

**"DIMENSION\*" 400 PBX  
SYSTEM DESCRIPTION**

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**NOTICE**

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## 1. GENERAL

**1.01** This section describes the DIMENSION 400 PBX which is an electronic switching system that uses a stored program control for call processing and system diagnostics. This PBX is compatible with all central offices **except panel**. Figure 1 is a block diagram showing the component parts of the PBX.

**1.02** This section is reissued for the following reasons:

- (a) To provide current system information
- (b) To provide information on the following:
  - (1) Data Switching Level 1
  - (2) Wrist Grounding Strap
  - (3) Federal Communications Commission (FCC) (Part 15) Requirements.
- (c) To cover the following circuit packs:
  - (1) LC566, Data Interface Circuit
  - (2) LC567, Data Port Circuit
  - (3) LC10 TOUCH-TONE Service Register and Receiver

(4) LC30B Tape Transport Interface B

(5) LC45B Attendant Interface.

Revision arrows are used to emphasize the more significant changes.

**1.03** **Warning:** *This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.*

**1.04** The 554 Division of Bell System Practices covers the DIMENSION PBX product line and is structured so that related information is in the same layers as follows:

- Section 554-000-000 is an index of all Issue 1 or later sections.
- Layer 554-010-XXX contains sections common to more than one DIMENSION PBX system. It covers consoles, auxiliary circuits, DIMENSION PBX electronic custom telephone service (ECTS), remote maintenance, administration, and traffic system (RMATS), station message detail recording (SMDR), customer administration center system (CACS), customer administration panel (CAP), and automatic voice network (AUTOVON).
- Sections 554-101-XXX and 554-102-XXX pertain to the DIMENSION 100 and 400 PBX Systems.
- Sections 554-105-XXX pertain to DIMENSION 600 PBX Systems.
- Sections 554-106-XXX pertain to Energy Communication Service Adjunct.
- Sections 554-111-XXX pertain to DIMENSION 2000 and Custom PBX Systems.

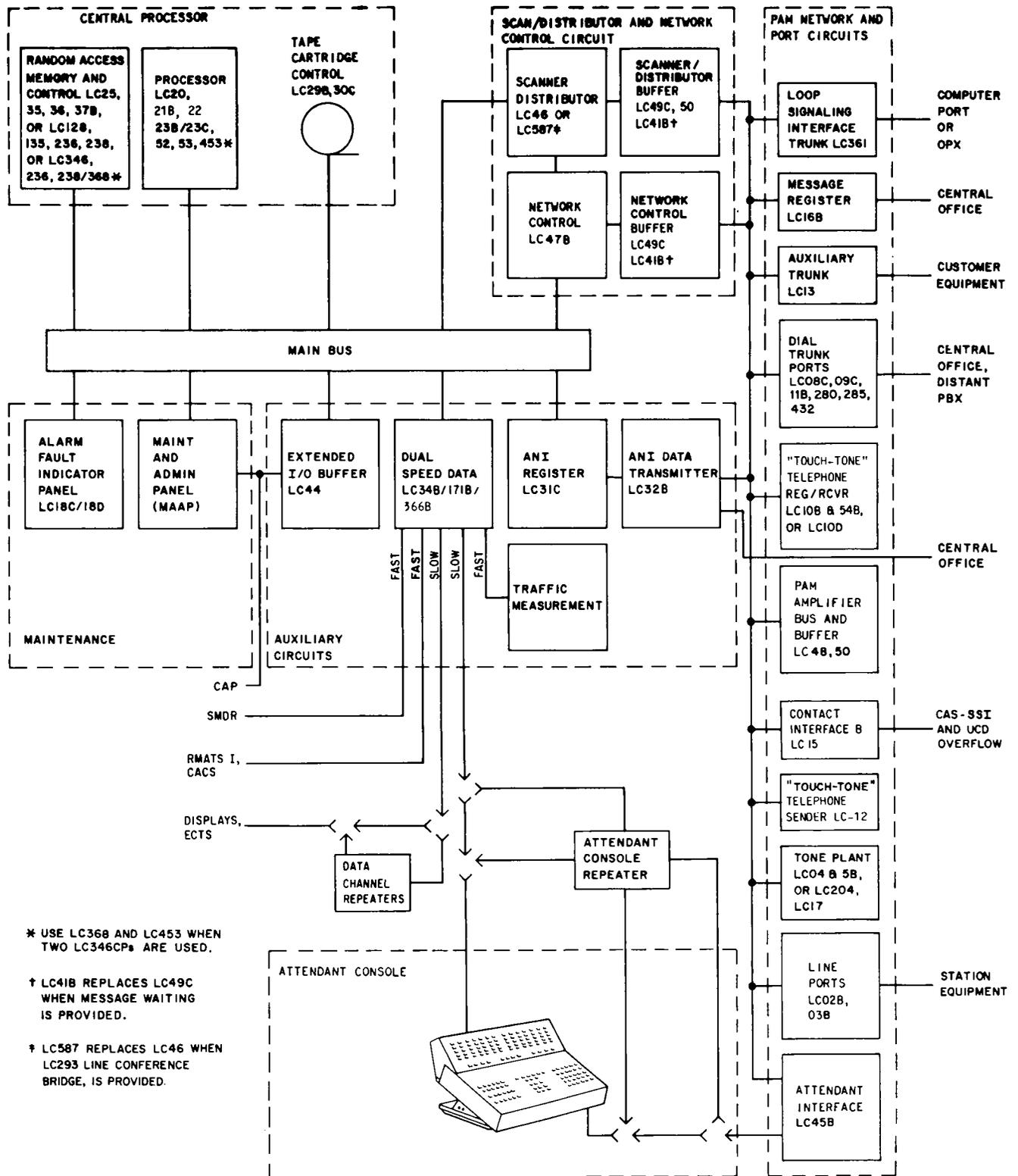


Fig. 1—DIMENSION 400 PBX—Block Diagram

- Sections 554-191-XXX contain feature documents.
- How-To-Operate instructions for the DIMENSION PBX consoles are contained in 999-200-XXX Sections.

**1.05** The 554-1XX-XXX sections contain system descriptions, engineering planning, and general software descriptions of a tutorial nature. The Task Oriented Practices (TOP) for each system are numbered in the appropriate layers for each DIMENSION PBX system. Maintenance support is provided in a series of sections prepared for major system elements such as the pulse amplitude modulation (PAM), scanner/distributor, processor, etc. The sections are intended to convey operational theory to provide a background for troubleshooting complex problems. Maintenance and administration manuals are provided to serve as guides for corrective action required beyond first-tier activities. In addition, Sections 554-101-115 and 554-111-115 contain descriptions and procedures for all field X-ray tests.

**1.06** This section is based on the drawings listed in Part 11. If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the schematic diagrams (SDs) and circuit description (CDs) to determine the extent of the changes and the manner in which the section may be affected.

## 2. DESCRIPTION

**2.01** DIMENSION PBXs use time division switching (Fig. 2) which involves sampling signals at the port circuits, summing the sampled signals in a central amplifier, and distributing the signals to the port circuits. The sampled signals charge an input capacitor at each port circuit which holds the energy level for the sample period. Smoothing of the sampled signals is provided by filters in the port circuits. Sampling at fixed time intervals permits sequential transmission of 64 simultaneous conversations over a single network path. The sampling rate is approximately 16,200 Hz or once every 62  $\mu$ s for a sample width of approximately 400 nanoseconds (ns) if circuit pack LC47 is used. If the LC47B is used, the sample width is approximately 600 ns. Data transmission of 4800 bits per second is possible via the system network.

**2.02** Each port circuit (line, trunk, attendant interface, etc) contains a time slot memory (shift

register) and a time division switch. The basic time division network includes a port circuit and a common bus wired to each port circuit with associated amplifiers and control circuits (Fig. 2).

**2.03** Functional operation of all portions of the PBX is under the control of the processor (Fig. 1). The processor controls all system activities by executing instructions read from the main program memory. A high-level instruction is read from the random access memory (RAM), and the processor executes a series of microinstructions in response to the high-level instruction. The processor communicates with the system via the main system bus and dedicated input/output (I/O) channels. Upon direct commands from the processor, the scanner/distributor scans for changes in port status, and time slots are assigned by the network control circuits. Once the time slots for active port circuits are assigned, the processor continues to scan the network ports by having the scanner/distributor scan for switchhook status.

**2.04** The call processing operations and features provided by the system are controlled by the program that is loaded into the RAM. The particular generic program provided with each system is chosen to provide the required features. A tape cartridge is prepared for each system which contains a generic program (feature package) and the translation data for the system.

**2.05** Translation data (class-of-service information, numbering plan, hunting, trunk grouping, and all similar customer information) may be provided either via a tape cartridge from the factory or by manual entry through the Maintenance and Administration Panel (MAAP) or RMATS. The data entered by the tape cartridge is generated from the DIMENSION PBX Ordering Form E-8124, which details the customer requirements. This form is processed at the factory, and the data is loaded on the same cartridge which contains the generic program. If local translation data is entered via the MAAP, detailed translation forms supplied by Business Services personnel must be completed for record-keeping purposes.

**2.06** Software programs are prepared for DIMENSION PBX systems prior to delivery and include the services and features desired by the customer as indicated on the DIMENSION PBX Ordering Form.

**2.07** The number of lines and trunks served by a particular DIMENSION 400 PBX is limited by

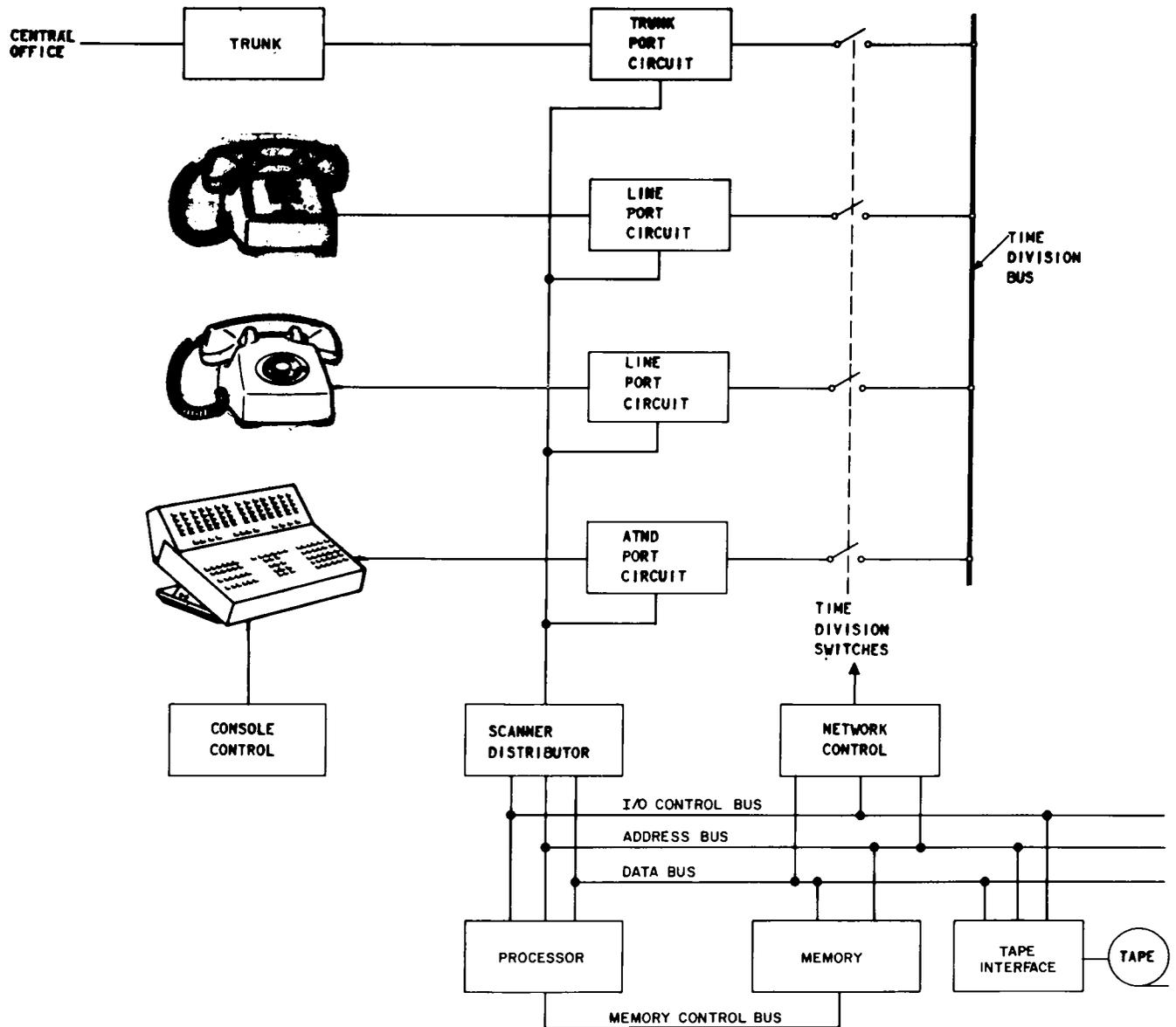


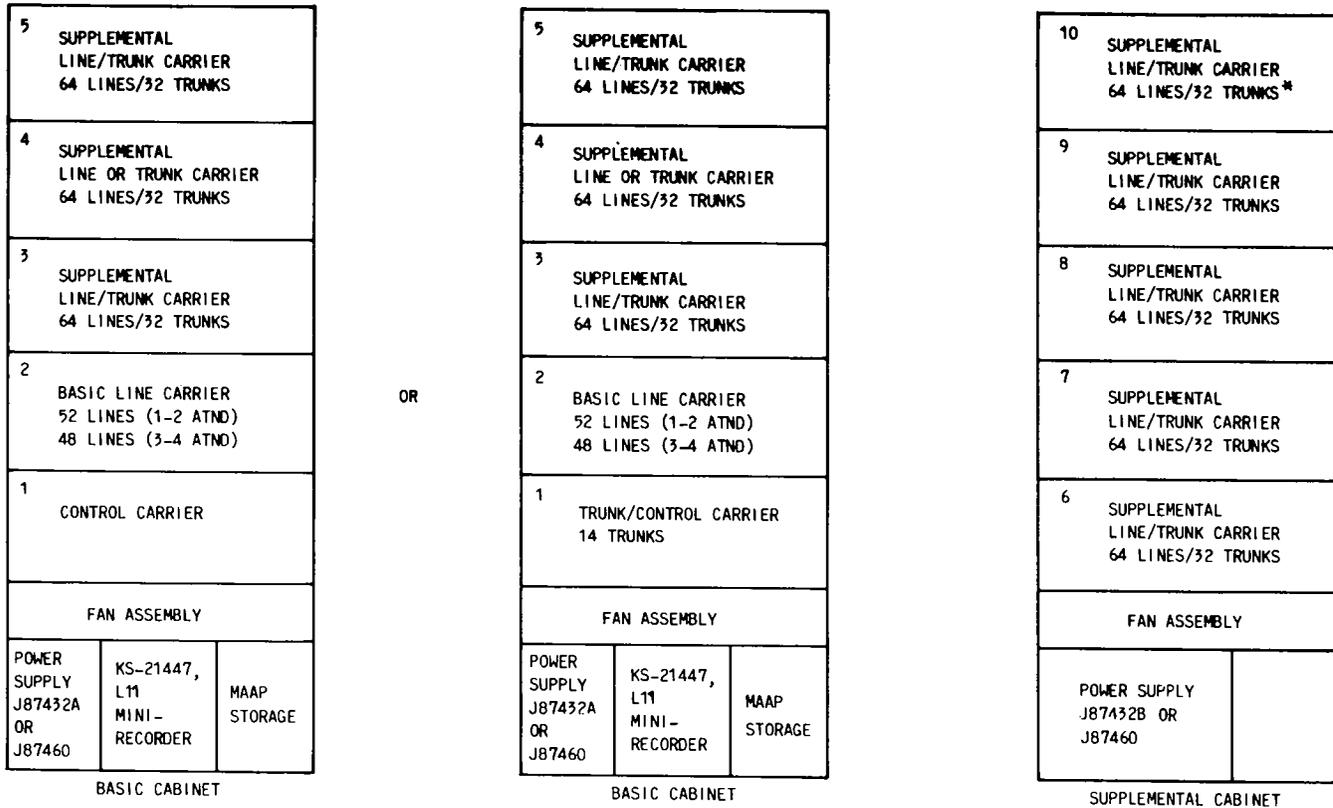
Fig. 2—Time Division Switching—Functional Block Diagram

the memory size and the number of circuit packs in the supplemental line and trunk carriers. Figure 3 shows the cabinet arrangements. Earlier systems, equipped with a control carrier in the basic cabinet, can only be used with Feature Packages 1, 2, 3, 4, 5, and 10. Later systems, equipped with a control/trunk carrier, can only be used with Feature Packages 2, 3, and 15. System parameters are shown in Table A.

**2.08** The basic equipment module is a circuit pack carrier. The system consists of line carriers,

trunk carriers, and a control carrier. The control carrier is installed in the basic cabinet while the line carriers and trunk carriers are installed in the basic or supplemental cabinets (Fig. 3), depending on customer requirements. Circuit packs containing the circuits for lines, trunks, and control functions plug into connectors in these carriers.

**2.09** Computation of the maximum line and trunk capacities for a typical 2-cabinet arrangement is shown in Fig. 3. The first line carrier capacity is



SYSTEM LIMITS								
	1 CABINET				2 CABINETS			
	CONTROL CARRIER J58879CA		TRUNK/CONTROL CARRIER J58879CC		CONTROL CARRIER J58879CA		TRUNK/CONTROL CARRIER J58879CC	
	LINES	TRUNKS	LINES	TRUNKS	LINES	TRUNKS	LINES	TRUNKS
MAXIMUM LINES	180	32	244	14	436	64	436	46
MAXIMUM TRUNKS	52	96	52	110	308	128	308	110

\* SUPPLEMENTAL EQUIPMENT LOCATION 10 IS NOT USED WHEN BASIC CABINET IS EQUIPPED WITH TRUNK/CONTROL CARRIER.

**Fig. 3—DIMENSION 400 PBX—Two-Cabinet Arrangement**

reduced by one slot for each pair of attendant positions required and for each tone plant circuit pack required. Individual line and trunk capacities can be used to arrange any size configuration to maximum size.

**2.10** The capacity of the system is a function of both hardware and software. Table A summa-

rizes the hardware and software capacities with respect to memory size. However, maximum numbers of all facilities cannot be provided in one system.

**2.11** The network capacity of the DIMENSION 400 PBX is 1662 CCS (hundred call seconds). The 1662-CCS rate divided by the total number of lines

**TABLE A**  
**"DIMENSION" 400 PBX SYSTEM PARAMETERS**

	ITEM	FEATURE PACKAGE (SEE NOTE)	MEMORY SIZE		
			A	B	C
Equipment	Cabinets	1, 3, 4, 5	2	2	2
		2, 10	—	2	2
		15	—	—	2
	Line Carriers	1, 3, 4, 5	2	4	7
		2, 10	—	4	7
		15	—	—	7
	Trunk Carriers (Including Trunk/Control Carrier When Provided)	1, 3, 4, 5	2	4	4
		2, 10	—	4	4
		15	—	—	4
System	ADSS Group Select Keys	1, 3, 4, 5	6	18	18
		2, 10	—	18	18
		15	—	—	18
	ARS Toll Tables	4	5	6	9
		10	—	6	9
		15	—	—	9
	ARS Patterns	4	16	32	32
		10	—	32	32
		15	—	—	32
	ARS 6-Digit Tables	4	4	5	8
		10	—	5	8
		15	—	—	8
	ANI Queuing Records	2, 10	—	4	4
		4, 5	4	4	4
		15	—	—	4

**Note:** Feature Package (FP) 1 is rated A&M.

TABLE A (Contd)

## "DIMENSION" 400 PBX SYSTEM PARAMETERS

	ITEM	FEATURE PACKAGE (SEE NOTE)	MEMORY SIZE		
			A	B	C
System (Contd)	Attendant Conference Trunks	4	1	2	4
		10	—	2	4
		15	—	—	4
	Attendant Consoles	1, 3, 4, 5	1	3	4
		2, 10	—	3	4
		15	—	—	4
	Attendant Originating Registers	1, 3, 4, 5	1	3	4
		2, 10	—	3	4
		15	—	—	4
	Call Pickup Groups	1, 3, 4, 5	31	31	31
		2, 10	—	31	31
		15	—	—	31
	Calling number Displays	3, 4	6	6	6
		10	—	6	6
		15	—	—	6
	Classes of Service	1, 3, 4, 5	31	31	31
		2, 10	—	31	31
		15	—	—	31
	Code Restriction Groups	2, 10	—	5	5
		3, 4, 5	5	5	5
		15	—	—	5

**Note:** Feature Package 1 is rated A&M.

TABLE A (Contd)

## "DIMENSION" 400 PBX SYSTEM PARAMETERS

	ITEM	FEATURE PACKAGE (SEE NOTE)	MEMORY SIZE		
			A	B	C
System (Contd)	Controlled Restriction Groups	3, 4	63	63	63
		10	—	63	63
		15	—	—	63
	Custom Intercom Numbers	4	250	500	750
		10	—	500	250
		15	—	—	750
	Dial Access Codes	1, 3, 4, 5	48	72	96
		2, 10	—	72	96
		15	—	—	96
	Dial Pulse/TOUCH-TONE Service Originating Registers	1, 3, 4, 5	7	11	14
		2, 10	—	11	14
		15	—	—	14
	Direct Department Calling (DDC) and/or Uniform Call Distribution (UCD) Groups	10	—	14	14
		15	—	—	14
	Directory Blocks (Station Line Tens Groups)	1, 4, 5	15	56	100
		2	—	56	100
		3	30	56	100
		10	—	56	100
		15	—	—	100
	ECTS Auto/Manual Intercoms	5	25	98	98
		15	—	—	98
	ECTS Button Assignments	5	1000	2560	2980
		15	—	—	2980

**Note:** Feature Package 1 is rated A&M.

TABLE A (Contd)

## "DIMENSION" 400 PBX SYSTEM PARAMETERS

	ITEM	FEATURE PACKAGE (SEE NOTE)	MEMORY SIZE		
			A	B	C
System (Contd)	ECTS Central Office Trunks	5	8	16	32
		15	—	—	32
	ECTS Controllers	5	1	2	3
		15	—	—	3
	ECTS Dial Intercoms	5	10	20	20
		15	—	—	20
	ECTS Lines	5	90	244	300
		15	—	—	300
	ECTS Line Appearances	5	600	1830	1830
		15	—	—	1830
	ECTS Memory Words	5	4096	8192	12,288
		15	—	—	12,288
	ECTS Stations	5	126	252	378
		15	—	—	378
	Flexible Night Service/Trunk Verification Trunks	1, 4, 5	45	78	128
		10	—	78	128
		2	—	108	158
		15	—	—	158
	Hot line Numbers	3	15	15	15
	Input/Output Data Channels	1, 3, 4, 5	16	16	16
		2, 10	—	16	16
		15	—	—	16

**Note:** Feature Package 1 is rated A&M.

TABLE A (Contd)

## "DIMENSION" 400 PBX SYSTEM PARAMETERS

	ITEM	FEATURE PACKAGE (SEE NOTE)	MEMORY SIZE		
			A	B	C
System (Contd)	Message Register Service Trunks	3	3	6	10
	Outgoing Trunk Queuing Groups	1, 4, 5	4	12	12
		2, 10	—	12	12
		15	—	—	12
	Remote Access Trunks	2, 10	—	4	4
		4, 5	4	4	4
		15	—	—	4
	SMDR/ARS Queuing Records	4	16	30	48
		10	—	30	48
		15	—	—	48
	SMDR Records	4	32	50	64
		10	—	50	64
		15	—	—	64
	Speed Calling Numbers	4	250	1000	1500
		10	—	1000	250
		15	—	—	1500
	Station Lines*	1, 3, 4, 5	116	244	436
		2	—	244	436
		10	—	240	432
		15	—	—	432

**Note:** Feature Package 1 is rated A&M.

\* Line sizes shown assume one attendant console and CAS tone circuit (FP10 and FP15) are provided. If no attendant console is provided, four additional lines can be provided. If CAS tone circuit (FP10 and FP15) is not provided, four additional lines can be provided.

TABLE A (Contd)

## "DIMENSION" 400 PBX SYSTEM PARAMETERS

	ITEM	FEATURE PACKAGE (SEE NOTE)	MEMORY SIZE		
			A	B	C
System (Contd)	Tandem Tie Trunk Restriction Dial Access Codes	2, 10	—	13	13
		3, 4, 5	13	13	13
		15	—	—	13
	Total Intercom, Queuing, and Physical Trunks	1, 4, 5	61	108	158
		2, 10	—	108	158
		3	45	108	158
		15	—	—	158
	Trunk Groups	1, 3, 4, 5	31	63	63
		2, 10	—	63	63
		15	—	—	63
	Trunk-to-Trunk Restriction Dial Access Codes	2, 10	—	13	13
		3, 4, 5	13	13	13
		15	—	—	13
	Memory Words Required	FP1, Iss 2.0	36K	36K	40K
		FP2, Iss 3.1	—	40K	44K
		FP3, Iss 2.0*	36K	40K	44K
		FP4, Iss 2.0	52K	60K	64K
		FP5, Iss 2.0	52K	60K	64K
		FP10, Iss 1.0	—	64K	64K
		FP15, Iss 1.0	—	—	128K

**Note:** Feature Package 1 is rated A&M.

\* If hotel/motel message register service is provided, additional memory must be supplied by an LC25, LC39, or LC40 circuit pack. If LC128 circuit packs are used with FP3, 64K memory words are required for memory sizes A and B; also the LC25 cannot be used.

determines the CCS per line at a P.01 blocking. The processor can handle up to 1800 busy-hour calls.

**2.12** Line port carriers are divided into two ringing groups. There may be a maximum of 32 lines in a ringing group. Only four lines in a ringing group can be rung simultaneously; any additional calls to a line in the same group will receive reorder tone.

**2.13** In most cases, the ringing capability is more than adequate, since the probability of four station lines in a ringing group requiring simultaneous ringing is minimal. If ringing blockages are anticipated initially, stations with heavy ringing requirements may be designated as critical lines in the ordering questionnaire. These lines will be spread evenly over the equipped ringing groups. If blocking should occur due to ringing group imbalance after the system is installed, station lines may be easily reassigned to other ringing groups.

**2.14** To ensure proper load testing before shipment, all stations in at least one hunt group, one pickup group, and one hot-line group (in systems having these features) will be assigned in the first two line carriers at the factory.

**2.15** The station and trunk conductor loop range is as follows:

LOOP	RANGE
Station conductor	Nine hundred fifty (950) ohms or less plus the FCC registered terminal device resistance
Trunk conductor	Trunk conductor loop resistance shall not exceed the external circuit resistance of the connecting central office less 300 ohms.

**2.16** System Management has been developed and introduced as a means to reduce initial cost elements incurred by a customer. It also permits:

- The customer to design, configure, prepare, and input translations.
- Use of PBX models to make ordering easier and to reduce manufacturing interval.
- The ability to perform station review and prepare translations in parallel with ordering of PBX and terminal equipment.

**2.17** System Management concept for DIMENSION 400 PBXs provides the following levels of customer participation:

- **Full Participation:** This level results in the greatest initial cost reduction. It requires that the customer working with Marketing to design and configure the switch, conduct station reviews, prepare and input translations to the PBX prior to cutover. The customer will also be responsible for maintaining and updating translation records.
- **Full Order:** This level results in a smaller cost reduction than realized in Full Participation orders. In the Full Order plan, the customer, together with Marketing, designs and configures the switch, performs the station review, and completes the initial station user records. The Bell Operating Company prepares and inputs the translations to the PBX and maintains translation records.
- **Non-Participation:** In this level, orders will also be completed using models. In this instance, however, the customer, together with Marketing, will design and configure the switch. It will be the responsibility of Marketing to select the hardware and software model that comes closest to meeting the customer's desired configuration. Marketing will also be responsible for conducting the station review, and completing the initial station user records. The Bell Operating Company will be responsible for preparing and inputting the translations to the PBX and maintaining records.♦

### 3. FEATURES AND SERVICES

**3.01** DIMENSION 400 PBX Systems can provide the features and services listed in Table B. Features requiring hardware consideration (ie, features which require some hardware engineering) and issue number of the feature package that provides a feature are so designated in Table B.

**3.02** A description of the features and auxiliary services available with the DIMENSION 400 PBX is provided alphabetically in the following paragraphs.

#### ADVANCED PRIVATE LINE TERMINATION (APLT)

**3.03** This feature provides access to and termination from private line networks. The private

**TABLE B  
FEATURES AVAILABLE IN FEATURE PACKAGES**

FEATURE	FEATURE PACKAGE NO. (NOTE)							HARDWARE CONSIDERATION	
	1	A&M	2	3	4	5	10		15
Advanced Private Line Termination (APLT)			3.3		2	2	1	1	
Alphanumeric Display for ATND Position	1	1	1	1	1	1	1	1	X
ATND Conference					1		1	1	X
ATND Console	1	1	1	1	1	1	1	1	
ATND Control of Trunk Group Access	1	1	1	1	1	1	1	1	X
ATND DSS With Busy Lamp Field	1	1	1	1	1	1	1	1	X
ATND Lockout		1			1	1	1	1	
Attendant Release Loop (ARL)								1	
ATND Transfer - All Calls	1	1	1	1	1	1	1	1	
Automatic Callback - Calling		1			1	1	1	1	
Automatic Identified Outward Dialing (AIOD)		1			1	1	1	1	X
Automatic Route Selection (ARS)					1		1	1	
Busy Lamp Field	1	1	1	1	1	1	1	1	X
Busy Verification of Station Lines		1	1	1	1	1	1	1	
Call Forwarding	-	-	-	-	-	-	-	-	
- All Calls	1	1	1	1	1	1	1	1	
- Busy and Don't Answer		1	2	1	1	1	1	1	
- Don't Answer		3	2	2	2	1	1	1	
Call Hold	1	1	1	1	1	1	1	1	
Call Park		1	1	1	1	1	1	1	X
Call Pickup	1	1			1	1	1	1	
Call Waiting Services	-	-	-	-	-	-	-	-	
- ATND call Waiting	1	1	1	1	1	1	1	1	
- Originating Call Waiting	1	1	1	1	1	1	1	1	
- Terminating Call Waiting	1	1	1	1	1	1	1	1	
Calling Number Display to ATND	1	1	1	1	1	1	1	1	X
Calling Number Display to Station			1	1			1	1	X
Calls Waiting	1	1	1	1	1	1	1	1	
- With Audible Signal		3	2	2	2	1	1	1	X
CCSA Access		1			1	1	1	1	X
Centralized ATND Service (CAS)	-	-	-	-	-	-	-	-	
- W/Separate ATND Concentrator							1	1	X
Centralized Station Message Detail Recording (CSMDR)					1		1	1	X
Class of Service Display to ATND	1	1	1	1	1	1	1	1	X
Code Calling Access	-	-	-	-	-	-	-	-	
- 3A	1	1	1	1	1	1	1	1	X
- Chime Paging							1	1	X
Code Restriction		1	1	1	1	1	1	1	
Controlled Outward Restriction			1	1			1	1	

NOTE: Numbers indicate feature package issue that initially provided feature.

**TABLE B (Contd)**  
**FEATURES AVAILABLE IN FEATURE PACKAGES**

FEATURE	FEATURE PACKAGE NO. (NOTE)							HARDWARE CONSIDERA- TION
	1 A&M	2	3	4	5	10	15	
Controlled Outward Restriction			1	1		1	1	
Controlled Station to Station Restriction			1	1		1	1	
Controlled Termination Restriction			1	1		1	1	
Controlled Total Restriction			1	1		1	1	
Custom Intercom				1		1	1	
Customer Administration Panel							1	X
Data Communication Access		1	1	1	1	1	1	
Data Privacy		3	2	1	2	1	1	
Data Restriction		3	2	1	2	1	1	
Data Switching								
Level 1		3	2	1	2	1	1	
Dial Access to Attendant	1	1	1	1	1	1	1	
DIMENSION PBX Electronic Custom Telephone Service (See TABLE D)					1		1	X
Direct Department Calling (DDC)						1	1	
Direct Inward Dialing (DID)		1		1	1	1	1	X
Direct Outward Dialing (DOD)	1	1	1	1	1	1	1	X
Direct Trunk Group Selection		1		1	1	1	1	
Distinctive Ringing	1	1	1	1	1	1	1	
Executive Override		1		1	1	1	1	
Flexible Numbering of Stations'	1	1	1	1	1	1	1	
Flexible Numbering of Stations - Mixed Numbering			1					
Foreign Exchange (FX) Access	1	1	1	1	1	1	1	X
Fully Restricted Stations	1	1	1	1	1	1	1	
Hot Line Service			1					
Incoming Call Identification	-	-	-	-	-	-	-	
- Alphanumeric Display	1	1	1	1	1	1	1	X
- Lamps	1	1	1	1	1	1	1	X
Intercept Treatment	-	-	-	-	-	-	-	
- Recorded Announcement		3		1	2	1	1	X
- Tone & Attendant	1	1	1	1	1	1	1	
Inward Restriction	1	1	1	1	1	1	1	
Line Lockout With Warning	1	1	1	1	1	1	1	
Listed Directory Number (LDN) Service	1	1	1	1	1	1	1	
Loudspeaker Paging	-	-	-	-	-	-	-	
- Basic	1	1	1	1	1	1	1	X
- Deluxe		1	1	1	1	1	1	X
- w/Tie Trunk access allowed		3	2	2	2	1	1	
Manual Originating Line Service			1					

NOTE: Numbers indicate feature package issue that initially provided feature.

**TABLE B (Contd)**  
**FEATURES AVAILABLE IN FEATURE PACKAGES**

FEATURE	FEATURE PACKAGE NO. (NOTE)							HARDWARE CONSIDERATION
	1 A&M	2	3	4	5	10	15	
Manual Terminating Line Service	1	1	1	1	1	1	1	
Message Waiting Service			1					X
Miscellaneous Trunk Restriction	1	1	1	1	1	1	1	
Multiple LDN's	-	-	-	-	-	-	-	
- Non DID	1	1	1	1	1	1	1	
- Non DID & DID				1		1	1	
Music on Hold Access		3.1	2	1	2	1	1	X
Night Console Position	1	1	1	1	1	1	1	X
Night Station Service	-	-	-	-	-	-	-	
- Fixed Service	1	1	1	1	1	1	1	
- Full Service	1	1		1	1	1	1	X
Off-Premises Stations	1	1	1	1	1	1	1	X
Off-Premises Station w/Call control		1	1	1	1	1	1	
Origination Restriction	1	1	1	1	1	1	1	
Outgoing Trunk Queuing	1	1		1	1	1	1	
Outward Restriction	1	1	1	1	1	1	1	
Power Failure Transfer	1	1	1	1	1	1	1	X
Privacy & Lockout		1		1	1	1	1	
Radio Paging Access	1	1	1	1	1	1	1	X
Recall Dial Tone	1	1	1	1	1	1	1	
Recorded Telephone Dictation Access		1		1	1	1	1	X
Remote Access to PBX Services		1		1	1	1	1	X
Reserve Power	1	1	1	1	1	1	1	X
Rotary Dial Calling	1	1	1	1	1	1	1	
Route Advance	1	1	1	1	1	1	1	
Serial Call		1	1	1	1	1	1	
Single-Digit Dialing			1					X
Speed Calling				1		1	1	
Splitting - One-Way Automanual	1	1	1	1	1	1	1	
Station Hunting	-	-	-	-	-	-	-	
- Circular	1	1	1	1	1	1	1	
- Terminal	1	1	1	1	1	1	1	
Station Message Detail Recording (SMDR)				1		1	1	X
Station Message Register Service			1					X
Station Rearrangement and Change (used with CAP)							1	X
Station to Station Calling	1	1	1	1	1	1	1	
Straightforward Outward Completion (SFOC)	1	1	1	1	1	1	1	

NOTE: Numbers indicate feature package that initially provided feature.

**TABLE B (Contd)**  
**FEATURES AVAILABLE IN FEATURE PACKAGES**

FEATURE	FEATURE PACKAGE NO. (NOTE)							HARDWARE CONSIDERATION
	1 A&M	2	3	4	5	10	15	
Switched Loop Operation	1	1	1	1	1	1	1	
Tandem Tie Trunk Switching		1	1	1	1	1	1	
Termination Restriction	1	1	1	1	1	1	1	
Threeway Conference Transfer	1	1	1	1	1	1	1	
- With Trunk-to-Trunk Transfer		3	2	2	2	1	1	
Through Dialing	1	1	1	1	1	1	1	
Tie Trunk Access		1	1	1	1	1	1	X
Tie Trunk Access to Paging		3		2		1	1	
Timed Recall on Outgoing Calls				1		1	1	
Timed Reminders	1	1	1	1	1	1	1	
- With Audible Signal		3	2	2	2	1	1	X
Toll Restriction	-	-	-	-	-	-	-	
- Battery Reversal	1	1	1	1	1	1	1	
- 0/1	1	1	1	1	1	1	1	
- For Tandem Tie Trunks		3	2	2	2	1	1	
Toll Terminal Access			1					
TOUCH-TONE Calling	1	1	1	1	1	1	1	X
TOUCH-TONE Calling Senderized Operation				2		1	1	
TOUCH-TONE Service to Dial Pulse Conversion	1	1	1	1	1	1	1	X
Trunk Answer From Any Station (TAAS)	1	1	1	1	1	1	1	X
Trunk Group Busy Indicators on Attendant Position	1	1	1	1	1	1	1	
Trunk Group Warning Indicators on Attendant Position	1	1	1	1	1	1	1	
Trunk-to-Trunk Connections		1	1	1	1	1	1	
Trunk Verification by Customer		1		1	1	1	1	
Trunk Verification by Station		3		2	2	1	1	
Two-Party Hold on Console		1	1	1	1	1	1	
Uniform Call Distribution (UCD)						1	1	X
Uninterruptible Power Service (UPS)	1	1	1	1	1	1	1	X
Visually Impaired Attendant Service		3	2	2	2	1	1	X
WATS Access	1	1	1	1	1	1	1	X
Wide Frequency Tolerant Power Supply	1	1	1	1	1	1	1	X

NOTE: Numbers indicate Feature Package issue that initially provided feature.

network may be a common control switching arrangement (CCSA) or enhanced private switched communications service (EPSCS) network. The APLT provides for network inward dialing, direct outward dialing to the network, and other features similar to those provided on the public exchange network. The APLT trunks can tandem through the DIMENSION PBX without attendant assistance if the network has the capability. If off-net access is provided by the network, selected station lines can be denied off-net access.

#### ALPHANUMERIC DISPLAY FOR ATTENDANT POSITION

**3.04** A visual display device provided on the attendant position to display up to four digits, letters, or symbols as designated for the attendant display features. The display features include calling number display to attendant, class-of-service display to attendant, and incoming call identification.

#### ATTENDANT CONFERENCE

**3.05** An attendant can establish a multiparty conference connection of up to six conferees in addition to the attendant.

#### ATTENDANT CONSOLE

**3.06** A desk-top position from which the attendant handles assistance calls by means of nonlocking keys. Keys are provided for each of the control functions and for the loops which appear on the position. All calls placed by the attendant to trunks and to station lines are made using the TOUCH-TONE\* telephone dial provided or via the attendant direct station selection (ADSS) and direct trunk group selection (DTGS) features when available.

**3.07** The attendant console is completely electronic, using light-emitting diodes (LED) for indicator lamps and nonlocking keys for controls and loops. The console is designed for switched loop operation and can be provided with an attendant direct station selection and busy lamp field (ADSS/BLF) or with a busy lamp field only. A 4-character alphanumeric field or six indicator lamps can be provided for incoming call identification. Two sizes of the console can be provided and are similar in feature capabilities. Figure 4 shows a small attendant console. The

\*Trademark of AT&T.

large attendant console provides additional control and trunk group select keys.

**3.08** The dimensions of the attendant console without the ADSS/BLF are 406 mm (16 inches) wide by 229 mm (9 inches) deep by 76 mm (3 inches) high (front). The console with the ADSS/BLF increases the rear height from 147 mm (5.8 inches) to 229 mm (9 inches) and the depth from 229 mm to 279 mm (9 to 11 inches). The attendant console is mounted on a 203- by 381-mm (8- by 15-inch) baseplate. The K1A handset or a headset (60A or 61A) is recommended for use by the attendant, but not simultaneously.

**3.09** The console is equipped with a 2.44-m (8-foot) long, 12-pair mounting cord that is connected to a B12A (12-pair) or B25A (25-pair) distribution cable from the PBX. The mounting cord is equipped with a 50-pin KS-16689, List 1, connector, and the mating connector terminates the 12- or 25-pair distribution cable.

**3.10** The range of the 12-pair cable is 213m (700 feet) and the range of the 25-pair cable is 300m (1,000 feet). This range can be extended to 3300m (11,000 feet) with attendant console repeaters. If a particular installation requires that a stub-ended console cable be used, an A25B cable should be used and cut down in the normal manner on the cross-connect field.



***If the attendant console is located in a building other than the one in which the PBX is located, attendant console repeaters must be used.***

**3.11** For more detailed information on the attendant console, refer to Section 554-010-100.

#### ATTENDANT CONSOLE REPEATER

**3.12** The attendant console repeater unit (Fig. 5) provides lightning protection and range extension for the attendant console low-speed data channel. The attendant console repeater can be used in two configurations:

- (a) The attendant console repeater is used without range extension when the attendant console is located in a building different from the DIMENSION PBX and the distance is 300m (1000 feet) or less.
- (b) The attendant console repeater is used with range extension when the attendant console is

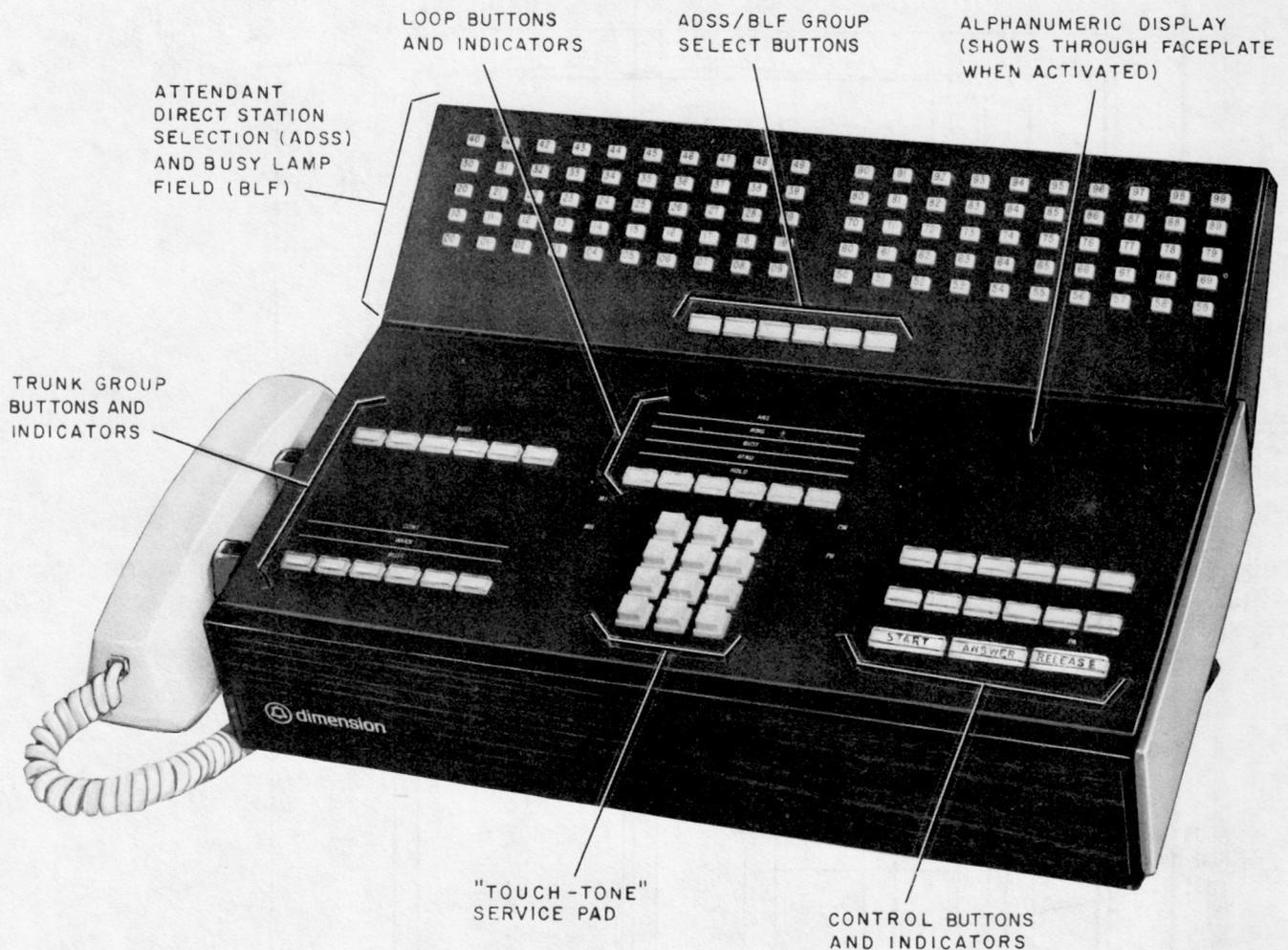


Fig. 4—DIMENSION PBX Attendant Console

located more than 300m (1000 feet) from the DIMENSION PBX.

**3.13** The repeater circuitry is housed in a modified key service unit (KSU), approximately 240 mm (9 1/2 inches) wide by 430 mm (17 inches) long. Each repeater unit can accommodate one attendant console repeater.

**3.14** Application of the attendant console repeater is shown in Fig. 6. Two repeaters are used in series to connect the PBX to an attendant console located in a separate building approximately 900m (3,000 feet) away. Four attendant console repeaters can be used in series to extend the distance between the PBX and attendant console to 3300m (11,000 feet).

**3.15** For more detailed information regarding the attendant console repeater, refer to Sections 554-010-100, 554-010-101, and 554-101-101.

#### ATTENDANT CONTROL OF TRUNK GROUP ACCESS

**3.16** An attendant can restrict dial access by all station lines to central office (CO), foreign exchange (FX), wide area telecommunications service (WATS), and/or tie trunk groups by dialing a code followed by the trunk group access code (or operation of a DTGS key when provided). Calls to groups so restricted will be routed to the attendant for subsequent completion or manual queuing.

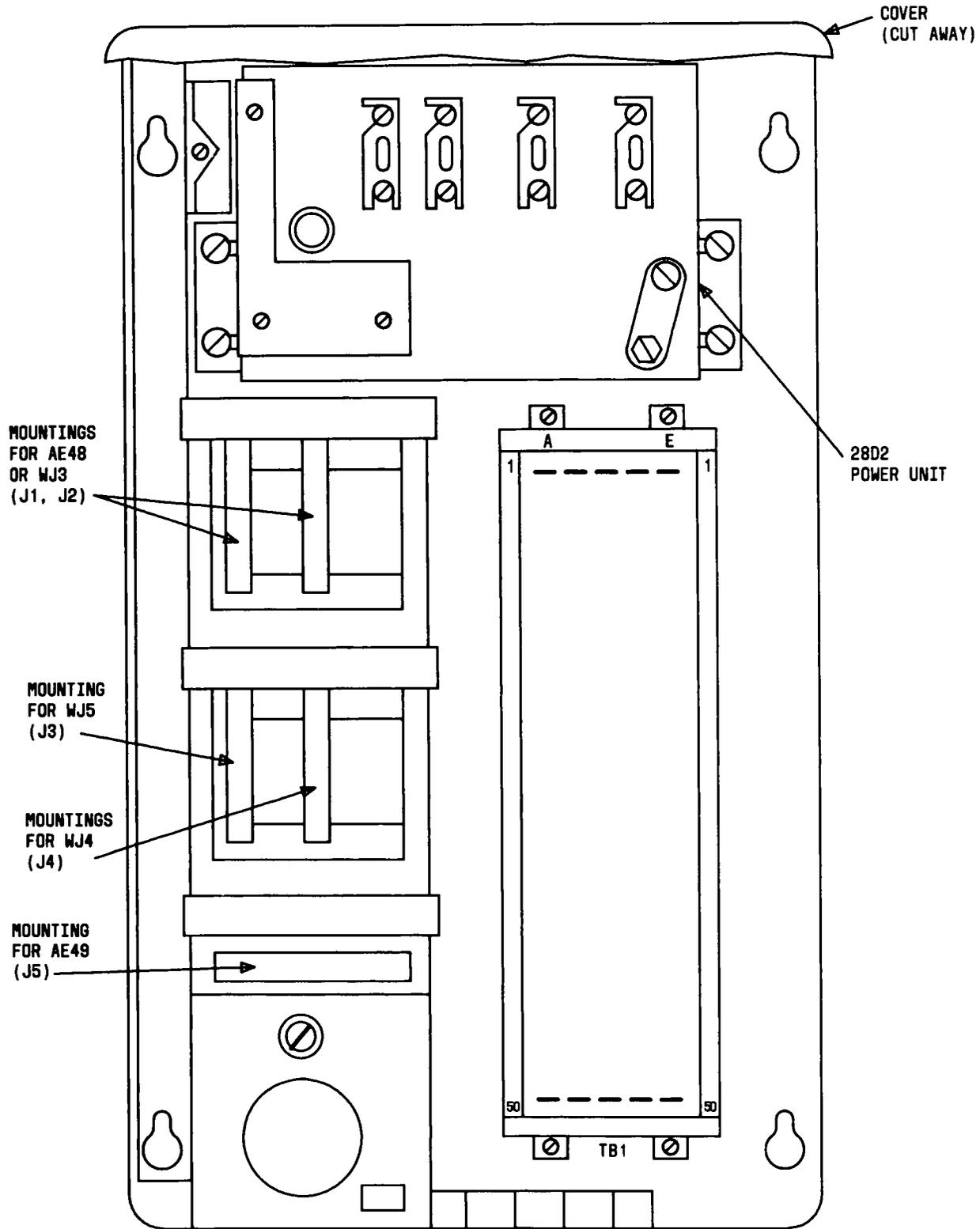
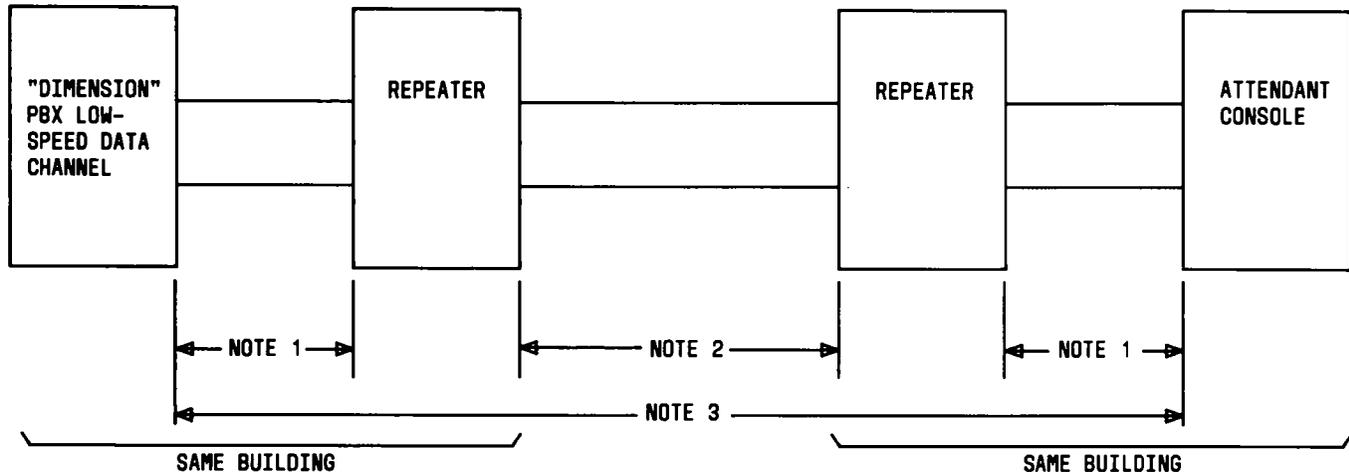


Fig. 5—Attendant Console Repeater

**NOTES:**

1. MAXIMUM DISTANCE FROM PBX TO REPEATER OR ATTENDANT CONSOLE TO REPEATER IS 300m (1000 FEET).
2. MAXIMUM DISTANCE BETWEEN REPEATERS IS 900m (3000 FEET). UP TO FOUR REPEATERS CAN BE USED IN SERIES.
3. MAXIMUM DISTANCE BETWEEN PBX AND ATTENDANT CONSOLE WITHOUT RANGE EXTENSION IS 300m (1000 FEET).

**Fig. 6—Attendant Console Repeater Arrangement**

**3.17** When attendant control of trunk group access is activated, access to the group is restricted only if the access code for that group is dialed. Trunk groups assigned as second, third, or fourth choices in route advance sequences are accessible if the first choice group is busy.

**ATTENDANT DIRECT STATION SELECTION (ADSS) WITH BUSY LAMP FIELD**

**3.18** An attendant at a console can place or complete calls to stations within the PBX by pressing a nonlocking pushbutton key associated with the desired station line. A visual indication of the busy or idle condition of the stations is provided via a LED lamp associated with each pushbutton. Keys and lamps are provided for only 100 station lines. When more than one hundreds group capability is desired, up to 18 group-select keys are provided to allow preselection of the desired 100-line group. The average feature capacity console can be equipped with either 0 or 6 group-select keys. The large feature capacity console can be equipped with 0, 6, or 18 group-select keys.

**ATTENDANT LOCKOUT**

**3.19** The attendant is denied the ability to reenter an established connection held on an attendant position unless recalled by a station user. The 2-party hold-on-console feature is required for operation of this feature.

**ATTENDANT RELEASE LOOP (ARL)**

**3.20** This feature permits an incoming trunk call extended to an unanswered station to be held off-loop whenever the station is ringing or whenever attendant call waiting is provided for the call. This feature is effected by the attendant pressing the RELEASE key or a different loop key during ringing or after receipt of call waiting confirmation tone. A call unanswered within an attendant-administrable 00- to 98-second interval is placed in the attendant incoming call queue along with other waiting calls and, when served, is routed to an idle console, which may be different from the original console. These redirected calls are identified by an appropriate flashing RING or BUSY lamp on the applicable console loop.

**ATTENDANT TRANSFER—ALL CALLS**

**3.21** A station user participating in any 2-party connection can call (recall) an attendant so that the attendant may transfer the call or provide other assistance as desired. A flash during any established call will return recall dial tone to the initiating station and hold the other party. The station user then dials the access code (usually dial "0") to call the attendant. If the call had been held on the console loop, or the initiating station is a manual originating line, the flash will result in immediate attendant recall.

**AUTOMATIC CALLBACK—CALLING**

**3.22** A station user calling a busy station line can be automatically connected to the called station when the station becomes idle. The non-ECTS station user precedes the called number with an activation code and hangs up. When both are idle, the activating station is rung and, upon answer, the called station is rung. The activating station may originate or receive other calls while the feature is active. If the callback sequence is not successful within 20 to 40 minutes, the request is deactivated.

**3.23** An ECTS station user can activate automatic callback—calling by pressing the assigned button upon hearing a busy signal when calling another station. The automatic callback status lamp lights steadily, confirmation tone is heard, and the station hangs up to activate the feature.

**AUTOMATIC IDENTIFIED OUTWARD DIALING (AIOD)**

**3.24** Automatic number identification (ANI) of station lines is provided on outgoing calls in conjunction with automatic message accounting (AMA) facilities at the serving CO. This permits individual station billing on toll calls and the equivalent on CCSA or EPSCS calls. A limit of two COs can be connected to receive AIOD information (one for CO calls and the other for either CCSA or EPSCS calls). The system may be arranged for five types of individual billing numbers:

- (a) **Individual station billing.**
- (b) **Auxiliary station billing:** Toll calls placed by a group of stations or by remote access trunks may be billed to an auxiliary billing number.
- (c) **Auxiliary trunk billing:** Toll calls placed by tie trunks may be billed to an auxiliary billing number.

(d) **Attendant billing:** Attendant-originated or completed AIOD calls are billed to the listed directory number (LDN).

(e) **Failure billing:** The ANI failures are billed to LDN.

**AUTOMATIC ROUTE SELECTION (ARS)**

**3.25** This feature provides automatic routing of outgoing calls over alternative customer facilities based on the direct distance dialing (DDD) number. The station user dials the ARS access code followed by a DDD number. The PBX routes the call over the first available special trunk facility (such as WATS, FX, or off-net CCSA) checking in a customer-specified order. Any number translation necessary to route the call is performed. Overflow routing to toll facilities is optional. If a nontoll ARS access code is dialed, the routing will not include toll facilities. The ARS incorporates the functions of and replaces the code restriction and route advance features for routes included in the ARS route patterns.

**AUTOVON ACCESS ARRANGEMENT**

**3.26** This arrangement allows interconnection of a DIMENSION 400 PBX to a 4-wire AUTOVON switching center via AUTOVON access lines.

**3.27** The console functions needed for AUTOVON have been incorporated in an adjunct console and integrated with the DIMENSION PBX console (Fig. 7). This new combination will permit an attendant to handle both regular and AUTOVON traffic. The selector console adjunct has a capacity of 30, 60, or 90 trunk buttons. Additional buttons in the bottom key of the console provide the four TOUCH-TONE dialing precedence level signals required for outgoing precedence calls. This arrangement permits the retention of a 12-button TOUCH-TONE telephone dial in the standard DIMENSION PBX console. A data-link connection between each selector console adjunct and corresponding control circuits in the basic AUTOVON equipment carrier provides the means for completion of all AUTOVON calls requiring attendant handling and for driving the status lamp indicators.



**This feature can only be used with an 02-system DIMENSION PBX attendant console.**

**3.28** For more detailed information regarding the AUTOVON access arrangement, refer to Section 554-010-135.

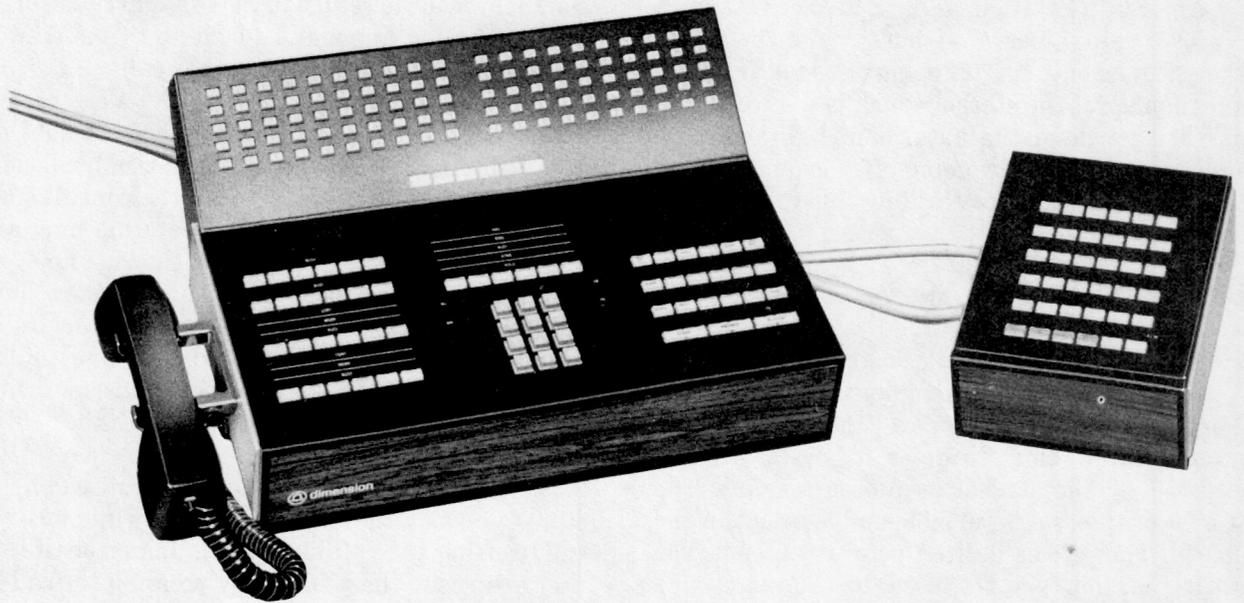


Fig. 7—DIMENSION PBX Attendant Console With 21A Selector Console

#### BUSY LAMP FIELD (BLF)

**3.29** The attendant is provided with visual indication of the busy or idle condition of station lines via a LED lamp associated with each station line. Lamps are provided for only 100 stations. When more than one hundreds group capability is desired, up to 18 group-select keys are provided to allow preselection of the desired 100-line group. When the ADSS feature is not provided, pushbutton direct station selection (DSS) keys are not associated with the lamps.

#### BUSY VERIFICATION OF STATION LINES

**3.30** The attendant can establish a “talking” connection to an apparently busy station line to determine if the station line is in working order. Prior to connection of the attendant to a busy line, a 2-second spurt of tone is applied to alert the talking parties of the attendant’s presence, and a 1/2-second spurt of tone is reapplied every 15 seconds until attendant disconnects. An idle station line will be rung normally when busy verification is attempted.

#### CALL FORWARDING—ALL CALLS

**3.31** This feature allows all calls destined for a station to be routed to another station (or to the attendant), designated during activation, regardless

of the busy or idle state of the called station. This feature can be activated or canceled by the station user from an idle station (or busy state if call hold is in the same feature package) or by the attendant. The activating station may be used to originate calls while activated. All stations can be using this feature simultaneously.

**3.32** An ECTS station user can activate call forwarding—all calls by pressing the assigned button after going off-hook and dialing the number of the station which is to receive the calls. When activated, the status lamp lights. Deactivation is accomplished by going off-hook on the line and pressing the call forwarding—all calls button.

#### CALL FORWARDING—BUSY AND DON’T ANSWER

**3.33** This feature allows calls destined for a station to be routed to another station (or to the attendant), designated during activation, whenever the called station is either busy or does not answer. This feature can be activated or canceled by the station user from an idle station (or busy state if call hold is in the same feature package) or by the attendant. The don’t answer interval is variable per system and is based on the number of ring cycles desired before transfer. The activating station may be used to originate calls while activated. All stations can be using this feature simultaneously.

**3.34** An ECTS station user can activate call forwarding—busy and don't answer by pressing the assigned button after going off-hook and dialing the number of the station which is to receive the calls. When activated, the status lamp lights. Deactivation is accomplished by going off-hook on the line and pressing the call forwarding—busy and don't answer button.

#### CALL FORWARDING—DON'T ANSWER

**3.35** This feature allows calls destined for a station to be routed to a designated location (attendant or another station) whenever the called station does not answer. This feature can be activated or deactivated by the station user or attendant. The don't answer interval is variable and is based on the number of ring cycles desired before transfer. The activating station may be used to originate calls while activated. All stations can be using this feature simultaneously.

**3.36** An ECTS station user can activate call forwarding—don't answer by pressing the assigned button after going off-hook and dialing the number of the station which is to receive the calls. When activated, the status lamp lights. Deactivation is accomplished by going off-hook on the line and pressing the call forwarding—don't answer button.

#### CALL HOLD

**3.37** A non-ECTS station user can hold any call in progress by flashing and then dialing a "hold" code. The station user is now free to do any of the following without the risk of causing a threeway conference connection:

- (a) Originate another call on the line
- (b) Activate a service
- (c) Return to another call that had been held via call hold.

If the station user does not dial any further digits after the "hold" code, muting of the station set and removal of dial tone will occur after about 6 seconds. The call will remain on hold until the controlling non-ECTS station user either hangs up, causing the station to ring with the held call, or flashes and redials

the "hold" code to return to the original call. Only one call per station line may be held at a time. The held call **cannot** be added to the other call.

**3.38** If a previous call has been placed on hold, dialing the call hold code automatically places the existing call on hold and returns the control station to the previous call. The control station may alternate between two parties using the call hold code, holding one while speaking with the other, but all three parties may not be placed on the same talking connection. A station may hold only one call at a time. If the controlling station completes one conversation and hangs up, it is rung back with the held call.

**3.39** An ECTS station user can activate call hold by pressing the call hold button while busy on a call, causing the call hold status lamp to wink. The user returns to the held call by pressing the call hold button. Disconnecting from the line causes the line to ring back with the held call.

#### CALL PARK

**3.40** This feature provides a station user the ability to place a call on hold without tying up the holding line. The call is transferred to a vacant port and then can be picked up by any PBX line by dialing the appropriate code.

#### CALL PICKUP

**3.41** A non-ECTS station user can answer any calls directed to another station line within his preset pickup group by dialing a pickup code from an idle or busy station. If more than one station line in the pickup group is ringing, the individual call to be answered will be selected by the system. There can be a maximum of 31 call pickup groups. Each group may contain an unlimited number of stations. With Feature Package 2 (Issue 3 or later), a station cannot pick up a data restricted line. A station attempting call pickup of a data restricted line will receive intercept tone.

**3.42** An ECTS station user can activate call pickup by pressing the assigned button when a station line within the same pickup group is ringing. When a line in the pickup group is ringing, the call pickup status lamp will flash. If activated while busy, the preset call will automatically be placed on call hold.

## CALL WAITING SERVICES

**3.43** This feature allows a call to a busy station line to be held waiting while a tone signal is directed towards the busy station user. (Only the called station user hears this tone.) The called station user may connect to this waiting call by hanging up, whereby the station will be rung and will be connected to the call upon answer. Alternatively, the non-ECTS station user may flash and dial an answer-hold code to hold the original call and answer the waiting call. Distinctive call waiting tone signals are provided to indicate the source of the call. One burst is used for station-to-station calls; two bursts are used for attendant and outside calls; and three bursts are used for originating call waiting calls. Call waiting is denied and busy tone is returned if the called station is not in a 2-party talking state, if a call is already waiting, or if the called station has activated a conflicting feature.

**3.44** An ECTS station user can activate originating call waiting by pressing the assigned button upon hearing a busy tone on calling another station. The associated status lamp lights steadily, and the 3-burst priority call waiting tone is applied towards the busy station. A busy ECTS station user upon hearing any call waiting tone can answer the waiting call by pressing the assigned button. If the original call is not terminated prior to pressing the button, it will automatically be placed on call hold.

**3.45 *Attendant Call Waiting (Replaces Attendant Camp-On):*** All calls the attendant completes to a busy station are held waiting. A 2-burst tone signal is directed towards the busy station user when the attendant leaves the connection. Subsequent tone signals are applied each time the attendant leaves the waiting connection after verifying the caller's desire to wait.

**3.46 *Originating Call Waiting:*** The originating class of service provides the station user with the ability to direct a 3-burst priority call waiting tone signal towards any other busy station or a 3-burst distinctive ringing signal to an idle station.

**3.47 *Terminating Call Waiting:*** The terminating class of service provides the station user with call waiting service with distinctive tone signals on any call attempting to terminate on the user station when the user is busy on another call.

## CALLING NUMBER DISPLAY TO ATTENDANT

**3.48** This feature provides the attendant with a visual display of the station number of any PBX station seeking attendant assistance. The number is displayed on the alphanumeric display.

## CALLING NUMBER DISPLAY TO STATION

**3.49** Equipment is provided at a called station to display the number of the calling station within the same PBX. This may be used, for example, in hotels/motels to display the number of the room calling a station such as room service. Capability for displaying up to four digits is provided.

**3.50** A block diagram of the calling number display to station arrangement is shown in Fig. 8. A maximum number of six display units can be provided. The following is a description of the equipment required for this feature.

(a) **102D1-A Display Unit (Fig. 9):** This unit is a terminal device capable of displaying up to four digits. It enables the user to determine the calling party number. This unit can be either desk- or wall-mounted and is available in black, white, or ivory with either a teak or walnut faceplate.

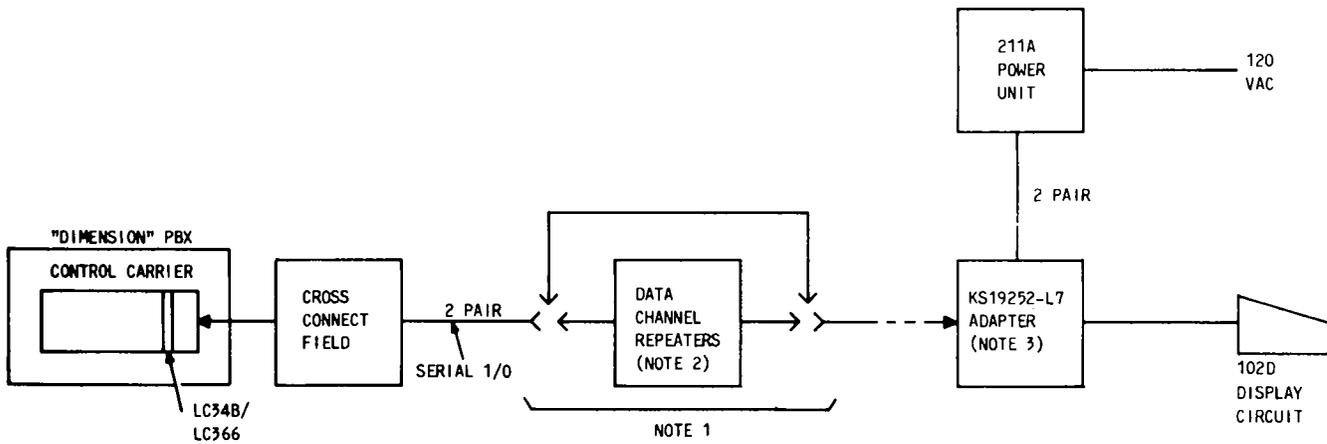
(b) **211A Power Unit (Fig. 10):** This unit supplies 5 Vdc to the 102D1-A. It can be wall-mounted and is available in avocado, blue, gold, orange, red, teak, or walnut faceplates.

(c) **KS-19252, List 7, Adapter:** This unit is used to interconnect the PBX serial data link from the cross-connect field to the 211A power unit and the 102D1-A display unit.

## CALLS WAITING

**3.51** When a call is waiting to be answered by the attendant and the attendant position is in use or busied out, the CW lamp lights.

**3.52** With Feature Package 2 (Issue 3 or later), Feature Packages 3, 4, 5, and 10 (Issue 2 or later), or Feature Package 15 and attendant console (01C-type or later or 02-system) when one or more calls are waiting, a 20-ms burst of 1.95-kHz tone is generated at the console every 800 ms. And, when the number of calls waiting to be answered exceeds the established calls waiting level (1 through 9), the CW lamp flashes.



## NOTES:

1. MAXIMUM DISTANCE BETWEEN PBX AND DISPLAY UNIT.  
WITHOUT DATA CHANNEL REPEATERS - 300m (1000 FEET)  
WITH DATA CHANNEL REPEATERS - 3300m (11,000 FEET)
2. DATA CHANNEL REPEATERS MUST BE LOCATED IN THE SAME BUILDING AND WITHIN 300m (1000 FEET) OF THE PBX AND DISPLAY CIRCUIT
3. DISPLAY UNITS MUST BE CONNECTED DIRECTLY TO ADAPTER USING MOUNTING CORDS, WITH NO EXTENSION CORDS.

Fig. 8—Calling Number Display to Station Arrangements

### CENTRALIZED ATTENDANT SERVICE (CAS) WITH SEPARATE ATTENDANT CONCENTRATOR

**3.53** This service permits multilocation PBX customers (branch locations), served by separate switching vehicles, to concentrate attendants at a single location. Incoming listed number calls come into each PBX directly from the CO and are switched to the centralized attendant positions over release link trunks (RLT). These trunks can be viewed as short holding time connections from the unattended PBX locations to the centralized answering point. Incoming LDN calls received over RLTs are always routed back over the same RLT (Fig. 11 and 12). Once the attendant releases the call, the trunks are made available for other calls.

#### A. Backup Telephone Option

**3.54** For backup telephones, one to four backup nonkey telephone station sets (2514BM) are required (Fig. 13). These sets are equipped with a plug-in headset or handset which supplements the existing handset that is left on the switchhook cradle.

These arrangements are necessary to permit the station user to bring the handset or headset to his ear before going off-hook to allow him to hear the CAS information tones.

**3.55** Associated with a backup station is a single lamp panel of eight lamps which provides a status indication of the RLTs and system alarm conditions. This lamp panel is coded 30A8 system status indicator (Fig. 14). The lamp indications are controlled from the contact interface B circuit pack, LC15. One circuit pack is required per PBX. The lamp functions are as shown in Table C.

#### B. Trunk-Answer-From-Any-Station (TAAS) Option

**3.56** With this option activated, all RLT calls are processed by the TAAS feature. The answering station extends the call to the desired station or trunk by use of threeway conference transfer. Any backup station may be used to transfer the RLTs to CAS or backup mode. If only the TAAS backup mode is required, any station at the PBX may be designated as a CAS mode control set (either a TOUCH-TONE telephone or rotary dial set).



Fig. 9—102D1-A Display Unit

**3.57** The normal switched loop console is used at each main or branch location for special services associated with the PBX such as FX, WATS, etc. Dial 0 calls are routed to the CAS attendant. One-, two-, or three-digit access codes are used to gain access to this special service console.

**3.58** For a more detailed description of CAS, refer to Section 981-012-100.

#### **CENTRALIZED STATION MESSAGE DETAIL RECORDING (CSMDR)**

**3.59** The CSMDR system provides for the centralized collection of traffic data from remotely located DIMENSION PBXs within a customer network. Traffic data at each remote location is collected and stored via a 94A local storage unit (LSU) for later periodic polling by the central polling unit. When the remote locations are polled, the traffic is transmitted



Fig. 10—211A Power Unit

to the central polling unit and made available in the form of a magnetic tape output or an interface to a computer port.

#### CLASS OF SERVICE (COS)

**3.60** A class of service is a group of features and restrictions assigned to a working station line. Each working station line must be assigned a COS, and more than one station line can be assigned to the

same COS. Combinations of features and restrictions in a COS are activated by using the MAAP, CAP, or RMATS-1 to provide the customers the flexibility they may require from the system. Some features are interactive and cannot be activated in the same COS. For example, call forwarding—all calls and call forwarding—busy and don't answer cannot be activated in the same COS. The DIMENSION 400 PBX can have a maximum of 31 different classes of service assigned. (The COS 31 is reserved for the remote access and ECTS personal CO line pickup features.)

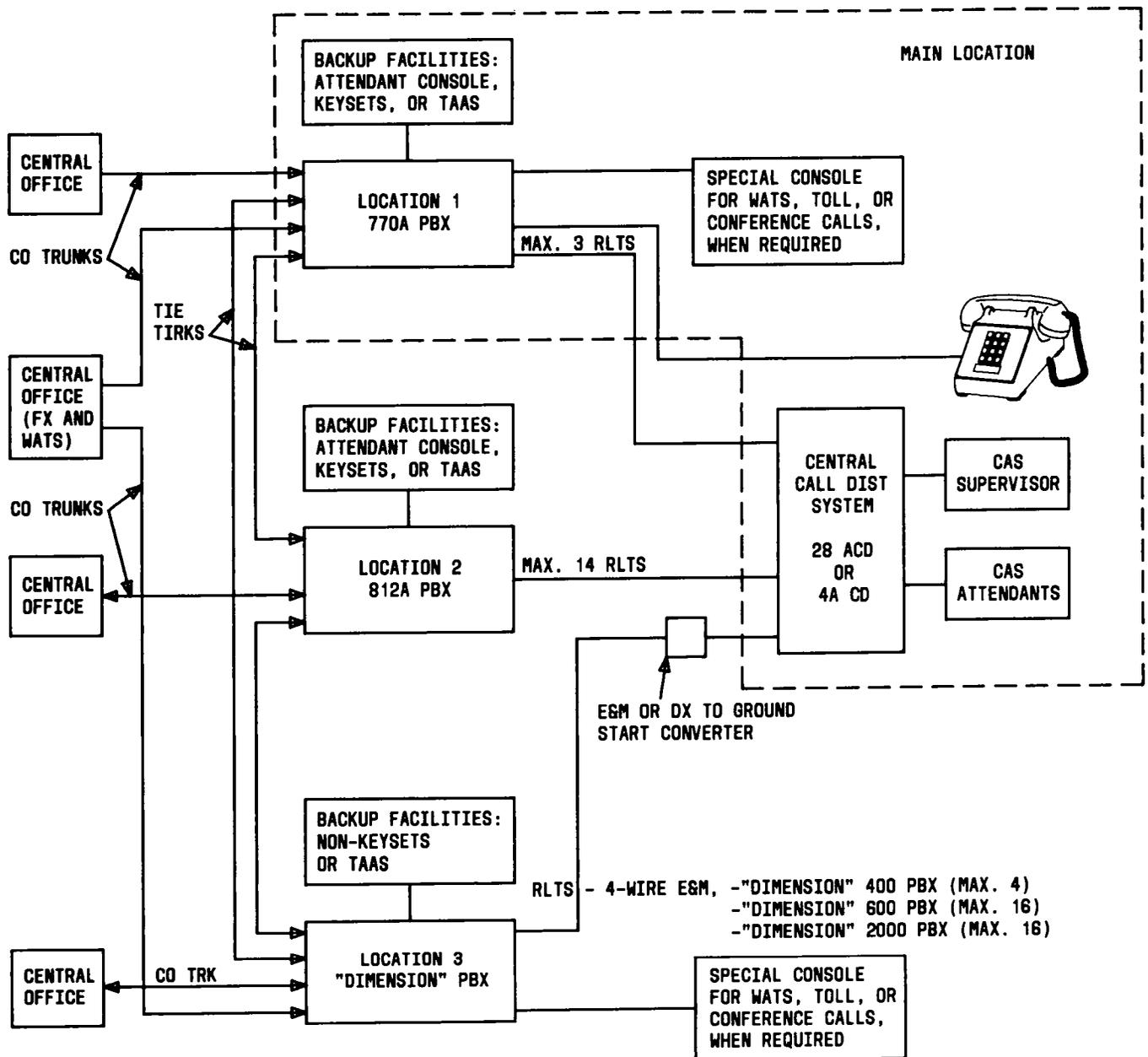


Fig. 11—CAS Arrangement With Separate Attendant Concentrator

**CLASS-OF-SERVICE DISPLAY TO ATTENDANT**

**3.61** This feature provides the attendant with an alphabetic or numeric code display representing the class of service of the calling PBX station connected to the attendant. The information is displayed on the alphanumeric display when the class-of-service key is pressed.

**CODE CALLING ACCESS**

**3.62** Attendants, station users, and tie trunks can dial an access code and a 2- or 3-digit called party code to activate a coded signal which corresponds to the called party code. The called party can then be connected to the calling party by dialing an answering code from any station within the DIMENSION PBX.

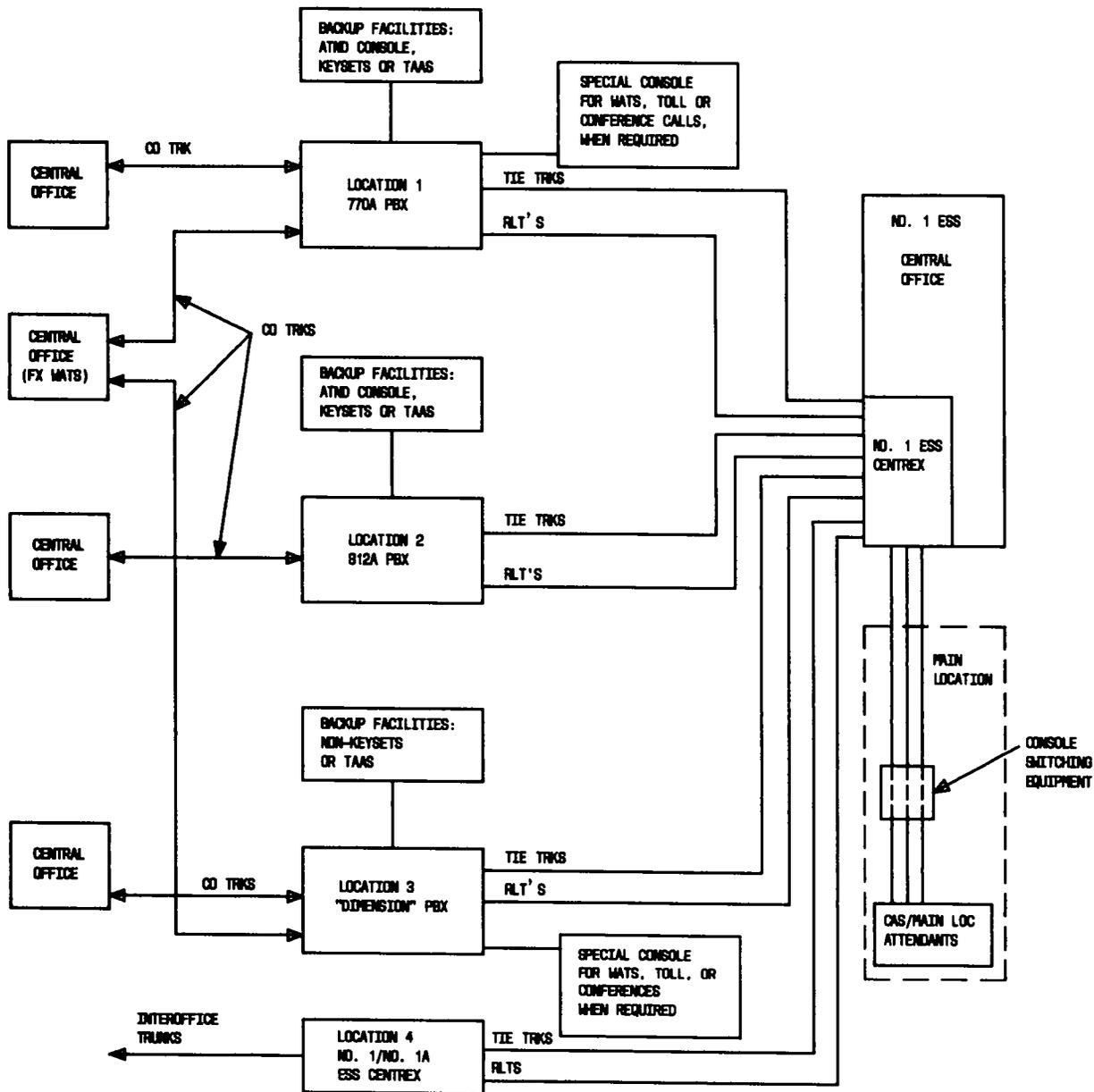


Fig. 12—Combined Main Location Switches and Attendant Concentrator

**CODE RESTRICTION**

**3.63** This feature denies selected station lines completion of dialed outgoing exchange network calls to selected office and area codes. The restricted

calls are routed to intercept tone. Three levels of authorization permit authorized station lines the ability to complete outgoing CO or FX calls to specified area, or office codes within an area. The calls allowed are a function of the particular trunk group dialed.

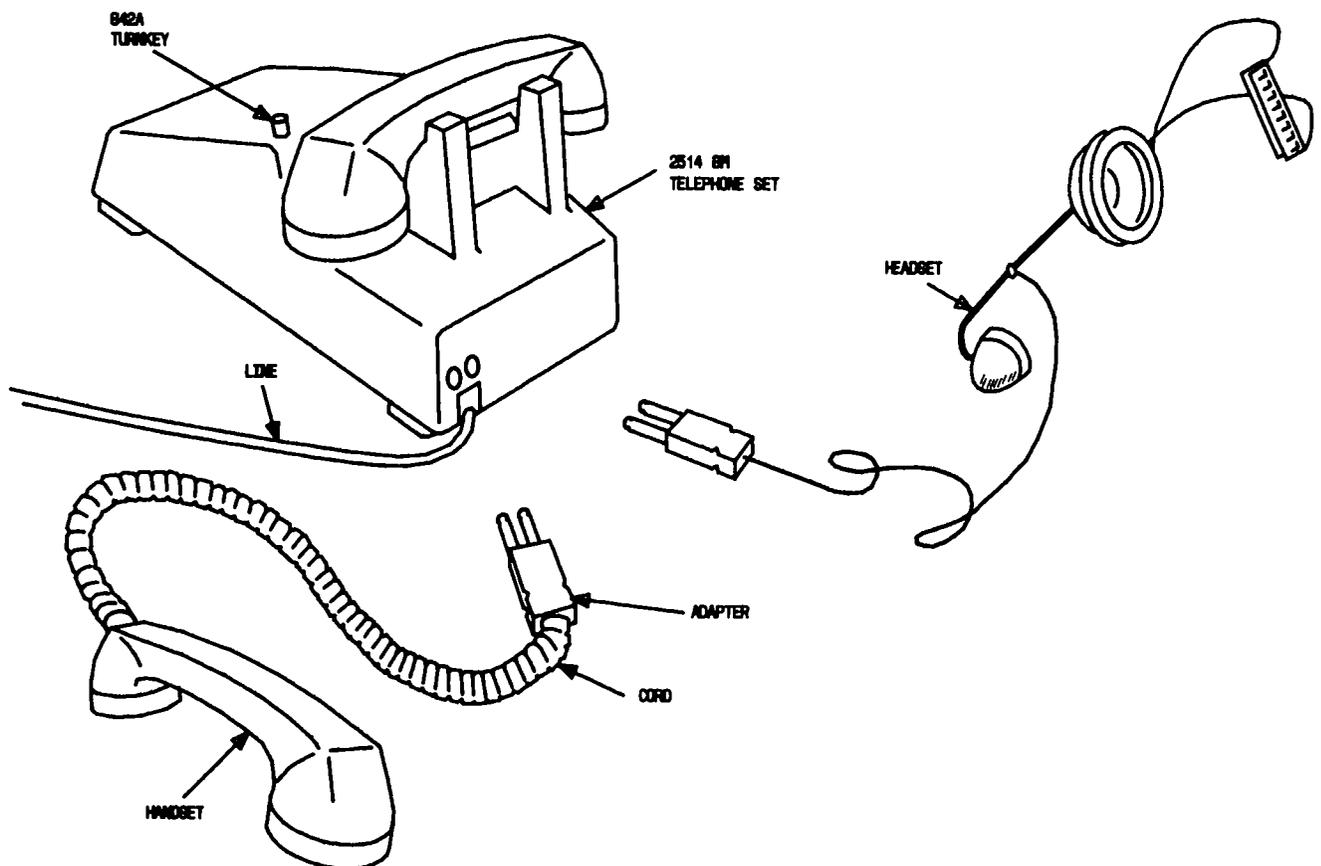


Fig. 13—CAS Backup Control Station

### COMMON CONTROL SWITCHING ARRANGEMENT (CCSA) ACCESS

**3.64** This service provides access to a CCSA network for network inward dialing, direct outward dialing to the network, and other features similar to those provided on the exchange network. The CCSA trunks cannot tandem through the system without attendant assistance. If off-net access is provided by the network, selected station lines can be denied off-net access. The CCSA termination is denied to a station when direct inward dialing (DID) restriction is applied.

### CONTROLLED OUTWARD RESTRICTION

**3.65** An attendant can control the restriction of direct dialed outgoing exchange network calls (local CO and toll calls in hotel/motel applications) from selected station lines or groups of lines. When

activated, the restricted calls are routed to intercept tone.

### CONTROLLED STATION-TO-STATION RESTRICTION

**3.66** An attendant can prevent selected station lines or groups of lines from receiving station-to-station calls. When activated, the restricted calls are routed to intercept tone.

### CONTROLLED TERMINATION RESTRICTION

**3.67** An attendant can prevent selected station lines or groups of lines from receiving any calls. This feature is a form of "do-not-disturb" service. When activated, restricted DID and CCSA calls are routed to the attendant, an announcement, or to intercept tone, depending on the option selected. All other restricted calls are routed to intercept tone.

attendant, an announcement, or to intercept tone, depending on the option selected. All other restricted calls are routed to intercept tone.

#### CUSTOM INTERCOM

**3.69** This service allows station users to dial 2- (up to 10 in a group) or 3-digit (up to 30 in a group) codes to reach frequently called PBX stations. The 3-burst distinctive ringing is provided to nonbusy called stations, and a 3-burst call waiting signal is provided when a busy station is called. The intercom numbers within a custom intercom group are changeable via a designated station line, via the MAAP, and via RMATS.

#### CUSTOMER ADMINISTRATION PANEL (CAP)

**3.70** The CAP is an adaptation of the DIMENSION 100/400 PBX MAAP mounted in a modified ECTS station set housing. It provides the customer the ability to change station user features and control other PBX features. The CAP is used on a local basis (ie, collocated with the PBX on customer premises).

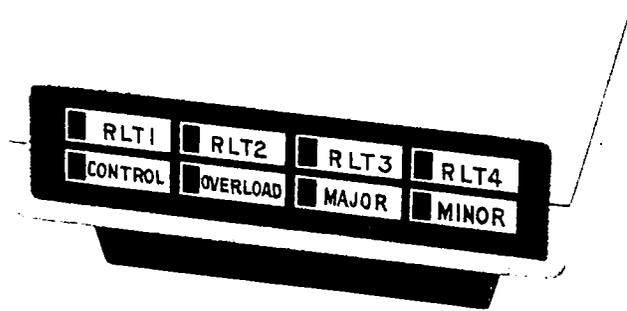


Fig. 14—30A8 System Status Indicator

#### CONTROLLED TOTAL RESTRICTION

**3.68** An attendant can prevent selected station lines or groups of lines from originating and receiving any calls. This feature is used to temporarily disconnect station lines. When activated, restricted DID and CCSA calls are routed to the

TABLE C

30A8 SYSTEM STATUS INDICATOR LAMPS

LAMP DESIGNATION	LAMP STATE
RLT1 BUSY	Dark — RLT idle or in backup mode
RLT2 BUSY	Steady — RLT busy — seized at both ends
RLT3 BUSY	Wink (30 ipm) — Maintenance busy
RLT4 BUSY	
CONTROL	Steady — Normal operation
	Wink (any rate) — Backup mode
OVERLOAD	Dark — No overload
	Steady — Queue threshold exceeded
MAJOR	Dark — No alarm
MINOR	Steady — Alarm

**3.71** Whenever the CAP is in use, a LED lights on the MAAP connector panel interface unit. For more detailed information regarding the CAP, refer to Section 554-010-142.

#### **CUSTOMER PREMISES FACILITY TERMINAL (CPFT) EQUIPMENT**

**3.72** The CPFT equipment is optional and, when furnished, provides transmission and signaling range extension for the DIMENSION 400 PBX line and trunk circuits. The CPFT equipment consists of metallic facility terminal (MFT) circuit packs housed in connectorized shelves (carriers) and can be mounted in an auxiliary cabinet or in any available 23-inch mounting space as long as power and alarm considerations are met. (See Section 332-610-100 for details.)

**3.73** The MFT family of voice frequency repeater/signal range extension units replaces earlier E6, V4, and dial long line (DLL) units in the central offices. The CPFT/MFT installation furnishes transmission and signaling equalization and gain to lines and trunks as required—ie, CO, FX, tie trunks, WATS, and private services.

#### **DATA CHANNEL REPEATER**

**3.74** The data channel repeater unit (Fig. 15) provides lightning protection for low-speed data channel cabling (except for attendant console) to locations outside the PBX building. It can extend the maximum distance between the DIMENSION PBX and ECTS controller or display units. It is connected in series with the data link and provides isolation between input and output pairs.

**3.75** When an ECTS controller or a display unit is in a location outside the PBX building and range extension is not required, data channel repeaters must be used to provide lightning protection. This arrangement uses data link buffer cards in place of unidirectional repeater cards.

**3.76** The repeater circuit is designed to operate in unexposed environments without additional protection and in exposed environments with standard protection.

**3.77** The repeater circuitry is packaged in a modified KSU approximately 241 mm (9 1/2 inches) wide by 432 mm (17 inches) long. Each repeater can

accommodate two data channel repeater circuits. The hardware includes a 28D2 power unit, mounting for one rectifier and timing reference card (CP AE-49), and mounting for four unidirectional repeater cards (CP AE-48) or four data link buffer cards (WJ3). The unit can be wall-mounted and must be connected to a 120-Vac 60-Hz outlet. A power cord (J58879KC, Lists A through D) is available in lengths from 610 mm (2 feet) to 3658 mm (12 feet).

**3.78** Application of the data channel repeater is shown in Fig. 16. Two repeaters are used in series to connect the PBX to an electronic telephone controller or a display unit located in a separate building approximately 900m (3,000 feet) away. With Feature Package 5 (Issue 2 or later) or Feature Package 15, four data channel repeater units can be used in series to extend the distance between the PBX and ECTS controller or display unit to 3300m (11,000 feet).

**3.79** For more detailed information regarding the data channel repeater, refer to Section 554-010-101.

#### **DATA COMMUNICATION ACCESS**

**3.80** This feature provides access to a customer's computer equipment by DIMENSION PBX users, via a trunk-type connection to data communication access ports (DCAP) on the PBX. Computer access is available to station users and attendants at the work facility where the PBX and computer are located, to remote users via the remote access to PBX services, off-premises stations, and off-premises stations with call control features, and to users of the electronic tandem system (Feature Package 8), dial repeating tie trunks (Feature Package 8 and other feature packages), and DID trunks (when station number to dial access code conversion is provided).

#### **DATA PRIVACY**

**3.81** Activation of this feature by a station user will deny other individuals the ability to employ various bridge-on features (eg, call waiting, executive override, busy verify, etc) to gain access to the station user's line and consequently disturbing any data transmission which might be occurring. The attempted bridge-on caller will be routed to a tone. When the station user goes on-hook, the restriction is automatically canceled.

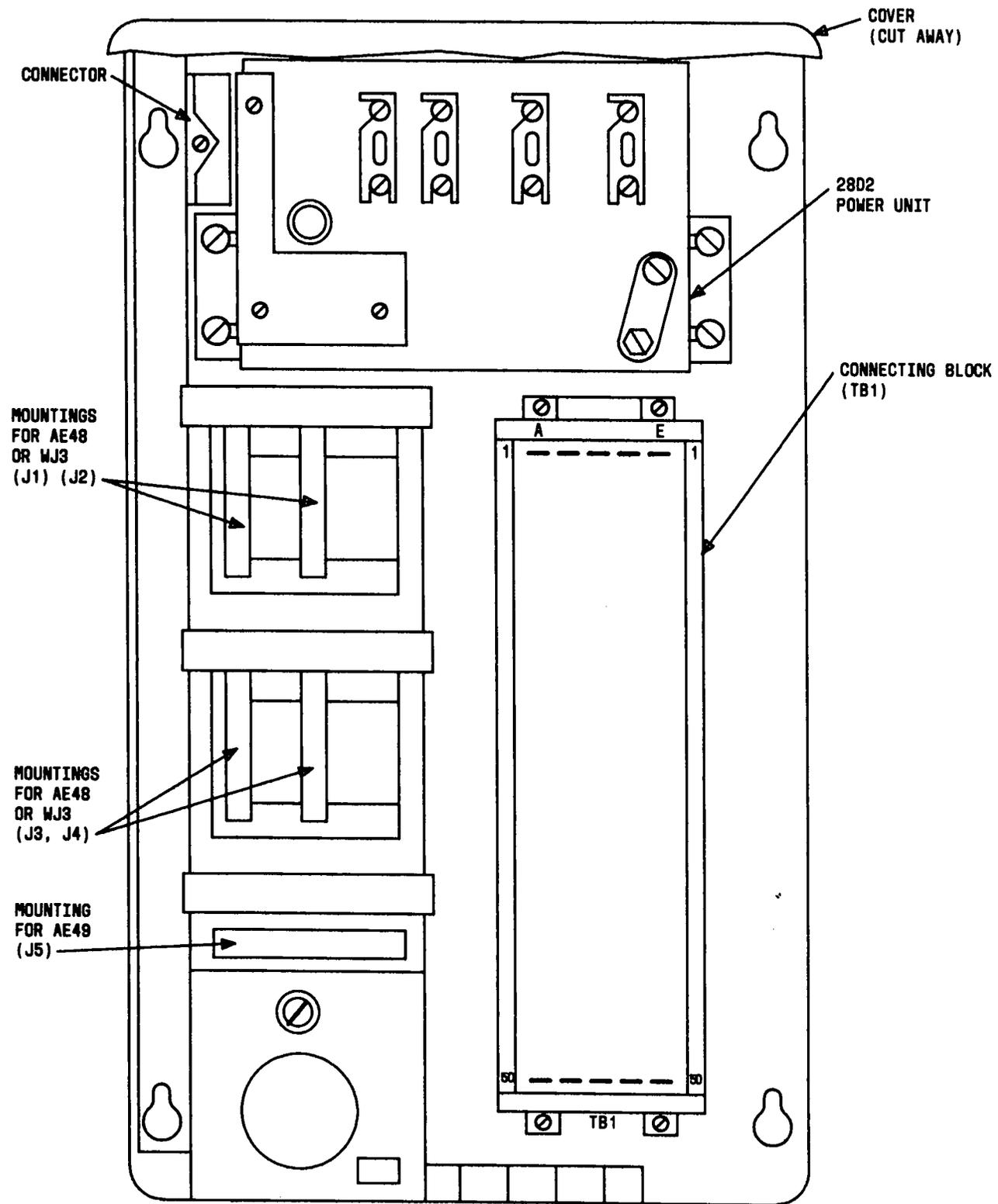
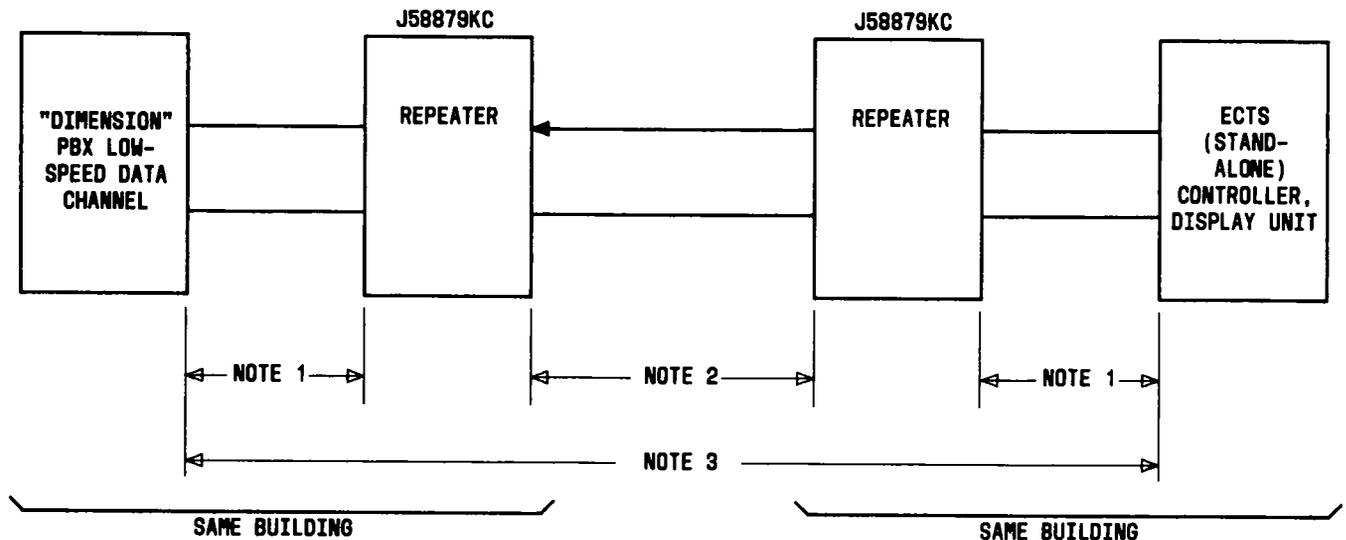


Fig. 15—Data Channel Repeater



## NOTES:

1. MAXIMUM DISTANCE BETWEEN PBX AND REPEATER OR REPEATER AND PERIPHERAL IS 300m (1000 FEET).
2. MAXIMUM DISTANCE BETWEEN REPEATERS IS 900m (3000 FEET). UP TO FOUR REPEATERS CAN BE USED IN SERIES.
3. MAXIMUM DISTANCE BETWEEN PBX AND PERIPHERAL WITH RANGE EXTENSION IS 3350m (11,000 FEET) USING FOUR DATA CHANNEL REPEATERS.

Fig. 16—Data Channel Repeater Arrangement

**DATA RESTRICTION**

**3.82** A station line or trunk group with data restriction assigned to its line class of service will deny other individuals the ability to employ various bridge-on features (eg, call waiting, executive override, busy verify, etc) to gain access to the station line or trunk and consequently disturbing any data transmission which might be occurring. The attempted bridge-on call will be routed to a tone.

**DATA SWITCHING**

**3.83** The DIMENSION 400 PBX can provide Data Switching Level 1. This service allows both synchronous and asynchronous data operation at rates up to 9600 baud using the existing PBX Pulse Amplitude Modulation (PAM) bus network. Data Switching Level 1 capabilities can be provided on a retrofit basis in any single module DIMENSION PBX without software changes.

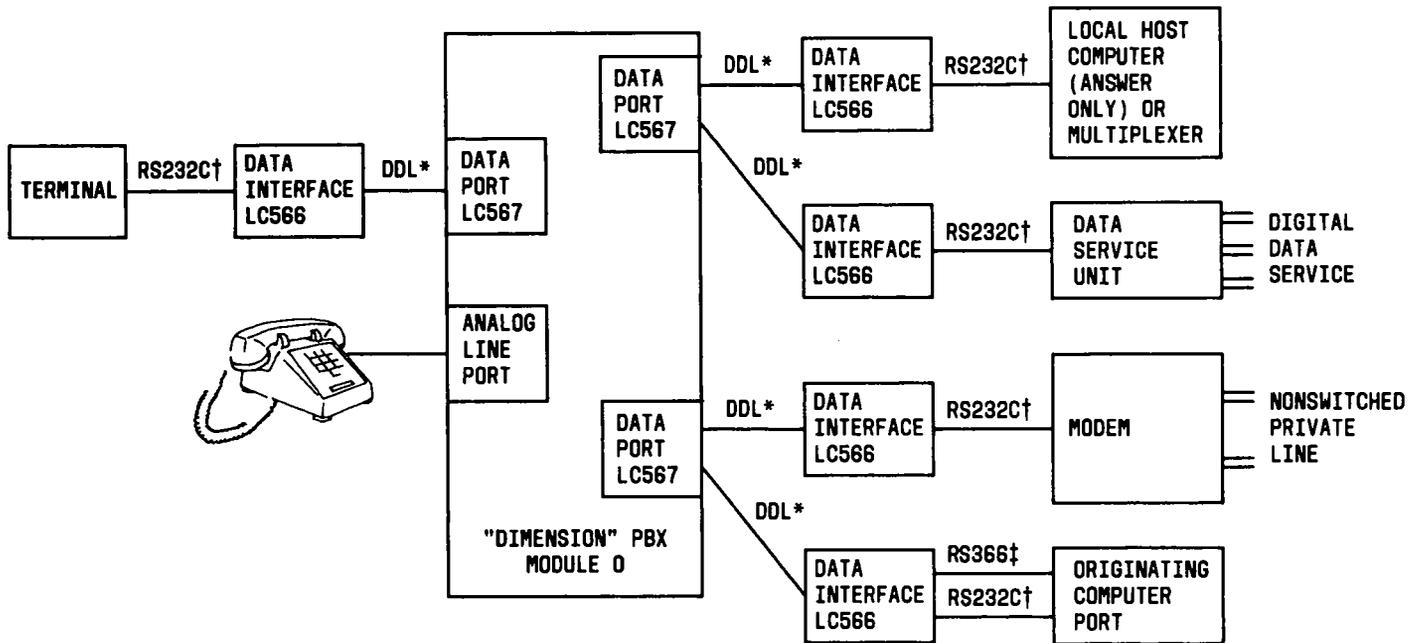
**3.84** Data Switching Level 1 can be retrofitted into a DIMENSION 400 PBX with only hardware changes. It allows the customer to connect computer

or terminal equipment to either the line or trunk side of the switch. It also allows off-premises communication using voiceband modem and leased private lines. Two hardware items are required for retrofit application: the Data Interface (DI) and the Data Port (DP). Figure 17 provides a typical configuration. Data Switching Level 1 provides:

- Single module data switching
- Terminal dialing
- Telephone set dialing using threeway conference transfer
- RS-366 dialing.

**Data Interface**

**3.85** The Data Interface, LC566, provides the standard Electronic Industries Association (EIA) RS-232C interface to the customer-provided terminal or host computer. It also provides the interface to voiceband modems. The Data interface will normally be located near the terminal and is designed for desk



\* "DIMENSION" DATA LINK (DDL) - FOUR WIRE FULL-DUPLEX DATA LINK WITH 5000 FOOT RANGE AND 9600 BAUD DATA RATE

† ELECTRONIC INDUSTRIES ASSOCIATION (EIA) - COMPATIBLE INTERFACE

‡ EIA - COMPATIBLE INTERFACE

Fig. 17—Single Module Data Switching Configuration

mounting. It requires a source of 120 vac power at mounting location. The multiple mounting arrangement is designed for computer rooms and other applications where a number of data interfaces are to be co-located.

#### Data Port

**3.86** The Data Port, LC567, contains two data port circuits and may be plugged into either a line carrier, a tie trunk carrier, or certain positions in other trunk carriers. When plugged into a line carrier, the data port appears to software as a line circuit, LC02. When plugged into a trunk carrier, the Data Port appears to software as a dial repeating in, automatic out tie trunk.

**3.87** The data interface connects to the data port via the DIMENSION PBX data link. The data link is a 4-wire full-duplex data link with a range of over 5,000 feet. It provides sufficient band width to carry customer data at 9600 baud.

#### Single Module Data Switching

**3.88** The data interface and data port circuits interpret keyboard operations and convert them to switchboard or dialing signals which would be expected from an LC02 Line circuit or an LC361 circuit pack. They also detect call progress tones and convert them into visual terminal prompts at the CRT console as follows:

tone	MESSAGE
Dial Tone	(CR) (LF) DIAL (CR) (LF)*
Recall Dial Tone	(CR) (LF) DIAL (CR) (LF)
Ringback Tone	RINGING (CR) (LF)
Special Ringback Tone	RINGING (CR) (LF)
(Ringback Removed)	ANSWERED (CR) (LF)
Busy Tone	BUSY (CR) (LF)
Reorder Tone	TRY AGAIN (CR) (LF)

\*CR is carriage return, LF is line feed, and BEL is bell.

tone	MESSAGE
Intercept Tone	DENIED (CR) (LF)
Confirmation Tone	CONFIRMED (CR) (LF)
Ringing	(CR) (LF) (BEL) INCOMING CALL (CR) (LF) + (BEL) every 4 seconds
(Distant Disconnect)	(CR) (LF) (BEL) DISCONNECTED (CR) (LF)
(Handshake Failure)	(CR) (LF) (BEL) CHECK OPTIONS (CR) (LF)

**3.89** In addition, when busy, reorder, or intercept tone is detected, the circuit automatically disconnects the call by going on hook.

#### Terminal Dialing

**3.90** To originate or answer a data call, or to hang up, the terminal user either operates the "ORIGINATE/DISCONNECT" button on the data interface housing, or holds the terminal BREAK key down for at least two seconds.

**3.91** Dialing from the terminal appears to the DIMENSION PBX as if a station is dialing and standard station call processing is used to complete the call to other data processing equipment.

#### Telephone Dialing

**3.92** A station can dial a data port, flash the switchhook, and transfer the call to an associated terminal.

**3.93** In the Data Switching Level 1, the threeway conference transfer feature is used to provide this function. There is no administered association between the originating station and the associated terminal.

#### RS-366 Dialing

**3.94** For computer port call origination, the data interface circuit provides an Automatic Calling Unit (ACU) function. An RS-366 connector is available for this purpose.♦

## DIAL ACCESS TO ATTENDANT

**3.95** This feature allows station users within the switching system or dial repeating tie trunks to reach the attendant by dialing a code, usually a single digit "0". The attendant may complete these calls to trunk facilities or station lines.

**"DIMENSION" PBX ELECTRONIC CUSTOM TELEPHONE SERVICE (ECTS)**

**3.96** The ECTS provides improved key telephone features and simplified access to custom calling PBX features (Table D). Some of the main characteristics are:

- A multibutton electronic telephone (MET) set (2990 through 2999 series), which can be used for single or multiline service.
- Nonlocking pushbuttons and LED indicators on the electronic telephone to provide line or feature access and status.
- Administration of features and maintenance routines which are controlled by software programs. Interface with the PBX is via MAAP or RMATS.
- All network and bridging connections are accomplished in the PBX.
- No switching functions are required in the telephone set.
- An ECTS controller may be optionally mounted in the PBX cabinet or in a separate cabinet located near the PBX or remote from the PBX within a limited distance.

**3.97** A MET set can be arranged for single line service or multiline (key-type) service. Conventional nonkey telephone sets (500 through 2800 series) can be used to pick up PBX lines which appear on an electronic key telephone set.

**3.98** The electronic telephones are controlled by an ECTS controller available in two line capacity sizes. A basic controller serves a maximum of 63 MET sets. A supplemental controller (always requires a basic controller) provides line capacity for 63 additional MET sets or a maximum of 126 per controller group. The DIMENSION 400 PBX will accommodate a maximum of three controllers.

TABLE D

**DIMENSION 400 PBX ELECTRONIC CUSTOM TELEPHONE SERVICE (ECTS) FEATURES**

FEATURE
Custom Calling Features
Automatic Callback - Calling
Call Forwarding - All Calls
Call Forwarding - Busy and Don't Answer
Call Forwarding - Don't Answer
Call Hold
Call Pickup
Call Waiting Services
Executive Override
Last Extension Called
Three-Way Conference Transfer
Key Service Features
Abbreviated and Delayed Ringing
Automatic Intercom
Bridged Call
Common Audible Ringing
Dial Intercom
Exclusive Hold
Hold
Idle Line Preference
I-Hold
Incoming Call Preference
I-Use Indication
Last Line Preference
Line Ringing
Line Status Indication
Manual Exclusion
Manual Intercom
Manual Signaling
Music On Hold Access
No Line Preference
PBX Line Access
Personal Central Office Line
Power Failure Transfer
Preselection
Prime Line Preference
Priority Hold
Recall Button
Ringing Line Preference
Ringing Transfer
Station Busy Indication
Station Direct Station Selection (DSS)
Station Message Waiting
Station Ringer Cutoff

**3.99** The basic and supplemental controllers are contained in circuit pack carriers which are the same size as DIMENSION 400 PBX carriers, and may either be mounted in a vacant carrier position in the basic, supplemental, or auxiliary DIMENSION 400 PBX cabinet or mounted in a separate controller cabinet. The supplemental carrier is powered by the basic carrier and must be mounted directly above the basic carrier. Due to heat dissipation, only two carriers can be mounted in a single DIMENSION 400 PBX

cabinet. However, a combination of one basic and one supplemental carrier can be mounted in the same cabinet.

**3.100** For more detailed information regarding ECTS and ECTS features, refer to Section 554-010-110.

#### **DIRECT DEPARTMENT CALLING (DDC)**

**3.101** This feature provides an economical alternative to DID service for selected high call volume departments behind a PBX. Each DDC group terminates one or more non-DID LDN-type trunks to a designated station which is normally in a hunting group. Calls to this station are queued if either the station or other members of the hunting group are busy. A maximum of 14 DDC and/or uniform call distribution (UCD) groups can be provided with the DIMENSION 400 PBX.

#### **DIRECT INWARD DIALING (DID)**

**3.102** An incoming call from the exchange network (not FX or WATS) can reach a specific station line without attendant assistance. The DID service can be provided for some station lines, and non-DID (LDN only) service can be provided for other station lines on the same PBX. The DID calls to DID restricted station lines are routed to the attendant or recorded announcement, depending on the option selected. This listed directory number can be dialed to receive attendant assistance.

#### **DIRECT OUTWARD DIALING (DOD)**

**3.103** A PBX station user can gain access to the exchange network without the assistance of the attendant by dialing an access code and receiving a second dial tone. The user may then proceed to dial the desired exchange network number.

#### **DIRECT TRUNK GROUP SELECTION (DTGS)**

**3.104** This feature allows the attendant active on a switched loop to directly access an idle outgoing trunk in a given trunk group by pressing the key associated with the desired trunk group.

#### **DISTINCTIVE RINGING**

**3.105** Unique patterns of station ringing (using existing station sets) are provided to permit

the station user to distinguish between various types of calls. Three patterns are available as follows:

- (a) One-burst (normal) ringing indicates a station-to-station call.
- (b) Two-burst ringing indicates an attendant call or outside call.
- (c) Three-burst ringing indicates either automatic callback, originating call waiting, outgoing trunk queuing callback, or a night service call to the default or common night station.

#### **ENERGY COMMUNICATIONS SERVICE ADJUNCT (ECSA)**

**3.106** The ECSA consists of DIMENSION PBX cabinet-mounted processor(s) and associated equipment for power, alarms, and program tape. In addition, there is a unique energy carrier and three circuit packs developed for the adjunct. Using this configuration, the adjunct is a dedicated system for monitoring and controlling the energy consumed by customer equipment. Call processing is performed by the host PBX to which the adjunct is connected by way of alarm circuitry.

**3.107** Important hardware considerations center around the use of the energy load control/circuit LC562. It provides a normally open contact interface at the ECSA, thereby eliminating the use of energy communications signaling units (ECSU) and corresponding hardware necessary to generate and pass tones to them over telephone lines. With the adjunct, it is necessary to provide dedicated wiring (and cross-connect field) from the LC562 contacts to the low voltage control circuitry for the energy consuming equipment. Due to the number of circuits per LC562 and number of circuit pack positions per energy carrier, the adjunct provides a higher load handling capability per cabinet than was possible using ECSUs and their supporting hardware. Other hardware considerations are that the use of CAP and attendant console are excluded from adjunct operation. The MAAP procedures are limited to a minimal number, and interface to the Remote Maintenance, Administration, and Traffic System (RMATS) is separate from that of the host PBX.

**3.108** Relative to feature package considerations, the ECSA is equipped with a program tape based on FP11 with generic wording. No call processing is provided.

**3.109** Additional information concerning the ECSA can be found in descriptive

Section 554-106-100 and preinstallation and planning  
Section 554-106-101.

### EXECUTIVE OVERRIDE

**3.110** The station user can enter an existing 2-party busy station connection. Before the add-on is established, a nominal 3-second burst of tone will be applied to advise the calling and talking parties.

**3.111** An ECTS station user can activate executive override by pressing the assigned button upon hearing a busy signal on calling another station. The status lamp remains illuminated until one of the original parties hangs up.

### FLEXIBLE NUMBERING OF STATIONS

**3.112** Station numbers can be assigned to lines at the time of installation in accordance with a customer-desired numbering plan and can be reassigned while in service to permit personnel moves without requiring number changes. Station number assignments can begin with any digit except \*, #, and 0, but must be fixed in length to either two, three, or four digits in the same installation. The same first digit cannot be used for both station numbers and trunk or feature access codes. The same first digit can be used for trunk and feature access codes where all codes starting with the first digit always have the same number of digits (two or three).

### FLEXIBLE NUMBERING OF STATIONS—MIXED NUMBERING

**3.113** Station numbers can be assigned to lines at the time of installation in accordance with a customer-desired numbering plan and can be reassigned while in service to permit personnel moves without requiring number changes. Station number assignments can begin with any digit except \*, #, or 0, and can vary in length from one to four digits within the same installation. Conflicts that result from the use of the same first digit for different length station numbers can be resolved with time-out, an end of dialing code (with TOUCH-TONE dialing), and/or by use of a prefix digit for multidigit station numbers. To avoid time-out, a different prefix code can be used for different length station number series. The same first digit cannot be used for both station numbers and trunk or feature access codes. The same first digit can be used for trunk and feature access codes.

### FOREIGN EXCHANGE (FX) CO ACCESS

**3.114** A service which provides access to a distant CO via FX trunks. All incoming calls to the PBX (from the FX CO area) are placed to the listed FX directory number and are answered by the attendant similar to LDN service. Outgoing calls are made on an attendant-handled basis via direct or dial access and/or on a dial basis by stations (through use of a trunk access code).

### FULLY RESTRICTED STATION

**3.115** Selected station lines are denied the ability to place or receive any but station-to-station calls. The DID calls are routed to the attendant or an announcement. The CCSA calls are routed to the attendant, an announcement, or to intercept tone. All other restricted calls are routed to intercept tone.

### HOT-LINE SERVICE

**3.116** This feature provides stations on the PBX system to automatically place a call to a pre-assigned called number when the station user goes off-hook. The hot-line station can receive calls normally. Hot-line calls can be directed to stations, exchange trunks, CCSA trunks, and internal miscellaneous trunks such as loudspeaker paging. A maximum of 15 lines can have this service. Up to 14 digits can be automatically dialed. Trunk signaling (eg, wink start) is properly handled.

### INCOMING CALL IDENTIFICATION (ICI)

**3.1117** An attendant at a switched loop console position can visually identify the type of service or trunk group associated with a call directed to that position. The visual indication can be provided via indicator lamps or via the alphanumeric display feature. When provided via indicator lamps, up to 6 incoming call indicators can be provided on the console. When provided via the alphanumeric display, up to 30 incoming call indications can be provided.

### INTERCEPT TREATMENT

**3.118** Calls which cannot be completed are routed to an appropriate audible signal, recorded announcement, or to the attendant depending on the noncompletion condition. These treatments are as follows:

- (a) **Attendant Intercept:** Certain calls that cannot be completed are routed to the attendant position for further treatment. The DID calls, so routed, are given normal charging treatment.

(b) **Intercept Tone:** This treatment provides a continuous tone alternating between a low pitch (440 Hz) and a high pitch (620 Hz) indicating that a restricted or unassigned code has been dialed or that a special service has been denied. This option is not available for DID trunks.

(c) **Recorded Announcement Intercept:** Intercepted calls are routed to a recorded message which indicates the reason the call was intercepted. This intercept treatment is provided as an alternative to attendant intercept or intercept tone for DID or CCSA calls only, as a system option. Only one message can be given.

#### INWARD RESTRICTION

**3.119** Selected station lines are prevented from receiving incoming exchange network calls and CCSA calls, either DID or attendant-completed. Attendant-completed calls are routed to intercept tone. The DID calls are routed to the attendant or to announcement.

#### LINE LOCKOUT WITH WARNING

**3.120** This feature provides 10 seconds of warning tone and then holds the line out of service when a station line remains off-hook for longer than 10 seconds without dialing or after the last digit dialed during call origination. The hold out-of-service condition does not tie up switching facilities or call processing time and will be released when the station goes on-hook.

#### LISTED DIRECTORY NUMBER (LDN) SERVICE

**3.121** Incoming exchange network calls to the PBX via the assigned listed local telephone directory number are directed to the attendant. The attendant may complete these calls to station lines within the system or certain trunk facilities. When DID is not provided, all incoming exchange network calls must be made on an LDN basis. Listed numbers are provided for CO trunk (DID and non-DID) and CCSA trunk calls.

#### LOUDSPEAKER PAGING—BASIC

**3.122** This feature allows the attendant direct access and station users dial access to paging equipment for the purpose of voice paging. The paging amplifiers and speakers may be either customer-owned or telephone company provided. Voice paging

facilities make use of the telephone transmitter as the microphone. A control signal for cutoff or override of background music is also provided. Optional arrangements are available to provide multizone paging where a separate access code and/or console key (for direct access) is provided for each of up to six zones or all zones within a customer complex. Dial access to all zone paging is included when multizone paging is provided. Direct access (console key) to all zone paging is optional.

#### LOUDSPEAKER PAGING—DELUXE

**3.123** This feature allows the attendant direct access and attendant and station users dial access to paging equipment for the purpose of voice paging. The paging amplifiers and speakers may be either customer-owned or telephone company provided. Voice paging facilities make use of the telephone transmitter as the microphone. A control signal for cutoff or override of background music is also provided. Optional arrangements are available to provide multizone paging where a separate access code and/or console key (for direct access) is provided for each of up to six zones or all zones within a customer complex. Page answer capability is provided to allow the paged party to be connected to the calling party by dialing an answer code from any station within the PBX. Priority paging is provided to permit attendants and/or designated stations to dial access a paging zone and answer-back channel and preempt any station user connected to that zone or channel. Stations assigned with threeway conference transfer may also access paging while on any 2-party call. The second party can be added on or transferred to the page answer party but not to the paging input.

(a) **With Tie Trunk Access Allowed:** Tie trunk access to paging and answer-back equipment is a feature enhancement. The paging party at the remote PBX dials the tie trunk access code to access the DIMENSION PBX. Upon receiving PBX dial tone, the paging party accesses and uses loudspeaker paging in exactly the same way as a paging party at the DIMENSION PBX, except that the DIMENSION PBX does not recognize a flash over a tie trunk to release the paging equipment after making the announcement.

#### MANUAL ORIGINATING LINE SERVICE

**3.124** These station lines are arranged to automatically route to the attendant position for completion when the station user goes off-hook for

service. Dial tone is not provided to these lines, and all originating connections are made by the attendant. Terminating connections can be dialed directly to a manual line.

### MANUAL TERMINATING LINE SERVICE

**3.125** These station lines require all terminating calls to be completed by the attendant. Nonattendant-handled calls to these lines are routed to intercept tone. The CCSA calls are routed to the attendant, an announcement, or to intercept tone, depending on the option selected. The DID calls are routed to the attendant or an announcement. Originating calls are dialed in the normal manner.

### MESSAGE WAITING

**3.126** This feature provides the ability to light a lamp on a station set served by the PBX remotely (from a central location) to indicate that a message is waiting for the station user. The lamp can be activated from the attendant console via the DSS/BLF or from the station message register service inquiry/display terminal.

**3.127** ♦Message waiting service is restricted to on-premises application. Off-premises message waiting service is not a standard feature offered with the DIMENSION PBX and is not registered under the Private Line Service provisions of the FCC Rules (Part 68).♦

**3.128** A block diagram of the message register inquiry/display terminal is shown in Fig. 18. A maximum of three of these arrangements can be provided. The arrangement uses the 211A power unit or KS-19252, List 7, adapter described in paragraph 3.50 and the following units:

(a) **102E1-A Display Unit (Fig. 19)**—A terminal device used for station message register service and/or message waiting service. It can be operated in either the station message register service mode or the message waiting service mode by the operation of buttons on the TOUCH-TONE telephone pad. When used for station message register service, the unit is used to display and/or clear the number of message units associated with DIMENSION 400 PBX lines. When used for message waiting service, the unit can be used to illuminate a message waiting lamp, check the status of

message waiting lamps, and clear message waiting lamps. It can be either desk- or wall-mounted and is available in black, white, or ivory with either a teak or walnut faceplate finish.

(b) **ADDMASTER\* Model 156 Printer Specification 9042-2 or Equivalent (Fig. 20)**—Used with station message register service in conjunction with the 102E1-A display unit to obtain a printout of message unit or message waiting status.

### MISCELLANEOUS TRUNK RESTRICTION

**3.129** Preselected station lines (and dial repeating tie trunks) are denied access to preselected miscellaneous trunk groups that may include FX, WATS, CCSA tie trunk, and auxiliary trunks. Restricted call attempts are given intercept tone.

### MULTIPLE-LISTED DIRECTORY NUMBERS

**3.130** More than one CO LDN can be associated with a single installation. Each LDN can be assigned a unique incoming call indication. With non-DID service, a separate trunk group is required for each LDN on which a unique ICI is desired.

### MUSIC-ON-HOLD ACCESS

**3.131** This feature provides customer-furnished music or other audible indication to the held party during the hold interval. The held call condition can be the result of attendant position hold, call hold, or threeway conference transfer hold, or the hold associated with other similar features. This feature is also activated when an ECTS station user places a call on exclusive hold, hold, I-hold, or priority hold.

### NIGHT CONSOLE POSITION

**3.132** A feature that provides an alternate attendant position which can be used at night in lieu of the regular attendant position(s) to answer all calls directed to the attendant. This position provides all of the regular attendant functions.

### NIGHT STATION SERVICE—FIXED SERVICE

**3.133** Arrangements are provided to route calls, normally directed to the attendant, to a

\*Registered trademark of Addmaster Corporation.

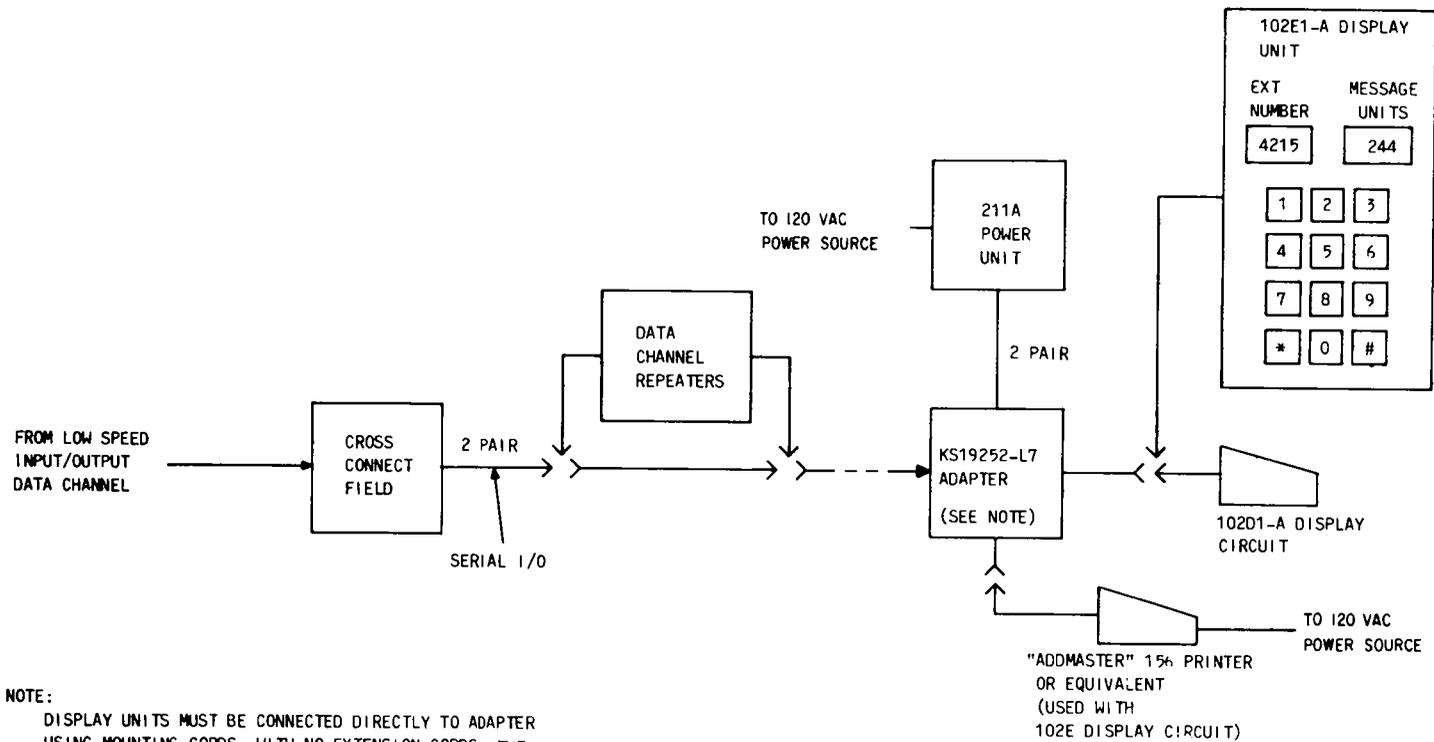


Fig. 18—Arrangement of Message Register Inquiry/Display Equipment Units

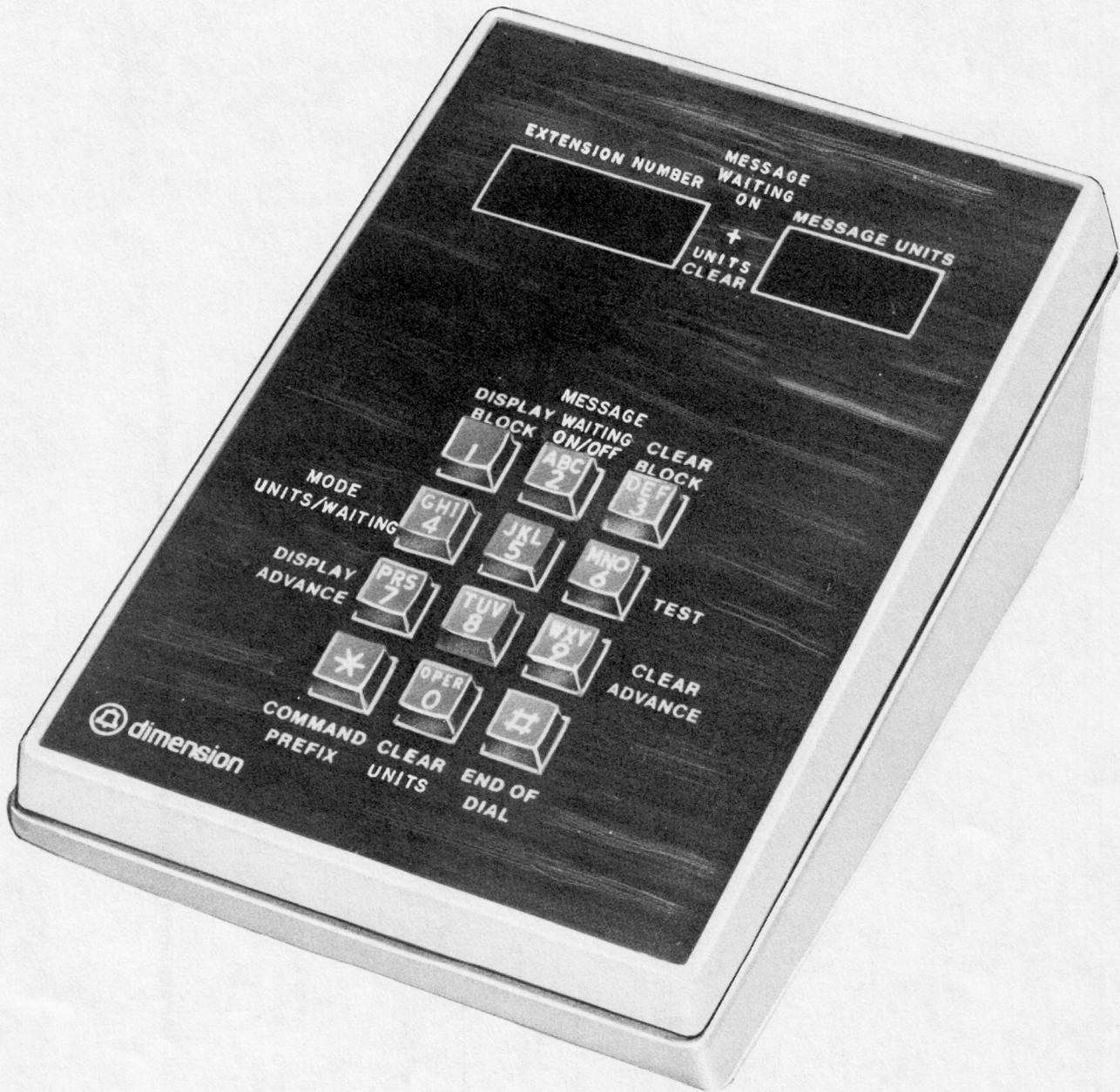


Fig. 19— 102E1-A Display Unit

preselected common station line within the system when night service is activated. In addition, incoming calls from specific non-DID exchange network trunks can be arranged to route to specific station lines. The routings are provided on a fixed basis by the telephone company at the time of order via MAAP or RMATS. The TAAS feature when included in the feature generic may also be provided for night calls not assigned to or that cannot be answered by night stations.

#### NIGHT STATION SERVICE—FULL SERVICE

**3.134** Arrangements are provided to route calls, normally directed to the attendant, to a preselected common station line within the system when night service is activated. In addition, incoming calls from specific non-DID exchange network trunks can be arranged to route to specific station lines. The routings can be assigned on a flexible basis by the attendant and remain in effect night-to-night until

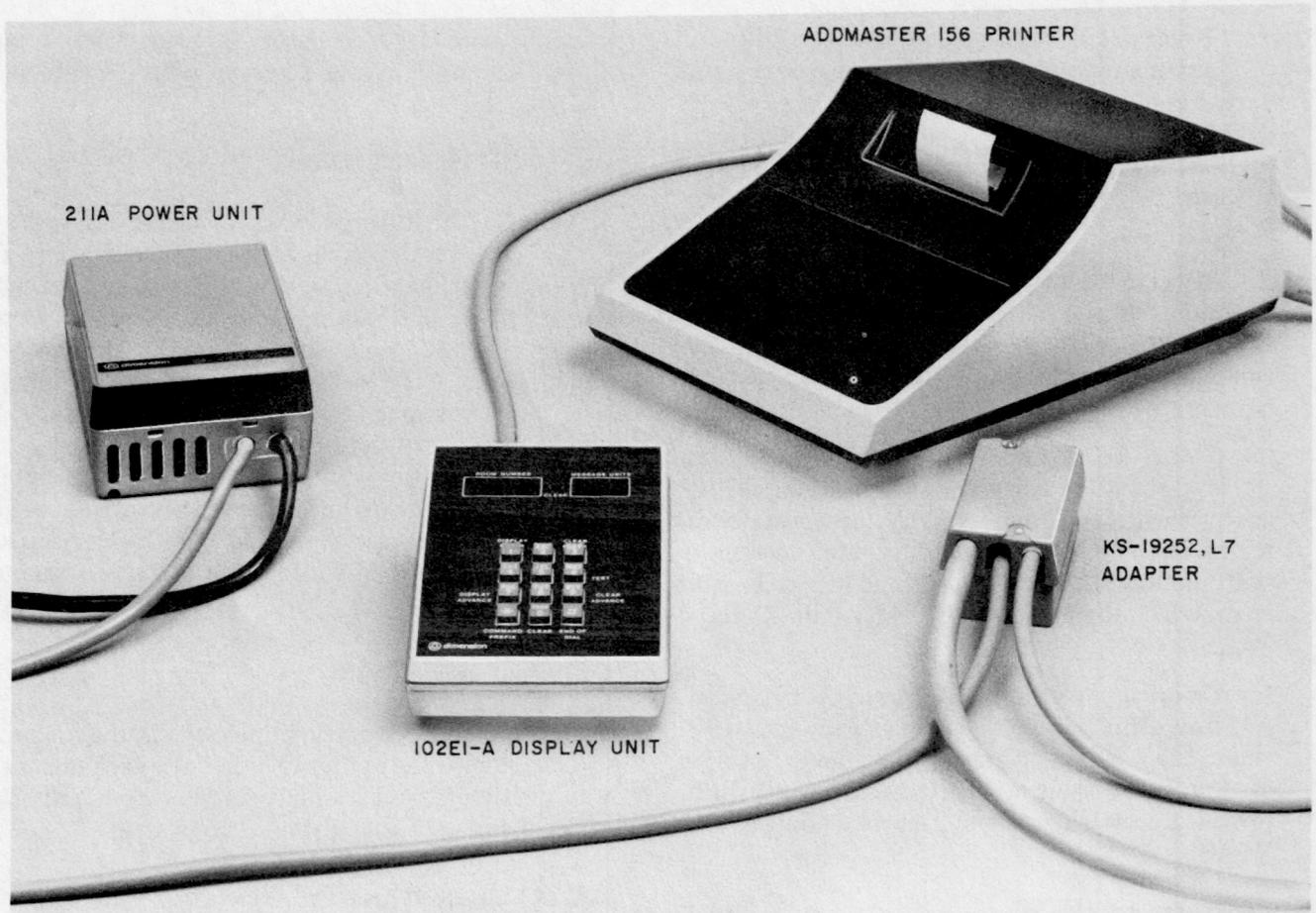


Fig. 20—Station Message Register Equipment

changed. A default common night station is assigned by the telephone company at the time of order via the MAAP, which is used in the event of power failure that causes loss of memory. The TAAS answering capability is provided for night calls not assigned to or that cannot be answered by night stations. When in night service, all stations have threeway conference transfer capability for transferring calls to other stations and call waiting service (if provided with the feature package) for night calls.

**3.135** In a system with night service—full activated, calls are completed as follows:

- **First Call:** Routes to the common number, if assigned, or to the default, if provided, and no common number is assigned by the attendant.

- **Second Call:** Waits in call waiting-terminating state for completion of the first call.
- **Third Call:** Routes to TAAS, if provided. Subsequent calls wait in queue for TAAS. If TAAS is not provided or the call goes unanswered, the third and all subsequent calls are held in queue and move up, in order, to the first and second positions as those calls terminate.

Audible ring is returned to the waiting party while the call is being held for answer.

**3.136** Several dial access codes are provided for attendant control of the night service—full feature.

(a) **Enter Night Station Number:** This code is used by the attendant to make specific trunk to station night assignments.

(b) **Enter Common Night Station Number:** This code allows the attendant to enter a common night station assignment. The common assignment overrides any preassigned default number.

(c) **Clear All Night Numbers:** This code allows the attendant to clear night assignments except the default number. All calls normally directed to the attendant will be routed to the default number. If TAAS is provided and no default is assigned in memory, the calls will route to TAAS.

(d) **Override Common Night Station Number:** This code enables the attendant to override the default and/or common station assignment for routing to TAAS. This code will be provided only when the system is equipped with TAAS.

#### OFF-PREMISES STATIONS

**3.137** This feature provides service between the PBX and a PBX station where the station is located some distance from the PBX premises.

#### OFF-PREMISES STATION WITH CALL CONTROL

**3.138** **Off-Premises Station With Call Control:** This feature provides access to the DIMENSION PBX by special off-premises extensions. The SMDR feature can be provided on all calls to and from these stations. Transmission level for a call to another station on the same PBX is approximately 5 dB higher on these stations than on regular off-premises stations. The PBX features available to users of the special off-premises extension are those features available to incoming dial repeating tie trunk users.

#### ORIGINATION RESTRICTION

**3.139** A station line with this restriction cannot be used to originate calls at any time. Attempted origination will be given line lockout with

warning tone (10 seconds of intercept tone) treatment. Terminating calls, however, will complete normally to this station line.

#### OUTGOING TRUNK QUEUING

**3.140** This feature provides a means for station users to dial a busy outgoing trunk group, be automatically placed in a queue, and to be called back when a trunk in the group is available. If the trunk group is part of a route advance group, the route advance sequence is checked before queuing is activated. Up to 4 outgoing trunk groups in memory size A, and 12 in memory sizes B and C, can be arranged for queuing. A practical limit on the number of stations that can be waiting in queue for each group can be set for a particular customer. Requests received after that limit is reached will cause the station user to hear reorder tone.

#### OUTWARD RESTRICTION

**3.141** Preselected station lines within the PBX are denied the ability to access the exchange network without the assistance of the attendant. Restricted calls are routed to intercept tone.

#### POWER FAILURE TRANSFER

**3.142** This feature provides service to and/or from the exchange network (non-FX and WATS) for a limited number of prearranged stations during a power failure at a PBX customer location when reserve power is not provided or if battery reserve is provided, when the reserve depletes. Incoming service is not available for DID. The power failure stations must be equipped with a ground-start button to originate calls when in power failure mode and equipped with a rotary dial when the CO accepts only rotary pulsing.

**3.143** The use of one or more 609-type emergency transfer panels is required, each of which provides for transfer of ten trunks. When a power failure occurs, each CO trunk is connected directly to the predesignated station line, bypassing the PBX network and removing all restrictions and system features. This feature is also enabled as an emergency transfer under certain major alarm conditions such as processor time-out.

**3.144** The ECTS stations can also be arranged to act as power failure transfer stations with

the addition of an auxiliary ringer adjunct to the station tip and ring for incoming calls.

#### **PRIVACY AND LOCKOUT**

**3.145** Privacy automatically splits the connection whenever an attendant would otherwise be bridged on a call with more than one facility (eg, with both a calling and a called party). Attendant lockout denies an attendant the ability to reenter an established connection held on the console position, unless recalled by a station. When privacy is provided, the attendant lockout feature is also provided.

#### **RADIO PAGING ACCESS**

**3.146** This feature provides attendant and station users dial access to customer-owned radio paging equipment to selectively tone-alert or voice-page individuals carrying pocket radio receivers. The paged party may answer by dialing an answering code from a station within the PBX system.

#### **RECALL DIAL TONE**

**3.147** This feature provides a means of indicating to the station user that the switchhook has been successfully used to generate a flash to request a service feature during an established call instead of having caused a reorigination to occur. The result of a successful use of the switchhook flash is three bursts of dial tone followed by steady dial tone. The result of a reorigination is steady dial tone. Dialing is not registered during the interrupted portion of recall dial tone.

#### **RECORDED TELEPHONE DICTATION ACCESS**

**3.148** This feature permits access to and control of customer-owned dictating equipment by station users within the system. The start and stop functions of customer-owned telephone dictating equipment may be voice-controlled or dial-controlled. The record, playback, etc, functions are dial-controlled.

#### **REMOTE ACCESS TO PBX SERVICES**

**3.149** This feature allows a user outside the PBX to access the PBX services via an exchange network connection. The user dials a preestablished DDD number to connect to the PBX and then dials a 4-digit authorization code. The user may then place

any call as if the user were at a PBX station. This service can be arranged for fully, outward, or toll restriction and/or can be denied access to miscellaneous trunk groups. All signaling is done using TOUCH-TONE dialing, and the authorization code is readily changed by the attendant. Dedicated full time or shared night service-only trunk facilities can be used for providing this service.

#### **REMOTE MAINTENANCE, ADMINISTRATION, AND TRAFFIC SYSTEM (RMATS-1)**

**3.150** The RMATS-1 is a system which provides remote access to the logic and memory of RMATS-1-equipped DIMENSION PBX systems from a central facility (CF). This capability allows certain maintenance, administrative, and traffic routines to be performed from a remote location.

**3.151** The RMATS-1 arrangement consists of the RMATS-1 equipment which is connected to the DIMENSION PBX in the serving area via dial-up data links.

**3.152** The RMATS-1 provides the capability to administer and change nearly all customer service, features, and restrictions from a remote operation center. In addition, traffic service polling is provided as an integral part of RMATS-1, making it possible to obtain traffic data on a regularly scheduled basis without the use of traffic equipment at the PBX location.

**3.153** Since each PBX is equipped with only one data set, maintenance/administrative and traffic polling activities cannot be performed at the PBX at the same time. Maintenance and administrative activities should normally be conducted during the business day by specially trained personnel.

**3.154** When the data link has been seized by the RMATS-1 CF, the local MAAP is disabled and cannot be used.

**3.155** In order to function with the RMATS-1 CF, the PBX must be equipped with an LC171B circuit pack (with slow-speed option) and one low-speed automatic answering data set. An optional telephone set may be used if voice communication over the data link is required.

**3.156** Four types of control carriers exist for DIMENSION 400 PBX Systems. Certain carriers require field modifications of backplane wiring

and additional minor cabling to accommodate RMATS-1 (J58879CA-1, List 1, wired to agree with SD-1E443-01, Issue 5 or earlier). The later systems are factory-furnished for RMATS-1 and may be equipped without wiring changes.

**3.157** For more detailed information regarding RMATS-1, refer to Section 554-010-130.

#### RESERVE POWER

**3.158** This feature provides an alternate independent source of power to maintain PBX service for a limited time (normally 8 busy hours) during a power failure at the customer location.

#### ROTARY DIAL CALLING

**3.159** Dialing information from standard rotary dial station equipment will be accepted. At a calling station, this feature utilizes a rotary device to generate dc pulses, representing either the address of the called facility or an instruction to a dial-controlled device. TOUCH-TONE dialing signals from station lines with the rotary dial class of service will not be accepted.

#### ROUTE ADVANCE

**3.160** This feature routes outgoing calls over alternate facilities when the first choice trunk group is busy. The station user selects the first choice route by dialing the corresponding access code, and the equipment automatically advances to alternate trunk groups. The digits following the access code must be identical for any of the trunk groups selected. The alternate groups may also be accessed by other codes. Up to ten route advance groups may be provided, each containing a maximum of five trunk groups.

#### SERIAL CALL

**3.161** An attendant can complete an incoming trunk call to two or more station lines in succession without requiring the called station user(s) to recall the attendant. This feature is implemented through the use of the 2-party hold-on-console feature.

#### SINGLE-DIGIT DIALING

**3.162** A station user can reach any of a preselected group of stations by dialing\* single-digit

codes. Time-out is available in cases where the single digit used conflicts with the normal numbering plan.

#### SPEED CALLING

**3.163** Station users can dial 2- or 3-digit codes to reach frequently called PBX stations or outside telephone numbers except International Direct Distance Dialing (IDDD) and tie trunk calls. Individual lists can be changed by the station line to which that list is assigned. Group lists are changeable via a designated station line within each group. Individual or group lists can also be changed via the MAAP or RMATS.

#### SPLITTING—ONE-WAY AUTOMANUAL

**3.164** This feature allows an attendant to consult privately with one party on a call without the other party hearing. The split (allowing private consultation with the called party) goes into effect automatically when the attendant starts to complete a call, but the attendant can take positive action to unsplit or to reinstate a split condition.

#### STATION HUNTING

**3.165** A call is routed to an idle station line in a prearranged group when the called station line is busy. Station lines cannot be in more than one hunting group; however, more than one station line may hunt to the same line. The number of hunting groups is unlimited. The size of each hunting group is limited to 30 station lines per group. The hunting sequence over the prearranged group can be accomplished as given below:

(a) **Terminal Hunting:** The hunt always starts with the called station line and ends with the last station line in the prearranged group, completing the call to the first idle station line encountered. Unless the first station line is called, only a portion of the group is tested. The prearranged hunting sequence can be either **consecutive** (station numbers are in ascending numerical sequence) or **nonconsecutive**.

(b) **Circular Hunting:** The hunt starts with the called station line and always proceeds in a prearranged order to test all lines in the group once, completing the call to the first idle station line. The station numbers may be in consecutive or nonconsecutive order.

**STATION MESSAGE DETAIL RECORDING (SMDR)**

**3.166** This feature provides a record of the PBX station (or attendant) identity, call completion time, call duration, and the trunk group used for outgoing and/or incoming calls. The call duration is measured from about 10 seconds after the establishment of the connection in the customer system to the time when the station goes on-hook. Hence, busy signal, don't answer, and wrong number calls may also be recorded. For outgoing calls, the called number is recorded. Also, a station-dialed maximum 5-digit account code may be recorded in addition to the calling station number.

**3.167** Information is passed from the DIMENSION 400 PBX to the SMDR equipment via a data channel, fast/slow speed data input/output circuit pack LC34B, LC366B, or LC171B. When RMATS is provided, LC171B is used, and one data channel is dedicated to SMDR (high-speed option).

**3.168** The SMDR hardware is provided in either the direct output version or 9-track magnetic tape application.

**A. Direct Output Version Application**

**3.169** The direct output version provides station message recording on a printer, tape punch, or customer-provided terminal (ie, magnetic tape cartridge, printer, paper punch). The record is available as a hard-copy printout, or can be stored on paper tape or a magnetic tape cartridge. The amount of output information from SMDR is proportional to customer traffic, number of stations within the PBX, and number of trunks to be monitored. The capacity of the SMDR buffer memory allows 16 call records to

be stored for outputting to terminal. The output data may be transmitted at a speed of 300, 600, 1200, 2400, 4800, or 9600 baud. At 4800 baud, the direct output version SMDR should handle a 4000-line heavy traffic DIMENSION PBX. Hardware consists of a small cabinet containing eight circuit packs.

**B. COMM-STOR II Application**

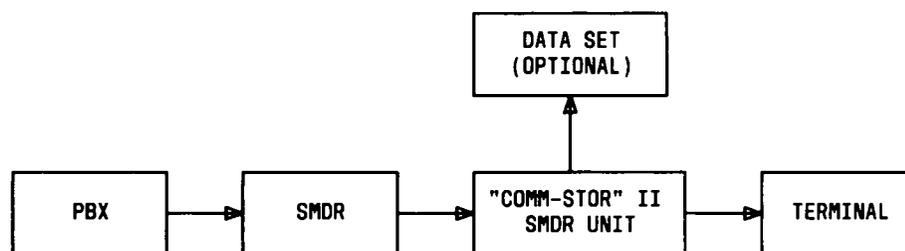
**3.170** The COMM-STOR II unit (Fig. 21), when used with SMDR, is a totally dedicated system, which interfaces with the DIMENSION PBX to record the call records generated by the PBX SMDR direct output system. In addition, the COMM-STOR II unit is capable of generating reports that summarize toll use and toll changes by station or by department, and trunk usage data.

**3.171** These reports may be used by the customer in allocating costs and evaluating toll facilities. They also aid in identifying abuse to the customer's network.

**3.172** The operator communicates with the COMM-STOR II unit via a terminal (43 teleprinter, DATASPEED\* 40/2 terminal set or equivalent). The system displays a message on the terminal, to which the operator responds. The operator may be instructed to perform a particular action or enter information in response to a question. Frequently, a list of operations appear from which the operator must choose one to perform. Through the interaction of terminal displays and operator responses, the operator can perform all of the necessary procedures.

**3.173** Reports are displayed on a CRT and/or printed for hard-copy retention, depending on the option chosen by the customer.

\*Registered trademark of AT&T.



**Fig. 21 — Block Diagram of SMDR With COMM-STOR II Unit**

**3.174** For more detailed information regarding SMDR, refer to Sections 554-010-122 and 554-010-123, SMDR System Description and SMDR Maintenance Support, respectively.

**C. 9-Track Magnetic Tape Application**

**3.175** For systems requiring capacity greater than the direct output for storing the recorded calling information, the 9-track magnetic tape version may be used. This version of SMDR provides a call storage medium (9-track magnetic tape) with a capacity of 330,000 calls per tape. The tape may be changed, as required, depending on customer requirements (traffic capacity or monitoring of calls). The 9-track system is equipped with a Kennedy 9217 tape formatter used to write data on a standard 9-track magnetic tape. When output information is required by the customer in the form of a hard copy for visual inspection, the 9-track magnetic tape requires machine processing (software decoding) to group the output from the magnetic tape as required by the customer, ie, grouped by type of calls, account numbers, specific dates, etc. This feature provides a record of trunk calls which may be used to tally costs, allocate charges, analyze calling patterns, and effect implementation of controls and/or restrictions. The 9-track magnetic tape SMDR uses the same receiving circuitry as the direct output version and provides greater record storage capacity. The 9-track magnetic tape SMDR is mounted in a dedicated SMDR cabinet and consists of a power supply, circuit pack carrier, a tape driver, and a tape formatter.

**3.176** For more detailed information regarding SMDR, refer to Section 554-010-122.

**STATION MESSAGE REGISTER SERVICE**

**3.177** Message registration equipment, which is centrally located on customer premises, is provided for use by the customer. Message unit information is recorded on a per-station-line basis for each completed outgoing local service call made by the station user. Optional surcharge arrangements may also be provided to score an additional predetermined number of units per call.

**3.178** The message unit information is stored in electronic memory, and the stored information is obtained by the customer's desk clerk via an inquiry/display terminal with a digital readout. Optionally, a hard-copy printer is available for use with

the inquiry/display terminal. Furthermore, the message unit information relating the local calling usage can be generated internally on the basis of timing or can be generated by detection of and counting message unit pulses from the CO on a third wire per CO trunk. With the internal generation method, the PBX does not receive answer supervision from the CO; therefore, all trunk seizures which persist longer than an assumed answer time are counted as valid completed calls.

**STATION REARRANGEMENT AND CHANGE**

**3.179** This feature allows the customer, by use of the CACS or the CAP, to move stations, change the features and/or restrictions assigned to a station, administer all of the features associated with the DIMENSION PBX ECTS, and perform search routines on individual stations in order to identify the services provided for that station.

**STATION-TO-STATION CALLING**

**3.180** The station user can directly dial other stations within the same system without the assistance of the attendant. The number of digits required depends on the numbering plan engineered for the customer.

**STRAIGHTFORWARD OUTWARD COMPLETION (SFOC)**

**3.181** An attendant can place an outgoing call for a station user who reached the attendant via dial 0 or intercept or attendant-originated call, without requiring the station user to hang up. The attendant will dial the called number for the station user or, with through dialing, allow the station user to complete the dialing.

**SWITCHED LOOP OPERATION**

**3.182** The attendant position is arranged so that each call requiring attendant assistance is automatically switched to one of a limited number of idle loops on an available attendant position. Normally, a call will automatically release from the attendant position as soon as it is answered by the called station. Incoming calls are queued (retained in a waiting state) in the order of their arrival when all attendant positions are busy. To distribute the call load evenly to each attendant, each queued call is automatically switched to the first available attendant position. A console lamp indication (CW) is given to the attendant when calls are waiting to be served.

**TANDEM TIE TRUNK SWITCHING**

**3.183** A service arrangement that allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the distant PBX station user. Tandem connections can be restricted on a trunk group basis. Restricted calls are routed to intercept tone.

**TERMINATION RESTRICTION**

**3.184** Station lines with this restriction cannot receive calls at any time. Calls can be originated normally from this station. The DID calls are routed to the attendant or to an announcement depending on the option selected. The CCSA calls are routed to the attendant, an announcement, or to intercept tone, depending on the option selected. All other terminating calls are routed to intercept tone.

**THREWAY CONFERENCE TRANSFER**

**3.185** A non-ECTS station user can, by flashing while on any 2-party call, effect a threeway conference and transfer. After flashing, the station dials the third party (which can be a trunk) for private consultation while the second party is held in soft hold. By flashing a second time, a threeway conference is effected. Subsequently, a transfer is accomplished when the original party goes on-hook and one of the remaining parties (second or third party) is a station, or, if both remaining parties are trunks, trunk-to-trunk transfer must be available. Where two trunks are involved in a conference and trunk-to-trunk transfer is not available, all conferees are released from the connection when the controlling station goes on-hook. In addition, the controlling non-ECTS station can drop the third party by flashing during the threeway conference.

**3.186** An ECTS station user can activate threeway conference transfer via use of the recall button in lieu of using the switchhook.

**THROUGH DIALING**

**3.187** At the discretion of the attendant, station users can complete dialing after the attendant selects the trunk facility on attendant-handled outgoing calls.

**TIE TRUNK ACCESS**

**3.188** This feature provides access to dedicated 1-way or 2-way circuits between this PBX and another PBX.

**TIMED RECALL ON OUTGOING CALLS**

**3.189** With this feature, outgoing trunk calls from selected stations are automatically transferred to the attendant after a timed interval assigned to the trunk group between 1 and 31 minutes. A warning tone is sent to the calling party 30 seconds before the transfer takes place.

**TIMED REMINDERS**

**3.190** The attendant is automatically alerted after 30 seconds when a call on the console is waiting on a busy station line (attendant call waiting), or the called party has not answered, or the incoming call is held on the console. This signal is retired when the loop is reseeded by the attendant and will be reactivated 30 seconds after the attendant releases from the connection and the call is still waiting, unanswered, or held. If the system is equipped with Feature Package 2 (Issue 3), Feature Packages 3, 4, and 5, (Issue 2), or Feature Packages 10 and 15 and attendant console (01C-type or 02 system), an audible tone is also provided.

**TOLL RESTRICTION (BATTERY REVERSAL OR 0/1)**

**3.191** A limited form of code restriction which permits station users to access the local CO and to dial local service area calls but prevents completion of toll calls or calls to the toll operator without the assistance of the attendant. Restricted toll calls are given intercept tone. This feature is provided on a per-station-line basis and is available in two mutually exclusive forms:

(a) **Battery Reversal:** A battery reversal signal from the CO on an outgoing call will route the toll-restricted calling station to intercept tone.

(b) **0/1 (With Limited 3-Digit):** This form of toll restriction is based on screening at the PBX rather than at the CO. Toll restricted (0/1) stations will be routed to intercept tone if the first or second digit dialed following the trunk access code is a 0 or a 1 and the office or area code is not in the allowed call list (which has a maximum capacity of ten 3-digit codes).

**TOLL TERMINAL ACCESS**

**3.192** A station user or attendant can dial a toll operator directly or access a uniquely identified trunk group to a Traffic Service Position System

(TSPS) position with a single-digit access code. Toll operator callback over the toll terminal will not be provided. Audible ring is provided with direct access to toll operator positions.

#### "TOUCH-TONE" CALLING

**3.193** Dialing information from standard TOUCH-TONE telephone station equipment will be accepted. At a calling station, this feature utilizes pushbutton-operated audible tones, a series of which represent either the address of a called facility or an instruction to a dial-controlled device. Rotary station instruments can be used on station lines with the TOUCH-TONE calling class of service for testing purposes. Address information will only be accepted from either TOUCH-TONE telephone or rotary dial instruments during the same call.

#### "TOUCH-TONE" SERVICE TO DIAL PULSE CONVERSION

**3.194** TOUCH-TONE dialing signals will be converted to dial pulse signals when the distant end associated with outgoing trunk calls is not equipped to receive TOUCH-TONE dialing signals or when transmission loss prevents reliable TOUCH-TONE service signaling. External dial pulse conversion equipment is not required for this feature. The TOUCH-TONE calling station can press the # button to indicate when conversion is no longer required on the call. This permits TOUCH-TONE dialing signals to pass through to the distant end without having to wait for a time-out period.

#### "TOUCH-TONE" CALLING SENDERIZED OPERATION

**3.195** TOUCH-TONE dialing signals can be used when the distant end associated with outgoing trunk calls is equipped to receive TOUCH-TONE dialing signals. This takes place on speed calling, ARS, ARS—deluxe, and automatic alternate routing calls. With ARS, the calling station must be equipped with a TOUCH-TONE telephone dial.

**3.196** When TOUCH-TONE calling senderized operation is required, sender circuit packs (LC12) must be installed. The quantity of circuit packs required will be determined by traffic load.

#### TRAFFIC MEASUREMENT

##### A. Before RMATS-1 Capability

**3.197** Before RMATS capability, there were two types of traffic measurement associated with the DIMENSION PBXs—early warning measurement and detailed measurement.

#### Early Warning Measurement

**3.198** The remotely accessed traffic system (RATS), a completely software-oriented method, is standard to all feature packages and is primarily used as an early warning device to determine if a detailed traffic study is required. The RATS is not available with Feature Packages 1, 2, 3, 4, or 5 (Issue 2 or later), or with Feature Packages 10 and 15.

**3.199** Under normal operation, the PBX measures and stores traffic usage information for three studies, which can be applied to any combination of time slots, TOUCH-TONE service receivers, or trunk groups. Each study has an associated threshold that can be set to a value between 0 and 4096 CCS. If this value is exceeded for four successive weeks, a warning flag is set. The usage information is stored for the single greatest peak hour for each study for the current week and for the previous six weeks.

**3.200** The RATS has a special line number which is dialed by the attendant or via a DID trunk. The system responds with one of the following tones:

- **Recall dial tone:** Indicates traffic overload if warning flag is set
- **Miscellaneous tone:** Indicates maintenance alarm operated
- **Intercept tone:** Indicates all seems well.

**3.201** An additional peg count study may be initiated for any processor overloads, indicating that the processor is low on real-time call-carrying capacity.

#### Detailed Measurement

**3.202** Detailed traffic measurement is accomplished by extracting usage (CCS) and peg (CCS PEG) count data via software and special test equipment. Figure 22 shows the possible interconnection of the traffic measurement units.

**3.203** The CCS PEG program is used in conjunction with the Alston Count Monitor/Scanner Model 516A/201 with modification 329200-1 or equivalent (Fig. 23). The scanner can be polled from a remote location or it can be connected locally to a teletypewriter (TTY) for traffic reports. After the scanner is connected to the high-speed channel of a

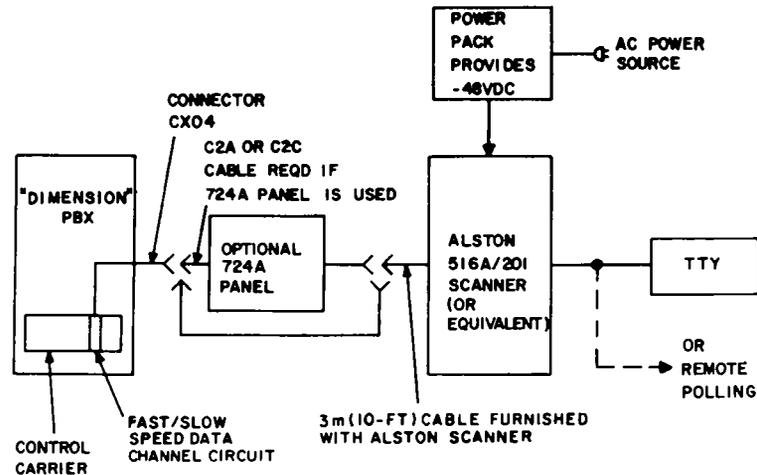


Fig. 22—Interconnection of Traffic Measurement Units

data buffer circuit pack (LC34B or LC366B), MAAP procedures are used to prepare a traffic study. After the study is initiated, the MAAP is disconnected. Traffic data can be printed on an hourly basis in the form of a 10-word-per-line TTY printout of 150 words. A direct polling technique may be used, instead of the TTY, where the data is analyzed by an Alston Programmable Data Controller (PDC), or equivalent poller, via the switched network. The study continues until it is terminated again by MAAP procedures.

**3.204** The scanner connection can be made directly to the PBX cabinet or via the optional 724A panel in the cross-connect field (Fig. 22).

#### B. After RMATS-1 Capability

**3.205** DIMENSION PBX systems with RMATS capability do not have RATS or early warning measurement capability. Feature Packages 1, 2, 3, 4, and 5 (Issue 2 or later) and Feature Packages 10 and 15 are compatible with RMATS. Traffic studies and structures may be flexibly administered in the PBX and automatically polled by the RMATS-1 CF. Optionally, the system can be polled using existing polling equipment such as an Alston scanner. Measurements are accumulated hourly and may be polled hourly or daily. Daily polling provides only the data for the peak traffic hour for each data item.

**3.206** The traffic studies at the PBX will function in a default mode and will output accumulative values and a fixed study set if specific studies are not prescribed. Table E shows the default studies that are run in the default mode. Specific CCS, peg, and overflow peak data may be accumulated on a per-trunk-group basis, in addition to the accumulated values. Information is stored in registers which are updated hourly as peak values occur. Trunk group activity measurements may be obtained which will be time coincident with certain peak values studied. Time coincident studies of traffic items and related peak register studies may also be flexibly assigned. Trunk group combinations, outgoing trunk queuing (OTQ) activity, and ARS studies may be assigned, as required.

**3.207** The traffic values, default and/or assigned, are stored in a dedicated memory area which is outputted to RMATS-1 on a polling schedule prescribed in the RMATS-1 CF. Assignable traffic values are shown in Table F.

**3.208** The RMATS-1 facility can be arranged to automatically poll on a daily or hourly interval. The RMATS-1 dials the PBX via the DDD network, sends the PBX unique security access code, and receives and records data stored in the PBX. Traffic study values in the PBX are zeroed after polling. In the case of polling with an Alston scanner, a system MAAP procedure is used to eliminate the requirement for a security code before data transmission.

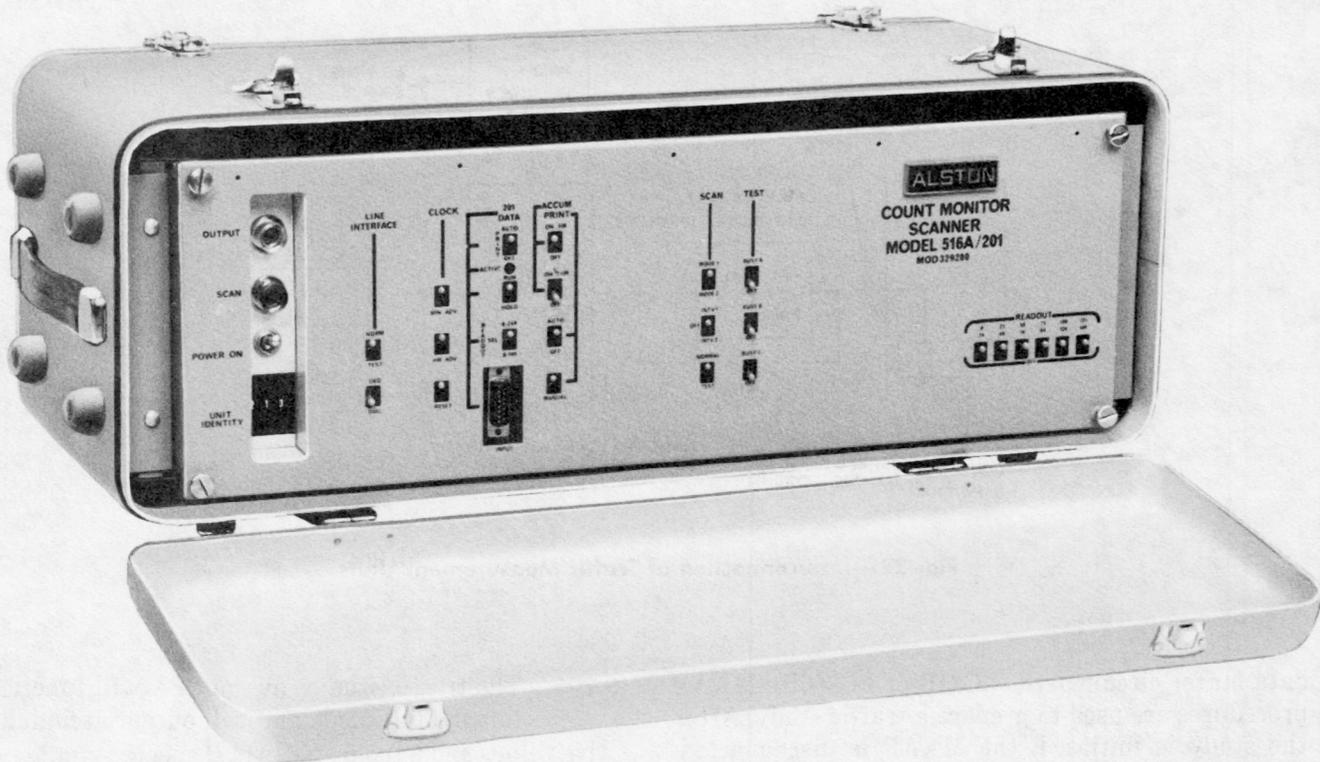


Fig. 23—Alston Count Monitor/Scanner Model 516A/201

**3.209** Early DIMENSION PBXs require backplane wiring modifications, an additional connector for a 103-type data set, and LC18B and LC171 circuit packs (in place of LC18 and LC34B) in the control carrier. Section 554-010-130 contains details on RMATS-1 interface operations and details of PBX wiring and configurations.

#### TRUNK ANSWER FROM ANY STATION

**3.210** Incoming calls, normally directed to the attendant, activate a common alerting signal on the customer premises when night service is activated and night stations are not assigned or are all busy. These calls may then be answered by any station user in the system who dials a special code from any nonrestricted station.

#### TRUNK GROUP BUSY INDICATORS ON ATTENDANT POSITION

**3.211** The attendant(s) is provided with a visual indication when all trunks in a group are busy. Up to 24 busy indicators can be provided.

#### TRUNK GROUP WARNING INDICATORS ON ATTENDANT POSITION

**3.212** The attendant(s) is provided with a visual indication when a preset number of trunks in a group are busy. This number can be specified via the MAAP. Up to 12 warning indicators can be provided.

#### TRUNK-TO-TRUNK CONNECTIONS

**3.213** This feature allows an incoming or outgoing trunk call to be extended via the attendant to another outgoing trunk. Trunk-to-trunk connections can be effected among the following types of trunks: CO, FX, WATS, CCSA network, and tie trunks. Disconnect supervision can be automatic in some cases; but, in others, the attendant must monitor the connection and manually disconnect after use.

#### TRUNK VERIFICATION BY CUSTOMER

**3.214** This feature provides attendant access to individual trunks of a group for making test

**TABLE E**  
**DEFAULT STUDIES**

ACCUMULATED VALUES	
1 PROCESSOR OVERLOAD	31 CALL FORWARDING-DEACTIVATE
2 RING GROUP BLOCK GROUP 0	32 SPEED CALLING
3 RING GROUP BLOCK GROUP 1	33 CODE CALLING
4 RING GROUP BLOCK GROUP 2	34 PAGING - CODE DIALED
5 RING GROUP BLOCK GROUP 3	35 PAGING - ANSWERBACK
6 RING GROUP BLOCK GROUP 4	36 CANCEL OUTGOING TRUNK QUEUING
7 RING GROUP BLOCK GROUP 5	37 ACTIVATE CONTROL TRUNK GROUP ACCESS
8 RING GROUP BLOCK GROUP 6	38 DEACTIVATE CONTROL TRUNK GROUP ACCESS
9 RING GROUP BLOCK GROUP 7	39 CONFERENCE-CALL
10 RING GROUP BLOCK GROUP 8	40 CALL WAITING ORIGINATING (BY ATTENDANT)
11 RING GROUP BLOCK GROUP 9	41 ATTENDANT ORIGINATED CALLS (START) KEY
12 RING GROUP BLOCK GROUP 10	42 ELECTRONIC CUSTOM TELEPHONE SERVICE - AUTOMATIC CALLBACK
13 RING GROUP BLOCK GROUP 11	43 ELECTRONIC CUSTOM TELEPHONE SERVICE - CALL HOLD
14 RING GROUP BLOCK GROUP 12	44 ELECTRONIC CUSTOM TELEPHONE SERVICE - CALL PICKUP
15 RING GROUP BLOCK GROUP 13	45 ELECTRONIC CUSTOM TELEPHONE SERVICE - CALL WAITING - ORIGINATING
16 DIRECT INWARD DIALING BUSY	46 ELECTRONIC CUSTOM TELEPHONE SERVICE - ANSWER HOLD
17 DIRECT INWARD DIALING DON'T ANSWER	47 ELECTRONIC CUSTOM TELEPHONE SERVICE - CALL FORWARDING - ALL CALLS
18 INCOMING CALL ATTENDANT ABANDONED	48 ELECTRONIC CUSTOM TELEPHONE SERVICE - CALL FORWARDING-BUSY AND DON'T ANSWER
19 TRUNK ANSWER ANY STATION CALL	49 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 1
20 TRUNK ANSWER ANY STATION CALL ABANDON	50 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 2
21 REMOTE ACCESS (RIGHT CODE)	51 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 3
22 REMOTE ACCESS (WRONG CODE)	52 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 4
23 SMDR RECORDING-BLOCK	53 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 5
24 AUTOMATIC CALLBACK	54 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 6
25 CALL HOLD	55 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 7
26 CALL PICKUP	56 UNIFORM CALL DISTRIBUTION WARNING PEG - GRP 8
27 CALL WAITING ORIGINATING (BY STATION)	57 CENTRALIZED ATTENDANT SERVICE CALL ABANDON
28 ANSWER HOLD	58 VALID RMATS SECURITY CODE DIALED (FP15 ONLY)
29 CALL FORWARDING-ALL CALLS	59 INVALID RMATS SECURITY CODE DIALED (FP15 ONLY)
30 CALL FORWARDING-BUSY AND DON'T ANSWER	60
DEFAULT REGISTER ASSIGNMENTS	
PEAK REGISTER NUMBER	TIME COINCIDENT REGISTER
1 TIME SLOT PEG	1 PROCESSOR OCCUPANCY 2 PROCESSOR OVERFLOW 3 STIMULUS PEG 4 ELECTRONIC CUSTOM TELEPHONE SERVICE TOTAL PEG
2 TIME SLOT CCS	5 TIME SLOT PEG 6 TANDEM TRAFFIC PEG
3 INCOMING CALL QUEUE CCS	7 INCOMING CALL QUEUE PEG 8 CONSOLE GROUP WORKED CCS 9 CONSOLE GROUP WORKED PEG 10 INCOMING CALL QUEUE ATTENDANT ABANDONED PEG 11 LISTED DIRECTORY NUMBER CALL ANSWERED PEG 12 NON-LISTED DIRECTORY NUMBER CALL ANSWERED PEG 13 ATTENDANT RECALL PEG 14 ATTENDANT ORIGINATED (START KEY) PEG
4 CONSOLE GROUP WORKED CCS	15 CONSOLE ACTIVE CCS 16 INCOMING CALL QUEUE CCS 17 INCOMING CALL QUEUE PEG 18 CONSOLE NUMBER 1 WORKED CCS 19 CONSOLE NUMBER 1 WORKED PEG

TABLE F

TRAFFIC TYPE AND ITEM DEFINITION

TYPE	ITEM	DESIGNATION	TYPE	ITEM	DESIGNATION
1 TRUNK GRP COMBINATIONS	1	TRK GRP COMBN 1	4 QUEUE MEASURE OTQ	1	QUEUE
	2	1		2	1
	3	1		3	2
	4	2		4	3
	5	2		5	4
	6	2		6	5
	7	3		7	6
	8	3		8	7
	9	TRK GRP COMBN 3		9	8
2 ATTENDANT FEATURES	1	GROUP WORKED	10	9	
	2	GROUP MANNED	11	10	
	4	CONSOLE 1 WORKED	12	11	
	5	2	13	12	
	6	3	14	13	
	7	4	15	14	
	8	1	16	15	
	9	2	17	16	
	10	3	18	17	
	11	CONSOLE 4 WORKED		18	
	12	INCOMING CALL QUEUE	5		
	13	INCOMING CALL QUEUE	6		
	3	GROUP WORKED	7		
	14	INC. CALL QUEUE, ATND ABANDON	8		
	15	LDN CALLS ANSWERED			
	16	NON-LDN CALLS ANSWERED			
	17	ATTENDANT RECALL			
	18	ATTENDANT ORIG (START KEY)			
3 NETWORK & PROCESSOR	1	TIME SLOT			
	2	TANDEM TRAFFIC			
	3	TIME SLOT			
	4	OCCUPANCY			
	5	OVERFLOW			
	6	STIMULUS			
	7	ECTS CONTROLLERS-TOTAL			

calls to verify supervision and transmission. Where a busy trunk is encountered, a bridged connection with a warning tone to the busy parties is provided to verify use. The attendant operates a test access code followed by the normal trunk group access code (or operation of the direct trunk group selection [DTGS] key) followed by the specific number of the trunk to be tested. A dial code must be assigned to incoming trunk groups to allow attendant access for testing. This same dial code is used to establish night connections on incoming trunks.

#### **TRUNK VERIFICATION BY STATION (TVS)**

**3.215** This feature permits a designated station, a remote maintenance station, or a backup control station associated with a centralized attendant service release link trunk (CAS RLT) to access individual trunks, or trunk groups terminating on the PBX, for the purpose of making test calls to verify supervision and transmission. To test incoming trunks or where a busy trunk is encountered, an optional bridged connection with a warning tone to the busy parties is provided to verify use. If a defective trunk is found, a code can be dialed from the designated station line or control station to put the trunk in a maintenance busy state until required. Any dial repeating tie trunk can also be used to remotely test trunks on a PBX, but is limited only to those trunks to which it can normally be connected. However, the busy trunk override option is not provided. This feature also permits testing of outgoing RLT trunks in a CAS installation.

**3.216** Using the TVS feature, a designated station can access a specific trunk to determine if it is idle before the trunk tip and ring is manually switched to an alternate use such as a data set. This same station can also busy or unbusy the trunk to all PBX traffic. The feature also provides the designated station the ability to test the trunk after it is placed back in normal PBX use to verify that the switch was made properly.

#### **TWO-PARTY HOLD ON CONSOLE**

**3.217** This feature allows an attendant to hold on the console a call with both a calling and a called station or trunk facility (or two called facilities) connected. Two-party hold is required for the operation of the attendant lockout, serial call, and trunk-to-trunk connections feature.

#### **UNIFORM CALL DISTRIBUTION (UCD)**

**3.218** This feature, which is similar to automatic call distribution service, permits DID or PBX incoming CO calls, FX calls, tie trunk calls, and inward wide area telecommunications service (INWATS) calls to be terminated directly from the CO to the most idle of a prearranged group of stations without attendant assistance. Each UCD station is typically a nonkey telephone set which can also be used in a normal manner to make and receive calls directly. A maximum of 14 DDC and/or UCD groups can be provided with the DIMENSION 400 PBX.

#### **UNINTERRUPTIBLE POWER SERVICE (UPS)**

**3.219** This is an optional feature which provides operating power for the DIMENSION PBX during commercial ac power interruptions. When such an interruption occurs, the UPS provides the required power (holdover) from batteries which have been charged during normal commercial power operation. The UPS feature is available in either a "nominal holdover" configuration in which battery power can be supplied in terms of minutes or in an "extended holdover" configuration in which battery power can be supplied in terms of hours. Standard UPS refers to support of cabinet equipment which performs PBX functions. Descriptions of the major UPS categories follow.

**3.220** *Nominal Holdover* provides power for DIMENSION PBX cabinets and peripherals during relatively short commercial power interruptions. This allows all PBX functions to continue without interruption for several minutes. Nominal holdover has been designed primarily for those customers who provide supplemental power sources, such as engine-alternators, that can be expected to take over local power loads within seconds or, at most, a few minutes. For customers without such backup arrangements, nominal holdover prevents loss of PBX service for perhaps 95 percent of all power interruptions, depending on local experience. The duration of the power holdover is dependent on the load on the cabinet power supply.

**3.221** *Extended Holdover* provides power holdover up to approximately 8 hours for DIMENSION PBX cabinets by the use of a separately housed battery plant and charging unit, such as a 100-type battery reserved power plant. The UPS

power supplies contain an inverter, thereby eliminating the need for an external unit as required in other reserve power arrangements. However, a cabinet-mounted dc filter is required in the battery feed to the UPS power supply. Extended holdover is not offered with peripheral UPS.

**3.222 Standard UPS** provides power holdover to DIMENSION PBX cabinets (providing PBX functions) during commercial power disruptions. The hardware for standard UPS is completely self-contained and is installed in DIMENSION PBX cabinets in place of the normal power supply unit. This eliminates the need for extra cabinets holding rectifiers, inverters, and banks of batteries. Standard UPS can accommodate either nominal or extended holdover arrangements. During a commercial power interruption, the nominal holdover arrangement provides electrical power through a UPS rectifier/converter power supply. The power originates from a UPS battery pack which has been charged from commercial power by a UPS battery charger. A full recharge after a power interruption should occur within 24 hours. The extended holdover arrangement uses the UPS rectifier/converter power supply but uses a locally engineered battery reserve type power plant and charger. A dc line filter is also required in the feeder pairs from the reserve type power plant.

### VISUALLY IMPAIRED ATTENDANT SERVICE

**3.223** Visually impaired attendant service capability is achieved by augmenting the normal visual signals provided on a standard attendant position with special tactile devices and/or audible signals which enable a visually impaired person to operate the position. This service is provided using a light-sensitive probe (990A light sensor), a grooved console faceplate (6A guide), and additional audible tones which identify the type of call. New DIMENSION PBX consoles allow plugging an audible tone adjunct (2A translator) directly into the console. The new audible signals identify the type of incoming call, and new tones indicate calls waiting and timed reminders. The additional console equipment required to provide this service is shown in Fig. 24.

**3.224** The 2A translator performs two functions. *First*, it monitors the six incoming call indicator positions on the attendant console and produces a logic output that controls audible ringing. In this way, six different audible ring codes are generated

that identify which of the six incoming call indicators are active. If the console is equipped with an alphanumeric display, the ICI information will also appear in the alphanumeric display field. The six coded call indicators are as follows:

- (1) LDN call
- (2) Attendant call "dial 0"
- (3) Attendant recall
- (4) Customer options (tie trunk, etc)
- (5) Customer options (WATS, etc)
- (6) Other than items 1 through 5.

The ring rates for these call indicators are shown on Fig. 25. *Second*, a 2A translator senses the light-sensitive probe output when the probe is placed over an illuminated console LED, and injects a tone onto the console headset.



*This feature can only be provided with an 02-system console.*

### WATS ACCESS

**3.225** This service provides access to or from a WATS serving office. All incoming calls to the PBX are placed to the assigned INWATS number and are answered by the PBX attendant similar to LDN service. Outward wide area telecommunications service (OUTWATS) calls to the various geographic areas are made on an attendant-handled basis via DTGS when provided, or dial access, and/or on a direct dial basis by stations.

### WIDE FREQUENCY TOLERANT POWER PLANT

**3.226** The PBX power plant facilities are provided that will operate from ac energy sources which are not as closely regulated as commercial ac power. The wide tolerant plant will tolerate average frequency deviations of up to  $\pm 3$  Hz or voltage variations of  $-15$  percent to  $+10$  percent as long as both of the conditions do not occur simultaneously. This feature permits operation with customer-provided emergency power generating equipment.

### 24A-TYPE LINE STATUS INDICATOR

**3.227** The 24A-type line status indicator is used to provide a visual status indication of specific station lines (off-hook, on-hook, and ringing).

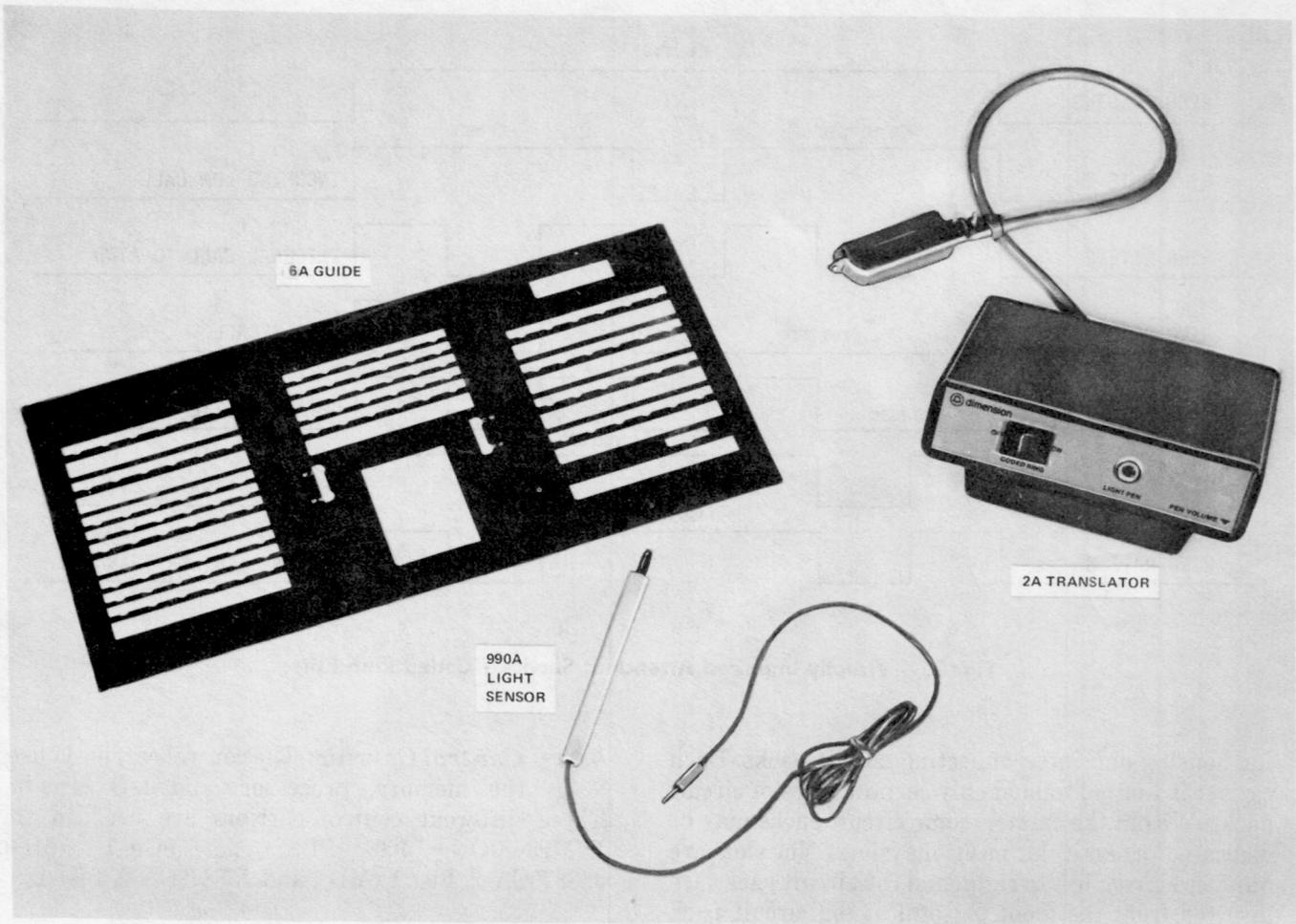


Fig. 24—Visually Impaired Attendant Service—Console Equipment

**3.228** The 24A-type line status indicator is available with capacities for monitoring 8, 16, or 32 lines and can be either desk- or wall-mounted. (See Section 463-210-101 for details.)

#### 4. PHYSICAL ARRANGEMENTS

##### CABINETS

**4.01** The DIMENSION 400 PBX equipment is housed in cabinets measuring 610 mm (24 inches) deep by 800 mm (31 1/2 inches) wide by 1765 mm (69 1/2 inches) high. The cabinet can accommodate five carriers. The number of carriers, and consequently the number of cabinets required, is determined by the line, trunk, and service circuit requirements of the customer. Each cabinet is made up of a basic framework with side and front panels

hinged for easy access. Within the cabinet, carriers are mounted on frames in accordance with customer requirement. Location of the carriers, to some extent, varies (Fig. 26). Cabinets are shipped from the factory complete with units, wiring, cabling, and circuit packs in place. Front panels are available to blend with office decor. The front panel colors are available in avocado, teak, walnut, gold, orange, red, and blue. In addition, an option is available for the use of a customer-provided panel. An auxiliary cabinet is provided to house standard optional circuits such as CPFT equipment and interface trunks.

##### CABINET-MOUNTED EQUIPMENT

###### A. Carriers

**4.02** Carriers of the DIMENSION 400 PBX are small frames, including wiring and apparatus

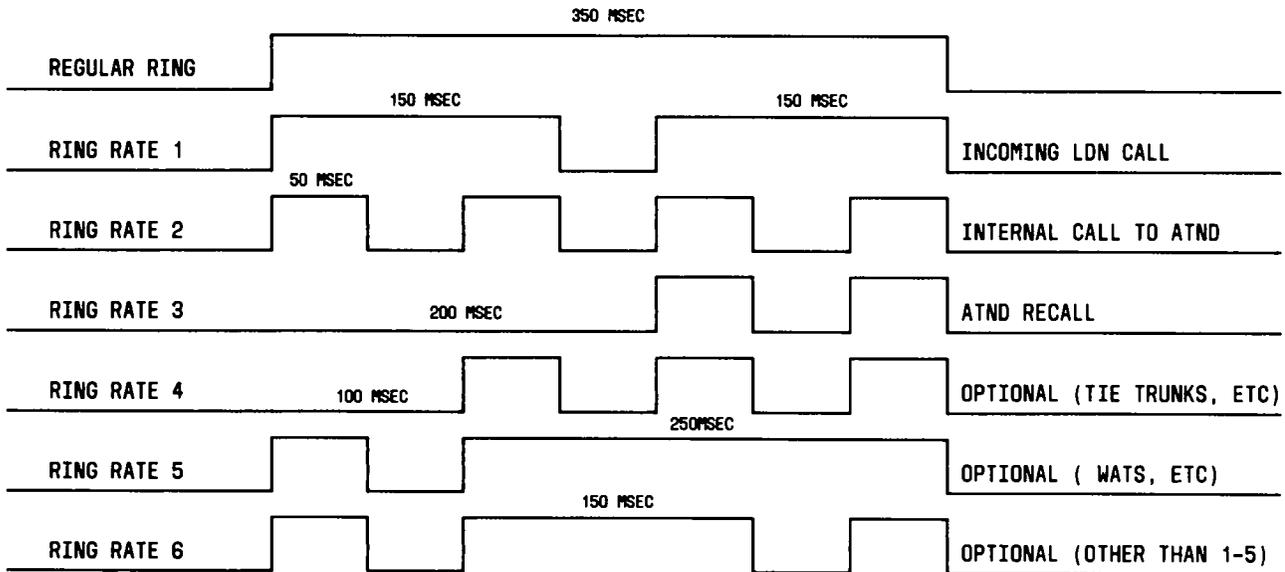


Fig. 25—Visually Impaired Attendant Service—Coded Ring Rates

for housing and interconnecting circuit packs. Each carrier is limited to hold only certain types of circuit packs. Within the carrier, some circuit packs may be dedicated to particular positions (slots). The slots are numbered from left to right, and the circuit packs are inserted from the front. A total of ten circuit pack carriers may be provided with a maximum size system (two cabinets). Regardless of system size, a control carrier or trunk/control carrier and a basic line, attendant, and tone port carrier must always be provided. The remaining number and type of carriers to be provided are determined by customer requirements (lines, trunks, and service circuits). The carriers measure 660 mm (26 inches) wide by 241 mm (9 1/2 inches) high by 457 mm (18 inches) deep. The type of carriers and the maximum number of each type which may be provided are as follows:

- Control carrier or trunk/control carrier (one always required)
- Basic line and attendant port carrier (one always required)
- Universal trunk port carrier (maximum number of four when control carrier is provided or maximum number of three when trunk/control carrier is provided)
- Supplemental line port carrier (maximum number of six).

**4.03 Control Carrier:** The control carrier houses the memory, processor, and I/O circuits. Three different control carriers are used in the DIMENSION 400 PBX: J58879CA-1 (MD); J58879CA-2, List 1 (MD); and J58879CA-2, List 13.

**4.04 Control Carrier J58879CA-1 (MD) (Fig. 27):** This carrier was the initial control carrier provided for the DIMENSION 400 PBX. This carrier provides mountings and interconnections for 43 circuit packs. This carrier has a wired backplane and uses 4K memory circuit packs (LC25).

**4.05 Control Carrier J58879CA-2, List 1 (MD) (Fig. 28):** This carrier provides mounting and interconnections for 43 circuit packs. This carrier has a printed backplane and uses 4K memory circuit packs (LC25).

**4.06 Control Carrier J58879CA-2, List 13 (A&M) (Fig. 29):** This carrier provides mountings and interconnections for 43 circuit packs. This carrier has a printed backplane with wiring changes and uses 16K memory circuit packs (LC128).

**4.07 Trunk/Control Carrier:** Trunk/control carrier (J58879CC-1) (Fig. 30) provides mountings and interconnections for 33 circuit packs. This carrier houses the memory, processor, I/O circuit,

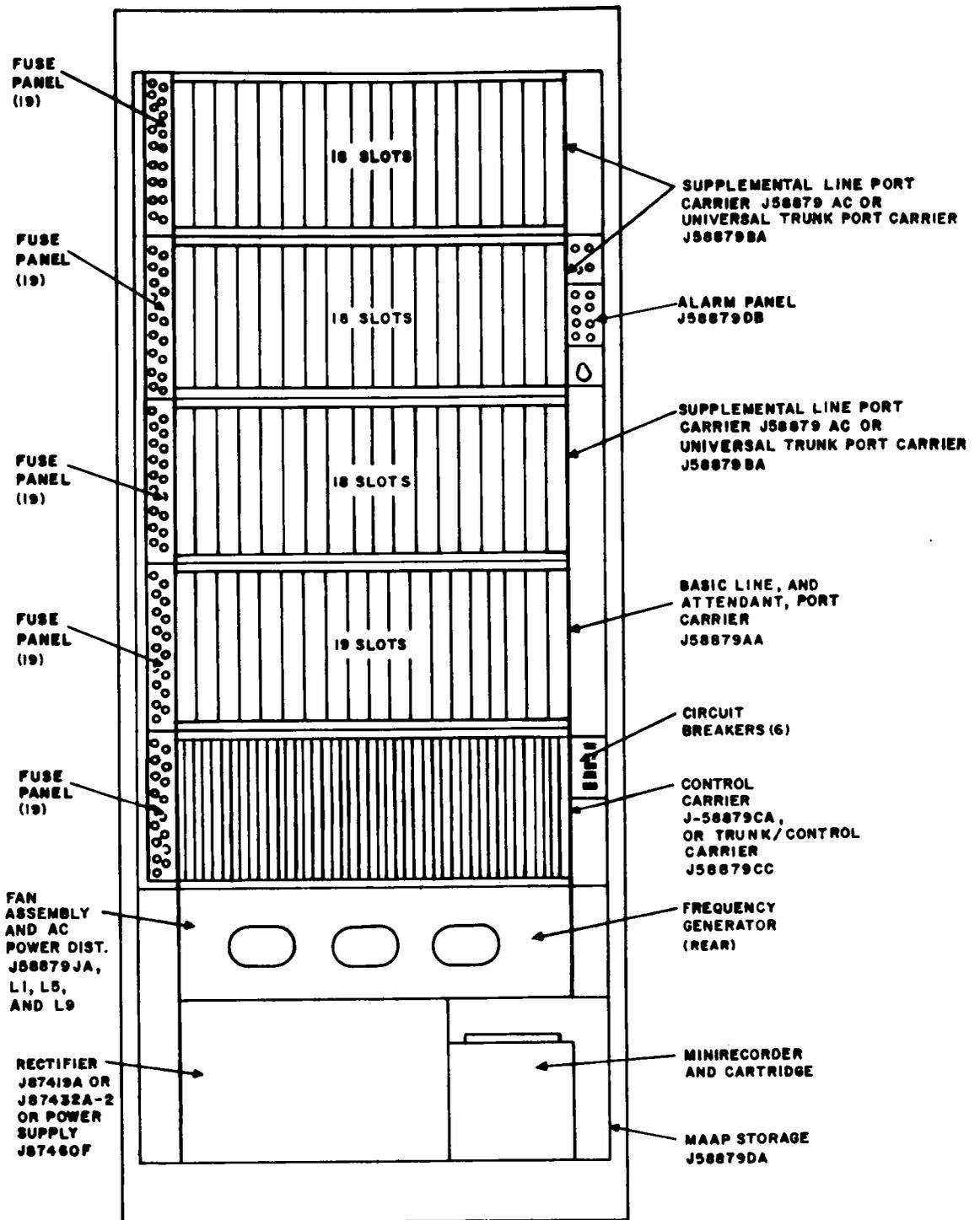


Fig. 26—Typical Equipment Arrangement—Basic Cabinet

and seven trunk-type circuit packs (slots 02 through 08). This carrier has a printed backplane and uses 64K memory circuit packs (LC346).

**4.08 Line Port Carrier:** The line port carrier houses and provides interconnections for a total of 19 circuit packs. The circuit packs always provided are analog buffer and digital buffer. These circuit packs utilize 2 of the 19 circuit pack slots. The remaining 17 circuit pack slots may be occupied by a combination of circuit packs listed in Tables G and H. A maximum of seven line carriers may be provided—ie, seven line carriers plus two trunks, six line carriers plus three trunks, or five line carriers plus four trunks. The two types of line carriers are the basic line and attendant port carrier (J58879AA) and supplemental line port carriers (J58879AC). The basic carrier contains tone circuits, attendant interface circuits, line circuits, and buffers. The supplemental carriers contain only buffers and line circuits.

**4.09 Universal Trunk Port Carrier:** The universal trunk port carrier houses and provides interconnections for a total of 18 trunk and service circuit packs. The circuit packs always provided are analog buffer and digital buffer. The remaining 16 circuit pack slots may be occupied by a combination of circuit packs listed in Table I. A maximum of four trunk carriers may be provided without the trunk/control carrier. When using the trunk/control carrier, only three trunk port carriers, in addition to the trunk/control carrier, can be provided. The four basic trunk circuit types are:

- **CO:** One-way incoming, 1-way outgoing, or 2-way CO, FX, or WATS
- **DID:** One-way incoming DID
- **Auxiliary Interface:** Paging, recorded telephone dictation, or music-on-hold
- **Tie Trunk:** One-way outgoing, 2-way dial repeating, or automatic tie trunks; 1-way incoming, 1-way outgoing, 2-way CCSA trunks, or release link circuits.

#### B. Circuit Packs



◆ **In order to preclude electrostatic noise in the system, the frame shall be well grounded. Always attach authorized wrist grounding strap**

**before working on system or handling circuit packs.◆**

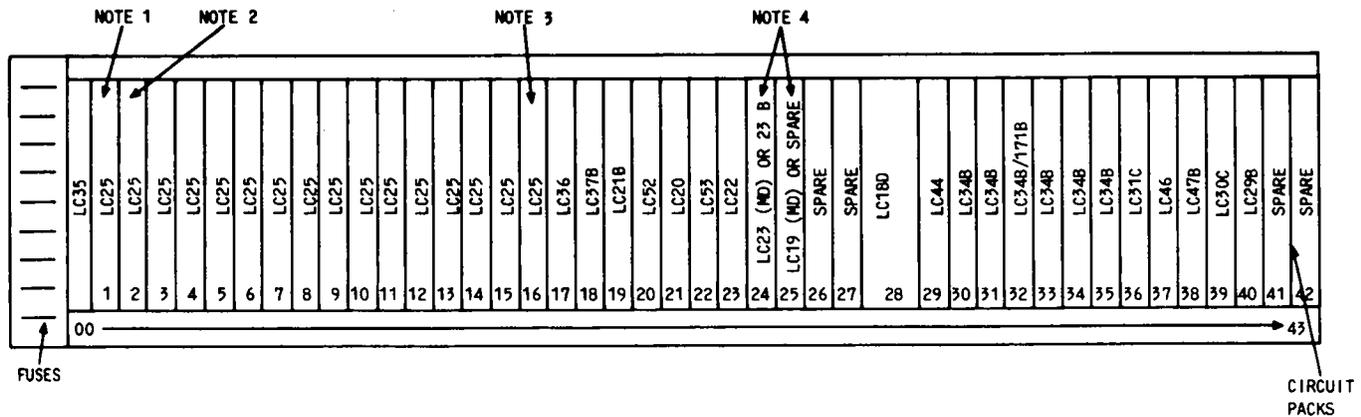
**4.10** Circuit packs are 203 mm by 292 mm (8 by 11 1/2 inches). Each pack is equipped with an identification faceplate containing a color-coded label. The circuit packs have been separated according to function to simplify maintenance and repair. In addition, the circuit pack faceplates have test points to allow interrogation of internal circuit states for fault diagnosis.



**A circuit pack is always replaced with a circuit pack having either the same or later alpha suffix as printed on the carrier label. That is, an LC08 cannot be used if the label specifies LC08B. The LC08B, C, or later alpha-suffixed circuit packs are suitable replacements for an LC08B.**

**4.11** Circuit packs contain the circuits for the system and plug into connectors on associated carriers. Every circuit can be addressed by a 5-digit number which tells its location by carrier-slot-circuit. For example, circuit number 02-16-1 indicates the circuit located in carrier 02, slot 16, circuit number 1. The following is a numerical listing and a brief description of the DIMENSION 400 PBX circuit packs.

- **LC02—Line Circuit:** The LC02 is the interface to stations within the DIMENSION 400 PBX. It receives loop signaling from the station sets to detect on- and off-hook status and dial rotary pulses. It alerts the station by sending 20-Hz ringing. Tip and ring cannot be cut through the time-division switch to achieve dc continuity. Each LC02 contains four separate line circuits.
- **LC02B—Line Circuit:** The LC02B performs the same function as the LC02 with changes in components to meet FCC registration requirements.
- **LC03—Message Waiting Line Circuit (MD):** The LC03 line circuit provides an interface for stations requiring a message waiting lamp. It functions in the same manner as the LC02 line circuit but, in addition, can interface with a message waiting lamp located on or near a DIMENSION 400 PBX



CIRCUIT PACK POSITION IN CARRIER	CURRENT CIRCUIT PACK CODE	CURRENT CIRCUIT PACK FUNCTION
00	LC35	RAM CONTROL
01 THRU 16 (NOTE 5)	LC25, 38, 39, OR 40	RAM
17	LC36	RAM CONTROL
18	LC37B	RAM CONTROL
19	LC21B	PROCESSOR
20	LC52	PROCESSOR
21	LC20	PROCESSOR
22	LC53	PROCESSOR
23	LC22	PROCESSOR
24	LC23B	PROCESSOR
25 THRU 27	SPARE	
28	LC18D (REQUIRES TWO POSITIONS)	ALARM CONTROL
29	LC44	EXTENDED I/O
30 THRU 35 (NOTE 6)	LC34B OR LC171B (NOTE 6)	SLOW/FAST SPEED INPUT/OUTPUT DATA LINK
36	LC31C	ANI-REGISTER
37	LC46	SCAN AND DISTRIBUTE
38	LC47B	METHOD CONTROL
39	LC30C	CARTRIDGE TRANSPORT INTERFACE B
40	LC29B	CARTRIDGE TRANSPORT INTERFACE A
41 AND 42	SPARE	

NOTES:

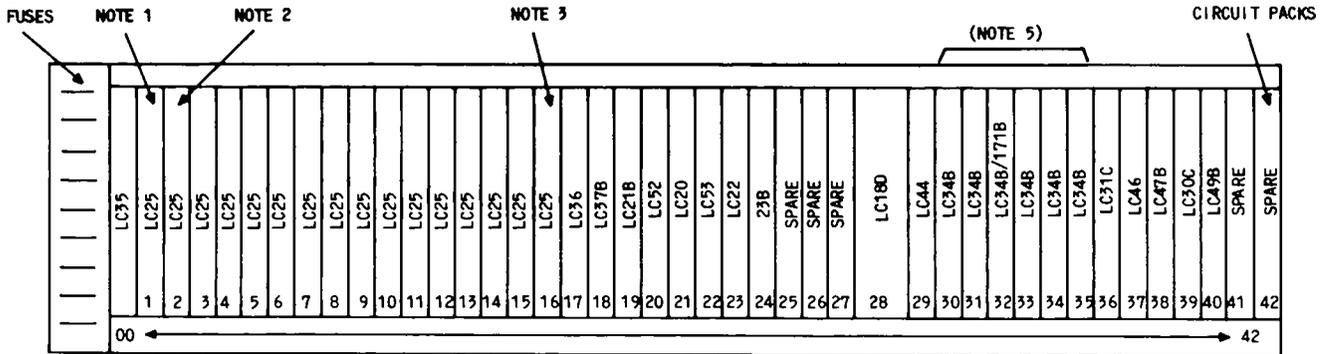
- FIRST MEMORY CIRCUIT PACK.
- LAST MEMORY CIRCUIT PACK.
- SECOND MEMORY CIRCUIT PACK.
- WHEN THE LC23B CIRCUIT PACK IS USED, POSITION 25 MUST BE LEFT VACANT. WHEN LC23 (MD) CIRCUIT PACK IS USED, LC19 (MD) MUST OCCUPY POSITION 25.
- FOR HOTEL/MOTEL APPLICATIONS (PG1E003), USED LC38, 39, OR 40 AS FOLLOWS:

CIRCUIT PACK POSITION IN CARRIER	CIRCUIT PACK CODE	CIRCUIT PACK FUNCTION
14 AND 15	LC38	POWER RESERVE - FOR STATION
16	LC39	MESSAGE REGISTER MEMORY
16	LC40	MESSAGE REGISTER MEMORY (MEMORY SIZE A)
		MESSAGE REGISTER MEMORY (MEMORY SIZE B OR C).

6. POSITIONS 30 THROUGH 35 ARE USED AS FOLLOWS:

CIRCUIT PACK POSITION IN CARRIER	CIRCUIT PACK	CIRCUIT	CIRCUIT PACK FUNCTION	OPTION
30-31	LC34B	0-1	ATTENDANT	SLOW
32	LC34B	0	SMDR	FAST
		1	TRAFFIC MEASUREMENT	FAST
	LC171B	0	SMDR	FAST
		1	RMATS I	SLOW
33-35	LC34B	0-1	DISPLAYS, ECTS	SLOW.

Fig. 27—Control Carrier (J58879CA-1, MD) With Circuit Packs in Place



CIRCUIT PACK POSITION IN CARRIER	CIRCUIT PACK CODE	CURRENT CIRCUIT PACK FUNCTION
00	LC35	RAM CONTROL
01 THRU 16 (NOTE 4)	LC25, 38, 39, OR 40	RAM
17	LC36	RAM CONTROL
18	LC37B	RAM CONTROL
19	LC21B	PROCESSOR
20	LC52	PROCESSOR
21	LC20	PROCESSOR
22	LC53	PROCESSOR
23	LC22	PROCESSOR
24	LC23B	PROCESSOR
25 THRU 27	SPARE	
28	LC180 (REQUIRES TWO POSITIONS)	ALARM CONTROL
29	LC44	EXTENDED I/O
30 THRU 35 (NOTE 5)	LC34B OR LC171B (NOTE 5)	SLOW/FAST SPEED INPUT/OUTPUT DATA LINK
36	LC31C	ANI-REGISTER
37	LC46	SCAN AND DISTRIBUTE
38	LC47B	NETWORK CONTROL
39	LC30C	CARTRIDGE TRANSPORT INTERFACE B
40	LC29B	CARTRIDGE TRANSPORT INTERFACE A
41 AND 42	SPARE	

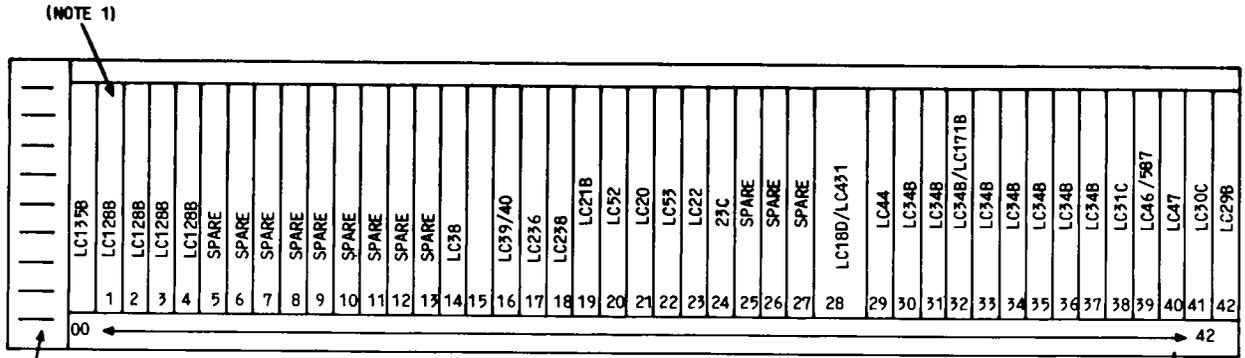
- NOTES:
1. FIRST MEMORY CIRCUIT PACK.
  2. LAST MEMORY CIRCUIT PACK.
  3. SECOND MEMORY CIRCUIT PACK.
  4. FOR HOTEL/MOTEL APPLICATIONS (PG1E003), USED LC38, 39, OR 40 AS FOLLOWS:

CIRCUIT PACK POSITION IN CARRIER	CIRCUIT PACK CODE	CIRCUIT PACK FUNCTION
14 AND 15	LC38	POWER RESERVE - FOR STATION
16	LC39	MESSAGE REGISTER MEMORY
16	LC40	MESSAGE REGISTER MEMORY (MEMORY SIZE A)
		MESSAGE REGISTER MEMORY (MEMORY SIZE B OR C).

5. POSITIONS 30 THROUGH 35 ARE USED AS FOLLOWS:

CIRCUIT PACK POSITION IN CARRIER	CIRCUIT PACK	CIRCUIT	CIRCUIT PACK FUNCTION	OPTION
30-31	LC34B	0-1	ATTENDANT	SLOW
32	LC34B	0	SMDR	FAST
		1	TRAFFIC MEASUREMENT	FAST
	LC171B	0	SMDR	FAST
		1	RMATS I	SLOW
33-35	LC34B	0-1	DISPLAYS, ECTS	SLOW

Fig. 28—Control Carrier (J58879CA-2, List 1, MD) With Circuit Packs in Place



CIRCUIT PACK SLOT IN CARRIER	CURRENT CIRCUIT PACK CODE	CIRCUIT PACK FUNCTION
00		
01 THRU 04	LC135B	RAM BUS TERMINATIONS
05 THRU 13	LC128B	RAM
14 THRU 16	SPARE	
17	(NOTE 2)	
18	LC236	RAM DATA CONTROL
19	LC238	RAM ACCESS AND TIMING CONTROL
20	LC21B	PROCESSOR
21	LC52	PROCESSOR
22	LC20	PROCESSOR
23	LC53	PROCESSOR
24	LC22	PROCESSOR
25 THRU 27	LC23C	PROCESSOR
28	SPARE	
29	SPARE	
30 THRU 37 (NOTE 3)	LC18D (REQUIRES TWO POSITIONS)	ALARM CONTROL
38	LC44	EXTENDED I/O
39	LC34B OR LC171B (NOTE 3)	DUAL SPEED SERIAL DATA CHANNEL
40	LC31C	ANI-REGISTER
41	LC46/587	SCAN AND DISTRIBUTE
42	LC47B	NETWORK CONTROL
	LC30C	CARTRIDGE TRANSPORT INTERFACE B
	LC29B	CARTRIDGE TRANSPORT INTERFACE A

NOTES:

- FIRST MEMORY CIRCUIT PACK.
- FOR HOTEL/MOTEL APPLICATIONS (PG-1E003), USED LC38, 39, OR 40 AS FOLLOWS:

CIRCUIT PACK SLOT IN CARRIER	CIRCUIT PACK CODE	CIRCUIT PACK FUNCTION
14 AND 15	LC38	POWER RESERVE - FOR STATION
16	LC39	MESSAGE REGISTER MEMORY
16	LC40	MESSAGE REGISTER MEMORY (MEMORY SIZE A)
		MESSAGE REGISTER MEMORY (MEMORY SIZE B OR C)

- POSITIONS 30 THROUGH 37 ARE USED AS FOLLOWS:

CIRCUIT PACK SLOT IN CARRIER	CIRCUIT PACK	CIRCUIT	CIRCUIT PACK FUNCTION	OPTION
30-31	LC34B	0-1	ATTENDANT	SLOW
32	LC34B	0	SMDR	FAST
		1	TRAFFIC MEASUREMENT	FAST
	LC171B	0	SMDR	FAST
		1	RMATS I	SLOW
33-37	LC34B	0-1	DISPLAYS, ECTS	SLOW

Fig. 29—Control Carrier (J58879CA-2, List 13) (A&M) With Circuit Packs in Place

01	02	03	04	05	06	07	08	10	13	14	15	16	17	18	19	20	21	22	23	24	27	28	29	30	31	32	33	34	35	36	38	39	40	41	42
LC00	TRUNK	TRUNK	TRUNK	TRUNK	TRUNK	TRUNK, LC32	TRUNK	LC48C	LC38	SPARE	LC39, 40, 346	LC346	LC236	LC236, 368	LC218	LC32	LC20	LC53	LC228	LC23C, LC463	TEST	LC180	LC144	LC368B, LC171B	LC368B	LC368B	LC368B	LC31C	LC46/567	LC47B	LC30C	LC288			

CIRCUIT PACK POSITION IN CARRIER	CURRENT CIRCUIT PACK CODE	CIRCUIT PACK FUNCTION
01	LC00	ANALOG BUFFER B
02 THRU 06	NOTE 4	TRUNK
07	LC32 (NOTE 4)	ANI DATA TRANSMITTER, TRUNK
08	NOTE 4	TRUNK
10	LC48C	DIGITAL BUFFER
13	LC38	HOTEL/MOTEL BATTERY RESERVE
14	SPARE	
15 (NOTE 1)	LC40 OR 346	RAM
16	LC346	RAM
17	LC236	RAM DATA CONTROL
18 (NOTE 2)	LC236, 368	RAM CONTROL
19	LC218	PROCESSOR
20	LC32	PROCESSOR
21	LC20	PROCESSOR
22	LC53	PROCESSOR
23	LC228	PROCESSOR
24	LC23C/453 (NOTE 5)	PROCESSOR CONTROL
27	STLS (TEST ACCESS)	SOFTWARE TROUBLE LOCATING SYSTEM
28	LC180	ALARM CONTROL
29	LC44	EXTENDED I/O
30 THROUGH 37 (NOTE 3)		
38	LC31C	ANI TRANSMITTER
39	LC46/567	SCAN AND DISTRIBUTE
40	LC47B	NETWORK CONTROL
41	LC30C	CARTRIDGE TRANSPORT INTERFACE
42	LC288	CARTRIDGE TRANSPORT INTERFACE

NOTES:

1. LC40 IS USED TO PROVIDE MESSAGE REGISTER MEMORY FOR MEMORY SIZE B OR C.
2. LC236 IS USED WITH ONE LC346. LC368 IS REQUIRED WITH TWO LC346.
3. POSITIONS 30 THROUGH 37 ARE USED AS FOLLOWS:

CIRCUIT PACK POSITION IN CARRIER	CIRCUIT PACK	CIRCUIT	CIRCUIT PACK FUNCTION	DATA SPEED
30	1/2LC368B	0	ATTENDANT - 0	SLOW*
		1	ATTENDANT - 1	SLOW
31	1/2LC368B	0	ATTENDANT - 2	SLOW*
		1	ATTENDANT - 3	SLOW
32†	1/2LC368B	0	SPDR	FAST*
		1	DISPLAYS, ECTS	SLOW
	LC171B	0	SPDR	FAST
		1	RMATS I, CACS	SLOW
33	1/2LC368B	0	DISPLAYS, ECTS	SLOW
		1	DISPLAYS, ECTS	SLOW
34	1/2LC368B	0	DISPLAYS, ECTS	SLOW
		1	DISPLAYS, ECTS	SLOW
35	1/2LC368B	0	DISPLAYS, ECTS	SLOW*
		1	DISPLAYS, ECTS	SLOW
36	1/2LC368B	0	DISPLAYS, ECTS	SLOW
		1	DISPLAYS, ECTS	SLOW
37†	1/2LC368B	0	DISPLAYS, ECTS	SLOW
		1	DISPLAYS, ECTS	SLOW.

\* ONLY THESE CIRCUITS HAVE DIAL SPEED CAPABILITY.  
 † IF LC171B IS INSTALLED IN SLOT 32, SLOT 37 CANNOT BE USED.

4. THE FOLLOWING TRUNK TYPE CIRCUIT PACKS CAN BE USED IN SLOTS 2 THROUGH 8:

CIRCUIT PACK CODE	CIRCUIT PACK FUNCTION	CIRCUIT PACK CODE	CIRCUIT PACK FUNCTION
LC08B	ATTENDANT CONFERENCE	LC13B	AUXILIARY TRUNK INTERFACE
LC08D	2-WAY CO TRUNK	LC14	CONTACT INTERFACE CIRCUIT
LC08D	DID TRUNK	LC15	CONTACT INTERFACE TRUNK B
LC10D	"TOUCH-TONE" SERVICE TELEPHONE REGISTER-RECEIVER	LC18B	MESSAGE REGISTER INTERFACE
LC11B	TIE TRUNK	LC381	LOOP SIGNALING INTERFACE TRUNK
LC12	"TOUCH-TONE" SERVICE TELEPHONE SENDER/DIAL TONE DETECTOR.		

5. THE LC463 IS REQUIRED FOR PROCESSOR CONTROL WHEN TWO LC346 MEMORY BOARDS ARE USED.

Fig. 30—Trunk/Control Carrier (J58879CC) With Circuit Packs in Place

TABLE G

BASIC LINE AND ATTENDANT PORT CARRIER—CIRCUIT CAPACITY AND POSITION IN CARRIER

CIRCUIT PACK		NO. CIRCUITS PER CP	MAX. NO. CPs PER CARRIER	MIN. NO. CPs PER CARRIER	POSITION IN CARRIER																	
TYPE	CODE				00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
J58878AA	PAM BUFFER	LC48	1	1	1	X																
	ATTENDANT INTERFACE*	LC48B	2	2 PER SYSTEM				X	X													
	DIGITAL BUFFER A †	LC48C OR LC41B	1	1	1								X									
	ANALOG BUFFER B	LC50	1	1	1		X															
	TONE PLANT A	LC04	4	1	‡			X														
	TONE PLANT B	LC06B	4	1	‡			X														
	TONE PLANT C	LC17B	1	1	1							X										
	LINE CIRCUIT †	LC02B OR LC08C	4	14					X	X	X	X	X	X		X	X	X	X	X	X	X
	TRANSMISSION TEST LINE§	LC146	2	1											X	X	X	X	X	X	X	X
	TONES CIRCUIT	LC204	1	1	‡			X														

\* NOTE 1: EACH LC46 SERVES TWO CONSOLES AND REQUIRES HALF OF A DUAL DATA CIRCUIT PACK (LC34B/368B).

† FOR HOTEL/MOTEL APPLICATIONS REQUIRING MESSAGE WAITING SERVICE, REPLACE THE LC48B WITH LC41 AND REPLACE LC02 WITH LC03.

‡ EITHER ONE LC04 AND ONE LC06B, OR ONE LC204 IS REQUIRED PER CARRIER. THE LC204 IS NOT A DIRECT REPLACEMENT FOR THE LC04 AND LC06B.

§ ONLY ONE LC146 IS USED IN A SYSTEM.



TABLE I

UNIVERSAL TRUNK PORT CARRIER—CIRCUIT CAPACITY AND POSITION IN CARRIER

CIRCUIT PACK		NO. CIRCUITS PER CP	MAX. NO. CPs PER CARRIER	MIN. NO. CPs PER CARRIER	POSITION IN CARRIER																		
TYPE	CODE				00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
J588798A	DIGITAL BUFFER A	LC48C	1	1	1								X										
	ANALOG BUFFER B	LC50	1	1	1		X																
	DID TRUNK	LC08D	2	16				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	ATTENDANT CONF*	LC08B	1	2				X	X	X	X	X	X	X									
	"TOUCH-TONE" SERVICE REGISTER†	LC10D	1	4										X		X		X			X		
	"TOUCH-TONE" SERVICE RECEIVER†	LC54B	1	4											X		X		X			X	X
	TIE TRUNK	LC11B	2	8				X	X	X	X	X	X	X									
	AUX TRK INTERFACE ‡	LC13B	2	8				X	X	X	X	X	X	X									
	CONTACT INTERFACE §	LC14	1	1											X								
	CONTACT INTERFACE B	LC15	8	2				X	X	X	X	X	X	X									
	MESSAGE REG INTERFACE ¶	LC16B	8	4				X	X	X	X	X	X	X									
	ANI DATA TRMTR**	LC32B	2	1											X								
	TWO-WAY CO TRUNK	LC08D	2	16				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	"TOUCH-TONE" SERVICE REGISTER-RECEIVER†	LC10D	1	16				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	"TOUCH-TONE" SERVICE SENDER/DIAL TONE DETECTOR	LC12	2	8				X	X	X	X	X	X	X									
LOOP SIGNALING INTERFACE TRUNK	LC361	2	8				X	X	X	X	X	X	X										

\* ONE LC08 ALLOWS ATTENDANT TO ESTABLISH A MULTIPARTY CONFERENCE OF UP TO SIX PARTIES, INCLUDING ATTENDANT.

† LC10 AND LC54 ADDED IN PAIRS. MINIMUM NEEDED DEPENDS UPON NUMBER OF "TOUCH-TONE" TELEPHONE STATIONS AND TRAFFIC LOAD. WHEN LC10D IS USED LC54B IS NOT REQUIRED. LC10D CAN ONLY BE USED IN SLOTS 11, 13, 15, AND 17 ON CARRIERS NOT WIRED TO AGREE WITH SD1E448-01, ISSUE 180 OR LATER IN SYSTEMS EQUIPPED WITH SOFTWARE ISSUES PRIOR TO ISSUE 3 OF FP2; ISSUE 2 OF FP3, FP4, AND FP5; AND ISSUE 1 OF FP10.

‡ AUXILIARY TRUNKS ARE REQUIRED FOR CUSTOMER-OWNED PAGING, ANNOUNCEMENT, RECORDED DICTATION, ETC. EQUIPMENT.

§ IN J58879CC TRUNK/CONTROL CARRIER, PLACE LC14 IN SLOT 08.

¶ HOTEL/MOTEL ONLY.

\*\* USED IN TRUNK CARRIER 0 ONLY.

station. Each LC03 contains four separate line circuits.

- **LC03B—Message Waiting Line Circuit (MD):** The LC03B performs the same function as the LC03 with changes in components to meet FCC registration requirements.
- **LC03C—Message Waiting Line Circuit:** The LC03C performs the same function as the LC03B with component changes to eliminate the requirement for the -5V potential.
- **LC04—Tone Plant A (MD):** The LC04 provides 350-Hz and 440-Hz tones. Tones from the LC04 and LC05 are used individually and in combination, steady and interrupted at various rates to provide eight distinct audible tones. One LC04 is required per system when an LC204 is not provided.
- **LC05—Tone Plant B (MD):** The LC05 provides 480-Hz and 620-Hz tones. Tones from the LC04 and LC05 are used individually and in combination, steady and interrupted at various rates to provide eight distinct audible tones.
- **LC05B—Tone Plant B (MD):** The LC05B is designed to be compatible with the DIMENSION 2000 PBX and performs the same function as the LC05 in all DIMENSION PBX applications. One LC05B is required per system when an LC204 is not provided.
- **LC06—Attendant Conference Circuit (MD):** The LC06 enables the attendant to establish a conference of up to six parties. This circuit can accommodate a maximum of six stations or four stations and two trunks. A separate time slot and conference circuit port is required for each conferenced party. Attendant conference circuit units cannot be bridged together. Each LC06 contains one attendant conference circuit.
- **LC06B—Attendant Conference Circuit:** The LC06B performs the same function as the LC06 with component changes to eliminate the requirement for the -5V potential.
- **LC08—Dual CO Trunk Circuit (MD):** The LC08 provides all CO, FX, and WATS ground-start trunk interfaces to a CO. This circuit employs standard ground-start signaling and can be used in 1-way incoming, 1-way outgoing, or 2-way modes. It detects CO battery 2-way modes and detects a CO battery reversal for toll diversion purposes. Each LC08 contains two separate trunk circuits.
- **LC08B—Dual CO Trunk Circuit (MD):** The LC08B performs the same function as the LC08, but prevents a lockup condition which occurred when connected to a step-by-step office. The LC08B is not a manufactured product but a shop or field modification of the LC08 with the addition of external tip and ring resistance pads.
- **LC08C—Dual CO Trunk Circuit (MD):** The LC08C performs the same function as the LC08 and LC08B with internal wiring improvements, eliminating the requirement for external resistance pads when connected to a step-by-step office. Removal of existing external pads is not required when replacing an LC08B. The LC08C must be used in all systems if the total conductor loop resistance toward a step-by-step CO is less than 700 ohms.
- **LC08D—Dual CO Trunk Circuit:** The LC08D performs the same function as the LC08C with component changes to eliminate the requirement for the -5V potential.
- **LC09—DID Trunk Circuit (MD):** The LC09 provides the DID trunk interface to a CO. It detects a low resistance loop closure (high-low signaling) as an incoming seizure and provides a reversal of battery and ground on the tip and ring leads as an off-hook indication from the PBX. Each LC09 contains two separate trunk circuits.
- **LC09B—DID Trunk Circuit (MD):** The LC09B performs the same function as the LC09, but also provides circuits compatible with hardware digit collection.
- **LC09C—DID Trunk Circuit (MD):** The LC09C performs the same function as the LC09B with changes in components to meet FCC registration requirements.
- **LC09D—DID Trunk Circuit:** The LC09D performs the same function as the LC09C

with component changes to eliminate the requirement for the -5V potential.

- **LC10—TOUCH-TONE Service Register (MD):** The LC10 is paired with an LC54 to process TOUCH-TONE dialing. The register circuit interfaces the receiver to the time-division network and converts the 2-out-of-7 output from the receiver to a binary-coded decimal (BCD) signal. Each LC10 provides one register circuit.
- **LC10B—TOUCH-TONE Service Register:** The LC10B performs the same function as the LC10 but has smaller physical size components.
- **LC10C—TOUCH-TONE Service Register and Receiver:** The LC10C processes TOUCH-TONE dialing. It converts TOUCH-TONE dialing signals to BCD signals. The LC10C combines the functions of the LC10B and the LC54B into a single circuit pack. When replacing an LC10B with an LC10C, it is recommended that the LC54B be removed to enhance system reliability.
- **LC10D—TOUCH-TONE Service Register and Receiver:** The LC10D performs the same functions as the LC10C with circuit changes to eliminate the problems incurred by the SMDR printout.♦
- **LC11—Tie Trunk Circuit (MD):** The LC11 provides CCSA access and tie trunk service. It is used as a DID trunk when DX or E&M signaling is required and is used as a release link trunk (RLT) for CAS. Each LC11 contains two separate 4-wire circuits that can be optioned on the circuit pack for DX or E&M signaling. It also contains 2-dB transmission pads that are switched in or out via software.
- **LC11B—Tie Trunk Circuit:** The LC11B performs the same function as the LC11, but is designed to correct crosstalk, longitudinal balance, and range signal problems.
- **LC12—TOUCH-TONE Service Sender:** The LC12 is a 2-circuit TOUCH-TONE service sender. It is used to output TOUCH-TONE dialing signals and to detect precise dial tone in a tandem switching arrangement.
- **LC13—Auxiliary Trunk Interface Circuit (MD):** Each LC13 provides two separate circuits. The LC13 provides the interface from the PBX to the following voice-connecting arrangements:
  - Loudspeaker paging coupler
  - Music-on-hold coupler
  - Recorded announcement trunk
  - Interface trunk circuit
  - Recorded telephone dictation trunk
  - Automatic trunk level interconnecting unit
  - AUTOVON ATND/LDN trunk.
- **LC13B—Auxiliary Trunk Interface Circuit:** The LC13B performs the same function as the LC13 with component changes to eliminate the requirement for the -5V potential.
- **LC14—Contact Interface Circuit:** The LC14 is required for X-ray test when the LC16 message register circuit is tested. For the test, an LC14 circuit pack must be located in slot 09 of the first trunk carrier (for J58879CC, slot 08) in the system. The first trunk carrier and each additional trunk carrier, containing an LC16 circuit pack, must be equipped with a trunk loopback fixture to perform the test.
- **LC15—Contact Interface B:** The LC15 drives the CAS system status indicator and the UCD traffic overflow indicator. Each LC15 contains eight circuits (six for status indicator lamps, one for busy/idle status, and one for traffic).
- **LC16—Message Register Interface (MD):** The LC16 detects M lead signals from the CO. The signals increment the message unit total for the line which is connected to the associated trunk circuit. Each LC16 contains eight station message register circuits.
- **LC16B—Message Register Interface:** The LC16B performs the same function as

the LC16, but provides power meter data input for the energy communications feature in the deluxe hotel/motel system for the DIMENSION 400E, 2000, or Custom PBXs.

- **LC17—Tone Plant C:** The LC17 provides CAS identification tones and a code calling access tone. The four tones provided are:

440 Hz and 480 Hz—CAS

480 Hz—CAS

440 Hz—CAS

880 Hz—Code Calling Access.

- **LC17B—Tone Plant C:** The LC17B performs the same function as the LC17.

- **LC18—Alarm Control Circuit (MD):** The LC18 circuit controls the alarm panel which is employed to display alarms and fault indications as well as to control system status and system microdiagnostics. One LC18 is required per system. It is located in the control carrier and requires two mounting positions (slots).

- **LC18B—Alarm Control Circuit (MD):** The LC18B performs the same function as the LC18, but with improved system response to certain types of component or tape failures that previously could cause a lockup of the system without an alarm indication. The LC18B is required when the PBX is connected to the RMATS-1 System.

- **LC18C—Alarm Control Circuit (MD):** The LC18C performs the same function as the LC18B, but with improvements to permit the system to recover more readily without reloading after a short power interrupt that has several on-off intervals. It permits the system to reload consistently without going to emergency transfer during power-on sequence.

- **LC18D—Alarm Control Circuit:** The LC18D performs the same functions as the LC18C, except that low profile relays are specified. One LC18D is required per system using trunk/control carrier (J58879CC).

- **LC18E—Alarm Control Circuit (MD):** The LC18E performs the same function as

the LC18D, but with improvements to enable the detection of an alarm condition via the peripheral contact interface and to alarm the PBX of this condition.

- **LC19—Processor Control (MD):** The LC19 is the programmable read-only memory (PROM) version of the microstore. The microstore is a read-only memory (ROM) and serves as a storage facility for the processor microinstructions. The LC23B now contains the microstore in ROM. One LC19 is required per system when an LC23B is not used.

- **LC20—Processor Control:** The LC20 contains six data register circuits and with LC21, LC22B, LC23C/453, LC52, and LC53 forms the processor. One LC20 is required per system.

- **LC21—Processor Control (MD):** The LC21 is the I/O interface circuit in the processor and with LC20, LC22B, LC23C, LC52, and LC53 forms the processor. It contains a storage address register, a data register, and a parity generator/checker.

- **LC21B—Processor Control:** The LC21B performs the same functions as the LC21, but with improvements to correct the noise problem.

- **LC22—Processor Timing Circuit:** The LC22 provides a timing generator, decoding logic, and sanity timer and with LC20, LC21, LC23, LC52, and LC53 forms the processor. The LC22 combines with the 20-MHz clock to interrupt the microprogram instructions. One LC22 is required per system not using trunk/control carrier J58879CC.

- **LC22B—Processor Timing Circuit:** The LC22B performs the same functions as the LC22 except that it accommodates an additional read signal which is generated from microcode.

- **LC23—Processor Control (MD):** The LC23 receives the opcode portion of a high-level instruction and addresses a microinstruction in the microstore. One LC23 is required per system not using trunk/control carrier J58879CC.

- **LC23B—Processor Control:** The LC23B contains the processor ROM (microstore). It

combines the functions of LC19 and LC23 into a single circuit pack and with LC20, LC21, LC22, and LC52 forms the processor.

- **LC23C—Processor Control:** The LC23C performs the same functions as the LC23B except that the ROMs used do not require 12 volts. One LC23C is required per system using trunk/control carrier J58879CC used with Feature Packages 2 and 3.
- **LC25—RAM (4K):** The LC25 provides the main memory (RAM) for the PBX. Each LC25 contains storage for 4096 words (16 bits plus a sanity bit).
- **LC29—Tape Transport Interface A (MD):** The LC29 contains the interface circuits between the processor, data bus, and tape transport interface B. One LC29 is required per system.
- **LC29B—Tape Transport Interface A:** The LC29B performs the same function as the LC29, but is designed to accept increased speed and four tracks in the DIMENSION 2000 PBX.
- **LC30—Tape Transport Interface B (MD):** The LC30 controls the operation of the tape transport. One LC30 is required per system.
- **LC30B—Tape Transport Interface B:** The LC30B performs the same function as the LC30, but is designed to accept increased speed and four tracks in the DIMENSION 2000 PBX.
- **LC30C—Tape Transport Interface B:** The LC30C performs the same functions as the LC30B, but with improvements to correct noise problem.♦
- **LC31—ANI Data Register (MD):** The LC31 provides the ANI control and register circuits. It stores the identity of the calling station until it is transmitted to the CO. One LC31 is required per system when ANI is required.
- **LC31B—ANI Transmitter Circuit (MD):** The LC31B performs the same function as the LC31, but is designed to drive the increased number of circuits in the DIMENSION 2000 PBX.
- **LC31C—ANI Transmitter Circuit:** The LC31C performs the same function as the LC31B but is designed to improve reliability.
- **LC32—ANI Data Transmitter (MD):** The LC32 controls the transmission of ANI information to the CO. Each LC32 provides two data channels. One LC32 is required per system when ANI is required.
- **LC32B—ANI Signal Distribution Circuit:** The LC32B performs the same function as the LC32, but is designed to drive the increased number of circuits in the DIMENSION 2000 PBX.
- **LC34—Dual-Speed Serial Data Channel (MD):** The LC34 provides two dual-speed data channels (slow 185 kilobits [Kb], fast 833 Kb) used to convert and transmit data between the processor and peripheral units.
- **LC34B—Dual-Speed Serial Data Channel:** The LC34B performs the same function as the LC34.
- **LC35—RAM (4K) Data Buffer Circuit A:** The LC35 is one of three circuit packs that provide memory control for the RAM. It functions as a memory bus termination and, in conjunction with LC36, as a bit-swap circuit. One LC35 is required per 4K memory system.
- **LC36—RAM Control:** The LC36 is one of three circuit packs that provide memory control for the RAM, using 4K (LC25) memory circuit packs. It functions as a memory data buffer and, in conjunction with LC35, as a bit-swap circuit. One LC36 is required per 4K memory system.
- **LC37—RAM (4K) Address and Timing Control (MD):** The LC37 is one of three circuit packs that provide memory control for the RAM. It refreshes memory and provides a timing circuit that controls the internal timing of the memory. One LC37 is required per system.
- **LC37B—RAM (4K) Address and Timing Control Circuit:** The LC37B performs

the same function as the LC37. It improves the real time capability of the processor and memory. The LC37B is required with Feature Packages 4, 5, and 10 with memory configuration C.

- **LC38—Hotel/Motel Battery Reserve:** The LC38 is used with station message register service and provides up to 6 hours of battery holdover power in case of power failure for message register information storage. The LC38 is required only where battery backup power is desired. One LC38 is required per system.
- **LC39—Hotel/Motel RAM (256K):** The LC39 is used with station message register service. It provides 256 words of memory (RAM) to store message register information. It must be used with battery reserve (LC38) and memory size A. If battery backup is not desired, an LC25 memory circuit can be substituted for the LC39. One LC39 is required per system.
- **LC40—Hotel/Motel RAM (1K):** The LC40 is used with station message register service. It provides 1024 words of memory (RAM) to store message register information. It must be used with battery reserve (LC38) and either memory size B or C.
- **LC41—Signal Distribution Circuit (Hotel/Motel) (MD):** The LC41 circuit pack provides the functions of the LC49 and replaces the LC49 in the line carrier when stations are equipped for message waiting. It provides the message waiting lamp voltage (with a current detector circuit for testing the neon lamp in the station set) and an interrupter status lamp. One LC41 is required per line carrier.
- **LC41B—Signal Distribution Circuit (Hotel/Motel):** The LC41B performs the same function as the LC41 and also provides a message waiting function required with DIMENSION 600 (400E), 2000, and Custom PBXs.
- **LC44—Extended Input/Output (I/O):** The LC44 decodes data from the I/O address bus and distributes enable signals to the I/O

circuits. It interfaces the processor command leads, performs gating and timing functions for the extended I/O circuits, and provides separate command leads (such as read or write) to data links, the MAAP, and attendant console. One LC44 is required per system.

- **LC45—Attendant Interface (MD):** The LC45 connects the attendant console voice path to the time division bus. Each LC45 contains two separate 4-wire transmission circuits.
- **LC45B—Attendant Interface:** The LC45B is introduced to reduce transmission noise in the attendant console circuit. An LC45B is used when the attendant console is equipped with a 478B plug not containing a shunt resistor. An LC45 must be used when the attendant console is equipped with a 478A plug containing a shunt resistor.♦
- **LC46—Scanner/Distributor:** The LC46 interrogates the port circuits and reports status to the processor. In addition, it distributes control data to port circuits. This data controls the ring relay in the line ports and various trunk port relays. It is also used in conjunction with the network control during network tasks, and decodes carrier addresses and buffer board port address bits to the LC49. One LC46 is required per system.
- **LC47—Network Control (MD):** The LC47 establishes, removes, and audits all network connections in response to commands from the processor. It performs the timing control for port circuit connections to the PAM bus. One LC47 is required per system.
- **LC47B—Network Control:** The LC47B performs the same functions as the LC47 but increases the "on" time of the network sampling switches from 360 to 600 ns and, with backplane wiring changes, reduces gain variations.
- **LC48—PAM Distribution Circuit:** The LC48 serves as a common amplifier for all audio signals in the DIMENSION 400 PBX. Voice samples from all port circuits are summed on a time division basis at the input

to LC48. The summed voice samples are amplified and provided as an output on the time division bus to all port circuits. One LC48 is required per system.

- **LC49—Digital Network Buffer (MD):** The LC49 provides buffer gating and an audit selector for the network control, board and port selection decoders for the scanner/distributor, port reset logic, and common ringing application, and trip circuits for the line circuits. One LC49 is required per carrier.
- **LC49B—Digital Network Buffer:** The LC49B performs the same functions as the LC49, but is designed to reduce noise levels to acceptable levels when used with the printed backplane trunk carrier and is also designed to be compatible with the DIMENSION 2000 PBX.
- **LC49C—Digital Network Buffer:** The LC49C performs the same function as the LC49B with the addition of a power return circuit to hold the shift register of the PAM bus during powerup.
- **LC50—Analog Buffer B:** The LC50 provides status buffer gating and data distribution decoding for the scanner/distributor, a distribution amplifier, and PAM sum and distribution indicators for the PAM network. One LC50 is located in each line or trunk carrier.
- **LC52—Processor Data (AMU) Circuit:** The LC52 with LC20, LC21, LC22B, LC23C/453, and LC53 forms the processor. It is the arithmetic unit (AMU) which accepts data, performs 16 arithmetic operations, and applies the output to the address bus. One LC52 is required per system.
- **LC53—Processor Interrupt Circuit:** The LC53 with LC20, LC21, LC22B, LC23C/453, and LC52 forms the processor. It provides the interrupt and time clock. One LC53 is required per system.
- **LC54—TOUCH-TONE Service Receiver (MD):** The LC54 is paired with a TOUCH-TONE service register (LC10) to process TOUCH-TONE dialing. It converts the TOUCH-TONE dialing signals to a 2-out-of-7 dc signal.
- **LC54B—TOUCH-TONE Service Receiver:** The LC54B performs the same function as the LC54 but has smaller physical size components.
- **LC128—RAM (16K):** The LC128 provides storage for 16,384 words and can be used as the PBX main memory.
- **LC135B—RAM Bus Termination:** The LC135B provides terminations for the memory address, data, and control buses. One LC135B is required in place of the LC35 when 16K memory circuit packs (LC128) are used.
- **LC145—Transmission Test Line Circuit:** The LC145 provides the circuitry to perform transmission testing of trunks. One LC145 is required when transmission testing is required.
- **LC171—Data Control (MD):** The LC171 provides a data channel for the remote maintenance, administration, and traffic system (RMATS-1). One LC171 is required per system when associated with the RMATS-1 system.
- **LC171B—Data Control:** The LC171B performs the same function as the LC171 but provides a second data channel (high-speed) with a 1200-baud option for a high-speed printer and a printer cutoff lead.
- **LC204—Tone Circuit:** The LC204 provides 350-Hz, 440-Hz, 480-Hz, and 620-Hz tones. These tones are used individually and in combination, steady and interrupted at various rates to provide eight distinct audible tones. The LC204 combines the functions of the LC04 and LC05 into a single circuit pack, but is not a direct replacement for these circuit packs.
- **LC236—RAM Data Control:** The LC236 is one of three circuit packs that provides memory control for the RAM. It functions as a memory buffer and, in conjunction with the LC135B, as a bit-swap circuit. One LC236 is

required in place of the LC36 when 16K (LC128) or 64K (LC346) memory circuit packs (LC128) are used.

- **LC238—RAM Access and Timing Control Circuit:** The LC238 refreshes memory and provides a timing circuit that controls the internal timing of the memory. One LC238 is required in place of the LC37 when 16K memory circuit packs (LC128) are used, or one LC346 when used in trunk/control carrier J58879CC.
- **LC346—RAM (64K):** The LC346 provides storage for 65,536 words and is used as the PBX main memory when using trunk/control carrier J58879CC.
- **LC361—Loop Signaling Interface Trunk:** The LC361 provides two separate ports with loop signaling and trunk features for increased efficiency of access to on-premises computer ports. It also provides off-premise extension capability with call monitoring (SMDR) and transmission compensation.
- **LC366—Dual-Speed Serial Data Channel:** The LC366 contains four independent serial I/O data channels. The serial data channels are the interface between the PBX and peripheral unit. They transmit and receive data for distances up to 300m (1000 feet) without range extension. Circuits 1, 2, and 3 are designated low-speed and are fixed at 185 Kb. Circuit 0 is dual-speed and may be set at 185 or 833 Kb.
- **LC366B—Dual-Speed Serial Data Channel:** The LC366B performs the same function as the LC366, but is designed with improvements to correct the problems with power and ground distribution. The LC366B is also required with three or more consoles.
- **LC368—Access, Timing, and Extended Memory Control Circuit:** The LC368 refreshes memory and provides a timing circuit that controls internal timing of the memory. One LC368 is required per system when two LC346 circuit packs are used in trunk/control carrier J58879CC.
- **LC453—Processor Control:** The LC453 provides the microstore circuit for the processor. This circuit pack receives commands

from memory and produces microinstructions that are required to control internal processor action. The LC453 is similar to the LC23C except for the ROM device and the microcode. One LC453 is required per system and is located in the J58879CC-1 trunk/control carrier. Used with Feature Package 15 only.

- **LC551—Alarm Control Circuit:** The LC551 controls the alarm panel, which displays alarms and fault indications and controls system status. One LC551 is required per system. The LC551 replaces the LC18D as the standard alarm control circuit.
- **LC566—Data Interface Circuit:** The LC566 is required when data switching services are provided using the 9600 baud rate. The LC566 provides the RS-232C interface to the customer-provided terminal or host computer.
- **LC567—Data Port Circuit:** The LC567 is required when data switching services are provided using the 9600 baud rate. The LC567 contains two data port circuits. When plugged into a line carrier, it appears to software as a line circuit and when plugged into a trunk carrier, it appears as a dial repeating in, automatic tie trunk out.◀

### C. Minirecorder and Tape Cartridge

4.12 The KS-21447, List 11, minirecorder assembly houses one of the two 6.4-mm (0.25-inch) program cartridges provided with the system. The tape length of the cartridge is 91.4m (300 feet). This cartridge is used to initialize the memory at the time of installation and after subsequent power failures. The second cartridge is used as a backup and contains an identical program and translation. The recorder contains a 2-track read-after-write head, a detector for beginning-of-tape (BOT) and end-of-tape (EOT), a cartridge-in-place sensor, and the motion control and read-write electronics. The recorder has a slow drive (forward and reverse) capability that provides a speed of 762 mm (30 inches) per second. Data is recorded in a 63-bit-per-millimeter [1600 bit-per-inch (bpi)] format, separated by interrecord gaps. Each block consists of a 16-bit preamble, two hundred sixty-six (266) 16-bit words, a 16-bit cyclic redundant

check character (CRCC), and a 16-bit postamble. Data is transferred to the processor interface via LC29B and LC30B, using a serial non-return-to-zero (NRZ) format at 48,000 bits per second. The interface circuits can read and write a data block in the No. 1 (lower) track only. The minirecorder is mounted in the lower right-hand side of the basic equipment cabinet (Fig. 31). The unit is completely self-contained and connected to the system via two KS-type connectors. The transport assembly measures 184 mm (7.25 inches) wide by 188 mm (7.40 inches) high by 292 mm (11.51 inches) deep. Weight of the transport assembly is approximately 9 kg (20 pounds).

**4.13** The KS-21447, List 11, transport assembly is a modified KS-21447, List 1, tape transport assembly. The List 11 incorporates fast forward and

fast reverse tape drive capability that provides 2286 mm (90 inches) per second drive. The assembly also has slow tape drive capability that provides 762 mm (30 inches) per second drive. The List 11 assembly uses a tape cartridge that provides 137m (450 feet) of tape to accommodate more features and services available with the J58879CC control/trunk carrier.

#### D. Fan Assembly

**4.14** The fan assembly contains three blower fans (Fig. 31) mounted in the lower portion of the basic equipment cabinet. The fan assembly is an equipment option. Requirements for fan assembly and associated filters are specified in Part 5.

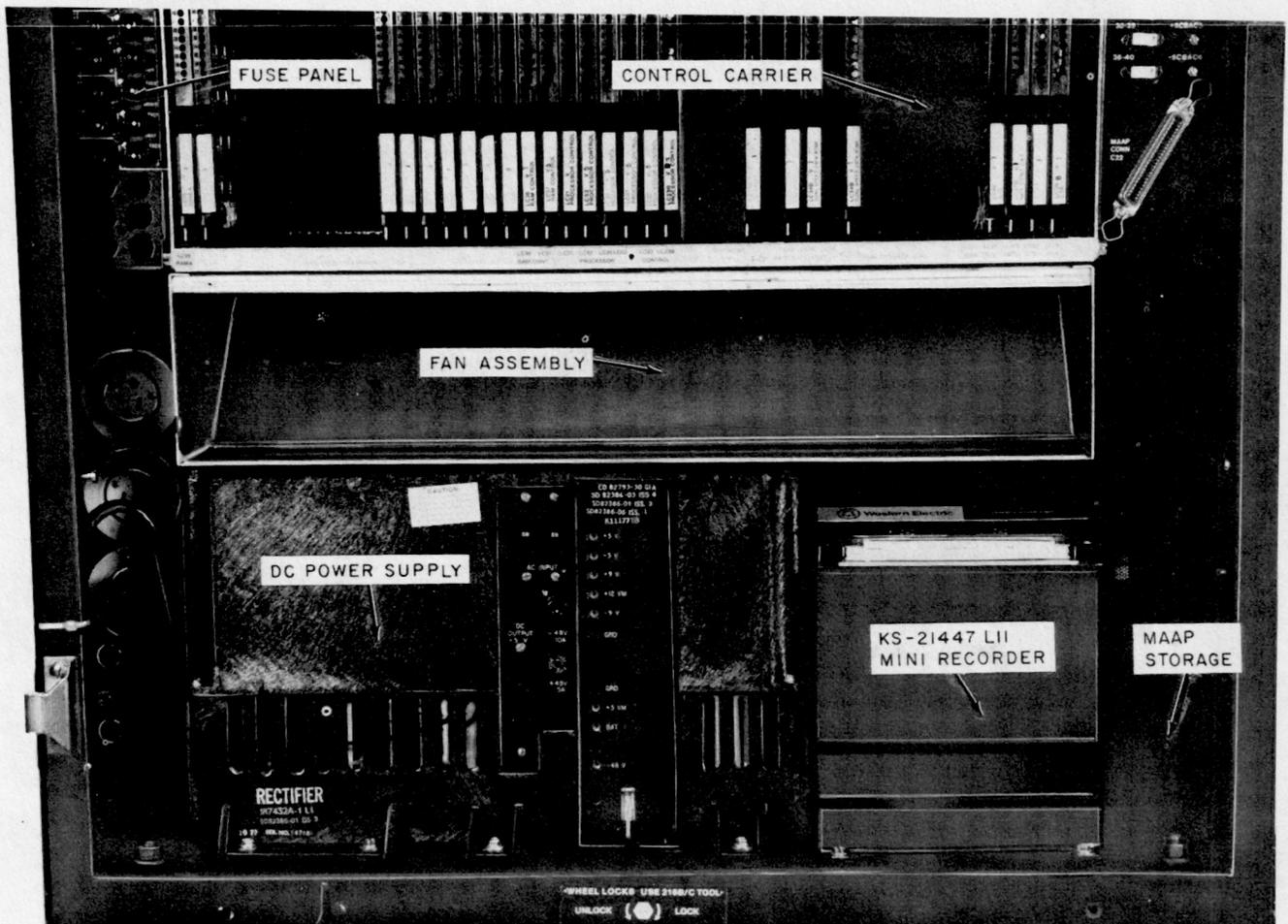


Fig. 31 — Fan Assembly, Power Supply, and Minirecorder

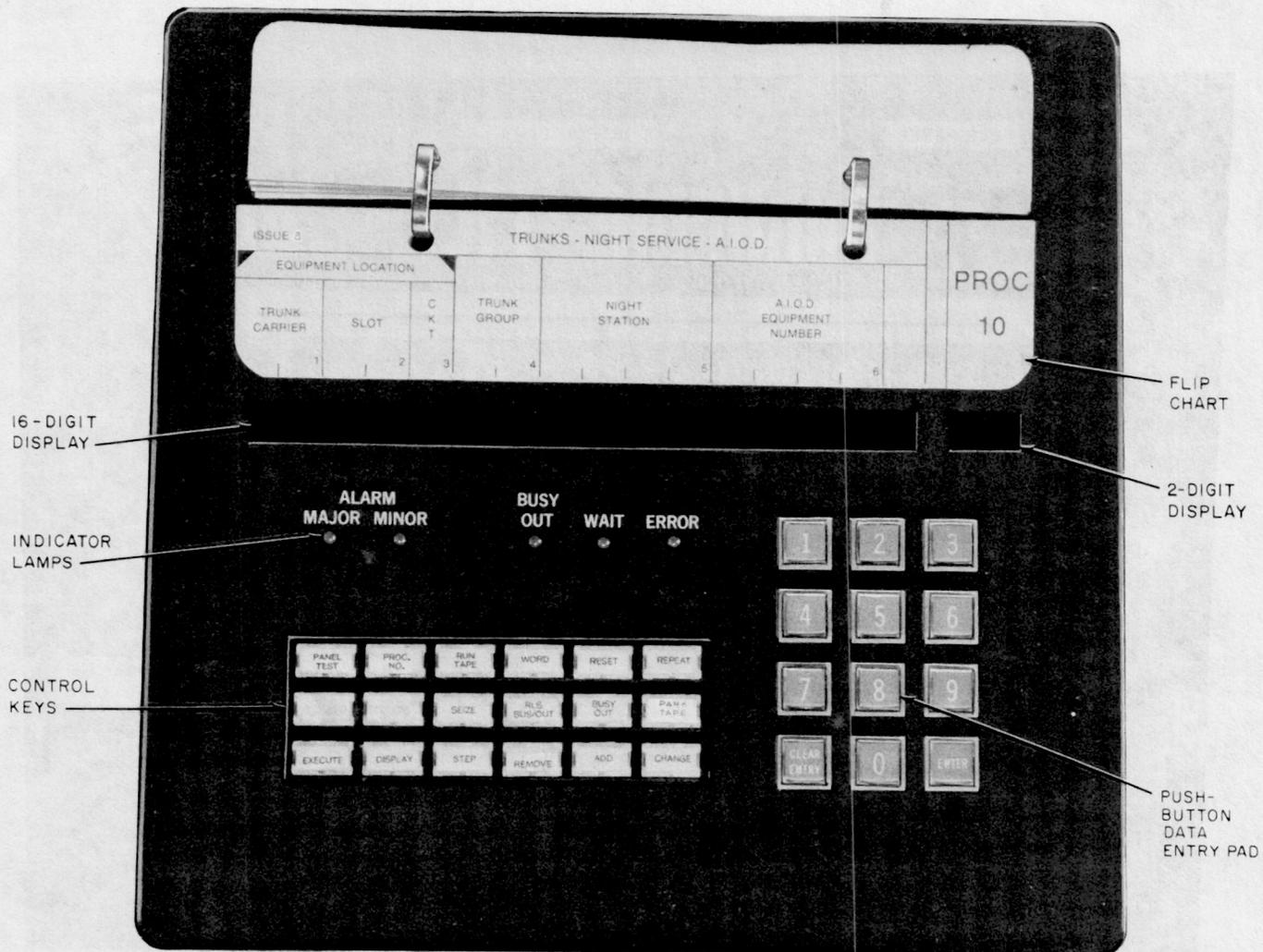
**E. Maintenance and Administration Panel (MAAP)**

**4.15** The MAAP (J58879DA) (Fig. 32) provides the means to alter translations (eg, class of service, line assignments), incorporate patches to the system program, initiate traffic measurement, insert software patches or overwrites, and initiate maintenance programs used to isolate faults. The MAAP contains a 12-pushbutton data entry pad and three rows of keys for control and operation, a 16-digit operational display, a 2-digit procedure display, and indicators for alarm and operational status.

**4.16** A set of flipcharts is furnished with each MAAP. Flipcharts show the format for the

procedures (PROCs). Additional sets of flipcharts can be ordered if necessary (comcode 840611867).

**4.17** The MAAP operations are divided into a series of procedures, each one having a well-defined function, such as isolation of tone failures, display and change of line information, etc. Each procedure has an associated 2-digit code from 00 through 99 which is used for its access. When a MAAP request is made, the DIMENSION 400 PBX causes the associated software program to be read from the tape cartridge into a designated memory block referred to as the paging buffer. When this is complete, the WAIT lamp is extinguished, and the procedure is available for use. Operation of the MAAP and tape cartridge



**Fig. 32—Maintenance and Administration Panel (MAAP)**

will interrupt customer service only in specific cases of system diagnosis, recovery, or rearrangement.

**4.18** The MAAP is stored inside the equipment cabinet adjacent to the minirecorder (Fig. 26). The MAAP is connected via a 25-pair, 2.44-m (8-foot) long extension cable and must be removed from its storage rack and plugged in each time it is used.

**F. Alarm Panel**

**4.19** An alarm panel (Fig. 33) is provided in the upper right-hand area of the basic equipment cabinet (Fig. 26). The alarm panel contains alarms, fault indicators, and controls used in determining system status or performing system microdiagnostics. The major or minor alarm lamps are illuminated as a result of one or more fault indications. The panel subsections for the SYSTEM, PROCESSOR/ MEMORY, and MAAP PROCEDURE are intended to isolate system faults. The TESTS subsection for PROCESSOR/MEMORY provides access to the Microdiagnostic Tests (0 through 9). The CONTROL subsection contains the GUARD indicator and the GO/HALT pushbutton to control the processor when necessary. Emergency transfer may occur during a major alarm and can be prevented (except during a power failure) by setting the EMER TRANSFER switch to the INHIB position. The ALARM RETIRE pushbutton and LOGIC PROBE outlet are on the remaining subsection panels.

**G. Power Supply**

**4.20** Internal power for the PBX is provided by the use of a power supply mounted in the lower left-hand portion of the equipment cabinet (Fig. 26). The power supply measures 406 mm (16 inches) wide by 254 mm (10 inches) high by 457 mm (18 inches) deep. The power supply weighs 47.6 kg (105 pounds). The system dc voltages are:

-48V	+5M (+5.1 VM)
BATT	+5V
+9V	-5V
-9V	+12V.

**AUXILIARY CABINET**

**4.21** System auxiliary equipment can be installed in a separate auxiliary cabinet (Fig. 34). The

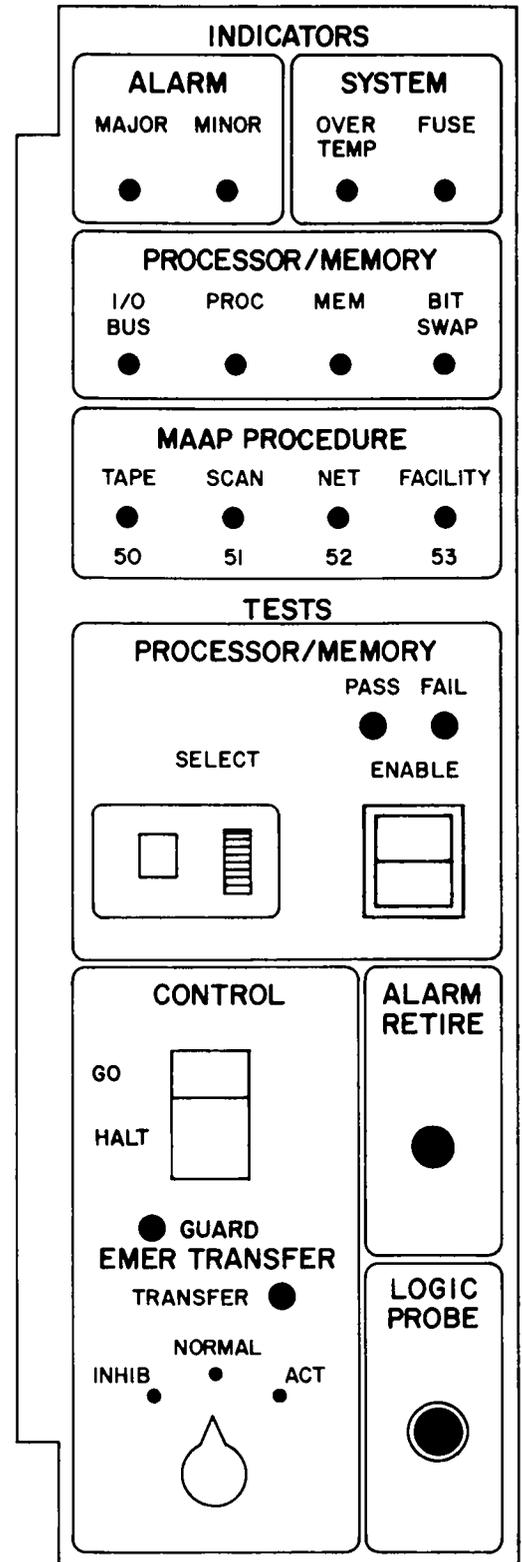


Fig. 33—Alarm Panel

auxiliary cabinet can be equipped with units such as CPFT, telephone dictation, recorded announcement, etc, as shown in Table J. Panels may be either 584 mm or 660 mm (23 or 26 inches) wide. An ac power distribution unit, a power supply, fan assembly, and fuse panel can be provided, depending upon local requirements.

**4.22** Whenever uninterruptible power service is required for the auxiliary cabinet, a 600-VA UPS unit provides power to the KS-22028 power supply via the J58879JA unit. The KS-22028 power supply provides -48V at 8 amperes to equipment located

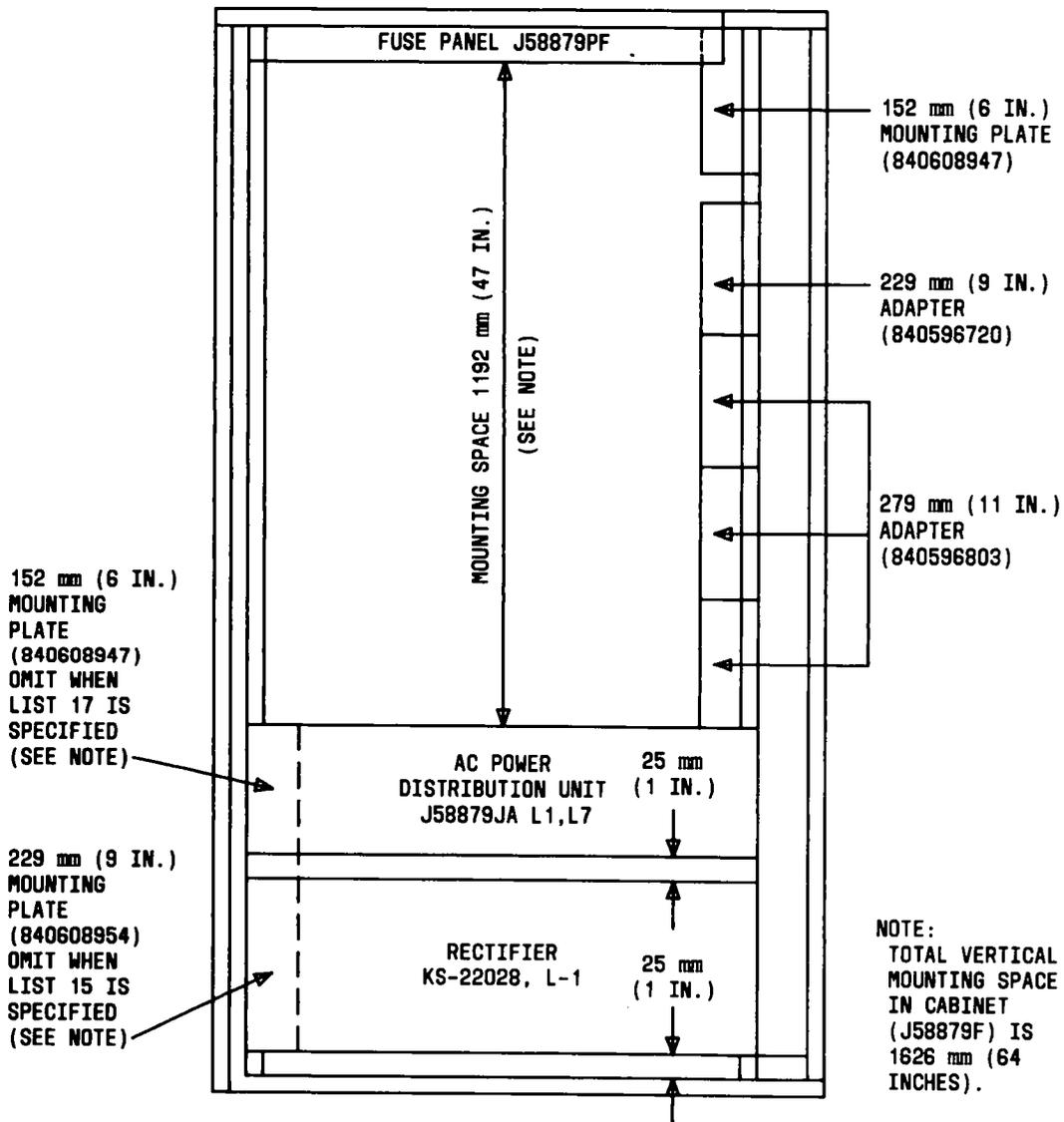
in the auxiliary cabinet. The J58879JA unit power cord plugs into the UPS unit, and the UPS unit plugs into the ac distribution bus.



*When recorded telephone dictation is provided, the frequency generator and interrupter unit must be powered by the UPS unit.*

**MODELS CONCEPT**

**4.23** There are eleven hardware and nine software models available in the DIMENSION 400



**Fig. 34—Auxiliary Cabinet (J58879F)**

TABLE J

## AUXILIARY CABINET EQUIPMENT INFORMATION

ITEM NO.	CODE	DESCRIPTION
1	J58879F-2, List 1 (MD)	Framework, assembly, wiring, and equipment to provide 1626 mm (64 inches) of vertical mounting space for 584 mm (23-inch) wide auxiliary equipment units.
	J58879F-2, List 2 (MD)	Equipment required in addition to List 1 to provide an ac power distribution unit, arranged for a 117-volt power source.
	J58879F-2, List 4 (MD)	Equipment required in addition to Lists 1 and 2 when a filtered air supply is required.
	J58879F-2, List 5 (MD)	Apparatus and wiring required in addition to List 1 to provide a cable assembly when connectorized cable is used from the auxiliary cabinet to the cross-connect field.
	J58879F-2, List 6 (MD)	Equipment required in addition to Lists 1 and 2 to provide a frequency generator.
	J58879F-2, List 7	Wiring and equipment required in addition to Lists 1, and 16 or 25 and 15, to provide 23 fuse positions (-48V) and ringing and interrupter terminal strips.
	J58879F-2, List 8 (MD)	Wiring and equipment required in addition to List 6 to provide one frequency interrupter unit.
	J58879F-2, List 10 (MD)	Equipment required in addition to List 1 to provide a standard perforated top.
	J58879F-2, List 11 (MD)	Equipment required in addition to List 1 to provide a liquid spill-resistant top assembly.
	J58879F-2, List 12	Equipment required in addition to List 1, 16, or 25 to provide one auxiliary circuit filter unit.
	J58879F-2, List 14 (MD)	Equipment required to provide a wall outlet and wall plate.
	J58879F-2, List 15	Equipment required in addition to List 1, 16, or 25 to provide a -48V power supply (rectifier).
	J58879F-2, List 16 (MD)	Framework, assembly, and equipment to provide 64" of vertical mounting space for 23" wide auxiliary equipment units.
	J58879F-2, List 17 (MD)	Equipment required in addition to List 1 or 16 to provide an ac power distribution unit, arranged for a 117-volt power source.
	J58879F-2, List 18 (MD)	Equipment required in addition to Lists 1, 16, and 17 when a filtered air supply is required.
	J58879F-2, List 19 (MD)	Equipment required in addition to Lists 1 and 2 to provide a -48 Vdc power supply.
	J58879F-2, List 20	Equipment required in addition to Lists 16, 25 and 17, 24 to provide a frequency generator.

TABLE J (Contd)

## AUXILIARY CABINET EQUIPMENT INFORMATION

ITEM NO.	EQUIPMENT	DESCRIPTION
1 (Contd)	J58879F-2, List 21	Wiring and equipment required in addition to List 20 to provide one frequency interrupter unit.
	J58879F-2, List 22	Apparatus to provide wall outlet and associated mounting hardware.
2	Recorded Announcement Unit, H-400-107, List 1	Assembly, equipment and cords for one announcement set (KS-16765).
3	J58827E, List 1	Assembly, wiring, and equipment for one recorder telephone dictation trunk unit.
4	J98615AH	44V4A repeater for 48-volt operation.
5	J98615BJ, List 2	24V4C repeater for 48-volt operation.
6	J98615BL, List 2	24V4D repeater for 48-volt operation.
7	J59204CA-1, List 1	Assembly, wiring, and equipment for type G1 TOUCH-TONE calling receiving circuit, wired for two receivers.
8	J99380A, List 1	Assembly, wiring, and equipment for one single module shelf assembly equipped to accommodate up to 12 MFT transmission type plug-in units or up to 12 MFT loop extender (LSE) in any combination.
	J99380A, List 2	Assembly, wiring, and equipment required in addition to List 1 to provide for installation of List 1 into any DIMENSION PBX cabinet frames.
	J99380A, List 3	Equipment required to store one J99380TA test extender in List 2 shelf assembly.
	J99380A, List 4	Wiring and equipment required in addition to List 1 to provide for installation of List 1 as either a single shelf arrangement or the top shelf in a multiple shelf arrangement in the DIMENSION PBX auxiliary cabinet.
	J99380A, List 5	Wiring and equipment required in addition to List 1 to provide for installation of List 1 as an additional shelf in a multiple shelf arrangement in DIMENSION PBX auxiliary cabinet.
9	J99380E, List 1	Assembly, wiring, and equipment for one double module shelf assembly equipped to accommodate up to 6 MFT transmission type plug-in units and up to 6 MFT signal type plug-in units in dual mounting arrangements or up to 6 MFT transmission type plug-in units and up to 6 loop signal extender plug-in units in dual mounting arrangements.
	J99380E, List 2	Assembly, wiring, and equipment required in addition to List 1 to provide for installation of List 1 into any of the DIMENSION PBX cabinet frames.

TABLE J (Contd)

## AUXILIARY CABINET EQUIPMENT INFORMATION

ITEM NO.	EQUIPMENT	DESCRIPTION
9 (Contd)	J99380E, List 2	Assembly, wiring, and equipment required in addition to List 1 to provide for installation of List 1 into a J99380D, List 1 double depth mounting frame.
	J99380E, List 4	Wiring and equipment required in addition to List 1 to provide for installation of List 1 as either a single shelf arrangement or the top shelf in a multiple shelf arrangement in the DIMENSION PBX auxiliary cabinet.
	J99380E, List 5	Wiring and equipment required in addition to List 1 to provide for installation of List 1 as an additional shelf in a multiple shelf arrangement in the DIMENSION PBX auxiliary cabinet.
10	J58824CD-1, List 2	Assembly wiring and equipment required in addition to List 7 to repeat dialed digits to customer on a 2-out-of-7 lead basis
	J58824CD-1, List 7	Assembly, wiring, and equipment for one interface unit for dial or TOUCH-TONE dialing pulsing.
	J58824CD-1, List 9	Assembly, wiring, and equipment for one applique unit required in addition to List 7 when TOUCH-TONE dialing signals are converted to dial pulses.
	J58824CD-1, List 12	Wiring and equipment required in addition to List 7 to provide called party access.
	J58824CD-1, List 15	Assembly, wiring, and equipment for one applique unit required in addition to List 7 when TOUCH-TONE dialing signals are converted to DC signals on a 2-out-of-7 lead basis using type G1 receivers.
	J58824CD-1, List 16	Assembly, wiring, and equipment always required in addition to List 7 when used with the DIMENSION PBX system.
	J58824CD-1, List 17	Assembly, wiring, and equipment always required in addition to List 12 when used with the DIMENSION PBX system.
11	J53050F-1, List 1	Assembly, wiring, and equipment for one trunk level interconnecting unit.
12	J58847Y-1, List 3	Assembly, wiring and equipment for one link and EDU with fusing provided from PBX.
	J58847Y-1, List 4	Assembly, wiring and equipment for one link and EDU with fusing provided.
13	J58879KA-1, List 1	Assembly, wiring, and equipment for a basic electronic telephone control carrier (ECTS).
	J58879KB-1, List 1	Assembly, wiring, and equipment for a supplemental electronic telephone control carrier (ECTS).

PBX. Table K contains the eleven equipment configurations. Table L contains the nine translated tape models. These models will be assembled from standard available DIMENSION PBX hardware.

**4.24** The standard attendant console provided with these models is the small AGE-01DF. A maximum of four can be provided. This console includes 6 BLF/DSS keys, an alphanumeric display, and a walnut faceplate. Each model will include one LC45 circuit pack which interfaces two attendant consoles.

**4.25** The Customer Administration Panel option includes the CAP, a 50-foot cable, and a Customer Administration Record (CAR) document.

**4.26** Each model is available with an optional installation package consisting of connecting cables from carriers to connecting blocks, connecting blocks, and purple and white backboards.

**4.27** Additional circuit packs are available for the models as shown in Table M. The LC02 line circuit pack(s) in the slot(s) designated for the packs to be added, must be removed or relocated as required. Remove and add translations as required.

**4.28** Each hardware model will always be provided with the following:

- 1—HUBBELL\* 2310 Outlet and Plate
- 1—609A Panel
- 1—ED-1E310-11, Grp-58 Cable (RMATS Data Set Cable - 50-feet)
- 1—249A Adapter.

**4.29** Hardware models 4 through 11 will provide the following additional material:

- 1—HUBBELL 2310 Outlet and Plate
- 1—Wire Rope
- 2—Thomas and Betts TC-301
- 1—Thomas and Betts TY46M
- 2—End Caps.⚡

\*Registered trademark of Harvey Hubbell, Inc.

**TABLE K**

**SYSTEM MANAGEMENT  
HARDWARE MODELS**

MODEL	LINES		TRUNKS		
	EQUIPMENT	MAXIMUM	EQUIPMENT (NOTE)	MAXIMUM	NO. CABINETS
1	56	116	6	46	1
2	120	180	6	46	1
3	56	116	6	78	1
4	120	180	6	78	2
5	120	244	6	78	2
6	120	308	6	78	2
7	120	244	6	46	2
8	120	372	6	46	2
9	56	116	6	110	2
10	56	180	6	110	2
11	56	244	6	110	2

**Note:** Four 2-way CO trunks and two TOUCH-TONE calling registers

TABLE L

**SYSTEM MANAGEMENT  
SOFTWARE MODELS**

MODEL	REG. STA.	LINES		CO TRUNKS
		ECTS		
		BUTTONS		
		5	10	
A	1	—	—	1
B	56	—	—	4
C	56	15	15	4
D	56	30	30	4
E	120	—	—	4
F	120	15	15	4
G	180	—	—	4
H	150	15	15	4
I	120	30	30	4

**♦FCC REGISTRATION REQUIREMENTS**

**4.30** The following paragraphs provide planning information concerning the implementation of the FCC registration program for the DIMENSION PBX.

**4.31** The Commission has established a PBX register-only date and a PBX grandfather date. The PBX register-only date is the date by which all newly manufactured PBX systems being connected to the network must be registered. The PBX grandfather date is the date which establishes the systems that are excluded from the technical compliance regulations of the registration program. The grandfather provision of the registration program means that all PBXs that were legally connected to the network as of the grandfather date are grandfathered for life. These PBXs may remain connected; may be removed and reinstalled; and may be removed, repaired, refurbished, and reinstalled. Reinstallation of a removed PBX is not restricted to the same customer. The system may be reinstalled for any customer. Additions may be made to grandfathered

TABLE M

**SYSTEM MANAGEMENT  
ADDITIONAL CIRCUIT PACKS THAT MAY BE ORDERED**

CODE	DESCRIPTION
LC02	LINE
LC06	ATTENDANT CONFERENCE
LC08	CO, WATS, FX TRUNK
LC09	DID TRUNK
LC10	"TOUCH-TONE" SERVICE REG/REC
LC11	TIE TRUNK
LC12	"TOUCH-TONE" SERVICE SENDER/DT DETECTOR
LC13	AUXILIARY TRUNK INTERFACE
LC15	CONTACT INTERFACE
LC17	TONE PLANT
LC31	AIOD/ANI
LC32	AIOD/ANI
LC45	CONSOLE INTERFACE
LC55	ECTS STEERING CIRCUIT
LC145	TRANSMISSION TEST LINE
LC361	DATA ACCESS INTERFACE
LC366	DUAL SPEED DATA CHANNEL

systems using any equipment registered in configuration with the DIMENSION 400 PBX system. The grandfathered system does not become registered but the system does retain its grandfathered status. Specifically, this means that additions to grandfathered systems can only be made using units from Class C or Chief Engineers' stock. Grandfathered status is retained if units and/or cables used for repair and/or refurbishing are of a type that were connected to the network as of the grandfathered date. Therefore, orders for new units from Western Electric for grandfathered systems must be restricted to maintenance, repair, or refurbishing. †

**4.32** In order to comply with the FCC registration requirements, a registered DIMENSION 400 PBX must be connected to the network through a network interface jack approved by the FCC. The network interface jack is considered to be a part of the network through which registered terminal equipment connects to the network. An additional requirement is that cross-connect fields and registered terminal equipment be restricted in regard to access, either by locating the cross-connect field in the PBX equipment room or providing cross-connect field enclosures. Wiring in an equipment room with restricted access must remain exposed for the purpose of inspection and cannot be concealed or embedded in the building structure.

**4.33** The 66M3-50R connecting block is the recommended interface connecting block for the PBX. Each 66M3-50R connecting block provides the required RJ21X connector (Fig. 35A and 35B). An alternate arrangement consisting of the RJ21X network interface connector can also be provided, using the miniature ribbon connector-ended cable (Fig. 35C) without the 66M3-50R connecting block. When the registered terminal equipment is located in an equipment room with nonrestricted access, the connecting block should be mounted within 7.6m (25 feet) of the cross-connect field. However, for equipment rooms with restricted access, one registered 7.6-m (25-foot) extender cable in the path from the green cross-connect field to the interface jack is allowed to extend that length to no more than 15.2m (50 feet) (Fig. 35B).

**4.34** The only leads which are to be wired through the standard network interface are CO tip and ring leads for CO-type service (ie, CO trunks, FX, and WATS). Therefore with the PBX, only tip and ring

leads from circuit packs LC08D, LC09D, and LC285 are to be wired to the network interface. All other leads leaving the PBX toward the CO should be cross-connected to a separate connecting block on the green field. Caution should be used when determining circuits to be connected to the registered terminal equipment side of the network interface (between the RJ21X and the registered PBX). The leads to the network are not covered (protected) by the PBX registration protection.

**4.35** DIMENSION 400 PBXs have a registration label affixed on the control carrier in the basic cabinet. Grandfathered PBXs (those machines installed before the registration requirements) do not have the registration label. Registered PBXs must comply with the FCC technical requirement that CO tip and ring leads cannot be mixed in the same cable with leads for other services. Circuit packs used to provide these services are LC08D, LC13, and LC15.

**4.36** The FCC registration also requires that the station line circuit loop impedance, excluding terminal equipment, be less than 950 ohms (1150 ohms including the station set).

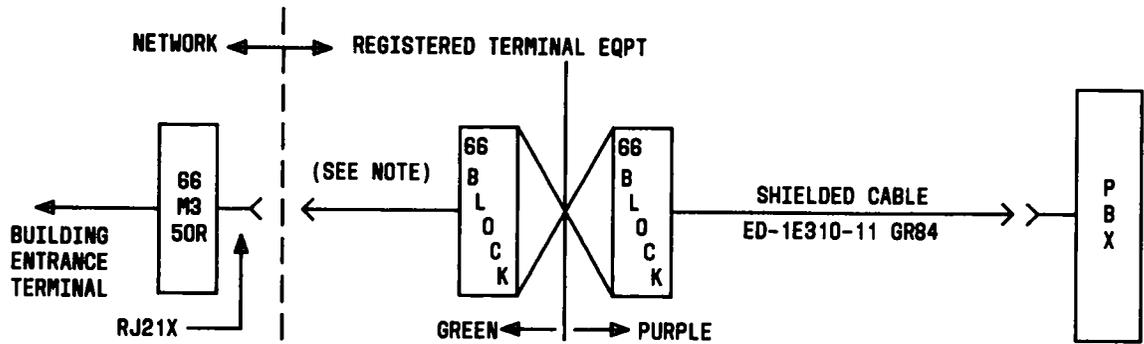
**4.37** Circuit packs LC02B, LC03B, LC09D, and LC49C meet FCC registration requirements for connections to the telephone network by providing additional protection from lightning surges and power crosses.



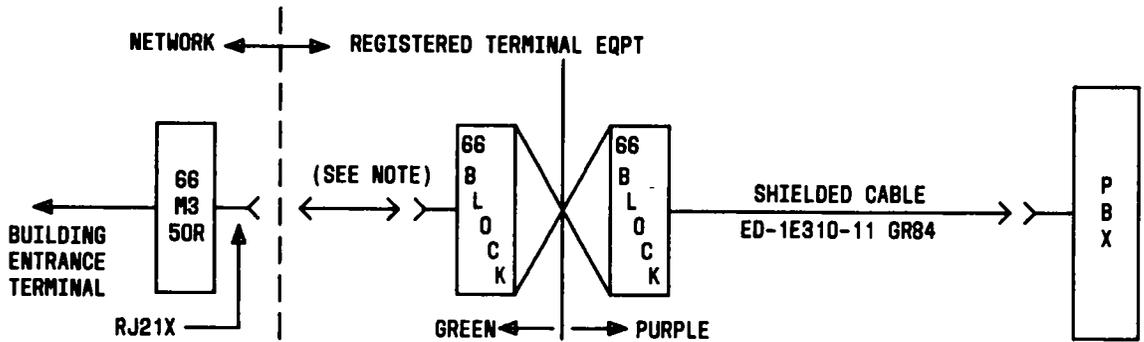
*A circuit pack is always replaced with a circuit pack having either the same or later alpha suffix as printed on the carrier designation strip. That is, an LC02 cannot be used if the designation strip specifies LC02B. The LC02B or later alpha-suffixed circuit packs are suitable replacements.*

**4.38** †**FCC Part 15 Compliance:** Although FCC Part 15 regulations apply to systems shipped on or after October 1, 1983, controlled introduction of compliant systems will be made in advance of this date. These compliant systems will have the following to make them more resistant to transmitting or receiving radio frequency interference (RFI):

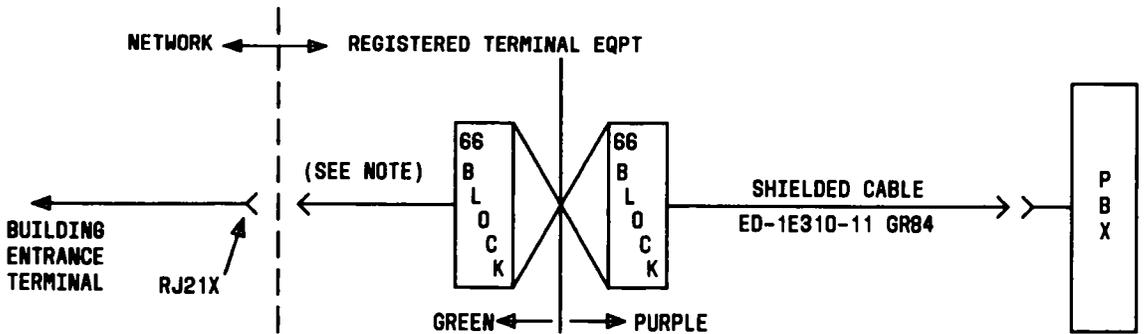
- Screen shielded cabinets
- Shielded cables to cross-connect field which are 30-feet minimum and have drain wire



A. WITH 66M3-50R ON THE NETWORK SIDE



B. WITH 66M3-50R ON BOTH THE NETWORK AND REGISTERED TERMINAL EQUIPMENT SIDE



C. WITH MINIATURE RIBBON CONNECTOR ENDED CABLE

**NOTE:**  
 THE DISTANCE BETWEEN THE REGISTERED TERMINAL EQUIPMENT  
 AND THE RJ21X CONNECTOR SHALL BE A MAXIMUM OF 7620 mm  
 (25 FEET) PLUS ONE 7620 mm (25-FOOT) REGISTERED EXTENDER.

Fig. 35—Typical FCC Registered Equipment Interconnections

shields with spade lug connectors which attach to mating connector field on the back of the cabinets

- The RFI gasket on mating surfaces of cabinet panels which can be removed
- Conductive paint on cabinet surface which permanently mate
- Fasteners which hold the doors in place
- Triaxial 4-MHz cable between cabinets.♦

## 5. ENVIRONMENTAL REQUIREMENTS

**5.01** Exposure to extreme temperatures and humidity may degrade telephone service and create a lasting damaging effect on the system equipment.

**5.02** The equipment is designed to operate at ambient temperatures from 0° to 49°C (32° to 120°F) and at 10 to 95 percent relative humidity conditions. These limits should not be regarded as desirable working conditions for minimum maintenance and do not include power or battery equipment. It is recommended that an ambient temperature in the range of 18° to 35°C (65° to 95°F) with relative humidity in the range of 20 to 60 percent be maintained for equipment locations. However, concurrent extreme temperature and relative humidity ranges should be avoided.

**5.03** When excessive room temperature and high contaminant levels are anticipated, blower fans and a filter assembly are required to be installed in the system equipment.

**5.04** The packing material used for shipping cabinets from Western Electric Company is adequate for upright or lay-down (on-side) shipment. However, upright shipment is preferred. If cabinets are shipped laying down, installation personnel should carefully raise the cabinets to upright position before unpacking.

**5.05** Minimum floor plans for single cabinet and 2-cabinet systems are given in Part 7. In all cases, the minimum requirement specified in commercial floor loading codes must be met. The total weight of one cabinet does not exceed 362 kg (800 pounds), and a free maintenance area of at least 1.4

square meter (15 square feet) must be provided per cabinet.

**5.06** All systems must be located in areas where adequate illumination is provided for maintenance and where noise levels do not exceed the levels specified in the Occupational Safety and Health Act (OSHA).

**5.07** In areas subject to electromagnetic interference, filters per ED-1E403 can be installed.

**5.08** Refer to Section 554-101-101 for detailed and additional environmental requirements.

## 6. POWER

**6.01** Commercial power for the system is provided at 120 volts 60 Hz with 20-ampere service per cabinet. Each 20-ampere circuit should be protected by a thermal magnetic circuit breaker (ITE Q120-B020 typical or approved equivalent). It must be capable of withstanding an initial current surge of approximately 150 amperes for a period of 10 ms. A nonswitchable power outlet for each cabinet must be provided.

**6.02** Dedicated power lines to the PBX should be provided to prevent the introduction of electrical noise and inadvertent removal of power from the system. In areas where excessive electromagnetic fields exist, special shielding, grounding, trunk line filtering, etc, must be provided.

**6.03** Wide-frequency tolerant rectifiers are standard and operate with an input frequency of 60 ±0.3 or ±3 Hz. The operating ranges are 99 volts to 129 volts if the variation from 60 Hz is ±0.3 Hz or 105 volts to 129 volts if the variation from 60 Hz is ±3 Hz. Both voltage and frequency cannot vary simultaneously without service degradation. A power outlet must be provided behind each cabinet. One HUBBELL twist-lock power receptacle, Cat No. IG-2310, must be installed by the customer for each cabinet.

**6.04** An installation consisting of a single cabinet or multiple cabinets requires a customer-provided load center capable of housing one 20-ampere thermal magnetic circuit breaker per cabinet and two customer-provided equipment ground conductor terminal bars mounted back-to-back on the load center wall. The circuit breaker provides power

to a nonswitchable power outlet (wall-mounted) for each cabinet.

**6.05** Each cabinet contains an ac distribution unit, a dc power distribution system, temperature sensors, and a fan assembly (optional). The ac distribution unit provides ac power for the rectifier, blowers, frequency generator, and a 60-Hz utility outlet. If the cabinet thermal sensors reach  $54^{\circ} \pm 2^{\circ}\text{C}$  ( $130^{\circ} \pm 5^{\circ}\text{F}$ ), the cabinet has reached a critical temperature and the fans will be activated. A critical temperature indicator will be activated at  $63^{\circ} \pm 2^{\circ}\text{C}$  ( $145^{\circ} \pm 5^{\circ}\text{F}$ ).

**6.06** The following rectifiers are used in DIMENSION 400 PBX cabinets:

- (a) Rectifier J87432A is installed in the basic cabinet when reserve power is not required.
- (b) Rectifier J87432B is installed in the supplemental cabinet when reserve power is not required.
- (c) Rectifier KS-22028 is installed in the auxiliary cabinet when reserve power is not required.

#### RESERVE POWER

**6.07** Reserve power can be provided with or without using a dc-to-ac inverter. Currently, existing systems can only be provided with reserve power using a dc-to-ac inverter.

**6.08** When reserve power is provided using a dc-to-ac inverter (Fig. 36), the proper type rectifier must be installed in the basic and supplemental cabinets. Reserve power is provided using a  $\text{100-type}$  power plant and a DEPENDAC\* inverter. Since auxiliary equipment is powered directly from the  $\text{100-type}$  power plant, a rectifier is not required in the auxiliary cabinet.

**6.09** The following rectifiers are used with reserve power in DIMENSION 400 PBX cabinets:

- (a) Rectifier J87432AA is installed in the basic cabinet when reserve power is required and a dc-to-ac inverter is used.
- (b) Rectifier J87432BB is installed in the supplemental cabinet when reserve power is required and a dc-to-ac inverter is used.

\*Registered trademark of Reliance Electric Co.

#### UNINTERRUPTIBLE POWER SERVICE (UPS)

**6.10** The UPS is divided into the two equipment configurations of standard UPS—nominal holdover, and standard UPS—extended holdover (Fig. 37). The equipment required for these configurations is listed below. A more detailed description of UPS can be found in Part 3.



*Circuit packs LC03, LC06, LC08C, LC09C, and LC13 must be replaced with LC03B, LC06B, LC08D, LC09D, and LC13B for UPS applications, respectively.*

**6.11** *Standard UPS—Nominal Holdover* equipment (Fig. 37) for DIMENSION 400 PBX cabinets is listed below:

- (a) J87460F rectifier/converter power supply is installed in the basic cabinets.
- (b) J87460B rectifier/converter power supply is installed in the supplemental cabinets.
- (c) J87455A, List 1, battery charger is installed in cabinet with UPS power supply.
- (d) J58879JA, List 2, List 4, List 5, and List 10, power distribution and fan assembly equipped with 124A ringing generator is installed in cabinet with UPS power supply.

**6.12** *Standard UPS—Extended Holdover* is similar to the nominal holdover configuration listed above, except that the battery and battery charger are not in the cabinet with the UPS power supply. They are provided in the form of a locally engineered battery reserve  $\text{100-type}$  power plant. A dc line filter connecting to this power plant is mounted in the cabinet in the space normally occupied by the battery pack. The following is a list of cabinet equipment for standard UPS—extended holdover:

- (a) J87460F-1 rectifier/converter power supply is installed in the basic cabinets.
- (b) J87460B-1 rectifier/converter power supply is installed in the supplemental cabinets.
- (c) J58882A, List 17, dc line filter is installed in the cabinet with the UPS power supply.
- (d) J58879JA, List 2, List 4, List 5, and List 10, power distribution and fan assembly equipped

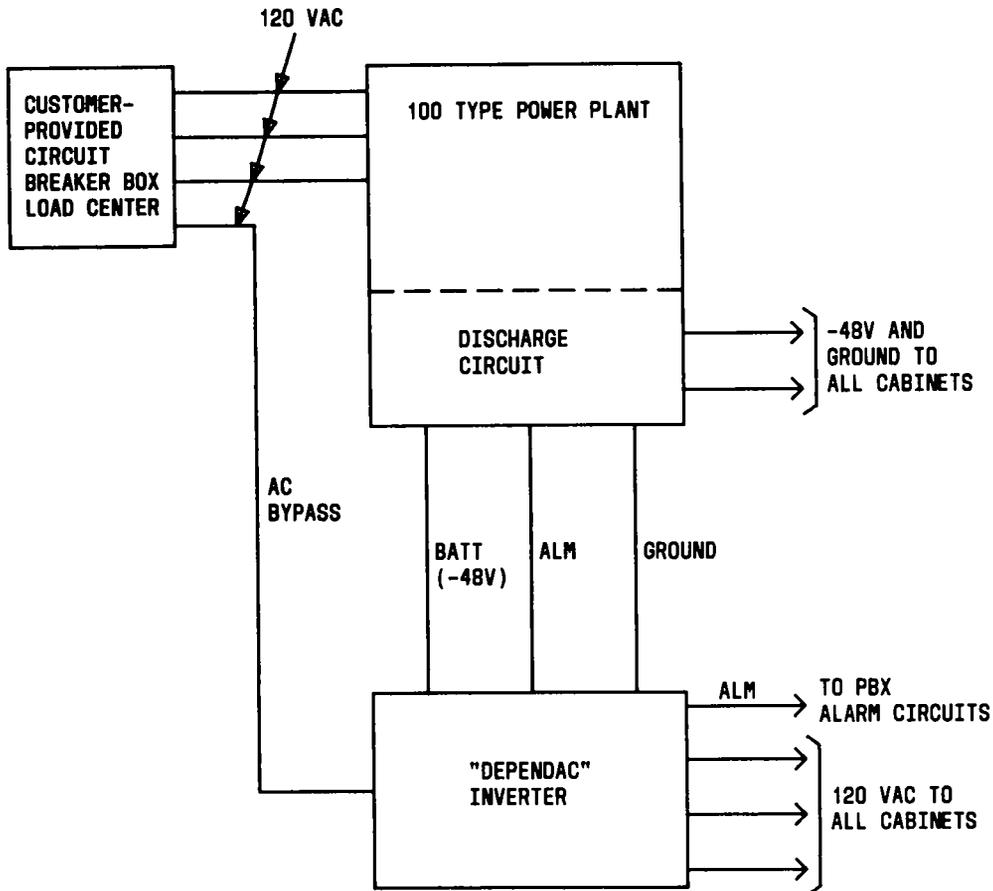


Fig. 36—Reserve Power Using DC-to-AC Inverter

with 124A ringing generator is installed in the cabinet with the UPS power supply.

cabinet and any obstruction, such as a shelf or a ceiling, to permit adequate air flow for cooling the system.

## 7. FLOOR PLANS, CABLING, CROSS-CONNECT FIELD, AND PROTECTION REQUIREMENTS

### CABLING

#### FLOOR PLANS

**7.04** A cabling plan requires the following considerations:

**7.01** Minimum floor plans for single-cabinet and 2-cabinet systems are shown in Fig. 38 and 39. All dimensions in these figures are minimal.

- Maximum cable lengths
- Number of cables required
- Future growth and rearrangements.

**7.02** A great deal of flexibility is available beyond these minimum standards. In all cases, the requirements concerning floor load and thermal environment must be followed.

**7.05** Standard A25-type cables are used for stations, trunks, consoles, etc, terminated at this cross-connect field. Some special flat and shielded cables are used for high-frequency data channels and carrier-to-carrier cabling.

**7.03** A minimum of 160 mm (6 inches) of space should be maintained between the top of the

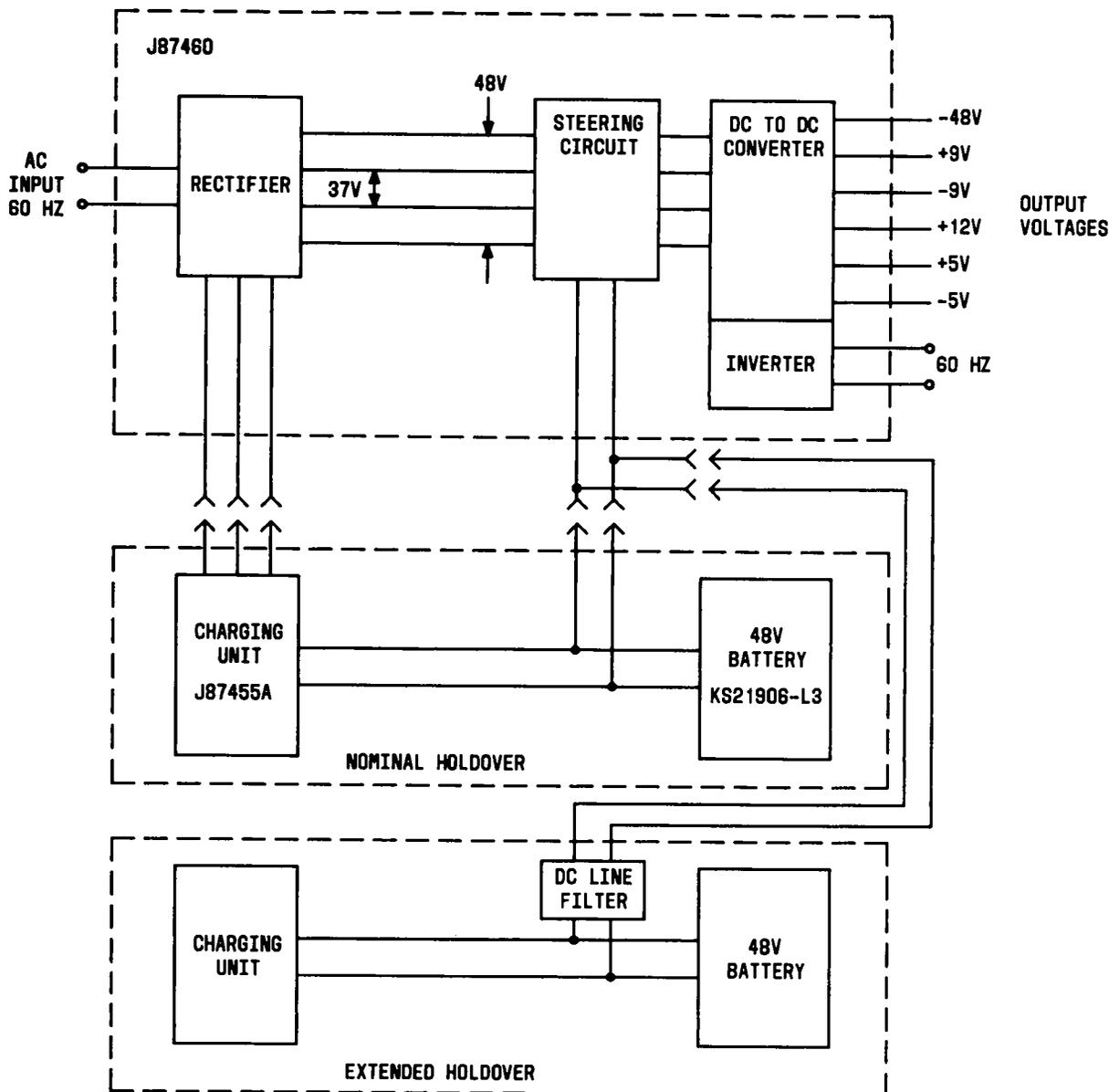


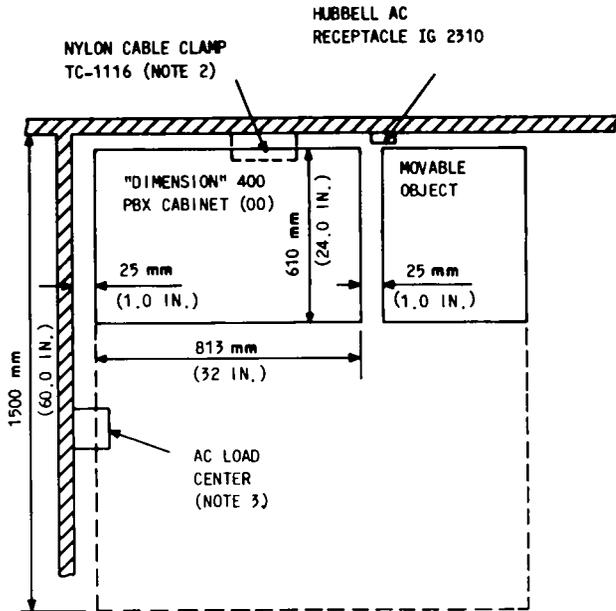
Fig. 37—Block Diagram of Standard UPS Showing Nominal and Extended Holdover Configurations

#### CROSS-CONNECT FIELD



*In order to meet FCC registration requirements, the cross-connect field must have a protective cover when located in an area having non-restricted access to assure that there is adequate insulation from commercial power wiring and grounding surfaces.*

**7.06** The cross-connect field can be contained in three common customer equipment enclosure assemblies which provide protection from dust and water. The enclosures also improve the appearance when the field is located in an office environment. The cross-connect field enclosure assembly (Fig. 40) is available in three sizes. The *first* size, 432 mm (17 inches) wide by 1930 mm (76 inches) high, is used to cover three standard 432-mm by 508-mm (17- by 20-inch) backboards and two 187B1 or 196A backboards.



## NOTES:

1. DASHED LINES INDICATE MINIMUM MAINTENANCE AREA.
2. CABLE CLAMP WALL MOUNTED AT 1800 mm (69.5 INCHES) HIGH.
3. MAX DISTANCE BETWEEN LOAD CENTER AND HUBBELL RECEPTACLE IS 6000 mm (20').

**Fig. 38—Minimum Floor Space Requirements (Single Cabinet)**

The *second* size, 432 mm (17 inches) wide by 1371 mm (54 inches) high, is used to cover two standard 432-mm by 559-mm (17- by 22-inch) backboards and two 196A backboards. The enclosures can be mounted above the floor to match the DIMENSION 400 PBX cabinet. The *third* size, 432 mm (17 inches) wide by 686 mm (27 inches) high is used for a smaller installation and uses one 432-mm by 508-mm (17- by 20-inch) backboard and a 196A backboard. Colored 183-type backboards are used on the cross-connect field to identify the types of circuits to be terminated at the various positions. The recommended 66-type connecting blocks are identified with the DIMENSION 400 PBX cables which terminate on the blocks. White (187B1) or 196A backboards, having stand-off-type-distribution rings, are used to separate the fields into upper and lower bands and are intended for use when wiring and cross-connecting the various connecting blocks. Prewired 609-type interface panels may be used to provide connections to emergency transfer facilities. Each 609-type panel contains apparatus for transferring ten PBX stations

to ten CO cable pairs during power failure of major alarm conditions. Figure 41 shows a general layout of a typical cross-connect field.

## PROTECTION REQUIREMENTS

**7.07** Protection is required on all exposed cable pairs. The protectors should be located as near the cable entrance to the building as practicable, and the protector ground terminal should be bonded to the system single-point ground. Sneak current protection (60D fuses) is required on all trunk pairs exposed to ac power crosses. Sneak current protection is not required on station pairs.

**7.08** Refer to Section 876-300-100, Issue 8 or later, for information on protection. Refer to Section 554-101-101 for detailed grounding and bonding information.

## 8. DESCRIPTION OF OPERATION

### CALL PROCESSING

**8.01** Call processing is under the control of the processor which determines the status of the peripheral circuits and reacts to changes of states by executing instructions which are read from the software program stored in the main memory. Each system has a program tape which contains call processing routines (generic program) and unique translation information. Translations include flexible assignment entries such as class of service, hunting, and line number-to-equipment location number translations. Translation updates or modifications can be made and recorded on tape at time of installation, or later, using the MAAP, CAP, RMATS, or CACS.

**8.02** When a system is installed, initialization is required which results in transferring all required data from the tape to the electronic memory. The RAM is called upon continually by the processor during call processing. The tape cartridge remains in the system, is periodically exercised, and is used for certain maintenance and traffic routines. The following problems will involve reinitialization procedures:

- (a) **Long Power Failure (memory contents lost):** This occurs after about 90 seconds of power outage. Memory contents are restored from the tape. The INIT program clears status memory and puts all peripheral units in the idle state. All calls are affected.

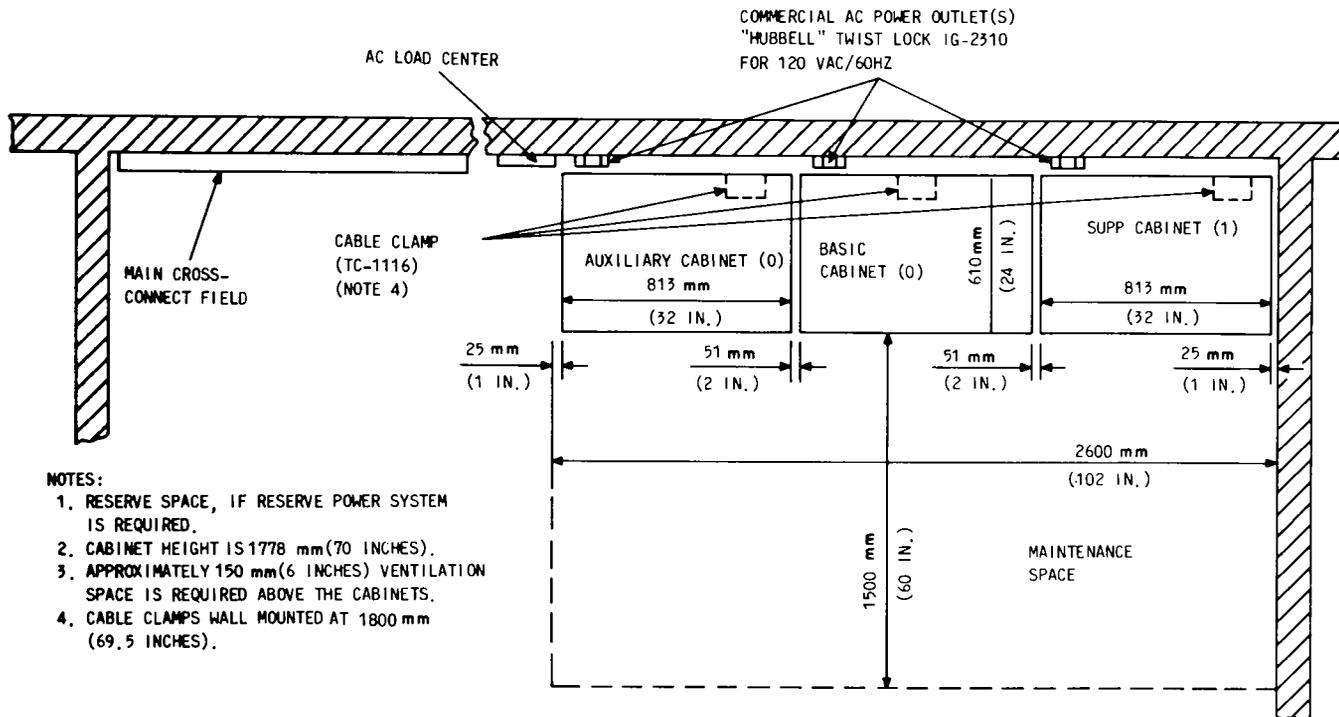


Fig. 39—Minimum Floor Space Requirements (Multiple Cabinets)

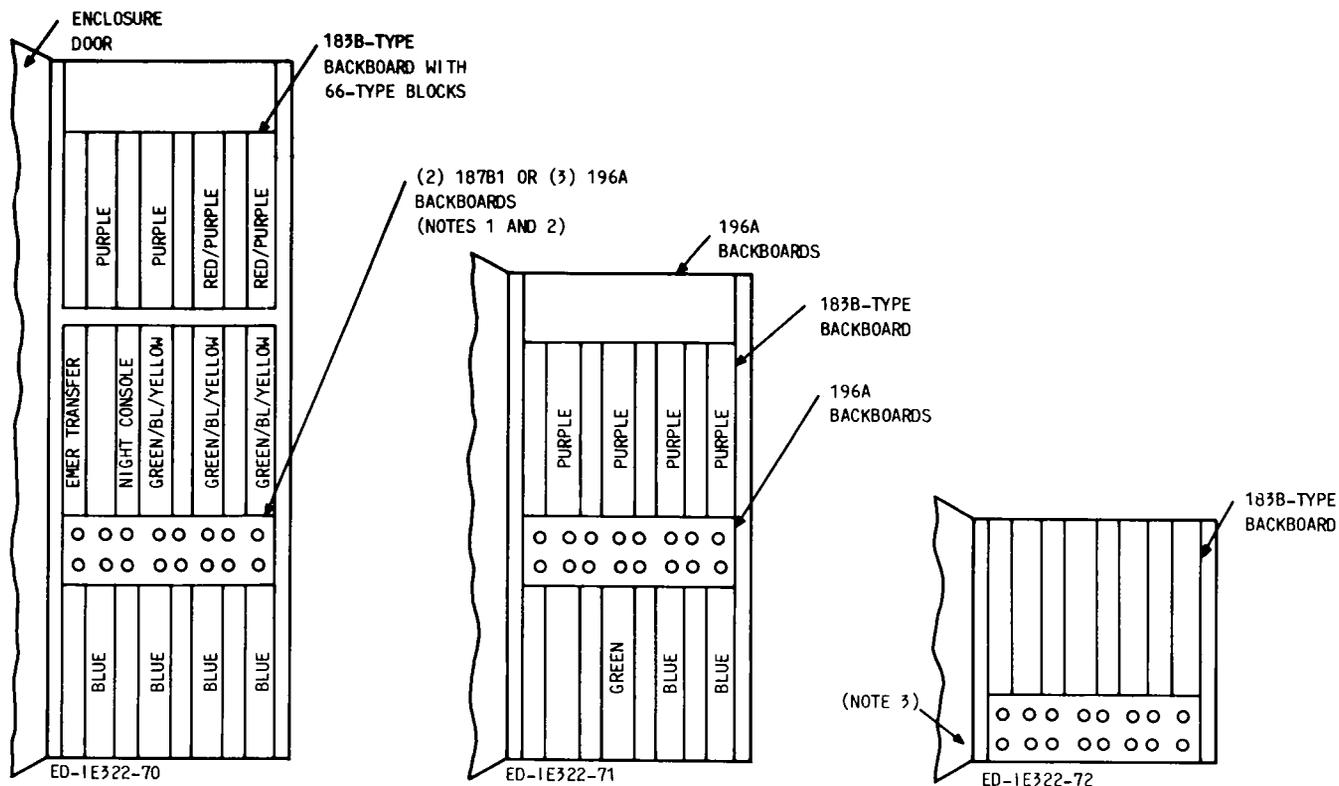
(b) **Short Power Failure (memory contents remain intact):** This is an outage of less than 90 seconds. The INIT program reschedules call processing tasks and attempts to quickly rebuild stable calls in network cabinets which lost power.

(c) **Software Errors:** When bad memory parity, illegal program branches, illegal memory writes, or other software problems occur, the INIT program will abort the call or maintenance task processed when the error was detected and reschedule call processing tasks.

(d) **Persistent Software Errors:** When five software errors occur in less than 2 minutes, the INIT program clears all of the status memory, constructs call records for stable calls based on information in the network port circuits shift register, and reschedules call processing tasks. A sixth software error in 2 minutes will cause memory to be reloaded from the tape, after which the INIT program follows the same steps as described for five software errors. A seventh software error will cause the processor to stop itself (go into "suicide") which will activate the emergency transfer panel (paragraph 4.19).

(e) **Manual Initialization:** Moving the control rocker switch on the alarm panel to HALT and back to GO causes the INIT program to react as though there had been a short power failure. Activating microdiagnostic "9" causes the memory to be loaded from the tape after which the INIT program follows the steps described for five software errors.

**8.03** The processor maintains records of call states and all port circuits in the memory. The processor monitors the on-hook/off-hook state of each line (or trunk) port by issuing commands to the scanner. The scanner interrogates the line circuit and reports the changes of states to the processor. When the scanner detects and reports a line off-hook to the processor, the processor interrogates its records for prior state information and line class-of-service information. If the prior state of the off-hook line was idle (and if allowed origination), the processor executes a series of instructions which result in the off-hook line receiving dial tone. The processor first searches for an idle time slot (1 of 64 available talking paths on the time division bus). If available, the

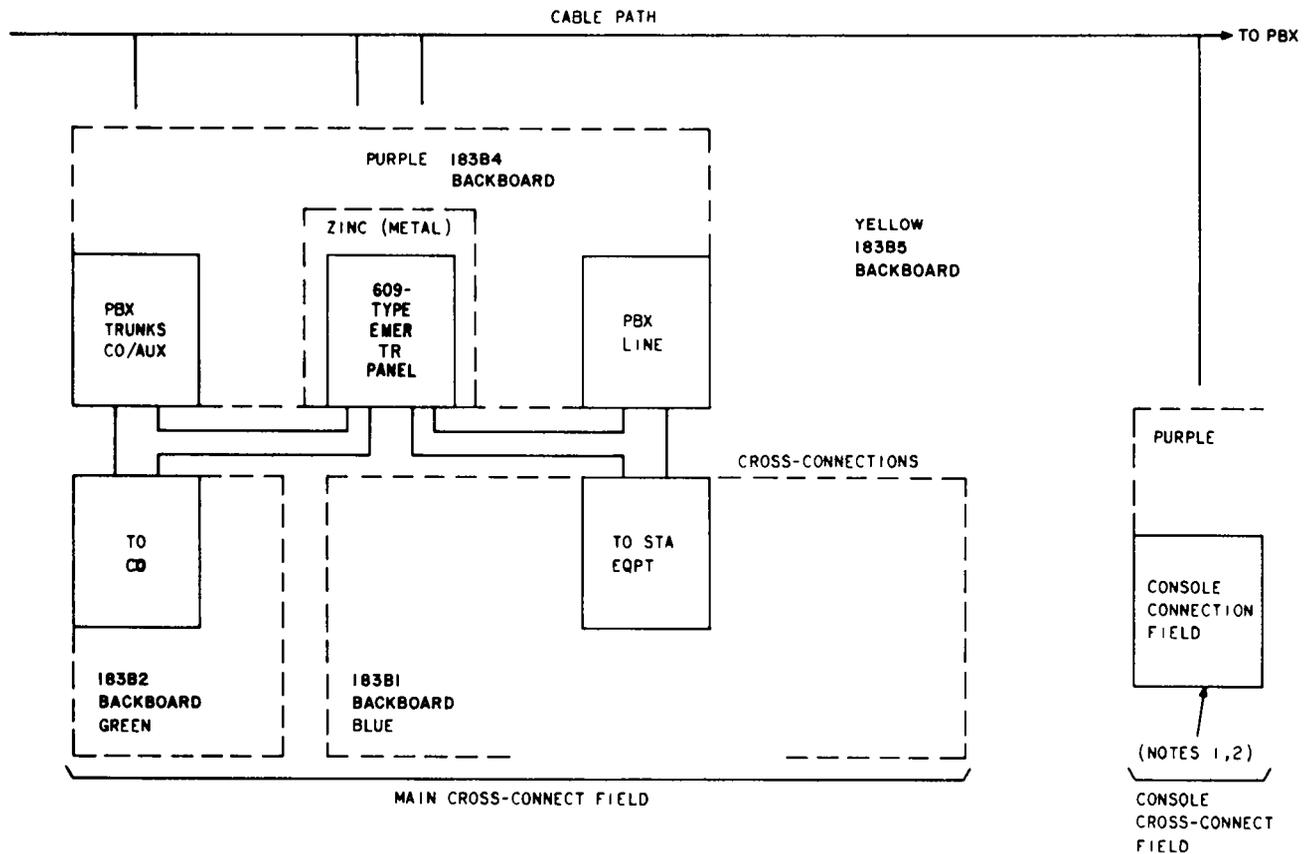


CODE (NOTE 4)	BACKBOARD COLOR	CIRCUITS OR EQUIPMENT TERMINATED
B2	GREEN	CENTRAL OFFICE TRUNK CIRCUITS
B1	BLUE	STATION LINE CIRCUITS
B3	RED	KEY AND ECTS EQUIPMENT
A5 OR B5	YELLOW	MISCELLANEOUS CIRCUITS AND EQUIPMENT
A4 OR B4	PURPLE	PBX CIRCUITS AND EQUIPMENT

NOTES:

1. PLYWOOD BACKBOARD MOUNTS FOR ALL SIZES (OPTIONAL).
2. BACKBOARD ARRANGEMENTS ARE FLEXIBLE. REFER TO SECTION 518-010-101 FOR TYPICAL LAYOUTS.
3. CABLING IN THROUGH KNOCKOUTS IN SIDE AND BOTTOM.
4. "A" SIZE = 21.5 cm X 50.8 cm (8.5 IN. X 20 IN.) "B" SIZE = 43.2 cm X 50.8 cm (17 IN. X 20 IN.)

Fig. 40—Cross-Connect Field Enclosures



## NOTES:

1. INSTALLED ADJACENT TO PBX TO PROVIDE CONNECTIONS FOR CONSOLES.
2. CONSOLE TERMINATIONS ARE FACTORY-CONNECTED FOR STANDARD CONSOLE KEY ARRANGEMENT

Fig. 41—Typical Cross-Connect Field

time slot is assigned in a memory record to the off-hook line. The processor then searches for an idle originating register (rotary or TOUCH-TONE dialing). If a register is available, the processor marks it busy (in memory) and records a connection between the off-hook line port and the register. If rotary dialing is used, the register is contained strictly in software, and no time slot connection is recorded.

**8.04** The processor then assigns a time slot to the line port, tone port, and TOUCH-TONE service receiver. The off-hook line appears in the same time slot with the port chosen by the processor and receives dial tone via the register circuit or tone port. If TOUCH-TONE dialing is administered, the TOUCH-TONE service receiver is also in the same time slot as the off-hook line, and TOUCH-TONE

dialing signals generated at the line are detected by the receiver.

**8.05** The processor continues to monitor the call progress by issuing commands to the scanner to monitor the dialing state. If rotary or TOUCH-TONE dialing takes place, the scanner detects the change of state and replies to the processor. The change of state is the line on-hook for rotary dialing or a non-zero digit from the TOUCH-TONE service receiver for TOUCH-TONE dialing. The processor recognizes the change of state as initial dialing and issues commands to have dial tone removed from the time slot by having the scanner/distributor and network control address the tone port and remove the *I* in the shift register that defines the time slot.

**8.06** Call processing under control of a stored program permits most of the data to reside in the memory and very little to be provided in the fixed logic circuits. The fixed logic circuits, lines, trunks, etc, can be kept simple and low in cost. The trunk circuits need only translate incoming signals (ground, loop current, battery reversal, etc) to a digital state for the scanner. The scanner reports the state to the processor, which compares it with the prior state and records any external stimulus (change in state). This stimulus is passed to the stored program which decides what action to take. Then, the program can cause the trunk circuit to assume a new state, eg, cut-through ground-start, battery reversal, transmission pad, etc, by operation of electronic flip-flops which control sealed reed relays in the trunk circuit.

**8.07** The time division bus (Fig. 2) is the multiplexing or common point for all voice and tone communicating circuits. Each connection or port appearance on the bus is controlled via a time division switch to the line, trunk, or service circuit. The time division switch of each port in a talking connection is activated simultaneously to provide connection of the desired circuits to the time division bus. Time division switching is provided by a master network clock located within the network control. Circuits in the network control set up or take down talking connections by writing or clearing time slot data from memory elements (shift registers) in each port circuit.

**8.08** The processor issues commands via the scanner/distributor and the network control circuits (in each network cabinet) when it assigns the time slot. The scanner/distributor addresses and enables each port circuit while the network control circuit provides each port circuit with timing necessary to define the time slot. In defining the time slot, the network control writes a bit into a shift register (time slot memory) in the active port circuit. The shift register maintains a record of the appropriate time slot. The shift register now contains a **1** which is recirculated by a clock and detected at the output stage once each cycle. When detected, the **1** causes the time division switch to close. Two port circuits assigned to the same time slot are connected together at the same instant. These simultaneous connections are repeated frequently enough to provide satisfactory transmission. The sampling rate is approximately 16,000 Hz or once every 64  $\mu$ s for an interval of 600 ns.

## SCANNER/DISTRIBUTOR AND NETWORK CONTROL

**8.09** The processor communicates with the line and trunk circuits via the scanner/distributor. When the processor issues a distribution command over the address bus, data bus, and control bus, the scanner/distributor decodes an address, designates the port equipment number, and selects the appropriate line or trunk circuit. A scan command returns the circuit status data to the processor from the decoded circuit, and a distribute command sends data from the processor to the decoded circuit. The status of each port in a given scan interval is compared with the previous status for that port by the processor, and any change initiates further processing. In case of an initial request for service, the processor signals the network control to assign a time slot to the port. The time slot assignment activates the time division switch of that particular circuit and provides an audio connection with all other ports having the same time slot. The processor periodically addresses ports via the scanner/distributor and searches for a change of status. Present status (eg, on- or off-hook of a line circuit) of the addressed ports is decoded, updated, and returned to the processor via the data bus. The scanner/distributor scans trunk circuits for incoming seizure, battery reversal, loop current, and dialing.

**8.10** The scanner/distributor receives the address of the port or ports to be scanned from the processor via the address bus. The address can contain as many as 11 bits. Bits 0 and 1 represent port-select. Bits 2 through 5 determine board-select. Bits 6 through 9 are carrier-select. Bit 10 is used as an additional port select bit when more than four port addresses per board position are required. The carrier address is decoded and enables the corresponding carrier buffer circuit pack. Buffer circuit packs and carriers have a direct relationship, eg, buffer number 2 is located in, and electronically associated with, units mounted in carrier number 2. The 4-bit board address is decoded into 1-of-16 circuit packs by carrier buffers. The 2-bit port address is decoded into 1-of-4 ports on the selected circuit pack.

**8.11** Once the carrier, has been selected and enabled, the scanner/distributor sequentially selects the addressed board and three adjacent boards, and returns four status bits for each of the four circuit packs to the processor.

**8.12** The network control sends timing and control inputs to the port shift registers. Upon command from the processor, the network control sets up connections (assigns time slots), takes down connections (clears time slots), or verifies an existing time slot assignment. Communication between the network control and the processor is via the control, address, and data bus. All network connections are established by writing time slots in port circuits. The port address, the time slot number to be written, and the load time slot (LOTS) command are sent to the network control by the processor. The appropriate port address is decoded and the desired port circuit is selected by the scanner/distributor. In response to the LOTS command, the time slot number is matched against a time slot counter in the network control circuit. When a match is found, the write signal is sent to all ports by the network control. The signal is recognized only by the selected port, and a logical **1** is written in that port register. The port register shifts the **1** under control of the time slot clock from the network control circuit. Each time the **1** cycles through the port register (once for every 64 clock pulses), the output of the shift register causes the port circuit to be connected to the time division bus. The **1** circulates in the shift register and establishes the connection in the correct time slot until a CLRTS or CLRSR processor command results in clearing the single **1** or clearing all **1s** in the port shift register.

**8.13** Both rotary and TOUCH-TONE dialing are provided. Conventional rotary dialing creates a series of makes (off-hooks) and breaks (on-hooks) on the dialing port. The loop status is detected in the corresponding port circuit, buffered, and made available to the scan and distribute circuit. The scanner/distributor scans the status leads every 10 ms under software control for the ports in an established dialing state. Dial pulse sampling is returned and stored directly in the appropriate software originating register. Rotary-dialed digits are registered one pulse at a time.

**8.14** TOUCH-TONE dialing requires the use of a TOUCH-TONE service receiver and TOUCH-TONE service register. The register has a port appearance on the time division bus. When the calling station is equipped for TOUCH-TONE dialing, a time slot assignment connects both the dialing station and the receiver. TOUCH-TONE dialing frequencies from the station are passed via the time division bus to the register port and on to the receiver. Circuitry in the receiver detects and decodes these

frequencies to a 2-out-of-7 code for the register. The register decodes this 2-out-of-7 data into BCD. The scanner/distributor circuit scans this register output and passes the BCD data to the processor via the data bus. TOUCH-TONE dialing digits are stored one digit at a time.

### **PULSE AMPLITUDE MODULATION (PAM) NETWORK AND PORT CIRCUITS**

**8.15** The PAM network is a common amplifier for all audio signals switched in the PBX. Outputs from all port circuits are transmitted on the SUM bus on a time division basis at the input to this amplifier. The audio signals are amplified and provided as an output on the distribution bus to all port circuits. Port circuits receive these signals only from ports on the same time slots.

**8.16** Port circuits are defined as all circuits having an appearance on the time division network, eg, line circuits, trunk circuits, TOUCH-TONE service registers, etc. Each port circuit contains the shift register (time division switching control memory) and a time division switch to establish a connection to the time division bus.

#### **A. Line/Trunk**

**8.17** The PAM network provides the time division bus common amplifier for all lines and trunks. Each line or trunk requires an appearance on the time division bus. Each port circuit is electronically connected to the time division bus common amplifier via electronic switches operated on a time division basis. The electronic switches are located in the respective port circuit and controlled by master timing in the network control.

#### **B. Tone Circuits**

**8.18** The tone circuits are contained on the LC04 and LC05 or LC204 and LC17 circuit packs. The call progress tones are generated from four single-frequency signal oscillators, usually combined and modulated, and are steadily maintained or interrupted at precise rates for the generation of the following 13 distinctive tones (Fig. 42).

- (a) **Dial tone (DT):** A 350-Hz and 440-Hz steady dial tone indicates processor is ready to accept dialed digits.

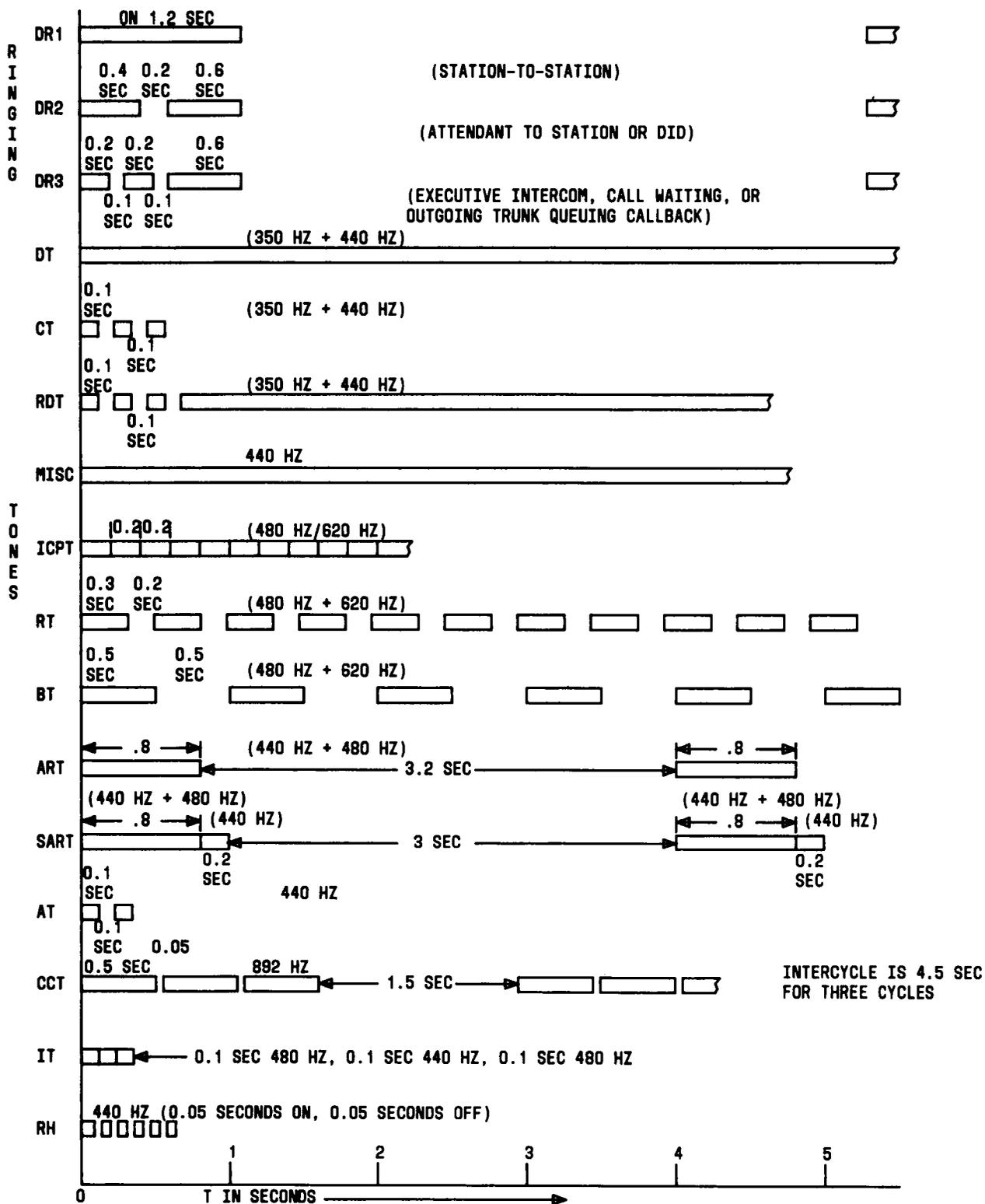


Fig. 42—DIMENSION 400 PBX—Tones and Ringing

- (b) **Confirmation tone (CT):** A 350 Hz and 440 Hz, three 0.1-second bursts, then silence indicates successful activation or deactivation of a feature.
- (c) **Recall dial tone (RDT):** A 350 Hz and 440 Hz, three 0.1-second bursts, then steady dial tone indicates successful flash, a party is placed on soft hold, and the processor is ready to accept dialed digits.
- (d) **Miscellaneous tone (MT):** A 440-Hz steady dial tone.
- (1) **Warning tone:** On for 1 to 2 seconds. Included are:
- Trunk verification by customer
  - Busy verification of station lines (tone repeated every 15 seconds)
  - Timed recall on outgoing calls
  - Executive override
  - Automatic route selection measured rate route selected.
- (2) **Call waiting tone:** One, two, or three bursts of tone on for 0.2 second and off for 0.2 second when the feature is activated. Included are:
- Attendant call waiting
  - Originating call waiting
  - Terminating call waiting.
- (e) **Intercept tone (ICPT):** A 620 Hz, on for 0.2 second and 440 Hz, on for 0.2 second indicates undefined dial code or illegal feature activation attempt.
- (f) **Reorder tone (RT):** A 480 Hz and 620 Hz, on for 0.3 second, off for 0.2 second at 120 ipm indicates temporary blockage due to traffic overload.
- (g) **Busy tone (BT):** A 480 Hz and 620 Hz at 60 ipm indicates destination station or circuit is busy.

- (h) **Audible ringback tone (ART):** A 440 Hz and 480 Hz, on for 0.8 second, off for 3.2 seconds indicates destination station is being rung or call is queued for attendant.
- (i) **Special audible ringback tone (SART):** A 440 Hz and 480 Hz, on for 0.8 second, followed by 440 Hz, on for 0.2 second, off for 3 seconds indicates call waiting is active on called station.

The following tones are generated by the LC17B circuit pack:

- (j) **Attendant transfer (AT):** A 440 Hz, on for 0.1 second, off for 0.1 second, on for 0.1 second.
- (k) **Code calling tone (CCT):** A 892 Hz—pulse timing, 0.5 second—interpulse intervals, 0.05 second—interdigital, 1.5 seconds—intercycle, 4.5 seconds—for three full cycles.
- (l) **Information tone (IT):** A 480 Hz, on for 0.1 second; 440 Hz, on for 0.1 second; 480 Hz, on for 0.1 second.
- (m) **Remote hold (RH):** Four to six bursts of 440 Hz, on for 0.05 second, off for 0.05 second.

The time division switching of the PBX permits the selected tone to be applied to the selected port. Several network ports can be connected to the same tone port in different time slots. Tone samples are placed on the time division bus by sampling switches similar to those used in other port circuits. All the tones for the DIMENSION 400 PBX are shown in Fig. 42. Distinctive ringing patterns, implemented through a basic system feature, are also shown in Fig. 42.

## PROCESSOR

### A. Control Logic

**8.19** The processor contained on six circuit packs is a 16-bit microprogrammed general-purpose computer. It performs the common control functions by executing a program stored in the dynamic RAM. The processor communicates with other circuits via the 16-bit unidirectional address bus, a 17-bit bidirectional data bus, and a 6-bit memory control bus. All internal data movement and manipulation is accomplished by operating on the 16-bit word in 4-bit segments.

**B. Memory and Memory Control**

**8.20** System main memory is comprised of a group of identical circuit packs in the control carrier or trunk/control carrier (Fig. 27 through 30). Each circuit pack contains dynamic RAMs that store 17-bit memory words (16 data bits plus one parity bit). Additional circuit packs furnish memory control. The memory provides storage capability for call processing programs, translation programs, and transient data relating to call processing. The entire memory is written when loading from the tape cartridge. During call processing, it is impossible to write into memory a word which is in storage that contains call processing program or fixed translation data.

**8.21** The high-level processing uses 16-bit words. The seventeenth bit in memory allows for odd parity checking and bit-swap redundancy. Odd parity means the extra bit is set to **1** or **0** based on the rest of the data stored in the word so that there is an odd number of **1s** in the word. Bit swap allows the seventeenth bit to be substituted for one of the other sixteen bits when one is found bad. When activated, bit swap applies to every word in memory. A major alarm is activated when a bit swap has occurred.

**8.22** The processor communicates with the memory by providing the address of the desired word on the address bus and issuing a read command. When the desired word is accessed, the memory control signals the processor that access of the desired word is complete. Internal processor control flip-flops indicate to the processor whether the accessed word was an instruction or a data word.

**8.23** To write a word into the memory, the processor places an address on the address bus, the data word to be written on the data bus; then issues a write command. After the data word has been written into the proper memory location, the memory control signals the processor that the write function has been completed. All processor-memory operations are conducted under internal synchronization which keeps the memory cycle complete signal active until the processor removes the request. Internal processor control circuitry also indicates whether the accessed word was an instruction or a data word. The memory control contains a refresh timing circuit and a refresh address counter with the control of memory allocated to either the processor request mode or the memory refresh mode.

**8.24** Once the DIMENSION 400 PBX is installed and initialized, the tape remains functionally

inactive until called upon due to a power failure, periodic translation updates, or maintenance or administration activity. At approximately 23-hour intervals, the tape is retensioned on the cartridge and translations are written from memory onto the tape. When a memory reload is required for any reason, the tape is activated and the entire memory is updated (or overwritten) from the tape. This requires approximately 2 minutes depending on memory size.

**8.25** The generic program can be modified by writing program patches into memory using the MAAP or via RMATS-1. The modified contents of the memory are then written onto the tape for a permanent record of the changes.

**Software Records**

**8.26** Software records are a part of memory and are required for trunks, station-to-station and station-to-attendant calling, and for dial pulse and TOUCH-TONE dialing digit registration.

**Trunk Records**

**8.27** One trunk record is required for each of the following: CO, FX, WATS, tie trunk, DID, CCSA, paging, ANI, dictation trunks, and others. These are referred to as hardware trunks since they also require circuit packs. In addition, trunk records are required for queue records and one trunk record is used for each attendant switched loop. All trunk records not assigned as hardware trunks, queue records, or ANI records become intercom records.

**Intercom Records**

**8.28** Intercom records are trunk records which are used on all station-to-station and station-to-attendant calls as well as incidental use for such features as automatic callback, call waiting, and call hold. On a station-to-station call, the intercom record is held for the duration of the call. On station-to-station calls, the intercom record is released when the attendant answers. There is no trunk hardware associated with an intercom call. Intercom records should be provided on a P.02 grade of service.

**Register Records**

**8.29** Register records are used on all station-originated calls as well as on incoming DID, tie trunk, and CCSA calls. The main function of a register record is to receive and store digits during call processing. Register records handling dial pulse calls

require no hardware, but register records handling TOUCH-TONE service calling require a TOUCH-TONE service register/receiver. Each register/receiver is associated with a specific register record. Register records with register/receivers can accept both TOUCH-TONE dialing and dial pulses. Register records without TOUCH-TONE service register/receivers can accept only dial pulses.

**8.30** The maximum quantity of register records is always provided with each memory configuration. Proper traffic engineering ensures that systems are equipped with the required amount of TOUCH-TONE service receivers and that record capacities are not exceeded.

**8.31** The register is used for record converting TOUCH-TONE dialing signals to dial pulses when the distant end is not equipped to receive TOUCH-TONE dialing signals. Both the TOUCH-TONE dialing signals and dial pulses are sent on CO-type calls to the distant end simultaneously. However, for tandem tie trunk calls, the TOUCH-TONE service receiver prohibits the TOUCH-TONE dialing signals from leaving the DIMENSION PBX on dial pulse tie trunk calls.

**8.32** Each attendant has a dedicated register record which cannot be accessed by stations, trunks, or other attendants. Although the attendant consoles are equipped with TOUCH-TONE telephone pads, the attendant register record does not require a TOUCH-TONE service receiver because signals are detected by attendant button scanning through the LC34B or LC366C data channel. Like the station register records, the attendant register records are capable of TOUCH-TONE dialing signals to dial pulse conversion, and both TOUCH-TONE dialing signals and dial pulses are sent to the distant end for CO-type calls but not for tie trunks.

### ***Two-Port Originating Register***

**8.33** A 2-port originating register can be provided for systems equipped with Feature Package 2 (Issue 3 or later), Feature Packages 3, 4, and 5 (Issue 2 or later), Feature Package 10 (Issue 1 or later), Feature Package 10 (Issue 1 or later), and Feature Package 15 (all issues).

**8.34** A 2-port originating register is provided for outgoing CO trunks requiring TOUCH-TONE calling to dial pulse conversion. This operation is necessary in cases where the trunk is defined as rotary

dial and the CO has the capability to receive TOUCH-TONE dialing signals. In some cases, the CO may not always be able to receive TOUCH-TONE dialing signals, so the trunk must be optioned for conversion of TOUCH-TONE calling to dial pulse signals. The two-port originating register is a special mode of operation of the standard TOUCH-TONE service receiver, whereby the TOUCH-TONE calling party is on one port and the called facility is on a second port. A talking path between ports one and two is normally maintained; however, when a TOUCH-TONE dialing signal is detected, this path is opened for the duration of the signal. This arrangement allows transmitting dial pulses only on trunks that are arranged for dial pulses. Previously, dial pulses and TOUCH-TONE dialing signals were transmitted simultaneously on such a connection. Prior to this arrangement, attendant TOUCH-TONE dialing to dial pulse conversion was accomplished without using a TOUCH-TONE service receiver.

**8.35** When TOUCH-TONE dialing signals to dial pulse conversion is required on attendant to tie trunk calls, the attendant bids for a station TOUCH-TONE service register record. The TOUCH-TONE service receiver then prohibits TOUCH-TONE dialing signals from leaving the PBX, eliminating the possibility of confusion at the distant end. When conversion is not required, the attendant will not access a TOUCH-TONE service receiver and TOUCH-TONE dialing signals will be sent over the tie trunk.

**8.36** An all-dial pulse system having dial pulse tie trunks will require at least one TOUCH-TONE service receiver so that TOUCH-TONE dialing signals will remain in the DIMENSION PBX on attendant-to-tie trunk calls.

## **9. AUXILIARY CIRCUITS**

**9.01** The processor interface circuits consist of tape cartridge control, data channel, extended input/output, and MAAP. Data channel circuit packs (LC34B or LC366B) are contained in the control or trunk/control carrier (Fig. 27 through 30). The LC34B and LC366B circuit packs are for fast/slow speed data transmission and reception. When used for this application, the circuit receives parallel data from the I/O bus and converts it to serial data for transmission to various types of peripheral equipment. Returning serial data is received and stored in

a register. The circuit pack is converted from fast to slow mode by a shorting plug.

**9.02** When RMATS is provided, the data channel is provided by circuit pack LC171B. Circuit pack LC171B provides the data channels for SMDR and RMATS operation.

**9.03** The extended I/O circuit pack (LC44) decodes data from the I/O address bus and distributes enable signals to the I/O circuits. The I/O circuit pack interfaces the processor I/O command leads, performs gating and timing functions for the extended I/O circuits, and provides separate command leads (such as read or write) to data links, the MAAP, and attendant console.

**9.04** The ANI circuit packs (LC31 and LC32B) are located in the control or trunk/control carrier and trunk carrier, respectively. The two circuit packs are furnished only when the customer requires identification, translation, and transmission of calling party numbers to the associated CO. This station and trunk number identification occurs during each outgoing call.

## 10. MAINTENANCE PLAN

### GENERAL



***◆ In order to preclude electrostatic noise in the system, the frame shall be well grounded. Always attach authorized wrist grounding strap before working on system or handling circuit packs.◆***

**10.01** The maintenance philosophy includes specific objectives and long-term goals to establish a practical maintenance plan. Design and development considerations include desired customer features with high reliability and ease of maintainability. The circuits are packaged on replaceable circuit packs. The components on a circuit pack are not replaceable in the field. The long-term goals (based on full usage of the provided maintenance aids) are as follows:

- (a) Isolation by craft personnel of at least 95 percent of all troubles encountered
- (b) Isolation and repair time—an average of 1/2 hour after arrival on premises
- (c) Correction of 90 percent of circuit pack failures by the first circuit pack replacement.

The ability of fault isolation to a single replaceable circuit pack minimizes replacement requirements and costs. It is estimated that less than 5 percent of the problems will be either software-associated or more complex multiple faults. The isolation of such faults may require personnel with additional training and experience. Automatic fault detection, fault reporting, and fault isolation aids are provided to support this maintenance plan. The maintenance plan calls for using these aids to isolate faults rather than replacing circuit packs as a fault isolating method.

### ALARMS

**10.02** A major or minor alarm is generated when a fault condition is detected by software or hardware. The alarms are indicated on LEDs inside the control cabinet and on the attendant console.

**10.03** A major alarm generally indicates a failure which removes a significant number of stations from service or removes a basic feature from most stations. A major alarm is also generated when any of the following conditions are experienced by the J87460F power supply in the basic cabinet:

- The -48V fuse is operated.
- The +5M, -5M, or +12V fuse is operated.
- When operating on direct current.
- When either input breaker is in the tripped or open position.

A minor alarm generally indicates a failure which affects a limited number of stations or trunks. A major alarm is generated when the J87460B power supply in the supplemental cabinet has the same conditions described above for the basic cabinet. A major or minor alarm is always indicated when one or more fault indicators light.

### FAULT INDICATORS

**10.04** Software and maintenance circuitry constantly monitor critical functions. When a fault condition is detected, a major or minor alarm is generated, and one or more fault indicators light on an alarm panel.

**10.05** The alarms and fault indicators are labeled to provide a quick index to specific maintenance procedures to restore the system to an operating condition.

#### MAINTENANCE AIDS

**10.06** Certain maintenance aids are built into the system. These maintenance aids and associated functions are as follows:

(a) **Maintenance and Administration Panel (MAAP):** This unit provides the basic craft interface with the system. It is used for diagnostic troubleshooting and for entry of translation and/or patch information. Lines, trunks, and registers may be individually selected and tested from this panel.

(b) **Alarm Panel:** Contains the major and minor alarm indicators, fault indicators, and controls used for system trouble analysis (performing diagnostic tests on the processor and memory). System initialization can also be accomplished from this panel. The ten fault indicators are grouped into subsections as follows:

- ALARM
- SYSTEM
- PROCESSOR/MEMORY
- MAAP PROCEDURE.

(c) **Other troubleshooting aids are:**

- Indicating-type fuses
- Test points on circuit packs
- Busy/idle indicators—LEDs on line and trunk circuit packs.

#### MAINTENANCE TOOLS AND TEST SETS

**10.07** The following tools and tests sets are recommended for maintenance:

(a) **X-Ray Program Package (J58879TB):** Used for intensive testing and troubleshooting.

(b) **Digital Multimeter (KS-20599, List 4):** Used for measurement of system voltages requiring greater accuracy than the standard VOM (KS-14510) can provide.

(c) **Automatic Number Identification (ANI) Test Set (J59204AJ):** Data link test set is used to troubleshoot the ANI circuitry. The test set verifies the proper signal being sent to the serving CO.

(d) **Carrying Cases:** Used for protection and shipment of magnetic tapes and circuit packs.

(e) **Transmission Test Set (Type 4AN):** Used to provide the interface between the standard hand test set and the tip and ring access points on circuit packs in order to test the transmission capabilities of the line circuits.

(f) **Hewlett Packard Model 10525T Logic Probe Equipped With Option H05, or Equivalent:** Used to detect absence or presence of system timing pulses. The logic probe can be ordered with the system.

(g) **Wrist Grounding Strap CP401 or equivalent:** Used to ground an individual who handles circuit packs to protect the circuit pack against static charges.

#### MAINTENANCE PHILOSOPHY

**10.08** Trouble reports may indicate that an alarm exists, accompanied by a customer complaint. After analyzing the report, the maintenance personnel perform the following routine procedures established for restoring the system to operational status:

- Verify trouble report with attendant.
- Observe the fault indicators and follow alarm procedures until all indicators and alarms are cleared.
- Make test calls.
- Follow nonalarm troubleshooting procedures until all nonalarm troubles are cleared.

Certain indications may require the use of one or more maintenance displays or programmed diagnostic procedures via the MAAP. The results of these diagnostic procedures are displayed on the MAAP.

Corrective action is usually simple circuit pack replacement. However, circuit pack replacement is never used as a trial-and-error method. Should use of the MAAP fail to isolate the problem, the logic probe provides additional means of locating faults.

**X-RAY PROGRAM PACKAGE**

**10.09** The X ray is a tape consisting of a series of software programs used to exercise the system. Programs are run at the factory and at the time of installation prior to any other system tests. The X-ray tape is loaded into the system in place of the system feature package tape. After initialization, the X rays run continuously unless a system failure is detected. If this occurs, a fault code is displayed on the alarm panel or MAAP. Special hardware is required for certain loop-around tests. Customer service is interrupted when X-ray tests are run. For further information regarding X ray, refer to Section 554-101-115.

**REMOTE MAINTENANCE, ADMINISTRATION, AND TRAFFIC SYSTEM (RMATS-1)**

**10.10** Maintenance testing can be performed at an RMATS-1 CF to evaluate a trouble report prior to dispatching a repairperson to the customer location.

**FEATURE PACKAGE UPDATING**

**10.11** All system feature packages can be updated to later issues by using the "blow-back" process. This entails returning the system tapes to Western Electric for updating.

**10.12** Feature Package 2 systems can also be updated by using on-site tape processing programs (ONTAP) per specification J58885A.

**10.13** The ONTAP is a DIMENSION PBX software capability which allows telephone companies to upgrade DIMENSION PBX customer's Feature Package 2 systems to new, higher issues. For example, ONTAP may be used to upgrade a customer from Feature Package 2, Issue 1, to Feature Package 2, Issue 2, and/or Issue 2 to Issue 3.1.

**10.14** The upgrade process involves transferring the customer's current translation data from its existing generic form to the form required by the new issue of the feature package. Once transformed,

the new translation data is recorded on the tape cartridge which contains the new issue of the feature package. All of the transformation and recording processing is done on the customer's DIMENSION PBX without interrupting telephone service. Hardware modifications to the system are not required to use ONTAP. However, modifications may be required in order to provide the services of the new feature package issue. For example, additional memory will normally be required when updating from Issue 1 to Issue 2 or Issue 2 to Issue 3.1.

**10.15** The upgrading of a customer's feature package with ONTAP can be done by DIMENSION PBX trained personnel. The operating instructions for ONTAP are simple and can be learned in about an hour by anyone who is familiar with the MAAP and minirecorder system. Instructions for usage are provided with the ONTAP software package.

**10.16** The ONTAP software packages are provided on standard DIMENSION PBX cartridges and may be reused to upgrade many systems. These tape cartridges are coded in the J58885A and B series.

**10.17** In addition to the ONTAP cartridges, it is necessary to obtain standard cartridges which contain the new issue of the feature package. Normally, three of these cartridges are required per system.

**10.18** In the case where a customer is being upgraded by more than one issue, then one standard cartridge for each issue is required. For example, in upgrading from Issue 1 to Issue 3.1 of Feature Package 2, one Issue 2 cartridge and one Issue 3.1 cartridge are required, plus an ONTAP tape for each issue.

**10.19** The ONTAP is designed to be activated via the RUN TAPE button on MAAP. This requires the ONTAP software to be loaded on a tape cartridge with the same physical tape block number and starting address as the run tape procedure for the issue being converted. With the ONTAP cartridge inserted in the tape transport, depression of the RUN TAPE button causes the system to request a load of the run tape procedure from the ONTAP cartridge. The effect of this is to load the ONTAP software into the system's paging buffer. Once loaded, the ONTAP software will receive control from the system once

every 25 milliseconds via the maintenance task dispenser. In order not to disturb the call processing activities of the system, the ONTAP program is partitioned into sequential states. The sequential states perform a small portion of the upgrade process and then "take a break" to let the system process calls. It is estimated that ONTAP processing adds no more than a 1 percent short-term real-time load to the system while transforming the customer's translations.

**10.20** The ONTAP transforms the customer's translation which resides in the main memory of the system. Transformation formulas are unique to the issue and memory configuration of the feature package being upgraded. The transformed data is stored in available main memory locations such as the paging buffer and unused patch space locations. The amount of memory available for storing the transformed data is usually very limited. Thus, only that data which changes numerically is stored. Translations which do not change numerically are not duplicated in memory. Instead, the memory locations of these constant translation entities are saved for direct address transformation. The transformation process may also alter the customer's translation in memory. Such transformations are designed to be compatible with the current issue of the feature package and the next issue of the feature package. This type of transformation is rare and will not change the customer's current translations.

## 11. REFERENCES

**11.01** The following sections are associated with the DIMENSION 400 PBX and, when available, may be used for additional information.

SECTION	TITLE
034-362-301	Minirecorder—KS-21447, Description, Operation, and Trouble-Locating Procedures
034-362-701	Minirecorder—KS-21447, Requirements and Adjusting Procedures
034-362-801	Minirecorder—KS-21447, Piece-Part Data and Replacement Procedures
332-610-100	Customer Premises Facility Terminal Equipment—General Description
463-210-101	24A-Type Line Status Indicator—Identification and Installation
463-332-130	89A Control Unit
554-000-000	DIMENSION PBX Numerical Index (Refer to this index for TOP Documents.)
554-000-100	DIMENSION PBX Miscellaneous Documentation Index (Refer to this index for Administration and Maintenance Manuals.)
554-010-100	DIMENSION PBX Attendant Console—Maintenance Support Information
554-010-101	DIMENSION TYPE PBX—Input/Output, Interface and Auxiliary Circuits—Maintenance Support Information
554-010-110	DIMENSION PBX Electronic Custom Telephone Service—System Description
554-010-122	DIMENSION PBX—Station Message Detail Recording
554-010-130	DIMENSION PBX—Remote Maintenance, Administration Traffic System (RMATS-1)—Description and Operation
554-010-135	DIMENSION 400 and 2000/Custom PBX—AUTOVON Service
554-010-140	DIMENSION PBX—Customer Administration Center—System Description
554-010-142	DIMENSION PBX—Customer Administration Panel—General Description
554-101-101	DIMENSION 400 PBX—Preinstallation Information
554-101-105	DIMENSION 100 and 400 PBX—Call Processing—Maintenance Support Information

**SECTION 554-101-100**

<b>SECTION</b>	<b>TITLE</b>	<b>SECTION</b>	<b>TITLE</b>
554-101-106	DIMENSION 100 and 400 PBX—Scanner/Distributor and Network Control—Maintenance Support Information	554-106-101	Energy Communications Service Adjunct—Preinstallation Information
554-101-107	DIMENSION 100 and 400 PBX—PAM Network and Port Circuits—Maintenance Support Information	554-191-100	DIMENSION PBX—Feature Document Reference Guide
554-101-108	DIMENSION 100 and 400 PBX—Central Processor—Maintenance Support Information	790-100-654	DC Power Plants
554-101-115	X-Ray Program Package—Operation Procedure—DIMENSION 100 and 400 PBXs and RMATS Central Facility	809-002-100	PBX Equipment Space
554-106-100	Energy Communications Service Adjunct—System Description	876-300-100	Electrical Protection—Station and Customer Premises Equipment
		981-012-100	Centralized Attendant Service (CAS)—General Description Information
		<b>11.02</b>	The following schematic diagrams (SDs) and associated circuit descriptions (CDs) are applicable and may be referred to when required.

DRAWING	ISSUE	TITLE	DRAWING	ISSUE	TITLE
SD-1C586-01	4	TOUCH-TONE Calling Receiving Circuit Type G1	SD-1E466-01	2	Attendant Console Repeater Circuit
SD-1E290-01	6	609-Type Emergency Transfer Circuit	SD-1E490-01	9	Remote Maintenance, Administration and Traffic System (RMATS-1)
SD-1E440-01	1	System Application	SD-1E493-01	1	30A8 CAS System Status Indicator
SD-1E441-01	25	Power Distribution	SD-5E038-01	10	Recorded Telephone Dictation Trunk
SD-1E442-01	14	Processor, Memory, and Alarm Circuits	SD-69910-01	8	Attendant Electronic Console
SD-1E443-01	7	Processor Interface Circuits	SD-7C010-01	11	Specification for CPFT
SD-1E444-01	16	Signal Distribution Circuits	SD-82386-01	7	Regulated Ferroresonant Rectifier
SD-1E445-01	6	Line, Attendant, and Tone Circuits	SD-82541-01	1	Regulated Ferroresonant Rectifier/Converter J87460B
SD-1E446-01	12	Central Office, Tie, Auxiliary Trunk, Register, and Conference Circuits	SD-82543-01	1	Regulated Ferroresonant Rectifier/Converter J87460F
SD-1E449-01	11B	Station Message Detail Recording (SMDR)	SD-95283-01	10	Recorded Announcement Unit
SD-1E450-01	7	Electronic Telephone Controller	SD-97736-01	2B	KS-21447 Minirecorder Circuit
SD-1E451-01	3	102C and 102D Display Circuits			
SD-1E460-01	2	Data Channel Repeater			