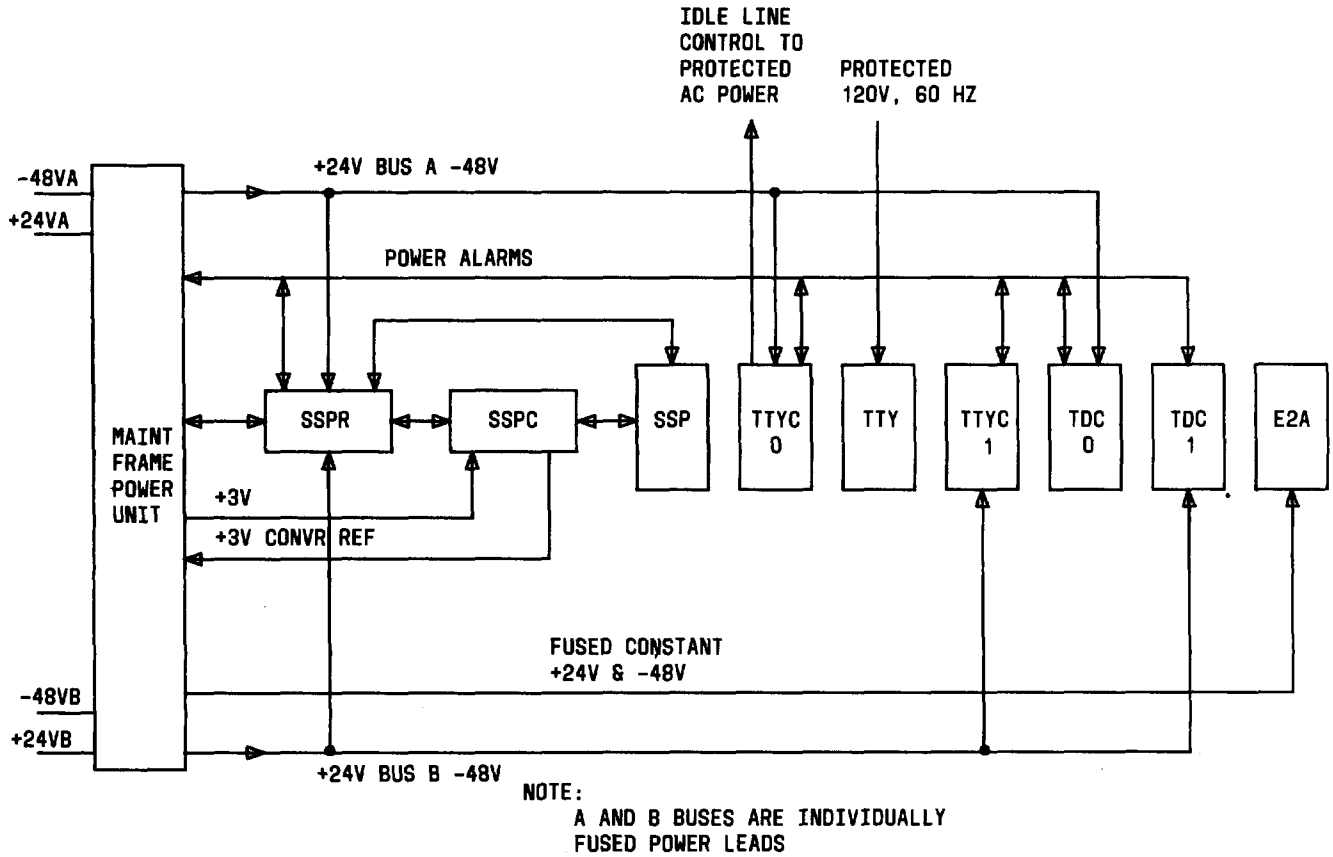


Fig. 13—Maintenance Frame Power—Block Diagram

MAINTENANCE FRAME POWER (MFP) UNIT

3.29 The MFP unit provides fuse protection for:

- MFP unit
- TTYC units 0, 1
- TDC units 0, 1
- SSP and SSPC units
- SSPR unit

The application of +3 volt power to the SSPC is under the control of the SSP POWER switch and associated circuitry in the SSPR unit and MTCE frame power unit. The SSPR unit supplies +24 volts from either the A or B source to the start leads of the two J87389F +3 volt power converters contained on the MTCE frame power unit (Fig. 14). The TTYC and TDC units contain power control circuitry which does not require an external ST signal.

MAINTENANCE FRAME ALARMS

3.30 Two FC210 alarm monitoring and alarm control circuit packs (Fig. 14, Fig. 15) and seven alarm control relays monitor frame FAs and PAs. A control relay (PAB24) on the power unit applies +24V B bus power to alarm relays and FC210 control circuitry. Six of the seven relays MJ0, MJ1, MJ2, MJ3, MN, and NPA are energized during normal (no alarm) operation. Relay PAT is energized only during a PAT test.

MAJOR ALARMS

3.31 When one of the four MJ relays deenergizes, its contacts signal an alarm condition (Fig. 15). The relay is controlled by dedicated monitoring circuitry on one of the two FC210 circuit packs. Table B lists the MJ relays and the power conditions

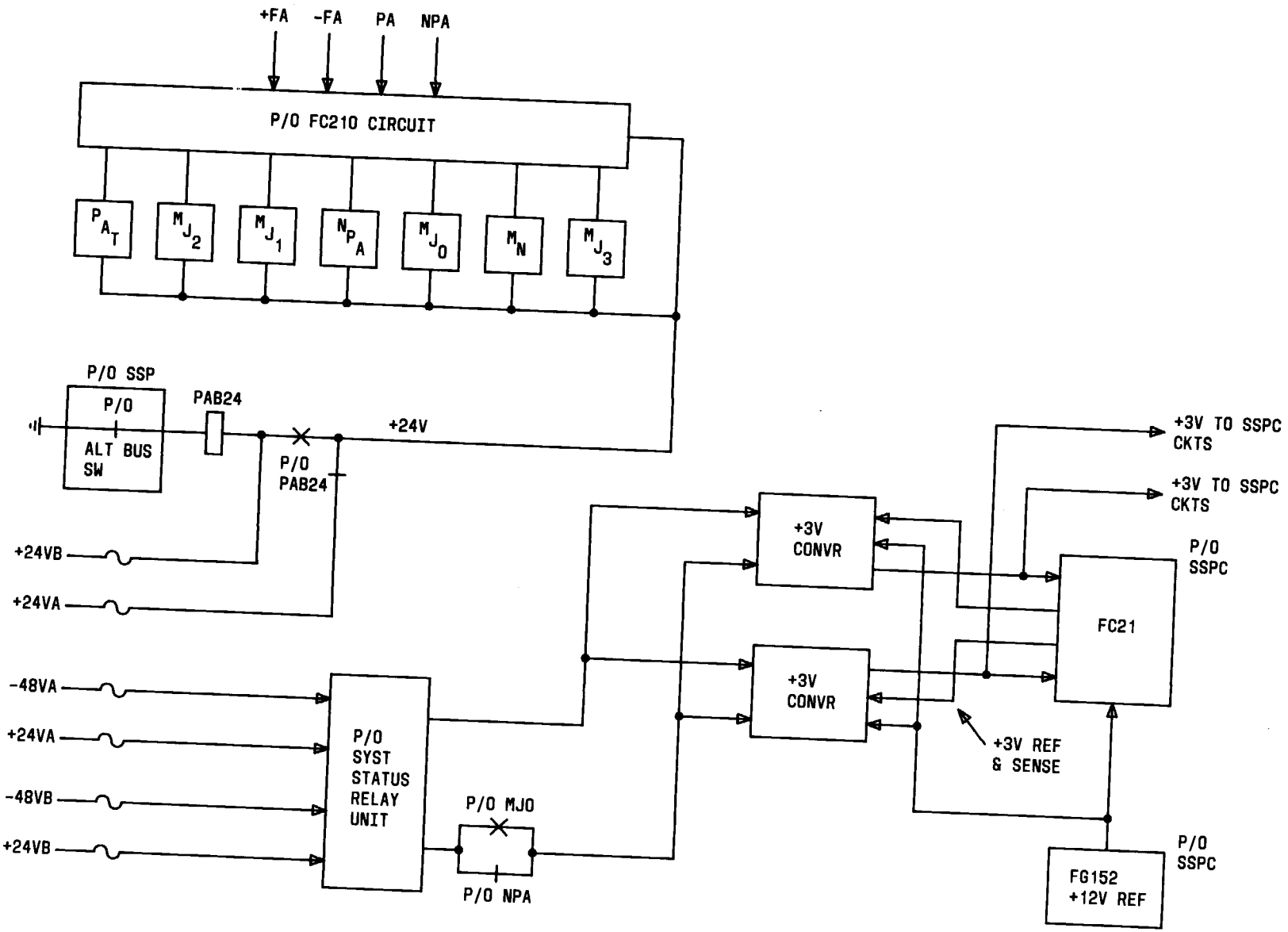


Fig. 14—Maintenance Frame +3 Volt Converters and Alarm Relay Power

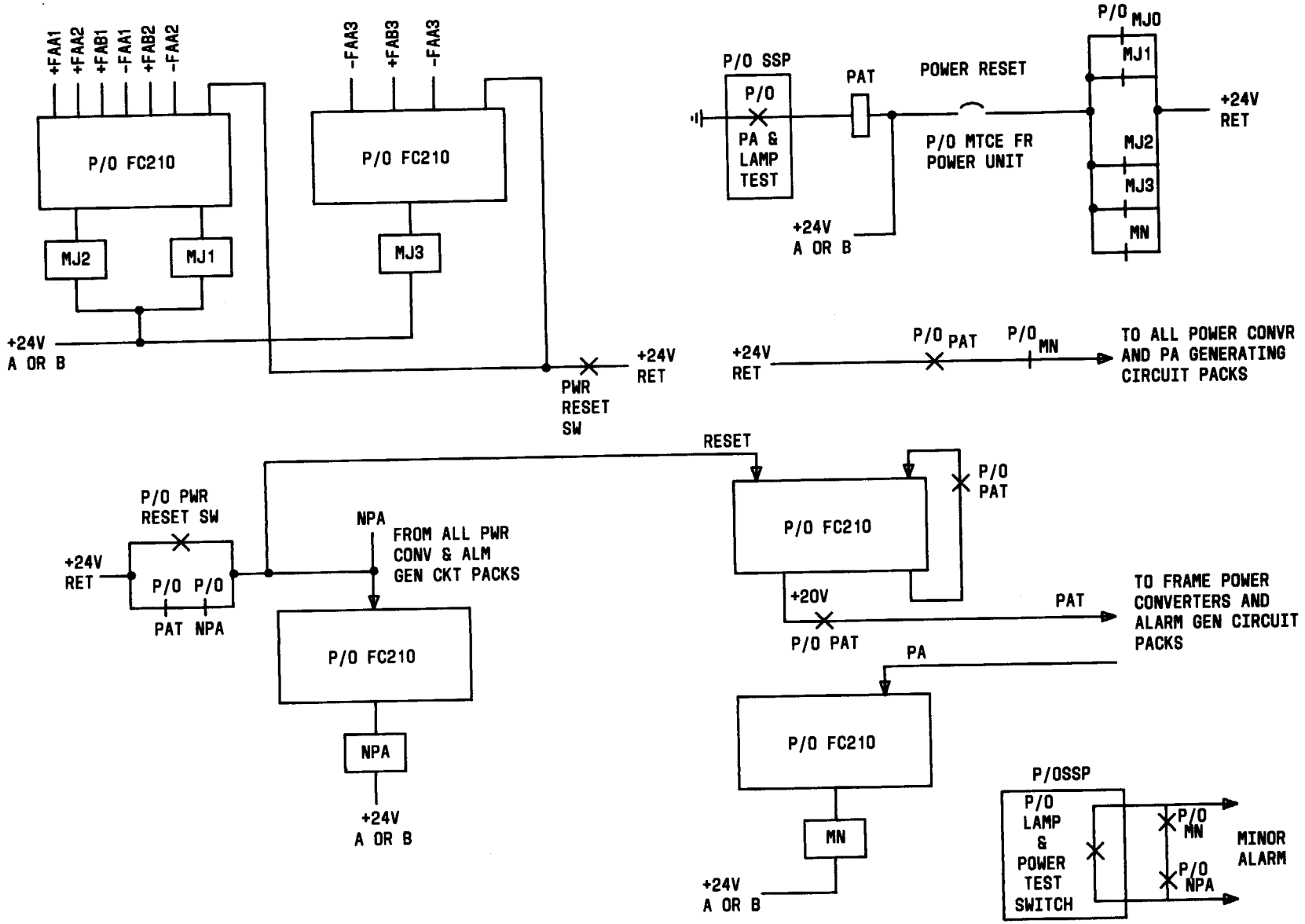


Fig. 15—Maintenance Frame Power Unit—Power Alarm Test and Reset

which are monitored to energize a particular relay. Major relays are energized by FAs from power converters and fuses.

MINOR ALARMS

3.32 The MTCE frame power unit contains one MN relay. Circuit pack FC210 circuitry monitors power alarms from power converters and PA generating circuit packs, in the maintenance frame, and deenergizes the MN relay when a PA is sensed. Table B lists the causes of maintenance frame minor alarms. An MN alarm may be retired when the cause no longer exists, by momentarily depressing the PWR RESET switch. This action also extinguishes the PWR RESET lamp.

MAINTENANCE FRAME POWER ALARM TEST

3.33 Depressing the SSP LAMP & POWER TEST switch (Fig. 15) energizes PA circuitry in the maintenance frame. Relay circuitry in the SSPR unit and power unit causes a +20 volt signal to be applied to the PA terminals of all power converters and PA generating circuit packs in the frame. The PA network is wired from unit to unit and terminates in circuit B of one of the FC210 circuit packs. The MN relay is then deenergized. When the PAT relay is energized, a ground is also applied to each PAT terminal on the assemblies which generate a PA. When the assembly responds to the PAT (ground input) its NPA terminal drops from approximately +20 volts to +4 volts. The +4 volt NPA terminals are monitored in two groups, in separate FC210 circuitry. When both sets of NPA terminals are true, the NPA relay is deenergized. Each assembly containing a PA LED should be lighted, the SSP LEDs and lamps should be lighted, and POWER RESET switch-lamp should be lighted. The LAMP & POWER TEST switch (on SSP) contains additional contacts which bypass (short) a set of MN alarm scan points to prevent the 3A CC from generating a minor alarm. A minor alarm may be generated via software control by applying a ground to the PAT relay. In this event the MN alarm contacts are not inhibited and the 3A CC monitors the presence of an alarm. Upon releasing the PAT relay, the 3A CC monitors for the absence of a minor alarm. The PWR RESET lamp (switch) is lighted during the test and extinguished when the test is complete.

TAPE DATA CONTROLLER

3.34 The TDC is duplicated in the maintenance frame (Fig. 13, Fig. 16) with each TDC receiving fuse protected power from a dedicated bus. The TDC contains an alternate action (push) TDC POWER ON switch with incandescent bulb. The TDC POWER ON switch contacts supply +24 volt start power to the two self contained J87421A +5 volt power converters, lights the TDC POWER ON switch, provides -48 volts to the TDC buffer circuit, and supplies -48 volts and +24 volts to the cartridge tape transport (CTT). The optional synchronous data set controller (SDSC) also receives -48 volt and +24 volt power via the TDC POWER ON switch. The two +5 volt power converters receive -48 volt and +24 volt power directly from the MTCE frame power unit fuses. An FA from the two power converters is returned to circuit B of the FC210 (02-16) circuit pack. An FA causes an MJ alarm in the frame which is subsequently sensed by the 3A CC via scan points. The MTCE frame power unit monitors PA, PAT, and NPA functions for the power converters. There are no provisions for remote control of power in the TDC.

TELETYPE CONTROLLER UNIT

3.35 The TTYC is duplicated in the maintenance frame (Fig. 13, Fig. 17). Each TTYC is fed from a separate bus; A-power bus feeds TTYC 0. Each TTYC contains:

- +3 volt power converter J87389F
- FC21 +3 volt reference and filter circuit
- FB152 +12 volt reference circuit pack
- FB494 circuit pack
- Power switch

The +3 volt converter produces an output when the TTYC POWER switch is operated, +24 volts is applied to the following:

- TTYC POWER lamp-switch (incandescent)
- TTYC circuitry
- +3 volt power converter

TABLE B

MAINTENANCE FRAME FUSES

FUSE DESIGNATION	AMPERAGE	POWER BUS	VOLTAGE	UNIT SUPPLIED
AA0A/AA0AP	2A/0.5A	A Bus	+24V	SSPR
AA0B/AA0BP	2A/0.5A	B Bus	+24V	SSPR
AA1A	0.5A	A Bus	+24V	ALM CKTS
AA1B	0.5A	B Bus	+24V	ALM CKTS
AB0A/AB0AP	2A/0.5A	A Bus	+24V	TTYC 0
AB0B/AB0BP	2A/0.5A	B Bus	+24V	TTYC 1
AC0A	0.75A	A Bus	+24V	TDC 0
AC0B	0.75A	B Bus	+24V	TDC 1
A1	1.75A	A/B Bus	−48V	E2A
A0A	2A	A Bus	−48V	SSPR
A0B	2A	B Bus	−48V	SSPR
B0A	2A	A Bus	−48V	TTYC 0
B0B	2A	B Bus	−48V	TTYC 1
C0B	1.75A	B Bus	−48V	TDC
C1B	2A	B Bus	−48V	TDC
C0A	1.75A	A Bus	−48V	TDC
C1A	2A	A Bus	−48V	TDC
AA2	0.75A	A/B Bus	+24V	SSP LEDs
AA3	1.3A	A/B Bus	+24V	SSP Incandescant Lamps
AA4	0.5A	A/B Bus	+24V	E2A

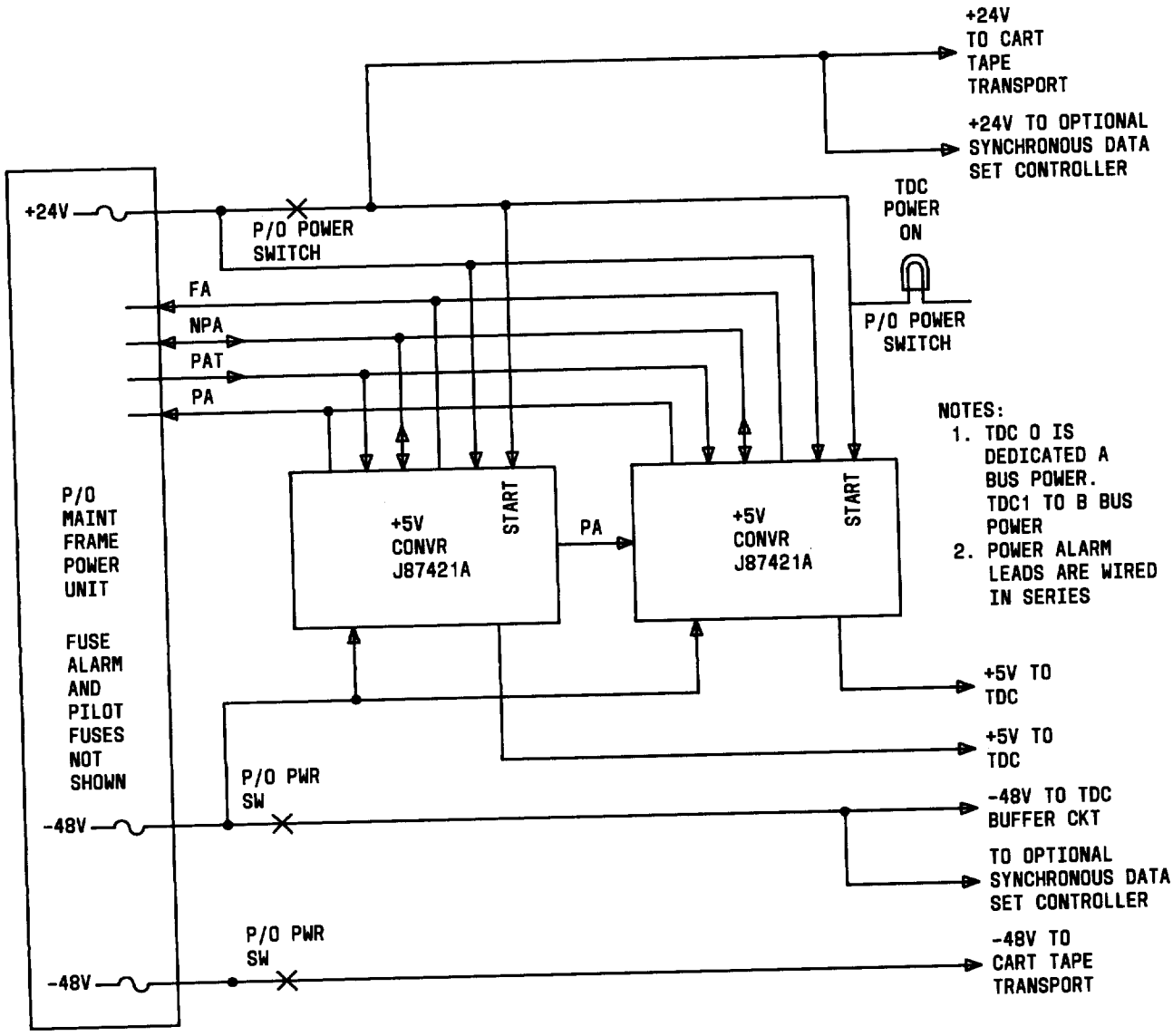


Fig. 16—Tape Data Controller Power and Power Alarms

Operation of the POWER switch also applies -48 volt power to a -48 volt to -24 volt converter on circuit pack FB494. The -24 volt output is fed to TTYC circuitry. The PA terminals of FB152 and the +3 volt converter are tied together and become a part of the power alarm network which terminates in circuit pack FC210 and the MTCE frame power unit. Power alarm test (application of ground) and NPA terminals from the TTYC are also monitored in the MTCE frame power unit. An FA from the +3 volt converter is terminated in FC210 circuitry. There is no provision for remotely controlling power in the TTYCs. During a PAT, the LED on the +3 volt converter and on FB152 are lighted. They are extinguished when the test is finished.

PROGRAMMED MAGNETIC TAPE SYSTEM FRAME

3.36 The PROMATS frame (Fig. 4) is duplicated. Each frame is fed from a dedicated -48 volt bus, PROMATS frame 0 from -48V(A), and PROMATS frame 1 from -48V(B). The frame contains two power converters, one type 132AB (+5V) for logic circuitry and the other a KS-21104 for the tape transport (Fig. 4, Fig. 18). The -48 volt input to the frame is fused in an office power distribution frame.

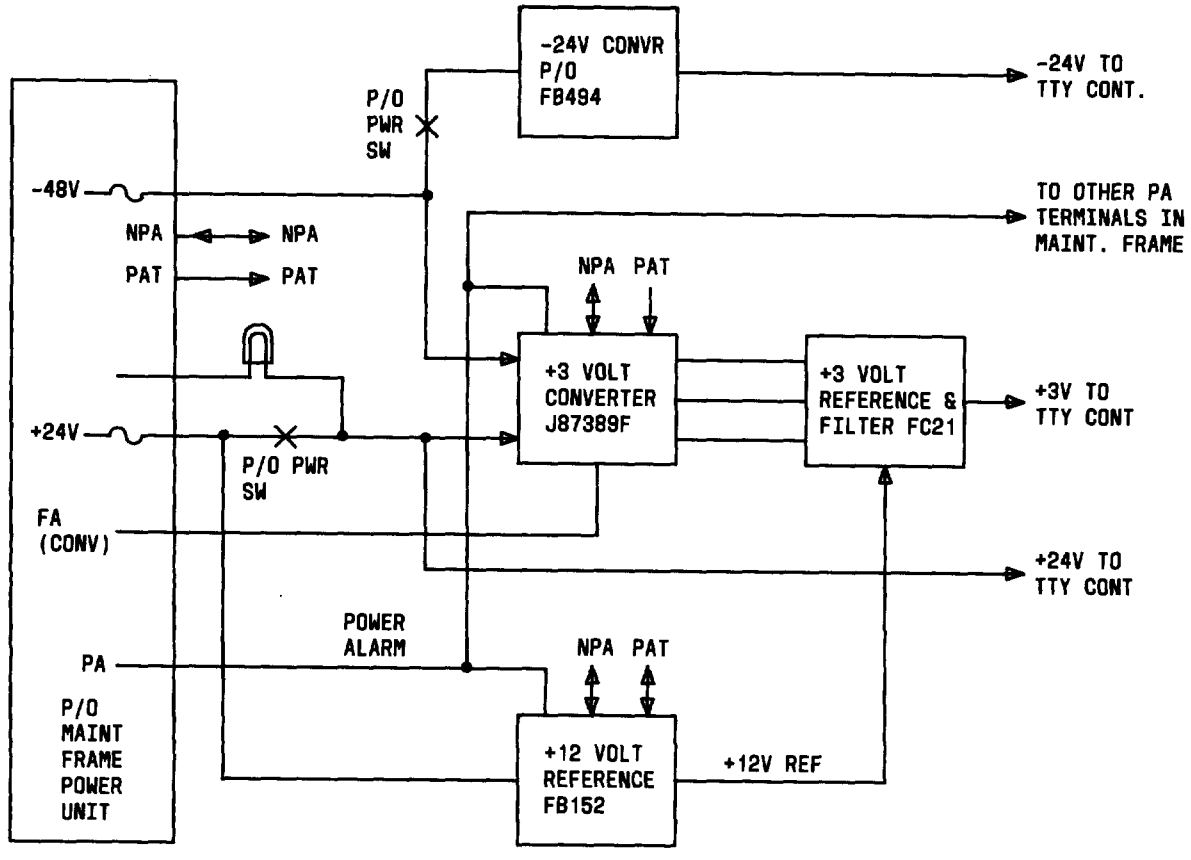


Fig. 17—TTY Controller Unit Power and Power Alarms

DC—DC CONVERTER (KS-21104)

3.37 The -48 volt power is fed to the converter (KS-21104) without frame fuse protection. The converter is actually two converters which are interrelated. One converter supplies -24.5 volts, the other supplies +5.3 volts, -15 volts, and +15 volts to the tape transport. An on-off switch (accessible by removing converter cover) energizes an internal relay which controls -48 volt surge current and enables the converters to produce an output. Table C lists converter outputs and fuse values.

CONVERTER ALARMS

3.38 A high voltage alarm (HVA) LED, beneath the cover, lights to indicate when the -23.5 volt or +15 volt output exceeds preset levels. The +5.3 volt and -15 volt outputs are slaved to +15 volts. The LED is lighted for the following conditions.

- Over voltage
- Over current
- Input (-48 volts) low.

CONVERTER MAINTENANCE

3.39 Fuses in the KS-21104 protect the power converter and KS-20571 tape recorder circuitry. An over-current (output) condition is sensed in the converter and causes the output voltage to be reduced, thus protecting the converter and its tape recorder load. Should the -48 volt bus input decrease to -42.5 volts, the converter ceases to produce an output until the input is greater than the critical value. The self contained fuses are not "alarm" types. Test points are provided on the secondary side of fuses F3, F4, F5, and F6.

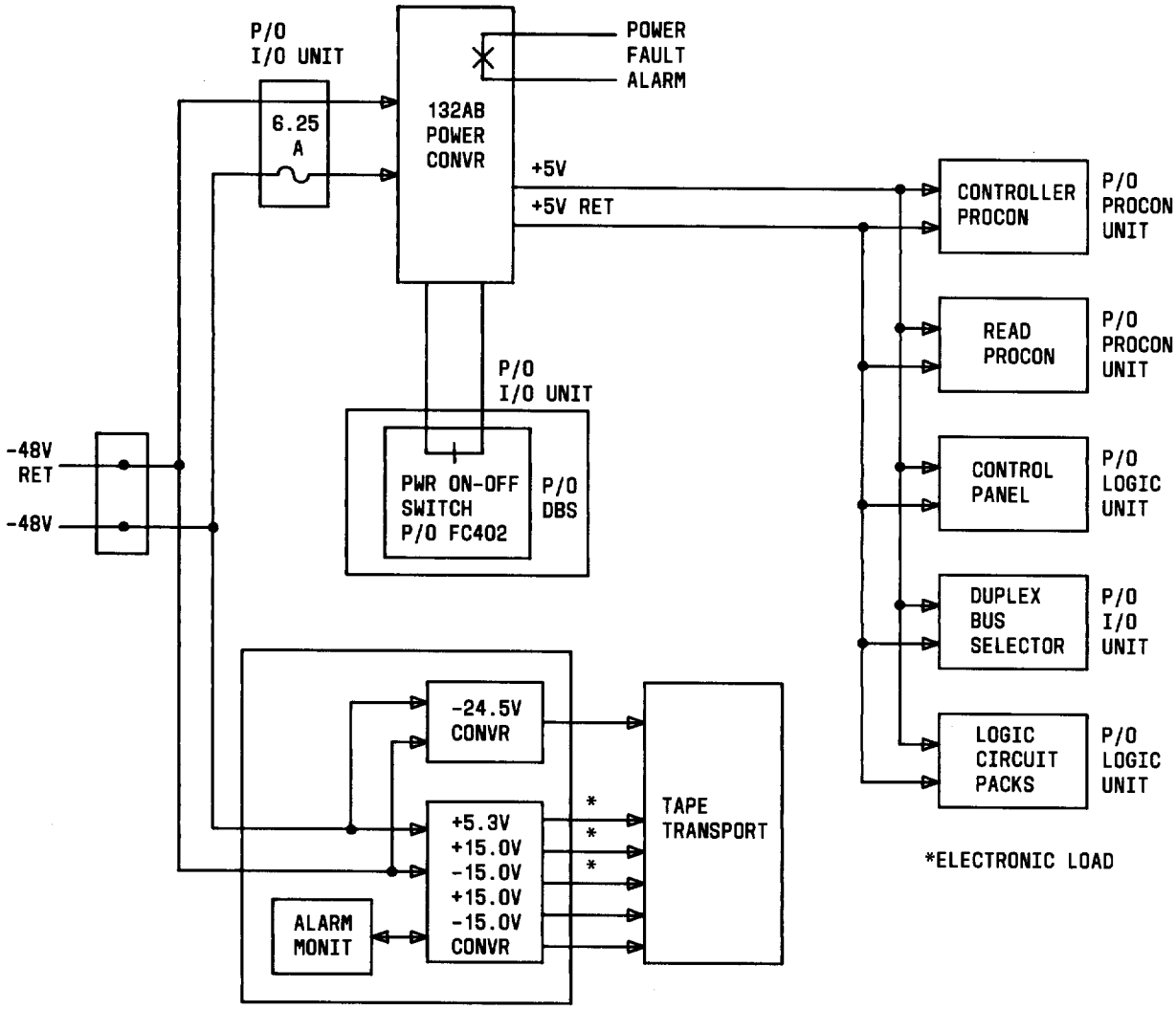


Fig. 18—Programmed Magnetic Tape System Frame—Power Block Diagram

132AB POWER CONVERTER

3.40 The 132AB DC—DC converter is housed in the J99384AA Programmed Magnetic Tape System—Procon Unit (Procon Unit). A 6.25A nonalarm fuse on the J99384AC I/O panel protects -48 volt power to the converter. The +5 volt output (not fused) powers PROMATS logic circuitry. A front panel on-off switch bypasses surge current limiting (-48 volt) circuitry and enables the converter to produce an output.

132AB ALARMS

3.41 A front panel low voltage alarm (LVA) LED lights to indicate that the output is too low. An output voltage below 4.4 volts causes the LVA circuitry to be activated and energize a self-contained relay. Contacts 13 and 14 are made to provide an alarm condition for 3A Processor use. An overcurrent condition causes internal circuitry to reduce the output voltage and thus output current. Circuitry fed by the 132AB would fail to function and cause a software initiated alarm to be generated.

132AB POWER CONVERTER CONTROL

3.42 The self contained (front panel) converter on-off switch and the FC402 (part of duplex bus selector) circuit pack POWER ON-OFF switch must be ON for the converter to produce an output. When the FC402 power switch is in the OFF

TABLE C

KS-21104 POWER CONVERTER FUSES

FUSE DESIGNATION	AMPERAGE	VOLTAGE	UNIT SUPPLIED
F1	8A	$+15\ ^{+1.2V}_{-1.2V}$	KS-26571
F2	8A	$-15\ ^{+1.2V}_{-1.2V}$	KS-26571
F3	25A	$-24.5\ ^{-1.0V}_{+1.5V}$	KS-26571
F4*	6A	$+15\ ^{+1.2V}_{-1.02V}$	KS-26571
F5*	5A	$+5.3\ ^{+0.53V}_{-0.53V}$	KS-26571
F6*	2A	$-15\ ^{+1.2V}_{-1.2V}$	KS-26571

* Feeds electronic loads.

position, -48 volts is applied to the converter shutdown terminal.

SUPPLEMENTARY MAIN STORE FRAME

3.43 The SMAS frames are added in pairs, to the processor frame (Fig. 5). Each SMAS frame contains a J87421A power unit and up to two SMASs (Fig. 19). Supplementary main stores are added in pairs with each SMAS frame receiving an SMAS.

SUPPLEMENTARY MAIN STORE FRAME POWER

3.44 Each frame receives dedicated +24 volt and -48 volt power from the system (office) bus (Fig. 1). Dedicated fuses on the SMAS frame power unit protect power and start voltages to equipped SMASs.

SUPPLEMENTARY MAIN STORE POWER UNIT

3.45 A SMASPU provides sequential control of STA and STB signals via self contained STA and STB relays (Fig. 19). Dedicated fuses (Table D) protect STA, STB, and +24 volt and -48 volt power to equipped MASs. A +5 volt power converter, on the SMASPU, provides power to 959B resistor termination boards. A second +5 volt power converter is added when a third MAS is installed in the SMAS frame.

CONTROL

3.46 Power (+24 volt and -48 volt) is applied to all power converters in the frame when bus power is applied to the frame. Each converter produces an output upon receiving a start voltage (ST). The STA relay is energized via an STA signal from a dedicated processor frame bay. An STB signal approximately 500 ms after STA energizes the STB relay. Circuit pack FC262 performs the same function in all stores. Each +12, -5 volt converter in an SMAS receives an STB signal from the FC262 when the following conditions have been met:

- +3 volt power converters (J87389F-2) are functioning
- +5 volt power converters (J87389J-2 and J87421A-2) in power unit is functioning
- +5 volt power converters on power unit and +5 volt (J87421A-2) on main store memory unit are not in a PA state

TABLE D

SUPPLEMENTARY MAIN STORE POWER UNIT FUSES

FUSE DESIGNATION	AMPERAGE	VOLTAGE	UNIT SUPPLIED
A0/A0P	3/0.75A	−48V	MAS1 +3V Converter
A1/A1P	3/0.75A	−48V	MAS1 +5V & (+12, −5V) Converter
A2/A2P*	3/0.75A	−48V	MAS1 +5V & (+12, −5V) Converter
A3/A3P*	3/0.75A	−48V	MAS1 +5V & (+12, −5V) Converter
A4/A4P*	3/0.75A	−48V	MAS1 +5V & (+12, −5V) Converter
A5/A5P	3/0.75A	−48V	MAS2 +3V Converter
A6/A6P	3/0.75A	−48V	MAS2 +5V & (+12, −5V) Converter
A7/A7P	3/0.75A	−48V	MAS3 +3V Converter
A8/A8P	3/0.75A	−48V	MAS3 +5V & (+12, −5V) Converter
A10	0.75A	−48V	SMASPU +5 Volt Converter (First)
A11	0.75A	−48V	SMASPU +5 Volt Converter (Second)
B0	0.75A	+24V	MAS1 PWR Converter Logic
B1	0.75A	+24V	MAS2 PWR Converter Logic
B2	0.75A	+24V	MAS2 Start B
B3	0.75A	+24V	MAS1 Start B
B4	0.75A	+24V	MAS2 Start A (+5V Converter)
B5	0.75A	+24V	MAS1 Start A (+5V Converter)
B6	0.75A	+24V	MAS1 Start A (+3V Converter)
B7	0.75A	+24V	MAS3 Start A (+3V Converter)
B8	0.75A	+24V	SMASPU Start A (+5V Converter)
B9	0.75A	+24V	SMASPU Logic (+5V Converter)
B10	0.75A	+24V	MAS3 PWR Converter Logic
B11	0.75A	+24V	MAS3 Start B

Note: P designates a pilot fuse.
* Designates added 32K or 64K memory modules.

- All 959A and 959B resistor termination boards are plugged in to provide continuity to FC262.

SUPPLEMENTARY MAIN STORE FRAME ALARMS

3.47 Power and fuse alarms generated in a supplementary store frame are routed to its dedicated processor bay. There are no alarm scan points in the supplementary store frame. Four alarms are wired to the processor frame bay:

- +Fuse alarms (fuses)
- -Fuse alarms (fuses)
- Fuse alarms (power converters)

- Power alarms.

Fuse alarms cause the processor bay alarm circuitry to remove STB which in turn causes a removal of +12, -5 volt power to the memory storage circuit packs. Concurrently the standby 3A CC—MAS is switched on-line. A power alarm signal to the processor bay causes a minor alarm relay to deenergize which provides scan point alarm circuitry conditions. The processor bay POWER RESET switch resets the minor alarm circuitry, if the alarm generating condition no longer exists. A PA from the J87421A-1 +5 volt converters, in the supplementary store frame, causes an associated FC262 circuit pack to generate an FA alarm which is routed to the processor bay alarm monitoring circuitry. When an alarm condition exists in the SMASF power converters or FC262, an LED is lighted on the front of the assembly.

MAINTENANCE

3.48 A power alarm test of the processor frame bay also includes its SMAS frame. An LED on the FC262 circuit pack of each MAS (under test) and all power converters in the supplementary store frame lights to indicate that the test has been initiated. When the POWER TEST switch is released, the LEDs are extinguished. When a second MAS is added (to each frame) the PA leads are wired such that during a power alarm test, all PA terminals in the supplementary store frame are placed in series and terminate in the FC210 circuit of the processor bay.

4. REFERENCES

4.01 The following information may assist in understanding this section:

- J99384A—Programmed magnetic tape system (PROMATS)
- J1C060A—Maintenance frame
- J1C065A-1—Supplementary main store frame
- J1C106B-1—Auxiliary 3A Processor frame
- CPS-FB152—+12 volt reference circuit.

5. GLOSSARY

5.01 A glossary of terms is provided to aid in the understanding of definitive words used in this section.

Converter Fuse Alarm—A fuse alarm generated by a power converter to indicate that the converter is no longer producing an output.

CTI/Power Unit—Collector diffusion isolation to transistor-transistor logic interface/power unit.

CTT—Cartridge tape transport.

DMA—Direct memory access.

Fuse Alarm (FA)—A voltage placed on an alarm bus as a result of a fuse blowing.

MAS—Main store.

MASC—Main store controller.

No Power Alarm (NPA)—A ground applied to the NPA terminal of each power converter and power alarm generating circuit pack.

PCH—Parallel channel.

PFPU—Processor frame power unit.

Power Alarm (PA)—An alarm generated as a result of a power converter output voltage exceeding its normal regulating range. Also certain voltage reference circuit packs generate a power alarm.

Power Alarm Test (PAT)—A ground applied to the PAT terminal of each power converter and power alarm generating circuit packs, during the test period.

PROMATS—Programmed magnetic tape system.

SDSC—Synchronous data set controller.

SMAS—Supplementary main store.

SMASPU—Supplementary main store power unit.

SSP—System status panel.

SSPC—System status panel controller.

SSPRU—System status panel relay unit.

STA—Start A.

STB—Start B.

TDC—Tape data controller.

TTYC—Teletypewriter controller.