

1 PACKET SWITCHING SYSTEM (OVERVIEW)

ENGINEERING GUIDELINES AND EQUIPMENT ORDER PREPARATION

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1. GENERAL

1.01 This section provides general information, hardware description, and requirements for the AT&T Western Electric® 1 Packet Switching System (1PSS). Also included are job aids (work sheets) for the preparation of the E-8202 questionnaire for the 1PSS.

1.02 Whenever this practice is reissued, the reason(s) for reissue will be listed in this paragraph.

1.03 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

1.04 The terms and specifications provided in this document are relative to 1PSS equipment arranged to operate with Release 3 programs.

2. 1 PACKET SWITCHING SYSTEM

A. Purpose of the 1PSS

2.01 The 1 Packet Switching System (1PSS) is used to provide a time-division multiplexed data switching capability between customer access lines and/or trunks connected to other 1 packet switch systems (Fig. 1). The 1PSS not only performs the packet switch function, but a 1PSS also serves as the Network Control Center System (NCCS). All lines and trunks are provided via facilities of DATAPHONE* Digital Service (DDS) or other common carrier service. The 1PSS can be used to provide data services such as AT&T ACCUNET† Packet Services, Regional Bell Operating Company (RBOC) Local Area Data Transport (LADT) service, or to serve other applications and customers.

B. Composition of the 1PSS

2.02 The 1PSS consists of the Packet Administrative Module (PAM), which is the AT&T 3B20D computer, the Packet Switch Module (PSM), and the optional Remote Packet Modules (RPMs) (Fig. 2).

C. Primary Access to the 1PSS

2.03 Access to the 1PSS is provided by the AT&T Western Electric® Channel Service Unit (CSU), the AT&T Western Electric® Data Service Unit (DSU), or other equipment that performs the same functions.

D. Remote Access to the 1PSS

2.04 Remote access to the 1PSS is provided by Remote Packet Modules (RPMs) or other equipment that performs the same functions. The RPMs are connected to the PSM by trunks. The RPMs may be either Model 1 (for synchronous inputs) or Model 2 (for asynchronous inputs). The RPMs can be collocated with the PAM and PSM for convenience.

* Registered service mark of AT&T.

† Service mark of AT&T.

3. FUNCTIONAL DESCRIPTIONS

A. Packet Administrative Module (PAM)

3.01 The PAM is the AT&T 3B20D Model 2 computer (Fig. 3). The 3B20D is a duplex computer system. Each side consists of a central processing unit, its 32-bit word memory, a Direct Memory Access Controller (DMAC), Input/Output channels, and standard peripherals. The off-line storage consists of moving head disks for processor boot and recovery and 9-track magnetic tape for measurement and billing output and initial program loading. The 3B20D computer also provides the interface to craft peripherals including display terminals, printers, and alarm devices. Input/Output circuits are provided to accommodate the following features.

- Automatic Message Accounting (AMA) teleprocessing
- Switching Control Center System (SCCS)
- Software Change Administration and Notification System (SCANS) II

B. Packet Switching Module (PSM)

3.02 The PSM consists of one or more (up to five) Packet Switch (PS) frames. Each PS frame can be equipped with 12 Packet Switch Units. Each Packet Switch Unit (Fig. 4) serves either two, four, or eight links (either lines or trunks or combinations of each). The Packet Switch Unit is a 16-bit simplex microprocessor based interface for bidirectional access lines or trunks (2.4, 4.8, 9.6, or 56 kb/s facilities). The circuitry for two Packet Switch Units is located in one apparatus rack; it is designated as a 4Axy processor. Each half of the 4Axy processor is a separate Packet Switch Unit.

3.03 Each half of the 4Axy processor consists of six major components. The following are the components of each half of a 4Axy processor (each Packet Switch Unit).

- Central Processing Unit, a TN-907 circuit pack
- Memory, a TN-908 circuit pack (two required)

- Duplex Dual Serial Bus Selector, a TN-69B circuit pack which interfaces with the 3B20D Model 2 computer.

- Data Service Unit Interface, a TN-906 circuit pack

- Link Interface, either a TN-909B or a UN-245 circuit pack. Each TN-909B Link Interface accommodates one line or trunk. Each UN-245 Link Interface accommodates up to four lines or trunks. Each Packet Switch Unit can be equipped either with two TN-909B circuit packs or with one or two UN-245 circuit packs.

- Power Converter, a 495-KA circuit pack.

The capacity of the PS frame is 12 Packet Switch Units, six 4Axy processors (up to 96 lines or trunks).

C. Digital Patch Unit (DPU)

3.04 The Digital Patch Unit (Fig. 5) is used to provide in-service monitoring and temporary reassignment of links between the 1PSS Packet Switch Module and the Data Service Unit (or other equipment that performs the same functions). There are two types of Digital Patch Units. The RS-232C Patch Interface Unit provides 16 interfaces that meet the RS-232C specifications. The V.35 Patch Interface Unit provides 12 interfaces that meet the 1980 Consultative Committee for International Telephone and Telegraph (CCITT) V.35 specification. The capacity of a Patch frame is 10 Digital Patch Units.

D. Data Service Unit (DSU)

3.05 The AT&T Western Electric 500B-type DSU (Fig. 6) serves one line or trunk and provides an interface between the Channel Service Unit and the Digital Patch Unit. At the CSU interface, it provides timing recovery, synchronous sampling, proper coding/decoding of signals, and detection of network control codes. For the Packet Switch Unit, the baseband bipolar signals from the DATAPHONE Digital Service channel are converted to serial unipolar signals that are sent to the Packet Switch Module through the Digital Patch Unit. The capacity of a DSU frame is 25 DSUs.

E. Channel Service Unit (CSU)

3.06 The AT&T Western Electric 550A-type CSU (Fig. 7) serves one line or trunk and provides access to the synchronous DATAPHONE Digital Service (DDS) channel local loop with equalization and local loop loss. It also serves to provide DATAPHONE Digital Service maintenance personnel with a remote-controlled, looparound-testing capability. The capacity of a CSU frame is 50 CSUs.

F. Model 1 Remote Packet Module

3.07 The Model 1 Remote Packet Module (Fig. 8) terminates originating subscriber access lines on one side, and the data transmission link on the other. The Model 1 Remote Packet Module unit accepts data from synchronous user terminals and transmits data to the PSM. The Model 1 Remote Packet Module performs various operations to communicate with the subscriber and simultaneously connect up to 124 access lines (limited by traffic capacity) on a single 56-kb/s DATAPHONE Digital Service facility to the PSM.

3.08 The Model 1 Remote Packet Module unit is made up of a processor complex subunit and two line group subunits. The processor complex subunit contains the intelligence of the Model 1 Remote Packet Module. It handles the communication protocol functions in addition to the network and craft terminal interface for inquiries. Each line group subunit contains its own power converters and up to 16 circuits packs (line cards). When fully equipped, a single Model 1 Remote Packet Module unit has a total of 31 line cards available for assignment for subscriber access lines. A dial access line card has four ports for assignment. A direct access line card via the Data Subscriber Loop Carrier (DSLCL) System has three ports for assignment. The first line card number 0 is assigned as the Test Access Circuit (TAC). A Model 1 Remote Packet Module frame can be equipped with two Model 1 Remote Packet Module units which will require two 56-kb/s DATAPHONE Digital Service facilities.

G. Model 2 Remote Packet Module

3.09 The Model 2 Remote Packet Module (Fig. 9) terminates originating subscriber access lines and connects to the PSM through the Data Service Unit (DSU) and the Channel Service Unit (CSU). The Model 2 Remote Packet Module accepts data from

asynchronous user terminals and transmits data to the 1PSS. The Model 2 Remote Packet Module performs various operations to communicate with a subscriber and simultaneously connect up 120 dial access lines for a fully equipped Model 2 Remote Packet Module frame.

3.10 The Model 2 Remote Packet Module unit for 24 dial access lines is a MICOM Model M8500-24 Packet Assembler/Disassembler (PAD). The MICOM unit handles the communication protocol functions and the network and craft terminal interface. A Model 2 Remote Packet Module frame can be equipped with five MICOM Model 8500-24 PADs (120 dial access lines).

3.11 Each MICOM Model M8500-24 PAD or 24 dialup access lines require a 9.6 kb/s DDS facility. A fully equipped Model 2 Remote Packet Module frame would require five 9.6 kb/s DDS facilities which interconnect with the PSM.

4. ENGINEERING GUIDELINES

4.01 When calculating the hardware requirements for a 1PSS, the engineer must be provided with the following:

- Location of the Base Wire Center.
- Location of the Remote Packet Modules (RPMs).
- Number of dial access lines required at each Remote Packet Module. (Dial access line is a circuit at the Remote Packet Module to which a telephone number is assigned.)
- Number of direct access lines required at each Remote Packet Module.
- Number of lines or trunks required at the Base Wire Center.
- The data transmission speed of each line or trunk to be served by the 1PSS.

With this information and the job aids provided in this section, the E-8202 questionnaire for the 1PSS can be completed for ordering the required equip-

ment. Copies of the E-8202 questionnaire may be obtained without charge by writing directly to:

AT&T Technologies, Inc.
Customer Information Center
2833 N. Franklin Road
P. O. Box 19901
Indianapolis, Indiana 46219

A. Packet Administrative Module (PAM)

4.02 The PAM (Model 2 3B20D computer) for the 1PSS consists of Processor Control (PC) frame, Mini Module Disk (MMD) frame, and Tape Unit (TU) frame (Fig. 3). This equipment is ordered as indicated in the E-8202 questionnaire.

4.03 The 3B20D computer, Data Set and Alarm frame, Power Distribution frame, spare equipment, and test equipment that are required are indicated in Fig. 10, Sheets 1 through 6.

4.04 A floor plan showing the location of all 1PSS frames and power equipment is required; normally, the power is obtained from existing power equipment. A typical 1PSS floor plan is shown in Fig. 11.

B. Packet Switching Module (PSM)

4.05 The Packet Switch (PS) frame (J70210E-1) is 7 feet high, 2 feet 2 inches wide, and 2 feet deep. Each PS frame can be equipped with 12 Packet Switch Units (6 type 4Axy Processors). Each Packet Switch Unit serves two, four, or eight lines or trunks and can be used for either 9.6 or 56 kb/s lines or trunks.

4.06 When the number of 9.6 and 56 kb/s lines and trunks are provided, the use of Fig. 4 and the completion of the 1PSS equipment work sheet (Fig. 12) will provide the PSM information to complete E-8202 questionnaire including the requirement for the spare circuit packs.

C. Digital Patch Unit (DPU)

4.07 The Patch frame [ED77010-(),G1] is 7 feet high, 2 feet 2 inches wide, and 2 feet deep. Each Patch frame can be equipped with 10 Digital Patch Units. There are two types of Digital Patch Units. The RS-232C Digital Patch Unit provides 16

interfaces that meet the RS-232C specifications. The V.35 Digital Patch Unit provides 12 interfaces that meet the 1980 Consultive Committee for International Telephone and Telegraph (CCITT) V.35 specification. Up to four Patch frames can be used with the 1PSS.

4.08 When the requirement for RS-232 and CCITT V.35 interfaces is determined by the use of Fig. 5 and the completion of the work sheet (Fig. 13), the information required to complete the E-8202 questionnaire will be available including the requirement for spare circuit packs.

D. Data Service Unit (DSU)

4.09 The DSU frame (ED-77010-1, G2) is 7 feet high, 2 feet 2 inches wide, and 2 feet deep. Each DSU frame can be equipped with 25 DSUs. Each DSU serves one line or trunk equipment (Fig. 6).

4.10 When the number of 9.6 and 56 kb/s lines or trunks are provided, the use of Fig. 6 and the completion of the 1PSS equipment work sheet (Fig. 14) will provide the DSU information to complete E-8202 questionnaire including the requirement for the spare DSUs.

E. Channel Service Unit (CSU)

4.11 The CSU frame (ED-77010-1, G3) is 7 feet high, 2 feet 2 inches wide, and 2 feet deep. Each CSU frame can be equipped with 50 CSUs. Each CSU serves one line or trunk equipment (Fig. 7).

4.12 When the number of 9.6 and 56 kb/s lines or trunks are provided, the use of Fig. 7 and the completion of the 1PSS equipment work sheet (Fig. 15) will provide the CSU information to complete E-8202 questionnaire including the requirement for the spare CSUs.

F. Model 1 Remote Packet Module Frame

4.13 The Model 1 Remote Packet Module frame (J1C167A1) is 7 feet high, 2 feet 2 inches wide, and 1 foot 6 inches deep. Each Model 1 Remote Packet Module frame can be equipped with two Model 1 Remote Packet Module units and a -48 volt power distribution (Fig. 8). Each Model 1 Remote Packet Module unit provides for a combination of 31 line circuits. Each line circuit contains either three data

subscriber loop carrier (DSL) ports (direct access lines) or four modem ports (dial access lines).

4.14 The Model 1 Remote Packet Module frame may be located remotely or collocated with the PAM and PSM. When the Model 1 Remote Packet Module frame is remotely located, each Model 1 Remote Packet Module unit requires a facility of 56-kb/s DATAPHONE Digital Service (DDS) to provide a link to the PSM. If the Model 1 Remote Packet Module is collocated, the distance must be less than 50 feet for interconnection with direct cable. If the distance is more than 50 feet and less than 4000 feet, limited distance modems are required at both ends.

4.15 When the number of direct and dial access lines are provided, the use of Fig. 8 and the completion of the Model 1 Remote Packet Module equipment work sheet (Fig. 16) will provide the information to complete the E-8202 questionnaire including the requirement for the spare circuit packs.

4.16 A floor plan showing the location of the Model 1 Remote Packet Module frame(s) and power equipment is required; normally, the power is obtained from the existing power equipment.

G. Model 2 Remote Packet Module Frame

4.17 The Model 2 Remote Packet Module frame (ED-4C401) is 7 feet high, 2 feet 2 inches wide, and 1 foot 6 inches deep. Each Model 2 Remote Packet Module frame can be equipped with five MICOM Model M8500-24 PADs (Fig. 9). One MICOM Model M8500-24 PAD provides 24 dial access lines.

4.18 To allow the Model 2 Remote Packet Module to connect to the PSM, a Data Service Unit and a Channel Service Unit or other equipment that performs the same functions for 9.6 kb/s is required.

4.19 The Model 2 Remote Packet Module, Data Service Unit, and Channel Service Unit frames may be collocated with the PAM and PSM. When the Model 2 Remote Packet Module, Data Service Unit, and Channel Service Unit equipment is remotely located, each MICOM Model M8500-24 PAD requires 9.6 kb/s Data Service Unit facilities. Cabling between RPM frames must not be longer than 50 feet.

4.20 When the number of dial access lines is provided, the use of Fig. 9 and the completion of the Model 2 Remote Packet Module equipment work

sheet (Fig. 17) will provide the information to complete the E-8202 questionnaire including the requirement for the spare circuit packs.

4.21 A floor plan showing the location of the Model 2 Remote Packet Module, Data Service Unit and Channel Service Unit frames, and power equipment is required; normally, the power is obtained from the existing power equipment.

5. 1PSS SITE PREPARATION

A. General

5.01 The site preparation requirements and guidelines for the 1PSS furnished herein provide currently available engineering rules and information to prepare and condition a site to support any reasonable 1PSS configuration for both architectural changes and future growth. The information covers building and environmental recommendations, floor layouts, ac power and grounding, etc. At a customer's request, AT&T can provide an initial survey of the site and provide a recommendation report to assist the customer in arranging for the preparation of the site. This service shall be offered as an integral part of the 1PSS support.

5.02 AT&T can provide site planning and preparation services. The customer can be provided with "contract ready" specifications to be used when contracting for work to be done. Alternatively, AT&T can arrange to have the work done for the customer. These services are billed separately; the price varies with the work to be done.

5.03 The AT&T requirements, guidelines, and recommendations for site preparation are as follows:

- Typical floor plan layout
- Structural considerations
- Power and grounding
- Air conditioning
- Security systems
- Lighting.

B. Typical Floor Plan Layout

5.04 A typical floor plan for the 1PSS, including the optional Power Plant area, is shown in Fig. 11.

Layout Restrictions

5.05 No restriction beyond those described in cable restrictions are known as of the issue of this document.

Cabling Restrictions

5.06 The cable length between the Channel Service Unit (CSU) and the Data Service Unit (DSU) shall be less than 50 feet. The cable length between the DSU and the Packet Switch (PS) frame shall be less than 50 feet for 2.4, 4.8, or 9.6 kb/s facilities; and not more than 100 feet for 56 kb/s facilities.

C. Structural Considerations

Guidelines

5.07 Except as specified herein, guidelines provided for New Equipment Building System (NEBS) standards shall be followed. The 1PSS must be located in a central office environment.

Vibration Requirements

5.08 A survey shall be made before site selection to ensure that the requirement for building vibration is met. Peak floor shocks in the vertical and transverse directions shall not exceed 2g, and the shocks shall not occur for longer than 10 milliseconds nor more often than twice each second.

Flooring

5.09 The 1PSS office floor should be capable of supporting the total New Equipment Building System live load of 150 pounds per square foot.

5.10 If any chilled water plumbing is present on the same floor as the 1PSS, adequate drainage shall be provided. It is desirable to avoid locating steam pipes and water pipes over the 1PSS. Where this is not feasible, precautionary measures must be taken to guard against possible damage due to accidental breakage, leakage, or condensation; e.g., provide drip pans or troughs under the pipes and avoid

placing the equipment, particularly disks, directly below such pipes. Floor and roof over the 1PSS must be watertight to prevent entry of water from above. Adequate floor drains shall be installed to carry water away.

5.11 To prevent damage to semiconductor circuitry caused by static discharge, carpeting is not permitted within the 1PSS area. Carpeting is also not permitted in the access to the maintenance area. Precaution shall be taken to protect equipment when carried to a carpeted area.

Walls

5.12 The location of the perimeter walls, and the location of entrances and emergency exits, are left to the discretion of the local engineering staff. Walls shall be provided according to criteria in the following two paragraphs.

5.13 For security reasons, it is recommended that a wall, from structural floor to structural ceiling, surround the secure area of the 1PSS. A perimeter wall surrounding a larger area is permissible as long as the stringent air-conditioning and security requirements of the 1PSS equipment are met and the dedicated power plant (-48 V dc) area, if provided, can be maintained.

5.14 The walls must be constructed so as to ensure an Underwriter's Laboratories (UL) 1-hour fire rating. For thermal and security reasons, windows shall not be provided. Walls shall be well insulated and shall have vapor barriers. Wall construction must neither harbor nor generate excessive dust. Doors should be held to the minimum number required for safe exit in an emergency, and only one door should be used as a normal entrance.

Doors

5.15 Doors shall be UL class C rated with either no windows or minimum safety windows. Access control shall be provided at the entrance door with emergency exit alarms on all other doors. Doors shall be marked for emergency exit and provided with overhead emergency lighting. Automatic door closers shall be fitted.

5.16 All doors shall be at least 3 feet wide and 7 feet high. Larger doors can be used and may be

required if the 1PSS is packaged using the "Unitized System" for shipping.

Noncombustible Materials

5.17 All building and finish materials in the 1PSS area including walls, partitions, insulation, suspended ceilings (if provided), and other construction material must be noncombustible or UL listed with a flame spread of 25 or less and a smoke developed rating of 50 or less.

Media Storage

5.18 About 200 square feet per 1PSS shall be provided for storage space for computer supplies such as magnetic tape, line printer paper, printed forms, etc.

D. Power and Grounding

Power

5.19 As indicated, the 1PSS requires the following power:

(a) -48 V dc to power the 3B20D computer and PS frames. The Triport frame has inverters which provide backup for 120 V ac commercial power from -48 V dc.

(b) 120 V ac, single-phase, commercial power obtained from the Power Distribution Service Cabinet (PDSC) for maintenance terminal, line printer, and facility access apparatus.

5.20 If existing -48 V power is not adequate, a dedicated -48 V Power Plant should be used. A 10-foot by 20-foot space is required for the -48 V Power Plant as shown in Fig. 11.

5.21 Within the site, the utility outlets provided for soldering irons, oscilloscopes, vacuum cleaners, etc., shall not be powered from the same PDSC as the 1PSS circuits.

Power Preparation

5.22 Site preparation requires that:

(a) Cables for the -48 V dc bulk supply and single-point ground be brought to the

immediate vicinity of the Power Distribution (PD) frame

(b) Cables for the 120 V ac supply from the Power Distribution Service Cabinet be brought to the immediate vicinity of the Triport frames.

Single-Point Ground

5.23 An important part of the power system is the ground system. This is recommended for personal safety, equipment protection, electrical noise reduction, and reliability.

5.24 The following is a safety requirement:

(a) Only one ground window may be utilized with a single isolated ground plane.

(b) Under no circumstance shall any electronic system framework that comprises a portion of the ESS* switch ground plane be more than one floor away from the ground window.

5.25 Metallic conduits extending ac service into the 1PSS area must be routed through the ground window and bonded therein to the main ground bus and isolated thereafter.

Electromagnetic Interference

5.26 Electromagnetic interference (EMI) at frequencies from 60 Hz to over 1000 MHz exists at all equipment locations. Typical sources of electromagnetic interference are lightning, radar systems, commercial broadcast stations, ultrasonic cleaners, automotive ignition systems, fluorescent lights, electromechanical switching systems, synchronous electronic circuits, etc.

Caution: *Dimmer switches for lighting are not recommended in computer areas because of their tendency to produce electromagnetic interference. Radio transmitters (walkie-talkies) are not allowed in the 1PSS area.*

5.27 Appropriate signs shall be placed at all entrances. The Packet Switch site must not have

* Trademark of AT&T Technologies.

radiation fields greater than 2.0 volts per meter at frequencies between 10 kHz and 1000 MHz. Therefore, sites shall be tested before the start of construction to ensure that fields exceeding these specifications are not present.

E. Air Conditioning

Requirements

5.28 A new or existing air-conditioning system must be provided to meet the New Equipment Building System (NEBS) specifications. Specifically, operating limits are the following:

- 40 to 100 degrees Fahrenheit (long-term limits)
- 35 to 120 degrees Fahrenheit (short term)
- Rate of temperature change: 27 degrees Fahrenheit per hour, maximum
- Relative humidity (noncondensing) 20 to 80 percent (short term).

Note: Short-term periods are defined as periods of not more than 72 consecutive hours and a total of not more than 15 days in 1 year.

Guidelines

5.29 The 3B20D computer and its associated peripheral equipment dissipate large amounts of local heat. It is recommended for those installations having conventional or class II cooling systems to add KS-21344 dropped air diffusers to the overhead supply duct. (A class II air-conditioning system is usually designed for a total pressure of up to 6-3/4 inches of water with air velocities inside ducts of less than 2000 feet per minute.) A sufficient supply and return of air must be provided to cool the 1PSS equipment. One KS-21344 air diffuser should be provided for every 3 kilowatts of equipment heat dissipation with an air volume flow rate of 500 to 600 cubic feet per minute per diffuser.

5.30 The modular cooling system will provide adequate equipment cooling without additional measures.

Air Quality

5.31 The NEBS air filtration standards are applicable with type II (medium efficiency) mechanical filters recommended for environmental categories A and B and type III (high efficiency) filters recommended for categories C and D.

General

5.32 It is recommended that power for the air-conditioning system be backed up by an essential ac power supply.

F. Security Systems

Physical Security

5.33 Total system security requires proper software design, secure hardware design, thorough personnel screening and effective physical security. Of these areas, physical security is the responsibility of the site designer. Physical security includes protection of the hardware and software from:

- (a) Fire and other natural disasters
- (b) Failure of the computer support system
- (c) Harmful activity by unauthorized persons.

Fire

5.34 Protection against fire requires adequate prevention, detection, and control. Preventive practices include wiring properly in accordance with the code, forbidding the storage of combustible supplies in the machine area, and purchasing only non-flammable equipment and building materials. All AT&T equipment in the 1PSS is manufactured to NEBS standards.

Fire Detection

5.35 Detection systems may be based around smoke detectors, ionization detectors, over temperature sensors, or a combination thereof. Coverage shall be provided for the primary machine room, all media storage sites, and all support systems such as power and air conditioning. The system should be zoned so as to prevent premature alarms.

5.36 Alarms should be audible and visible in all protected areas and should also be forwarded to a central security office. Manual alarm trips should be provided at each exit. Triggering of the fire alarm, manually or by sensors, shall automatically shut down the air conditioning to all 1PSS equipment if the 1PSS area is unoccupied. During occupied periods, the alarm shall activate audible and visual signals permitting trained personnel to power down the equipment manually and shut down the air-conditioning fans.

Fire Fighting

5.37 Once a fire is detected, careful execution of previously derived contingency plans is necessary. Fighting of the fire, notification of the fire department, protection of data, and evacuation of the site can all be quickly carried out if all personnel are thoroughly familiar with the appropriate plans.

5.38 Hand extinguishers (Halon or carbon dioxide for equipment) shall be readily available.

Note: Multipurpose A:B:C dry chemical extinguishers shall not be used in the 1PSS.

5.39 The use of sprinkler systems is not recommended for the 1PSS. Automatic gaseous flooding systems, preferably Halon, are expensive and effective but are not necessary for the 1PSS area. To support fire fighting operations, hand-held lanterns shall be used for emergency lighting. Exit doors shall close automatically but must still allow for easy evacuation by personnel. A direct phone line to security or to the fire department is recommended.

Environmental Alarms

5.40 The recommended alarm conditions are as follows:

- Operation of early warning fire detection system
- Presence of noxious elements in the air-conditioning system

- Opening of emergency exit doors, etc.
- Power out of specifications
- High water, if appropriate
- Failure of the air-conditioning system.

5.41 All such alarms should appear both on site and in the central control or security room and must be provided with power to operate in an emergency. Alarm appearances must be audible and visible.

The 1PSS Alarm System

5.42 The purpose of the alarm system is to provide audible and visual alarms in the 1PSS office. The alarm circuits receive alarm signals from the office hardware and the power plant, and they receive system alarms from the 3B20D computer.

G. Lighting

General

5.43 Both normal and emergency lighting should be provided. Normal lighting should provide an illumination of 60-foot candles at desk top level (40-foot candles in those areas where cathode-ray tubes are used). Light sources shall be glare free and shall be powered separately from the 3B20D computer area and its emergency shutdown switches. Illumination by direct sunlight must be avoided to prevent excessive illumination levels, high contrast, and unwanted thermal inputs.

Emergency

5.44 Emergency lighting that comes on in the event of a power failure shall be furnished in order to provide illumination for the 1PSS site until the ac power is restored.

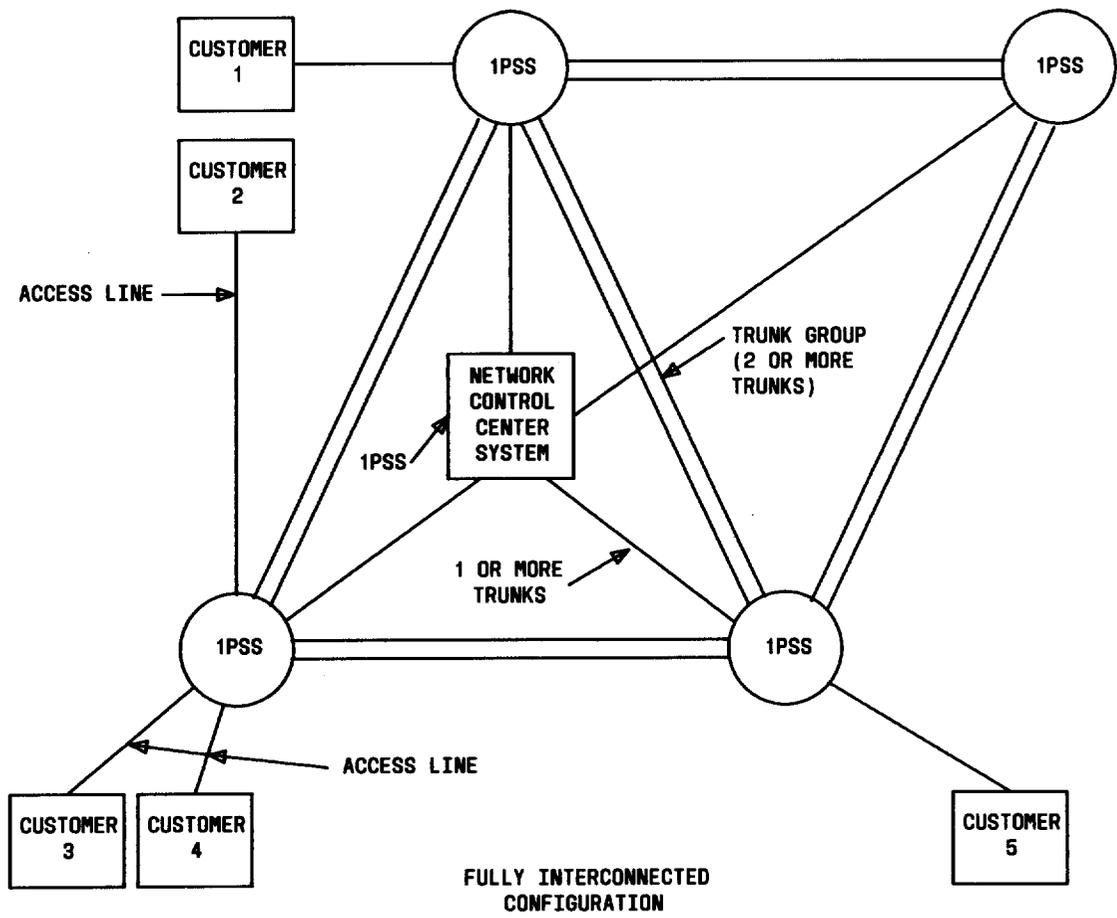


Fig. 1—Example of Interconnected 1 Packet Switch Systems

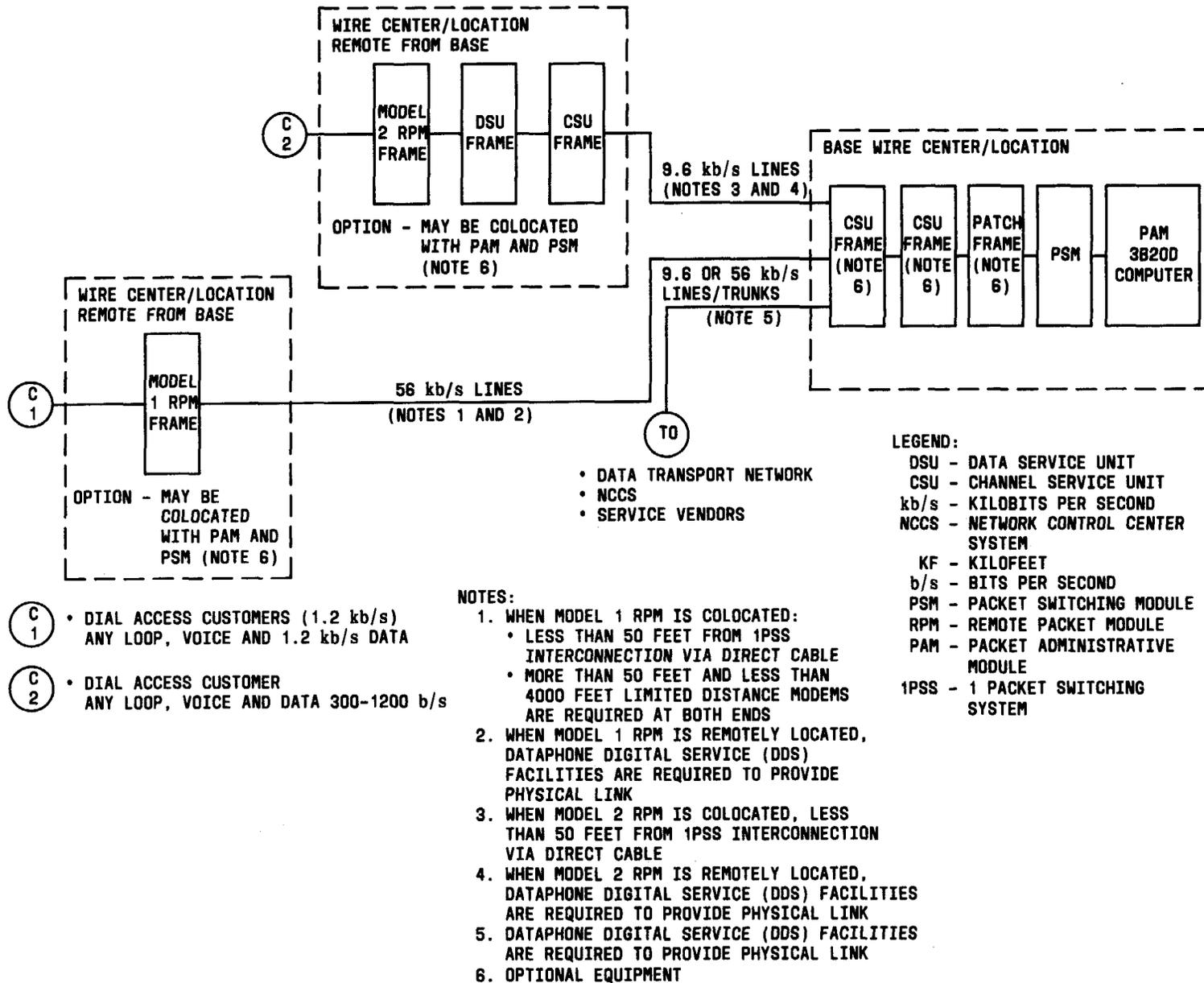


Fig. 2—1PSS Block Diagram—Paragraph 2.02

LEGEND:

- AMA - AUTOMATIC MESSAGE ACCOUNTING
- CRTI - CATHODE-RAY TUBE, INTERACTIVE
- CU - CONTROL UNIT
- DDSBS - DUPLEX DUAL SERIAL BUS SELECTOR
- DFC - DISK FILE CONTROLLER
- DMAC - DIRECT MEMORY ACCESS CONTROLLER
- DSCH - DUAL SERIAL CHANNEL
- IOP - INPUT/OUTPUT PROCESSOR
- MB - MEGABIT
- MTTY - MAINTENANCE TTY
- OFC ALM - OFFICE ALARMS
- PCS - PERIPHERAL CONTROLLERS
- PS - PORT SWITCH
- PSM - PACKET SWITCHING MODULE
- ROPT - RECEIVE-ONLY PRINTING TERMINAL
- RPM - REMOTE PACKET MODULE
- SCANS - SOFTWARE CHANGE AND NOTIFICATION SYSTEM
- SCCS - SWITCHING CENTER CONTROL SYSTEM
- SC/SD - SCANNER/SIGNAL DISTRIBUTOR
- SDLC - SYNCHRONOUS DATA LINK CONTROLLER
- TTC - TAPE CONTROLLER
- TU - TAPE UNIT (MAGNETIC)

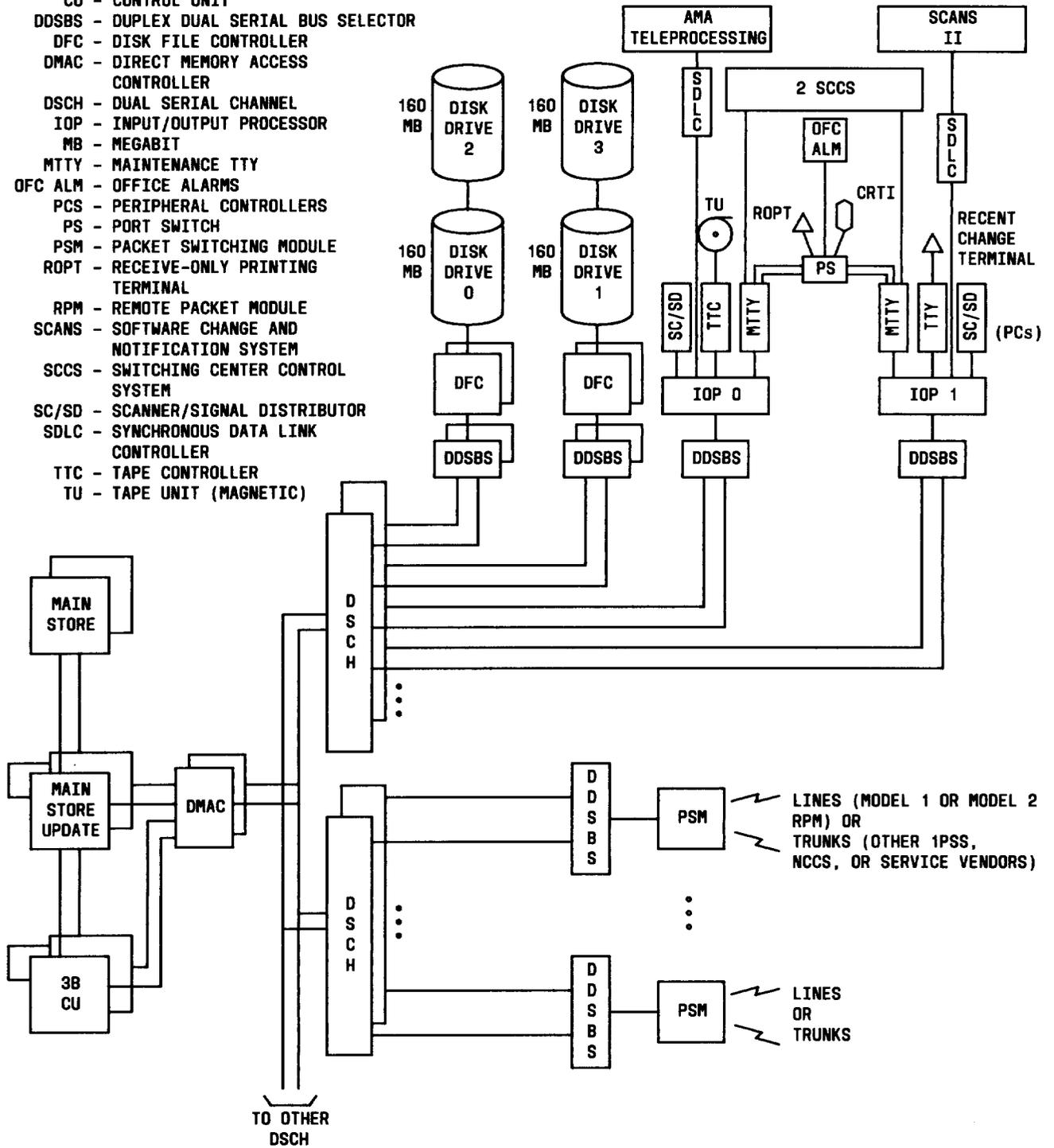
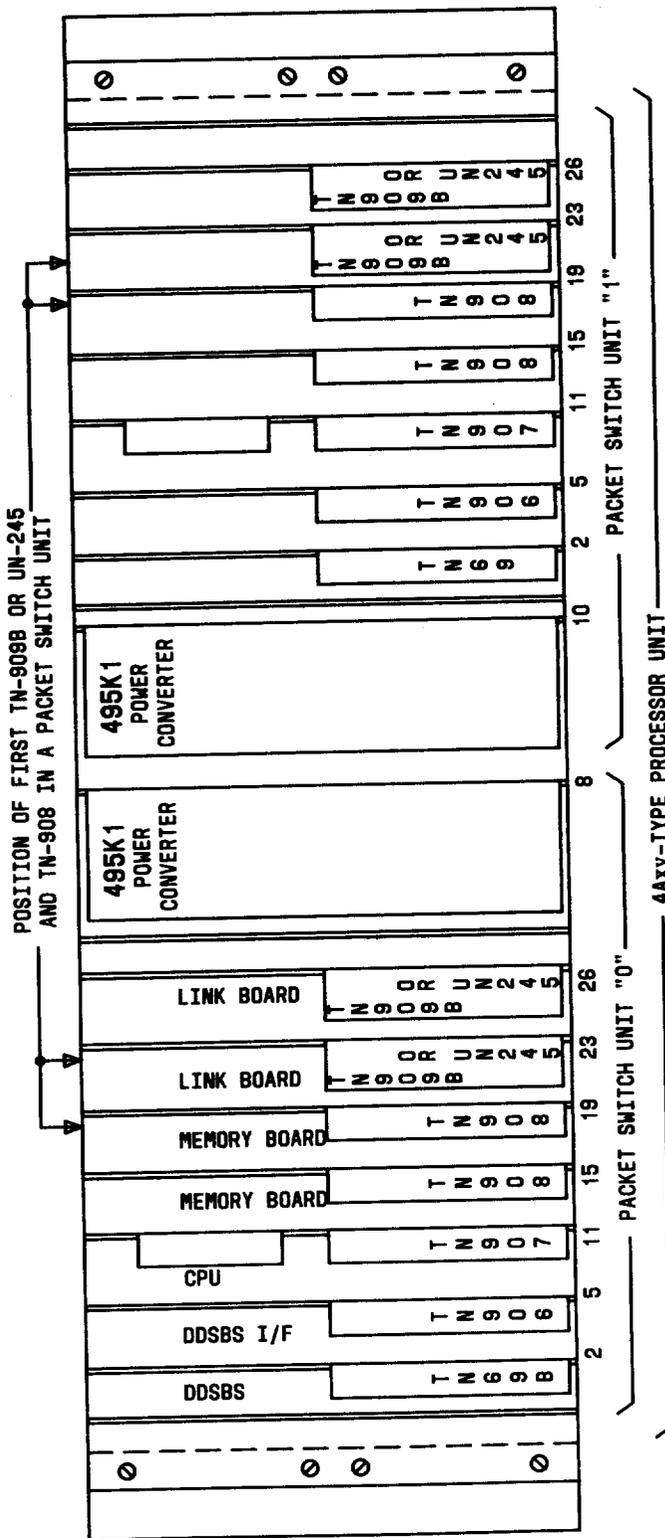


Fig. 3—3B20D Computer Configuration—Paragraphs 3.01 and 4.02



PS FRAME CAPACITY

- PACKET SWITCH UNIT - 2, 4, OR 8 PORTS (LINE OR TRUNK)
- LINE/TRUNK 9.6 kb/s OR 56 kb/s DATA TRANSMISSION
- 12 PACKET SWITCH UNITS PER PS FRAME
- UP TO 96 LINES OR TRUNKS OR COMBINATION OF LINES AND TRUNKS PER PS FRAME
- 60 PACKET SWITCH UNITS, 5 PS FRAMES MAXIMUM PER 1PSS

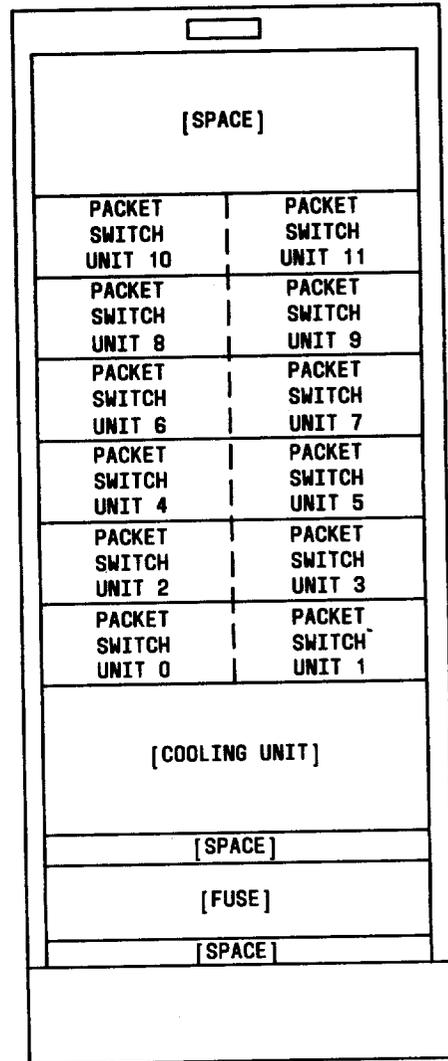


Fig. 4—Packet Switch Frame—Paragraphs 3.02 and 4.06

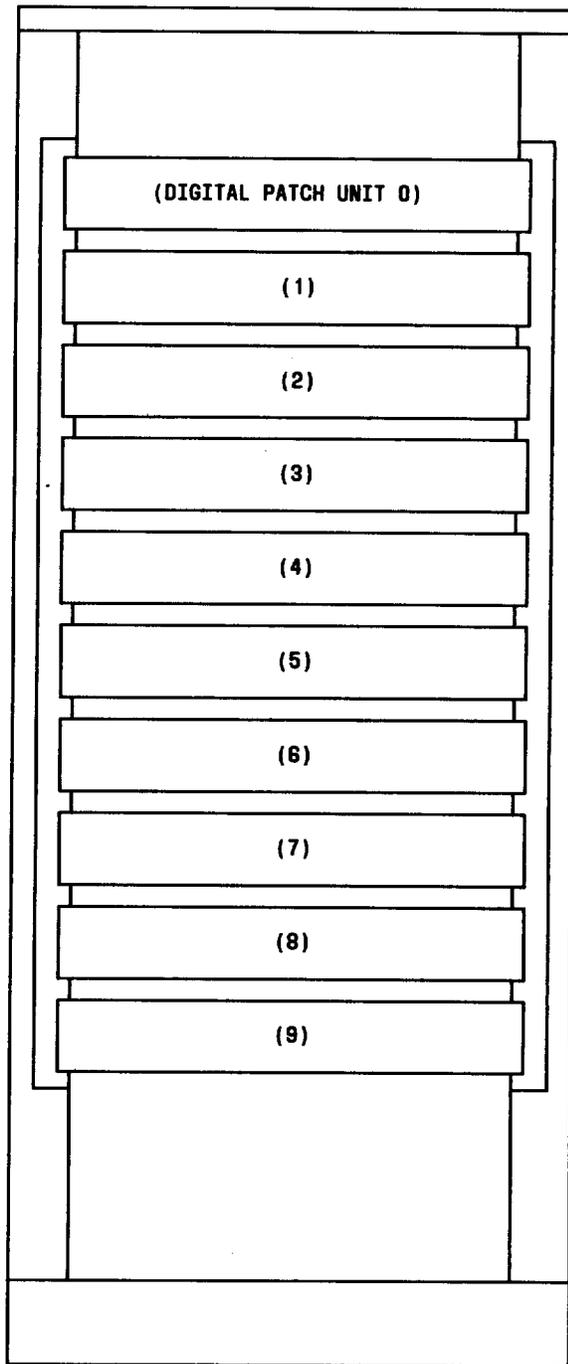


Fig. 5—Patch Frame—Paragraphs 3.04 and 4.08

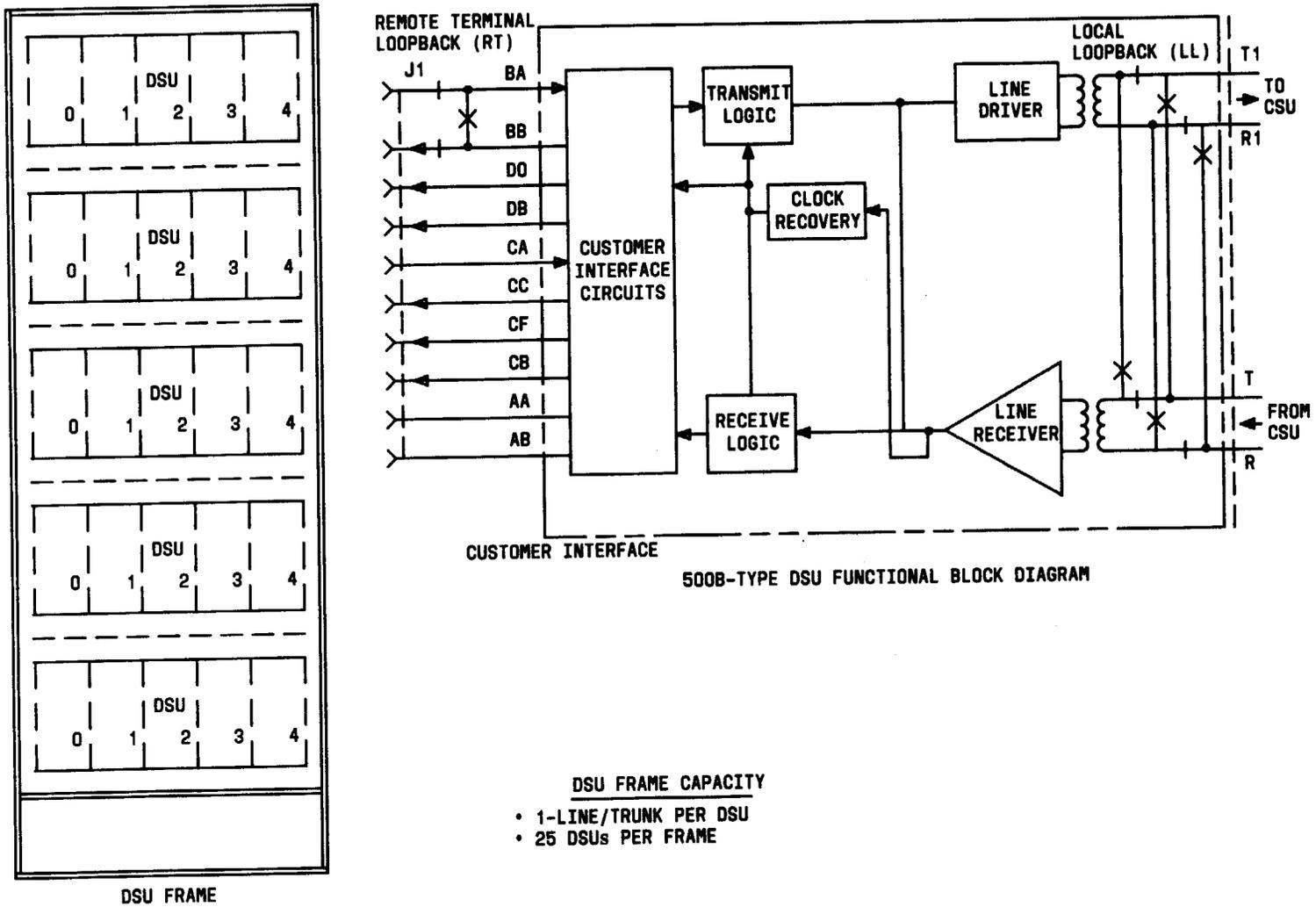


Fig. 6—Data Service Unit Frame—Paragraphs 3.05, 4.09, and 4.10'

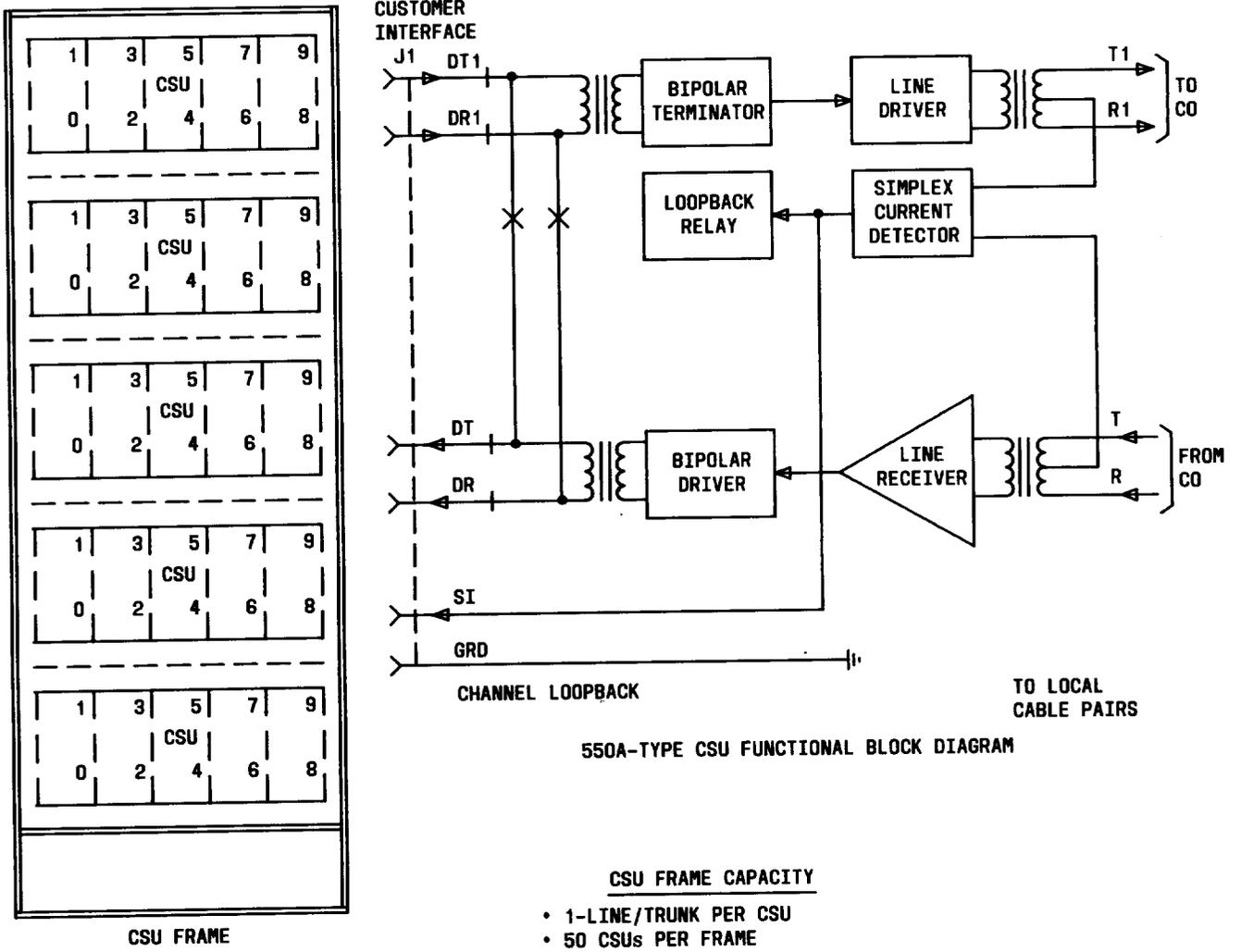
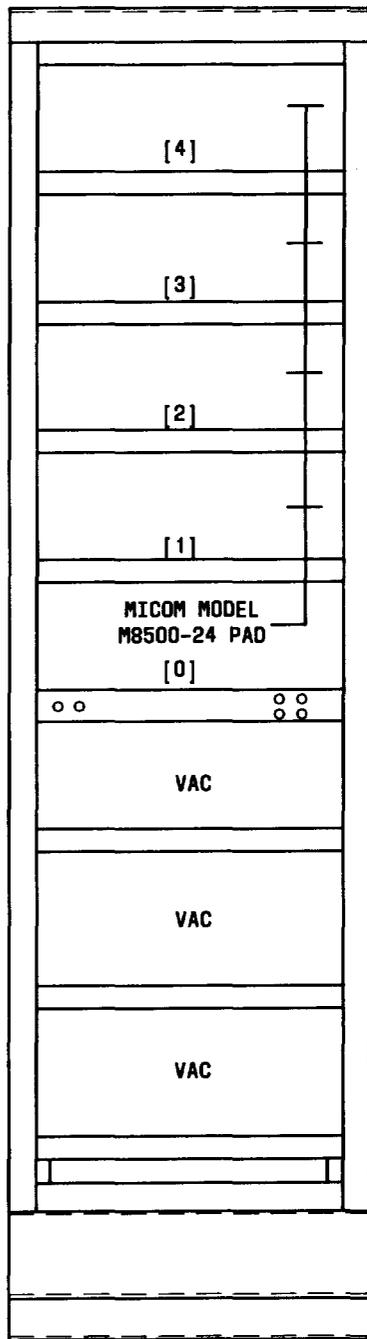


Fig. 7—Channel Service Unit Frame—Paragraphs 3.06 and 4.12



MODEL 2 RPM FRAME

Fig. 9—Model 2 Remote Packet Module Frame—Paragraphs 3.09, 4.17, and 4.20

MODEL 2 RPM FRAME HARDWARE CAPACITY

- 24 DIAL ACCESS LINES - PER MICOM MODEL M8500-24 PAD
- 5 MICOM MODEL M8500-24 PAD - PER MODEL 2 RPM FRAME
- 120 DIAL ACCESS LINES - PER MODEL 2 RPM FRAME

MODEL 2 RPM FRAME TRAFFIC CAPACITY

- 120 DIAL ACCESS LINES

DATA TRANSMISSION

- 9.6 kb/s FROM MODEL 2 RPM TO 1PSS
- ACCESS CUSTOMER TO MODEL 2 RPM
-DIAL ACCESS CUSTOMERS-300 OR 1200 b/s

LEGEND:

- RPM - REMOTE PACKET MODULE
- PAD - PACKET ASSEMBLY/DISASSEMBLY

MODEL 2 3B20D COMPUTER REQUIRED WITH 1PSS

1. The Model 2 3B20D computer for use in the 1PSS has duplicated control units. The Model 2 3B20D computer is ordered as indicated in the E-8202 questionnaire for the Packet Switching System and consists of the following:

3B20D (MODEL 2) COMPUTER

Processor Control Frame	— J1C148A-1, L1
Mini Module Disk Frame	— J1C148A-1, L27 and L27A
Tape Unit Frame	— J1C148A-1, L31 and L32
PG-70000 Generic for 1PSS	— J70184B

2. Additional equipment recommended as follows:

- Spare common equipment for 3B20D
- Test equipment for 3B20D
- Other equipment required with 1PSS

**Fig. 10—1PSS Equipment Work Sheet (PAM, 3B20D Model 2)—Paragraph 4.03
(Sheet 1 of 5)**

SPARE COMMON EQUIPMENT FOR MODEL 2 3B20D

CODE	DESCRIPTION	QTY
TF-2	Pack, Circuit (SCD)	2
TF-3	Pack, Circuit (PS)	2
TM-71	Pack, Circuit (IMC)	2
TM-72	Pack, Circuit (RETT)	2
TN-3	Pack, Circuit (PSW)	1
TN-5	Pack, Circuit (PSW)	1
TN-6	Pack, Circuit (PSW)	1
TN-9	Pack, Circuit (PWR CONV)	1
TN-10	Pack, Circuit (EAI)	1
TN-28	Pack, Circuit (MASA)	3
TN-61B	Pack, Circuit (PIC)	1
TN-63B	Pack, Circuit (MHDC)	1
TN-64B	Pack, Circuit (MHDDC)	1
TN-65B	Pack, Circuit (PSDI)	1
TN-68	Pack, Circuit (MCS)	3
TN-69B	Pack, Circuit (DDSBS)	1
TN-70B	Pack, Circuit (BIC)	1
TN-71	Pack, Circuit (PCM)	1
TN-73	Pack, Circuit (PCM)	2
TN-74B	Pack, Circuit (TTY PC)	1
TN-75C	Pack, Circuit (SDLC)	1
TN-83	Pack, Circuit (MTTY PC)	1
TN-84	Pack, Circuit (MCS)	1
UN-1C	Pack, Circuit (DMUO)	1
UN-2B	Pack, Circuit (SREGO)	1
UN-3B	Pack, Circuit (STEGO 1)	1
UN-6B	Pack, Circuit (SDC)	1
UN-9B	Pack, Circuit (DSCH)	1
UN-10B	Pack, Circuit (CAC)	1
UN-11B	Pack, Circuit (CAM)	1
UN-16B	Pack, Circuit (MLTS)	1
UN-21B	Pack, Circuit (UC)	1
UN-22C	Pack, Circuit (MCH)	1
UN-23C	Pack, Circuit (DMUI)	1
UN-25B	Pack, Circuit (SMI)	1
UN-28B	Pack, Circuit (MIC)	1
UN-32	Pack, Circuit (NNT PC)	2
UN-33B	Pack, Circuit (SSD)	1
UN-34B	Pack, Circuit (MASU)	1
UN-39	Pack, Circuit (MASC)	1

Fig. 10—1PSS Equipment Work Sheet (PAM, 3B20D Model 2)—Paragraph 4.03
(Sheet 2 of 5)

SPARE COMMON EQUIPMENT FOR MODEL 2 3B20D (Contd)

CODE	DESCRIPTION	QTY
UN-43C	Pack, Circuit (SAC)	1
UN-45C	Pack, Circuit (SAT)	1
UN-46B	Pack, Circuit (DMAC)	1
UN-48B	Pack, Circuit (WMS)	1
UN-52	Pack, Circuit (MTC)	1
UN-54	Pack, Circuit (DFCI)	1
UN-59	Pack, Circuit (MSC/MASC)	1
UN-64	Pack, Circuit (PDI)	1
UN-135	Pack Circuit (MC)	1
	Pack, Circuit (DFCI)	1
244-D	Unit PWR Module	2
495-FA	Unit PWR Module	2
495-GA	Unit PWR Module	2
ED-4C191-30G2	Unit, Cooling	2
ED-4C194-30G4	Unit, Plug-in Control	1
402406748	Filter, Fan	12
RS-22497, L1	Terminal Video	1
R040PZF	Printer	1
KS-22048, L1	Pack, Disk (KS-22071, L1 Drive)	1
KS-22091, L51	Kit, Spares	1
KS-22091, L64	Kit, MTCE	1
KS-22091, L52	Kit, Spares	1

TEST EQUIPMENT FOR MODEL 2 3B20D

ITEM	TEST EQUIPMENT
ITE 5632	Digital Multimeter Data Precision Model 258
ITE 5237C	Tektronix 465 Oscilloscope
ITE 4424A	Universal Voltmeter
ITE 5654	Logic Probe
ITE 4669	134 Amplifier Textronix P6021 Current Probe
ED-4C199-30	Microlevel Test Set
ITE 6111	Biomation Logic Analyzer (K 100-D)
ITE 6084	Acoustic Coupler—used w/microlevel test set
ITE 5689-L3	Teleprinter Model 43
	X.25 Protocol Analyzer
	ATTIS SCEPTRE* Terminal (for DSI)
KS-22072, L1 and L2	
CDC and CDS Disk Drives	
ITE-6158	Disk Exerciser CDC TB-216 Part No. 75144000
	or
	KS-22034 Disk Exerciser

* Trademark of AT&T.

Fig. 10—1PSS Equipment Work Sheet (PAM, 3B20D Model 2)—Paragraph 4.03
(Sheet 3 of 5)

TEST EQUIPMENT FOR MODEL 2 3B20D (Contd)

ITEM	TEST EQUIPMENT
KS-22072, L1 CDC Disk Drive ITE-6238	Alignment Disk Pack CDC Part No. 70430003
KS-22072, L2 ITE-6239	Alignment Disk Pack
KS-22072, L2 ITE-6243	Head Alignment Meter
KS-22706 Cipher Tape Drive ITE-6160	Tape Drive Exerciser Kennedy TB-9219 Part No. 192-0010-002
KS-22803, L1, L2, L3 CPI Bank Printer ITE-6229	Printer Exerciser from Printronix for AT&T Technologies
KS-22705, L1 and L2 Printronix Printer ITE-6229	Printer Exerciser

Note: The following are on an as-required basis: ITEs 5654, 4669, 6089, 6111, 6084, 5689-L3.

**Fig. 10—1PSS Equipment Work Sheet (PAM, 3B20D Model 2)—Paragraph 4.03
(Sheet 4 of 5)**

OTHER EQUIPMENT REQUIRED WITH 1PSS

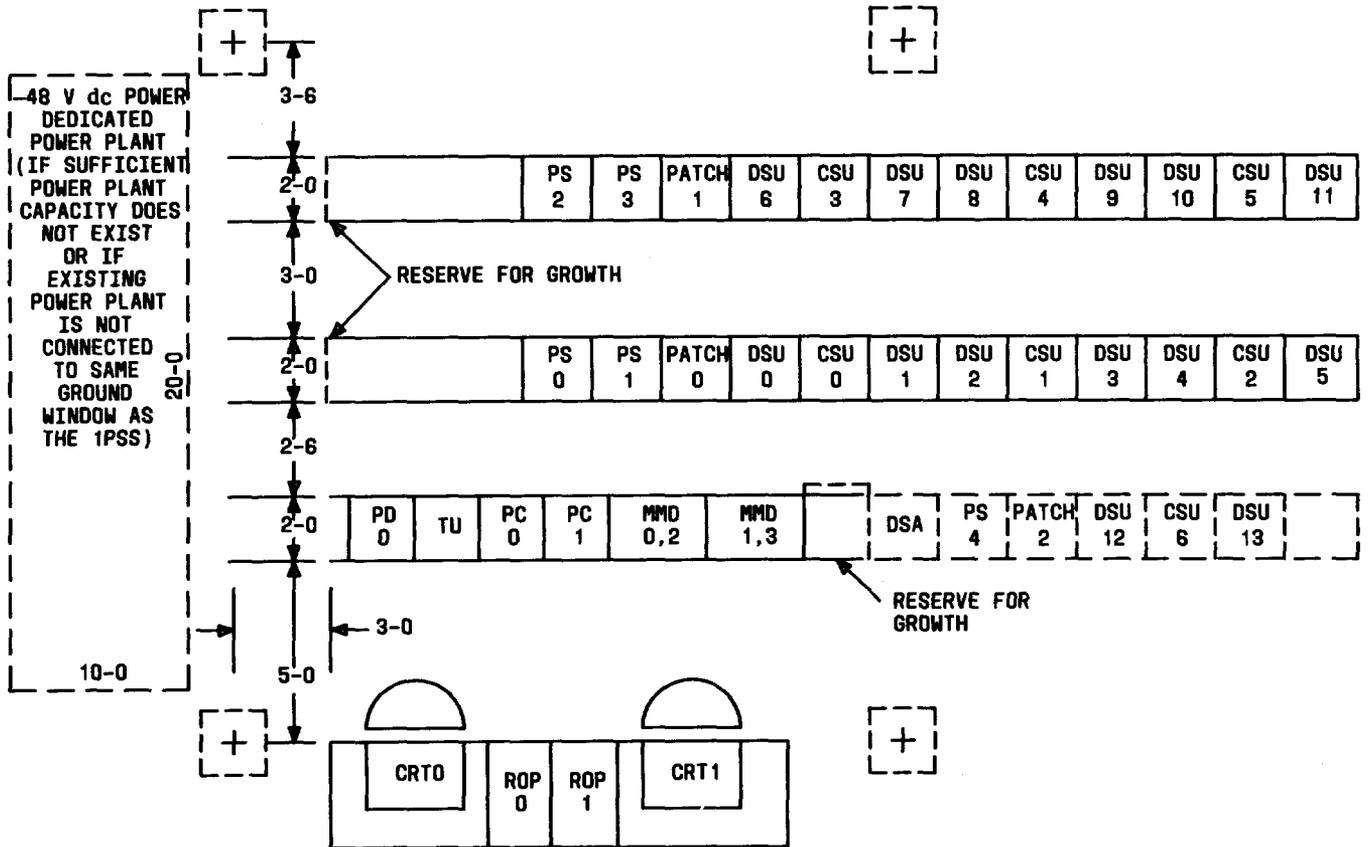
1. The following additional equipment is required as follows:

CODE	DESCRIPTION	16 LINES QTY	25 LINES QTY	72 LINES QTY	120 LINES QTY
J1C129A-1, L16	DSCH IN DMA-O	—	2	4	6
J70210F-1, L1, L2, L3, L4, L5, L6	Data Set and Alarm Frame	2	2	4	5
J86334C-1, L3	Power Distribution Frame	1	1	1	1
LB	48 V Alarm Circuit	1	1	1	1
LC	48 V Alarm Circuit	1	1	1	1
LD	Fuse Panel Positions 1 and 2	2	2	3	4
LE	Fuse Panel Position 5	1	1	1	1
LG	48 V Supply	2	2	3	4
LJ	Blank Positions 3 and 4	2	2	1	0
ED-1A226-10	Audible Alarm Panel	1	1	1	1
ED-1A226-10	Exit Pilot Lamp	(as required)			

2. Furniture:

CODE	DESCRIPTION
Pedestals	TTY Corp. — 4000-400F Pedestal and Top
Desks, and Chairs for CRTs and ROPs	System Mfg. Corp. — 0121-48M Left Desk 3013 Black Regency Walnut Top Chrome Leg Base
	Systems Mfg. Corp. — 0121-48M Right Desk 3013 Black Regency Walnut Top Chrome Leg Base
	Systems Mfg. Corp. — C217 Chair-Black X06

Fig. 10—1PSS Equipment Work Sheet (PAM, 3B20D Model 2)—Paragraph 4.03
(Sheet 5 of 5)



EQUIPMENT 1PSS

3B20D FRAMES

- MMD - MINI MODULE DISK (0,1,2,3)
- PC - PROCESSOR CONTROL (0,1)
- TU - TAPE UNIT
- CRT - CATHODE-RAY TUBE (0,1)
- ROP - RECEIVE-ONLY PRINTER

OTHER FRAMES

- CSU - CHANNEL SERVICE UNIT
- DSU - DATA SERVICE UNIT
- PD - POWER DISTRIBUTION
- DSA - DATA SET AND ALARM
- PATCH - PATCH
- PS - PACKET SWITCH

Fig. 11—Typical 1PSS Floor Plan—Paragraphs 4.04 and 5.04

PACKET SWITCHING MODULE EQUIPMENT REQUIRED WITH 1PSS

1. Number of 9.6 kb/s lines required from DSU frame(s)
2. Number of 56 kb/s lines/trunks required from DSU frame(s)
3. Total of 9.6 kb/s lines and 56 kb/s lines/trunks required (lines 1 and 2)
4. Total number of Packet Switch Units required (line 3) divided by 2, 4, or 8 (depends on the loading of links)

Note: Maximum of 12 Packet Switch Units per PS frame and 5 PS frames per 1PSS (refer to Fig. 4).

5. Spare circuit packs recommended:

CODE	DESCRIPTION	16 LINES QTY	25 LINES QTY	72 LINES QTY	120 LINES QTY
TN-69B	Pack, Circuit DDSBS	1	2	3	5
TN-906	Pack, Circuit DSU Interface	1	2	3	5
TN-907	Pack, Circuit CPU	1	2	3	5
TN-908	Pack, Circuit Memory	1	2	3	5
TN-909B/UN-245	Pack, Circuit Link Interface	2	4	6	10
495K1	Power Unit	1	2	3	5
ED-4C387-3, G1	Fan Unit	1	2	3	5

Fig. 12— 1PSS Equipment Work Sheet (PSM)—Paragraph 4.06

DIGITAL PATCH PANEL EQUIPMENT REQUIRED WITH 1PSS

- 1. Number of CCITT V.35 (56 kb/s) interfaces required _____
- 2. Each V.35 Digital Patch Panel provides 12 interfaces. Total number of V.35 Digital Patch Panels required (line 1 divided by 12) _____
- 3. Number of RS-232 (9.6, 4.8, and 2.4 kb/s) interfaces required _____
- 4. Each RS-232 Digital Patch Panel provides 16 interfaces. Total number of RS-232 Digital Patch Panels required (line 3 divided by 16) _____

Note: Maximum of 10 Digital Patch Panels per Patch frame and 4 Patch frames per 1PSS.

5. Spare circuits recommended:

		16 LINES QTY	25 LINES QTY	72 LINES QTY	120 LINES QTY
V.35	Digital Patch Panel	1	2	3	5
RS-232	Digital Patch Panel	1	2	3	5

Fig. 13—1PSS Equipment Work Sheet (Patch)—Paragraph 4.08

DSU EQUIPMENT REQUIRED WITH 1PSS

- 1. Number of 9.6 kb/s lines required from CSU frame _____
- 2. Number of 9.6 kb/s lines required for growth _____
- 3. Number of 9.6 kb/s lines required end of engineering period (lines 1 and 2) _____
- 4. Total of 9.6 kb/s Data Service Units (DSUs) required (line 3) _____
- 5. One DSU frame arranged for 16 DSUs equipped with 9.6 kb/s patch panel and cables for the first 8 DSUs (line 4) divided by 8 _____
- 6. Number of 56 kb/s lines/trunks required from CSU frame _____
- 7. Number of 56 kb/s lines/trunks required for growth _____
- 8. Number of 56 kb/s lines/trunks end of engineering period (lines 6 and 7) _____
- 9. Total 56 kb/s DSUs required (line 8) _____
- 10. One DSU frame arranged for 16 DSUs equipped with 56 kb/s patch panel and cable for the first 8 DSUs (line 9) divided by 8 _____
- 11. Total 9.6 kb/s DSUs (line 4) 500B L 1/4 data unit _____
- 12. Total 56 kb/s DSUs (line 9) 500B L 1/5 data unit _____

Note: Maximum arrangement of 16 DSUs per DSU frame—total of 16 DSUs (refer to Fig. 6).

13. Spare DSUs recommended:

CODE	DESCRIPTION	16 LINES QTY	25 LINES QTY	72 LINES QTY	120 LINES QTY
550BL 1/4 DSU	Data Service Unit 9.6 kb/s	1	2	5	8
500BL 1/5 DSU	Data Service Unit 56 kb/s	1	2	5	8

Fig. 14— 1PSS Equipment Work Sheet (DSU)—Paragraph 4.10

Wire Center/Location _____
 Order Number _____

CSU EQUIPMENT REQUIRED WITH 1PSS

1. Number of 9.6 kb/s lines required at cutover _____
2. Number of 9.6 kb/s lines required for growth _____
3. Number of 9.6 kb/s lines required end of engineering period (lines 1 and 2) _____
4. Total 9.6 kb/s Channel Service Units (CSUs) required (line 3) _____
5. One frame arranged for 8 CSUs equipped with 1 cross-connect panel for 9.6 kb/s (line 4) divided by 8 _____
6. Number of 56 kb/s lines/trunks required from Model 1 RPM, Data Transport Network, NCSS, and service vendors _____
7. Number of 56 kb/s lines/trunks required for growth _____
8. Number of 56 kb/s lines/trunks required end of engineering period (lines 6 and 7) _____
9. Total 56 kb/s CSUs required (line 8) _____
10. One frame arranged for 8 CSUs equipped with 1 cross-connect panel for 56 kb/s (line 9) divided by 8 _____
11. Total 9.6 kb/s CSUs (line 4) 500A L 1/4 data unit _____
12. Total 56 kb/s CSUs (line 9) 500A L 1/4 data unit _____

Note: Maximum of 50 CSUs per CSU Frame (refer to Fig. 7).

13. Spare CSUs recommended:

CODE	DESCRIPTION	16 LINES QTY	25 LINES QTY	72 LINES QTY	120 LINES QTY
550A L 1/4 CSU	Channel Service Unit 9.6 kb/s	1	1	3	4
550A L 1/5 CSU	Channel Service Unit 56 kb/s	1	1	3	4

Fig. 15— 1PSS Equipment Work Sheet (CSU)—Paragraph 4.12

Wire Center/Location _____
Order Number _____

- 1. Direct access lines required at cutover _____
- 2. Direct access lines required for growth _____
- 3. Direct access lines required end of engineering period (lines 1 and 2) _____
- 4. Direct access lines (line 3) divided by 3 _____
- 5. Total of Data Subscriber Loop Carrier circuits (TN-811 circuit packs) required (line 4) _____
- 6. Dial access lines required at cutover _____
- 7. Dial access lines required for growth _____
- 8. Dial access lines required end of engineering period (lines 6 and 7) _____
- 9. Dial access lines (line 8) divided by 4 _____
- 10. Total of modem circuits (TN-812 circuit pack) required (line 9) _____
- 11. TN-811 (line 5) _____
 TN-812 (line 10) _____

TOTAL _____ 1 through 31—one Model 1 RPM unit and one Model 1 RPM frame,
32 through 62—two Model 1 RPM units and one Model 1 RPM frame.

- 12. Provide one test access circuit per Model 1 RPM unit (refer to Fig. 8)

Fig. 16—Model 1 RPM Equipment Work Sheet—Paragraph 4.15 (Sheet 1 of 2)

13. Spare circuit packs recommended:

CODE	DESCRIPTION	SPARE REQUIREMENTS
TN-816	Formatter	2 spares for first 5 Model 1 RPM units plus 1 additional spare for each additional 5 Model 1 RPM units
TN-817	Group Distributor Circuit	
TN-818	Control Buffer and Clock	Model 1 RPM units
TN-819	DMA Processor	
TN-820	Main Processor	
TN-822	DSO	
495F1	+5 V Power Converter	
490A1	-5 V Power Converter	
ED-4C400	30 G1A Power Control and Display	
TN-821	RAM	3 spares for first 5 Model 1 RPM unit plus 1 additional spare for each additional 5 Model 1 RPM units
PLUG-INS		
CODE	DESCRIPTION	SPARE REQUIREMENTS
TN-811	Data-SCL Cards	3 spares for first 3 Model 1 RPM units plus 1 additional spare for each additional 3 Model 1 RPM units
TN-812	Modem Cards	3 spares for first 3 Model 1 RPM units plus 1 additional spare for each additional 3 Model 1 RPM units
TN-813	Test Access Circuit	2 spares for first 5 Model 1 RPM units plus 1 additional spare for each additional 5 Model 1 RPM units

Fig. 16—Model 1 RPM Equipment Work Sheet—Paragraph 4.15 (Sheet 2 of 2)

Wire Center/Location _____
 Order Number _____

1. Dial access lines required at cutover _____
2. Dial access lines required for growth _____
3. Dial access lines required end of engineering period (lines 6 and 7) _____
4. Dial access lines (line 8) divided by 24 _____
5. Total of M1COM Model M8500-24 required (line 9) _____
6. M1COM Model M8500-24 pads (line 10) _____ 5 per Model 2 RPM frame
7. Spare circuit packs recommended (refer to Fig. 9):

DESCRIPTION	SPARES 1-10 PADS	SPARE FOR EACH 10 ADDITIONAL UNITS
ED-4C401-10, G4 S8500 EXP	2	1
ED-4C401-10, G45 S8500 212T-8	2	1
ED-4C401-10, G6 4641/LR	3	2
ED-4C401-10, G7 S8500 CPU	2	1
ED-4C401-10, G8 S8500-48 VDB	2	1
ED-4C401-10, G9 4648C-48 VDB	2	1
ED-4C401-10, G10 F8500/LT8	2	1

Fig. 17—Model 2 RPM Equipment Work Sheet—Paragraph 4.20 (Sheet 1 of 2)

DSU EQUIPMENT REQUIRED WITH MODEL 2 RPM

1. Number of 9.6 kb/s lines required from Model 2 RPM frame(s) _____
2. Total 9.6 kb/s Data Service Units (DSUs) required (5 maximum) per Model 2 RPM frame _____
3. One DSU frame arranged for 25 DSUs (line 2) divided by 5 _____
4. Total 9.6 kb/s DSUs (line 2) 500B L 1/4 Data Unit _____

Note: Maximum arrangement of 25 DSUs per DSU frame (refer to Fig. 6).

5. Spare DSUs recommended:

CODE	DESCRIPTION	16 LINES QTY	25 LINES QTY	72 LINES QTY	120 LINES QTY
550B L 1/4 DSU	Data Service Unit	1	2	5	8

CSU EQUIPMENT REQUIRED WITH MODEL 2 RPM

1. Number of 9.6 kb/s lines required from DSU frame(s) _____
2. Total 9.6 kb/s Channel Service Units (CSUs) required _____
3. One CSU frame arranged for 8 CSUs equipped with 1 cross-connect panel (line 2) divided by 8 _____
4. Total 9.6 kb/s CSUs (line 2) 500A L 1/4 Data Unit _____

Note: Maximum of 4 arrangements of 8 CSUs per CSU frame—total of 32 CSUs (refer to Fig. 7).

5. Spare CSUs recommended:

CODE	DESCRIPTION	16 LINES QTY	25 LINES QTY	72 LINES QTY	120 LINES QTY
550 L 1/4 CSU	Channel Service Unit 9.6 kb/s	1	1	3	4

Fig. 17—Model 2 RPM Equipment Work Sheet—Paragraph 4.20 (Sheet 2 of 2)