AT&T

DEFINITY® Communications System Generic 1 and System 75

Property Management System Interface Specifications

555-200-925
Issue 1, April 1990

TO ORDER COPIES OF THIS MANUAL

Call: AT&T Customer Information Center on 800-432-6600
In Canada Call 600-255-1242

Write: AT&T Customer Information Center
2855 North Franklin Road
P.O. Box 19901
Indianapolis, IN 46219-1365

While reasonable efforts were made to ensure that the information in this document was complete and accurate at the time of printing, AT&T can assume no responsibility for errors. Changes or corrections to the information in this document may be incorporated into future reissues.

Published by
The AT&T Documentation
Management Organization

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

This document describes the Property Management System (PMS) data link interface for AT&T System 75 R1V3, and DEFINITY® Communications System Generic 1. This interface allows a PMS to provide front office and back office hotel/motel management features with communications related functions coordinated with the Switch. Although this document is written for the hotel/motel evironment, its specifications may also apply to hospital environments.

Within this document the term Switch is used to refer to the System 75 or the DEFINITY® Communications System.

Information concerning housekeeper dialed status changes, controlled restriction, and message waiting can be obtained from the Switch. The Switch receives check-in and check-out message (including the guest name and call coverage path in DEFINITY Generic 1.1), Guest Information Changes and can receive controlled restriction and message waiting data as necessary.

NOTE - DEFINITY Generic 1.1 will provide several new features including support for up to 5-digit extensions, Guest Name Registration, Call Coverage Path selection and Guest information Input/Change. The PMS vendor controls the implementation of these features on the PMS; however, implementation examples (Section 1.2.2) have been included in this document for better understanding of these features. To support the new features, an additional mode of PMS data link protocol is described called the transparent mode. Generic 1.1 supports the transparent mode as well as the previously supported mode (the normal mode) used in System 75. These new features and new feature codes will be highlighted throughout this document as **the Transparent mode using the symbol (T)** which will precede the item that pertains to (T) only. The use of 4 or 5 digits and names registration is explained in detail in Sections 3.5 and 3.8, respectively.

For the new features, this document defines new feature codes for the transparent mode (T). These codes will be used only for (T), and represents messages that use 5-digit extensions where applicable. In addition Generic 1.1 will support all Feature Codes used in System 75 R1V3. Consequently, the PMS must use a message set that supports either the normal or transparent mode but not both interchangeably.

1.1 System Description

The PMS Interface is a full duplex EIA RS232C-D asynchronous data link that operates under a specific message protocol and format. The characteristics of the link, the protocol used and the message text are described in detail in the Feature Description, Section 2.0. A configuration block diagram with the interface is shown on Figure 1-1.

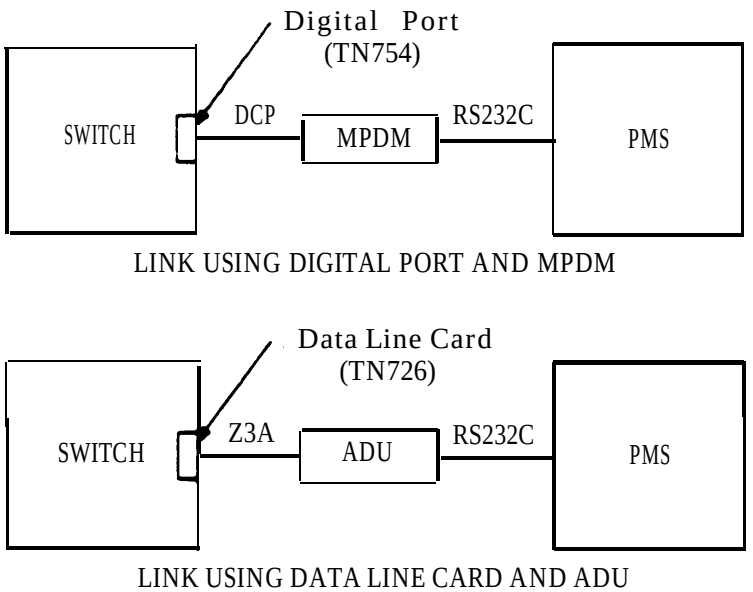


Figure 1-1. PMS Interface Block Diagram

The PMS Interface data link provides connection to the System 75 R1V3 and DEFINITY Generic 1.1. These packages provide hotel / motel communication services such as room status, controlled restrictions, message waiting, room change / room swap, housekeeper room status updates, and (T) Guest Name Display.

The PMS Interface feature is provided to permit a co-located PMS to request more sophisticated room status functions via the Switch and for communication of housekeeper status changes from the switch. In addition, the PMS may perform guest folio preparation and perform sophisticated message waiting and room station restriction functions utilizing the Switch control capabilities. The PMS can communicate with the Switch by sending and receiving specific messages associated with the functions to be performed. The PMS can receive from the Switch:

1. Housekeeper dialed status changes from guest rooms and/or designated stations.
2. Telephone restriction status changes entered on voice terminals.
3. Message waiting lamp changes entered on voice terminals.
4. Status inquiry and room data image messages indicating failures, requests for data base updates, requests or confirmation of impending link release for maintenance, and normal link operations.
5. (T) Guest Name and Coverage Path Number via room data image.

The PMS can send the Switch:

1. Room check-in and check-out messages. Check-in/check-out messages are required to support the data link since the PMS is controlling room status. Check-in messages may be sent with (T) or without guest name information. Check-ins may also include Call Coverage Path (T) number which coreelates to the destination of an unanswered call to a guest's room (for example, hotel attendant, voice mail, etc).
2. (T) Guest Information Input/Change messages. Allows input or changes in guest information (guest name and/or call coverage path) after check-in.
3. Room change or room swap messages specifying the “from” and “to” Room Station Numbers. These messages are required to support the data link so that the Switch will always reflect the most current guest room status information
4. Telephone restriction changes entered on PMS terminals.
5. Message waiting lamp changes entered on PMS terminals.
6. Status inquiry and room data image messages indicating failures, requests for data base updates, requests or confirmation of impending link release for maintenance, and normal link operations.

The messages to be sent and received depend on the functions required for the particular application This is discussed in detail in Application, Section 1.2. The specific actions taken by the Switch for each of the messages is discussed in the Operation coverage, Section 3.0.

1.2 Application

1.2.1 System 75 R1V3 and DEFINITY Generic 1 Administration Options

Hosptality Related System Parameters

The following information reviews the Switch administration forms used to implement the Switch system paremeters associated with the hospitality features. See Section 1.2.3 for hospitality screens.

- **PMS** (R1V3 only) - Yes/No.
- **Message Waiting Configuration** -determines if message waiting notification information is sent or accepted by Switch. If enabled, the Switch and the PMS exchange message waiting information. Allowable entries are act-noprns* or act-pms. Act-nopms means message waiting is operational on the Switch but no waiting message will be transmitted between the PMS and Switch Act-pros means message waiting is on the Switch and information between the PMS and Switch will be transmitted.
- **Controlled Restriction configuration** -determines if controlled restriction information is sent or accepted by the Switch. If active (act-pms), the Switch and the PMS exchange and accept controlled restriction information. Allowable entries are act-nopms* and act-pms.
- **Housekeeper Information Configuration** -determines if switch will communicate housekeeper information with the PMS. If active (act-pms) the Switch and PMS exchange and accept housekeeper information. Allowable entries are act-nopms* or act-pms.
- **Number of Housekeeper ID Digits** -the number of digits (0 through 6) the housekeeper must dial for identification.
- **Extension of PMS Log Printer** - the data extension number of the data module that is connected to the PMS/Log printer. The system dials this extension to send housekeeper status information.
- **Extension of Journal/Schedule Printer** -the data extension number assigned to the Journal/Schedule printer. This extension can be same as the PMS/Log printer. This extension is dialed by the system to send journal information or schedule reports to the printer.
- **(T) Default Coverage Path for Client Rooms** -defines the coverage path set when the Switch receives a check-out message for a valid extension when PMS is using the "transparent" mode. This only applies to stations with client room class of service.
- **Extension of PMS** -the data extension number the Switch must dial to access PMS. When this extension is entered and the PMS is ready, the Switch attempts to bring up the link.
- **(T) PMS Protocol Mode** -defines the mode of message protocol used between the switch and PMS. Allowable entries are "normal" and "transparent" .
- **Seconds Before PMS Link Idle Time-out** -the idle time in seconds (5 through 20) the Switch must wait for a signal before it enters link failure mode from the PMS transmission link.
- **Milliseconds Before PMS Link Acknowledgement Timeout** -the time in milliseconds in System 75 R1V3 (100-300) and Generic1.1 (100-500) Switch waits for an acknowledgement

---

• If act-nopms, MESSAGE ACK'ed but no action taken.

from the PMS indicating it correctly received a message. This value is also used as the "inquiry" (that is, ENQ) timeout.

- **PMS Link Maximum Retransmission** -the number or times (1 through 5) the Switch will retransmit a message to the PMS in response to a negative acknowledgement or send an inquiry for acknowledgement from the PMS before giving up on the message.
- **PMS Link Maximum Retransmission Requests** -the number of times (1 through 5) the Switch will allow the PMS to request acknowledgement for a message that it has sent.
- **Time of Scheduled Wakeup Activity Report** -the time the Wakeup Activity Report will be printed on the Journal Schedule Printer. This report summarizes the wakeup activity for each extension that had wakeup activity for the past 24 hours. Enter the time hh[:mm][a/pm] where hh=hour, mm=minute, a/pm=am or pm.
- **Time of Scheduled Wakeup Summary Report** -the time the Wakeup Summary Report will be printed on the Journal/Schedule printer. This report gives an hour-by-hour summary of the number of scheduled wakeup calls and a list of extensions to which wakeup calls were attempted but did not complete during the hour. Enter the time hh[:mm][a/pm] where hh=hour, mm=minutes, a/pm=am or pm.
- **Time of Scheduled Emergency Access Summary Report** -the time the Emergency Access Summary Report will be printed on the Journal/Schedule printer. The time is represented by hh[:mm][a/pm] where hh=hour, mm=minute, and a/pm=am or pm.
- **Announcement Type** -the type of automatic wakeup announcement the hotel guest will receive. Allowable entries are: external, music-on-hold, silence, or voice-synthesis.
- **Announcement Ports** -port numbers. The port numbers of the Speech Synthesizer circuit pack to be used for providing automatic wakeup call.
- **Auxiliary Board For Announcement** -a 3-character (for R1V3) and 4-character (for Generic 1) board number. This field requests the circuit pack address that connects to the external announcement equipment.
- **Length of Time To Remain Connected To Announcement** - the length of time in seconds (0 through 300) the hotel guest will receive a wakeup call announcement.
- **Routing Extension To Receive Failed Wakeup LWC Messages** -the extension number or 0 (attendant) where unsuccessful wakeup LWC messages will be stored.
- **Routing Extension On Unavailable Voice Synthesis** -the extension number or 0 (attendant) a wakeup call will go to if both wakeup announcements on the Speech Synthesizer circuit pack are not available.

1.2.2 Example Implementation of Names Registration and Coverage Path on a Property Management system

1.2.2.1 Names Registration

When a guest in a hotel calls any hotel service, the attendant should be able to use displayed name to address the caller correctly. One way of implementation by the PMS vendor is to have an additional field on the check-in form to enter an 'f' for a female guest, 'm' for a male guest, or 'x' for multiple guests. Using this field and the Last name field, PMS can then send the name field content that looks like "Mr. LastName" or "Ms. LastName" or "LastName" (multiple guests) to the switch.

1.2.2.2 Coverage Path

This part of the feature provides customized coverage for unanswered telephone calls to guests: for example, to send calls to the front desk, voice mail, or another room.

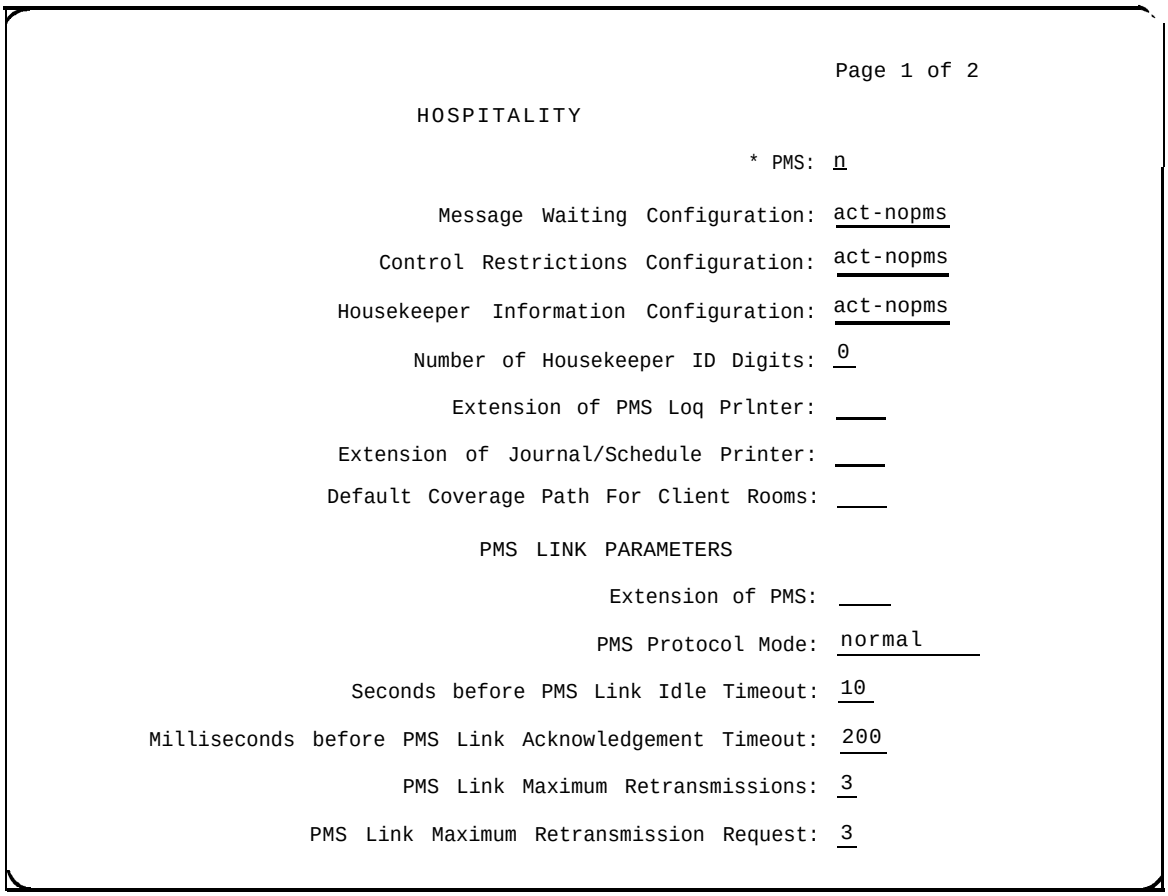
There are two parts to implementing this feature on the PMS end.

(1) PMS should provide a way to enter a "default coverage path number" (valid range 0 through 600 or blank) as part of the setup of the PMS software. This field must be alterable by the hotel personnel.

(2) PMS should add a field on the check-in form to enter a 3-digit integer (valid range 0 through 600 or blank) for the front desk to be able to enter a number if a guest desires a customized coverage path. If any number other than 0 or blank is entered, the selected coverage path is used. If 0 is entered, no coverage is used. If a blank is entered the default coverage path on the PMS is used. If the PMS default coverage path field is also blank. then the PMS can send "0xbbb" coverage path which would cause the switch to use its default coverage path (see section 1.2.1 bullet item "(T) Default Coverage Path for Client Rooms").

1.2.3 Hospitality Implementation Screens

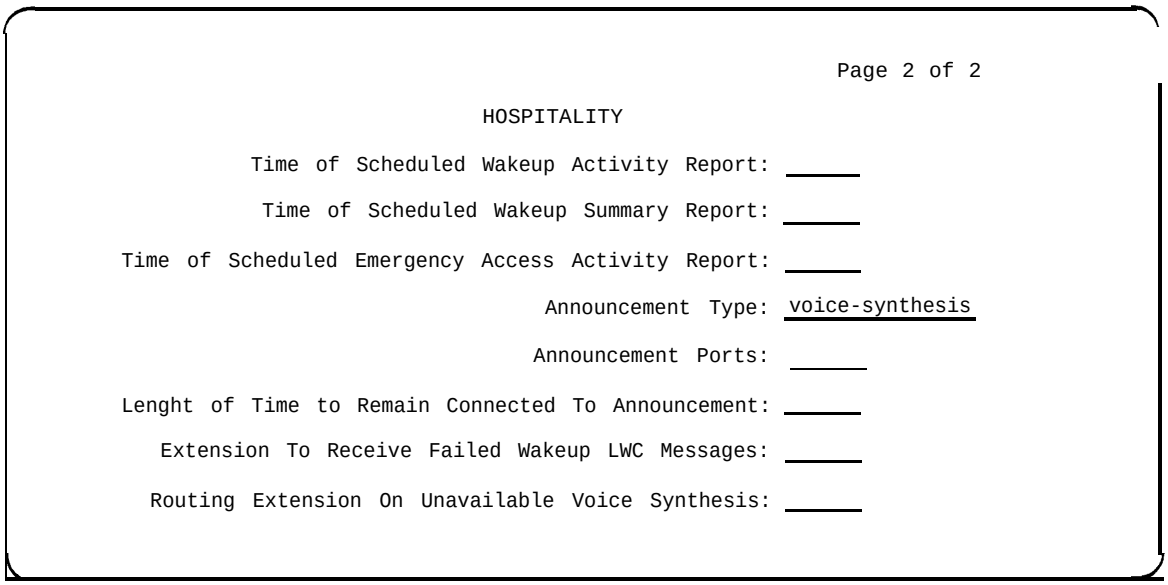
The following provides an example of the administrable Hospitality screen form. System defaults are shown in the various fields on the form. Details regarding administration of the fields are provided in the *DEFINITY® Communucations System Generic 1—Implementation* manual, 555-204-654. Information associated with the various administration commands such as "change" and "display" is provided in the *DEFINITY® Communications System Generic 1, and System 75—Administration and Measurement Reports* manual, 555-200-500.



Hospitality Form (Page 1 of 2)

Implementation Note:

* The PMS field is only displayed on a R1V3 screen, it is not displayed for R1V4.



Hospitality Form (Page 2 of 2)

Implementation Note:

This is Page 2 when the Announcement Type field is “voice-synthesis”. The Announcement Ports field must be completed if “voice-synthesis” is entered as the Announcement Type.

2. FEATURE DESCRIPTION

2.1 Line Control Characteristics

The hardware data link consists of an EIA RS232C Type D serial data electrical interface extended from a Switch data channel. The link interface appears as a data communications equipment (DCE) unit (CCITT definition) with the attributes as shown on Table 2-1 (also see Figure 1-1 and Figure 2-1 for PMS to Switch interface details):

TABLE 2-1. Link Interface Attributes

Item	Description
Data Rate	1200, 2400, 4800, 9600 bps (+1.0%, -2.5%) nominal asynchronous
Maximum Message Rate (2- Way) *	System 75 RlV3—8msg/sec DEFINITY Generic 1 Smallest message size—20msg/sec Largest massage size—2msg/sec
Operating Mode	Full Duplex Only
Electrical Interface (see Figure 2-1) Signal Form	EIA RS232C Type D Electrical standard compatibility EIA RS404
Interface Distances	From Switch to MPDM—Maximum 3000 ft. From Switch to ADU Speed (1200 bps)—Maximum Length - 20,000 ft. Speed (2400 bps)—Maximum Length -12,000 ft. Speed (4800 bps)—Maximum Length - 7,000 ft. Speed (9600 bps)—Maximum Length - 5,000 ft. From ADU/MPDM Maximum 50 ft. to PMS (RS232 Cable)
Word Framing (see Figure 2-2)	10 bits (1 start, 8 data bits, 1 stop)
Parity Options	No parity
Maximum Message Text	10 Frames (R1V3 and G1.1), (T) 30 Frames +

* The rate may vary with different values in the field "Milliseconds before PMS Link Acknowledgment Timeout."

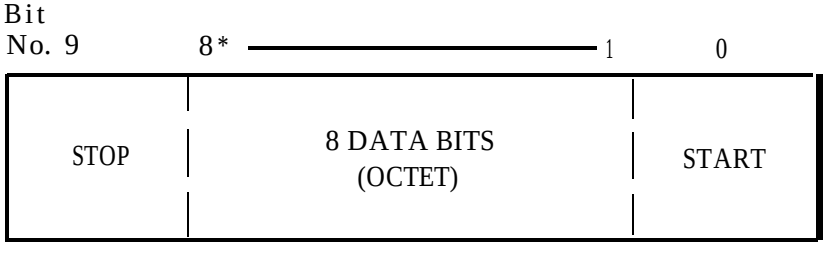
\+ DLE characters are not included.

LEAD	PIN NUMBER	FUNCTION	SOURCE
AA	1	FRAME GROUND	COMMON
BA	2	TRANSMITTED DATA	PMS
BB	3	RECEIVED DATA	INTERFACE
CA*	4	REQUEST TO SEND	PMS
CB*	5	CLEAR TO SEND	INTERFACE
CC*	6	DATASET READY	INTERFACE
AB	7	SIGNAL GROUND	COMMON
CF*	8	RECEIVED LINE DETECT	INTERFACE
CD*	20	TERMINAL READY	PMS

* These must be valid controlled signals.

Note: MPDM supports all of the above listed pins. ADU does not support pin 4. Pins 5, 6, and 8 are driven by one lead and are tied together.

Figure 2-1. PMS Interface Lead Designations



* The most significant bit is at the left.

Figure 2-2. Message Word Frame

2.2 Message Envelope

The envelope for the message text uses the following ASCII encoded characters:

STX: Start of data text, 0x02
ETX: End of data text, block check code follows, 0x03

The character oriented protocol used for communications exchange uses the following ASCII encoded characters:

ACK: Message acknowledged by receiver, 0x06
NAK: Message not acknowledged by receiver, 0x15
ENQ: Sender request for ACK/NAK from receiver, 0x05.

An *octet* is the 8-bit text field of a 10-bit word frame which excludes the Start and Stop (see Figure 2-2).

The control character frames use an entire octet for one ASCII encoded character (the most significant or 8th text bit is always a logical 0 - the STX is 0000 0010 in binary). The standard message text frames (not containing guest names) consist of two 4-bit characters per frame called nibbles (see Figure 2-3 and 2-4) which are binary coded decimal as defined in Figure 2-5.

(T) Message text frames containing Guest Names (Check-in w/Name, Guest Information Input/Change, and Room Image) will interpret the 8 data bits as two 4-bit nibbles in all frames not containing ASCII encoded name character.

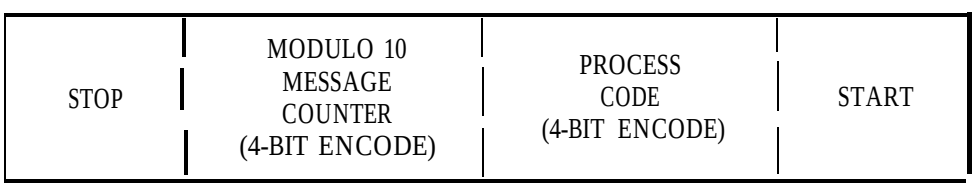


Figure 2-3. Message Format—Frame 2 (Normal Mode)

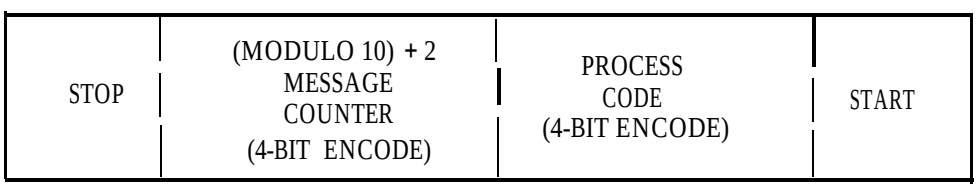


Figure 2-4. Message Format—Frame 2 (Transparent Mode)

VALUE	ENCODE	VALUE	ENCODE	VALUE	ENCODE	VALUE	ENCODE
0	0000	4	0100	8	1000	#	1100
1	0001	5	0101	9	1001	na	1101
2	0010	6	0110	‡	1010	na	1110
3	0011	7	0111	*	1011	NULL	1111

‡ The 0 encode is transmitted as "1010" in the normal mode and converted to "0000" by the receiver.

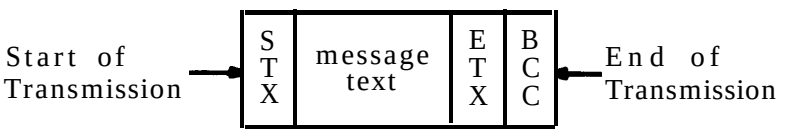
Note 1: In the Transparent Mode the message count ranges from 0x2->0xb. Thus, this nibble does not exactly follow the data encode as shown.

Note 2: na = not applicable.

Note 3. The "1011" and "1100" encodes are used to represent the "*" and "#" characters on voice terminal keypads.

Figure 2-5. Data Encoding of Message Text Nibbles

A start message will have the following general form:



Each message block will be terminated by a Block Check Code octet (BCC). The block check code is an Exclusive OR of all octets following the STX through and including the ETX (the STX is not inciuded in the BCC calculation). See Fugures 2-6 and 2-7 for example of a message. The BCC is used to insure message integrity.

Condition: Enable message waiting lamp (to PBX)

Feature Code: 13
MSG Count: 2
Function Code: 1
Station: 201

FRAME MESSAGE REGISTER No.	MESSAGE FORMAT
0	S T X
1	FEAT COD
2	MSGCT PROC
3	STA2 STA1
4	STA4 STA3
5	E T X
6	B C C

OCTET CONTENT OF ENCODED MESSAGE		STOP	MESSAGE FRAMES OCTET 9	8	5	4	1	START 0
0	2		1	0000	0010			0
1	3		1	0001	0011			0
2	1		1	0010	0001			0
A*	1		1	1010	0001			0
A	2		1	1010	0010			0
0	3		1	0000	0011			0
3	2		1	0011	0010			0

* A is the encode for 0 for transmission

Figure 2-6. Example Message - Nomal Mode

Condition: Checkin (36) Mr. John Smith, Room 22415, COV Path 157

Feature Code: 36
MSG Count: 2
Function Code: 1
Station: 22415

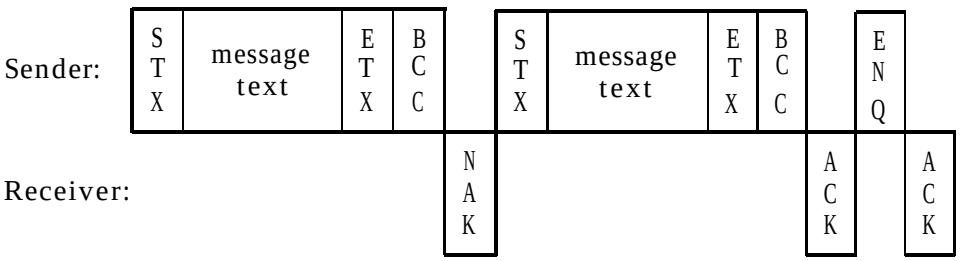
COV Path: 157
Name: Mr. John Smith

FRAME NO.	MESSAGE REGISTER MESSAGE FORMAT	OCTET CONTENT OF ENCODED MESSAGE		S MESSAGE FRAMES S				
				TOP	OCTET			START
				9	8 5	4 1		0
0	S T X	0	2	1	0 0 0 0	0 0 1 0		0
1	FEAT COD	3	6	1	0 0 1 1	0 1 1 0		0
2	MSGCT PROC	2	1	1	0 0 1 0	0 0 0 1		0
3	STA2 STA1	1	5	1	0 0 0 1	0 1 0 1		0
4	STA4 STA3	2	4	1	0 0 1 0	0 1 0 0		0
5	NULL STA5	F	2	1	1 1 1 1	0 0 1 0		0
6	CP2 CP1	5	1	1	0 1 0 1	0 0 0 1		0
7	NULL CP3	F	7	1	1 1 1 1	0 1 1 1		0
8	NAME CHAR 1	S		1	0 1 0 1	0 0 1 1		0
9	2	M		1	0 1 0 0	1 1 0 1		0
10	3	I		1	0 1 0 0	1 0 0 1		0
11	4	T		1	0 1 0 1	0 1 0 0		0
12	5	H		1	0 1 0 0	1 0 0 0		0
13	6	,		1	0 0 1 0	1 1 0 0		0
14	7	M		1	0 1 0 0	1 1 0 1		0
15	8	R		1	0 1 0 1	0 0 1 0		0
16	9	.		1	0 0 1 0	1 1 1 0		0
17	10	J		1	0 1 0 0	1 0 1 0		0
18	11	.		1	0 0 1 0	1 1 1 0		0
19	12	SPACE		1	0 0 1 0	0 0 0 0		0
20	13	SPACE		1	0 0 1 0	0 0 0 0		0
21	14	SPACE		1	0 0 1 0	0 0 0 0		0
22	15	SPACE		1	0 0 1 0	0 0 0 0		0
23	NULL NULL	F	F	1	1 1 1 1	1 1 1 1		0
24	NULL NULL	F	F	1	1 1 1 1	1 1 1 1		0
25	NULL NULL	F	F	1	1 1 1 1	1 1 1 1		0
26	NULL NULL	F	F	1	1 1 1 1	1 1 1 1		0
27	NULL NULL	F	F	1	1 1 1 1	1 1 1 1		0
28	E T X	0	3	1	0 0 0 0	0 0 1 1		0
29	B C C	9	9	1	1 0 1 0	1 1 0 0		0

Note: Ordering of Station Digits is REVERSE of other fields.
See section on “Message Text Ordering”.

Figure 2-7. Example Message - Transparent Mode

The ACK and NAK control characres are transmitted back to the sender by the receiver to indicate positive or negative acknowledgement to the transmitted message, respectively, NAK has the meaning for the sender of a request for retransmission of the message. The ENQ control character is transmitted by the sender when the ACK or NAK acknowledgement of a transmitted message is not received by the sender. and is a request for a repeat of the ACK or NAK response. Pictorially, a sample sequence would thus be:



2.3 Exchange Protocol and Message Responses

For the following discussions, the definition of sender and receiver is relative to the origination of the message because of full duplex operations:

The following parameters are administerable. See Section 1.2.1 "Administration Options" for detail on administration. The following acronyms are used in this section when referring to the parameters.

Parameters (Acronym)	**Administerable Entry**
PMS Link Maximum Retransmission Requests (MRR)	1-5 retransmissions
PMS Link Maximum Retransmission (MR)	1-5 retransmissions
Milliseconds before PMS Link Acknowledgement Time-out (LAT)	100-300 ms (R1V3) 100-500 ms (G1.1) (+l25ms tolerance)
Seconds Before PMS Link Idle Time-out (LIT)	5-20 Seconds

The sender must adhere to the following rules:

1. The BCC must be calculated for characters following the STX, including the ETX, and transmitted as the terminating character of a message packet. If the BCC is incorrect, the receiver will respond with a NAK.
2. The entire message (STX to BCC) must be transmitted within 200 ms, (T) within 350ms. If the messages is not completely transmitted within this time, the receiver will respond with a NAK ignore the rest of the message (which is interpreted as characters received outside of the framework of a message), and log the errors.
3. The next message cannot be transmitted until the last message has been acknowledged as successfully transmitted or is flushed because of message failure (administered MRR of

unanswered ENQs and/or NAK retransmissions). If this rule is violated, the receiver may accept and process messages but message overflow is likely (which possibly can result in link tear down).

4. If neither a positive acknowledgement (ACK) or negative acknowledgement (NAK) is received from the receiver within the LAT[1]. After transmission of the BCC, the sender will transmit an ENQ (inquiry), requesting a repeat from the receiver of that ACK/NAK response. After the initial LAT delay with no response from the receiver, the sender will issue up to MRR-1 subsequent ENQs in intervals of LAT (for a total of up to MRR ENQs requesting a message acknowledgement), after which the sender will flush the message. If the sender does not send an ENQ within the LAT, the receiver assumes that the ACK/NAK has been received. Consequently, if the sender transmits an ENQ after the LAT, the receiver logs the event as an unsolicited ENQ and sends a NAK.

5. The sender must assume that an expected ACK or NAK response to a sent message or an ENQ response to a received message does not occur in a message packet (STX through BCC) being simultaneously received. If the sender embeds an ACK or ENQ in a message, the receiver ignores the ACK or ENQ (and does not include in the BCC calculation) and logs an error.[2] If the sender embeds a NAK in a message (that is, it is really not a nibble with value 0x15 but a message response), the receiver transmits a NAK and logs an error since the NAK is considered part of the message text which causes the BCCs to be different.

6. Upon receipt of a NAK (negative acknowledgement) from the receiver, the sender will retransmit the current message using the same message count (up to MR attempts - see next note); retransmission must be started within the LAT after receipt of the NAK. If the transmission is not started (or an ENQ received) within LAT, the Switch will drop the link.

7. When MRR retransmissions are made due to receiver NAKs or MRR ENQs are sent to the receiver due to non-acknowledgement, the sender will flush the message and log the unsuccessful transmission. If the sender does not flush the message and keeps sending the message, the receiver treats the message as a new message.

8. Each time a new message is sent, the message count field must be incremented by 1, modulo (10) or (T) modulo (10) + 2.

9. The priority among conflicting actions at a sender is:

   - Message currently being sent
   - Responses to ENQ
   - ACK or NAK to received message

---

1. System 75 R1V3 and Definity Generic 1 have a tolerance of up to a 125ms delay for the LAT inherent in their system design. Therefore, the PMS should send ENQs such that the switch receives them as close as possible to but not after the LAT expires to compensate for switch's real time deficiencies. For example, if the LAT is 200 ms, the switch's LAT expires between 200 - 325 ms after the end of the original transmission. Similarly, if the PMS does not respond within the LAT, the switch sends an ENQ. However, the switch will send this ENQ between the tune of LAT to LAT plus 125ms.

2. Since the normal mode requires 0x0 -> 0xa conversion in the message text, the ACK and ESQ charactes are not possible in the message text in the sender and receiver rules are followed. However, these values are possible in the transparent mode. The difference between interpreting these chracters as control chracters or message text is the presence of a DLE character before these characters. See Section 2.5.

- Retransmission in response to NAK
- Generic message.

The receiver must adhere to the following rules:

1. Verify that the entire message (STX through BCC) is received within 200 ms (T 350ms). Otherwise, corrupted messages could be processed.
2. Calculate a BCC for the received characters following the STX, inciuding the ETX; compare the calculated BCC against the received BCC to insure message integrity. Otherwise, corrupted messages could be processed.
3. As soon as possible after the BCC verification (after 10 ms if receiver is not actively sending a message) the receiver must ransmit a response. If the receiver waits longer than the LAT, the sender will send an ENQ.
4. The receiver must complete sending a message packet before transmitting an ACK or NAK response to a received message. If the receiver breaks this rule by embedding an ACK or ENQ in an outgoing message, the sender ignores the ACK (and does not include in the BCC calculation), logs an error, and sends an ENQ after the LAT times out. If the receiver breaks this rule by embedding an NAK in an outgoing message (that is, it is really not a nibble with value 0x15 but a message response), the sender transmits a NAK in response to the outgoing message since the NAK is considered part of the message text which causes the BCCs to be different. Also, the sender logs an error and sends an ENQ after the LAT times out.
5. After transmitting the ACK/NAK response, the receiver must repeat the previous reply if an ENQ is received within the LAT after the original transmission of the ACK/NAK; this may be repeated until the maximum MRR (for a total of MRR received ENQs at LAT intervals). If the receiver does not reply, the sender transmits another ENQ.
6. The receiver must respond NAK to a message transmission when:
   a. A period of 200 ms (T) 350 ms has expired since reception of an STX with no BCC received (incomplete message)
   b. The BCC calculated for the received characters does not match the received character following the ETX
   c. The message text (excluding DLEs - see section 3.5) is less than three characters or greater than 10 or (T) 30 characters.
7. The receiver must respond with NAK to a received ENQ when:
   a. The original ACK/NAK reply has been repeated up to MRR times in response to ENQs spaced LAT or less. After MRR retransmission of an ACK/NAK, the link will also be dropped.
   b. The interval since the last response (to message or to ENQ) is greater than LAT ms (assumed missed message).
8. The receiver must increment the expected message count of the sender by one after receiving a message modulo (10) or (T) modulo (10) +2.

2.4 Link Setup and Drop Conditions

Link Setup

The PMS, if operational, must have the Data Terminal Ready EIA pin in the “on” state. The switch attempts to bring the link up by placing an internal call to the data extention connected to the PMS. This call sets the Data set Ready EIA pin to the “on” state which allows the PMS and the switch's data module to “handshake”. The switch will wait up to 12 LIT periods for the PMS to send a status inquiry message before dropping the link. However, if the PMS sends ten other messages before the status inquiry message, the switch will drop the link. Upon receipt of the status inquiry message, the switch sends a status inquiry response and restarts the LIT. Restarts (including power up) cause the switch to attempt link setups within 5 minutes after switch recovery. The switch will immediately retry after most link errors, but will wait 5 minutes for futher attempts if the first attempt fails. For protocol error counter overflow and internal buffering overflow, the switch will wait five minutes before attempting link setup.

Link Drop

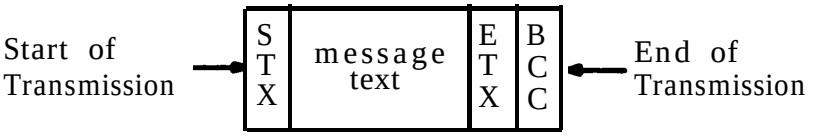
The switch drops the physical layer of the link by tearing down the call to thedata extension which causes the data channel to change the Data set Ready EIA pin to the “off” state. However, some date sets may keep the Data set Ready EIA pin “on” which may give the appearance that the physical layer is still “up”.

2.5 Time-out Control

In order to maintain normal link operations, the PMS must send the Switch at least one message every LIT seconds. Otherwise, the LIT will expire causing the link to drop.

2.6 Message Text Format Structure and Encoding

As noted previously, the general format for a message packet is:



Information in the text is treated as 8-bit characters. However, these characters are interpreted as either two 4-bit encoded digits (nibbles) or (T) ASCII characters. Consequently, a zero valued most significant bit is used to pad the ASCII character to 8-bits. Figure 2-5 shows the encoding of the nibbles and the format of the (T) ASCII chracters. Since ASCII characters are supported in some messages, (T) provides two modes of the protocol.[3] The first mode, “normal” only uses nibbles and converts all 0x0 message text nibbles into 0xa. System 75 and DEFINITY Generic 1.1 systems support this protocol. (T) The second mode, “transparent,” uses both nibbles (without 0x0 to 0xa conversion) and ASCII characters in the message text. The Data

3. The Names Registration, Guest Input/Change and 5-digit Room Station Number feature set require ASCII characters.

Link Escape (DE) character is used to precede any characters in the message text that have a value also used by "control characters" to distinguish message text from control characters (for example, STX) since 0x0 to 0xa conversion cannot be used. As an example, the character sequence "DLE STX" in the message text is interpreted as 0x02 character value whereas "STX" without the preceeding DLE is interpreted as the STX control character. (T) can use either mode.

The first two characters immediately following the STX are fixed in format and imply the format and length of the remaining message data characters, which varies for different message type to message type. A more detailed layout of the message is shown in Table 2-2.

TABLE 2-2. PMS Message Layout

FRAME NO.		
0	STX	8 bits
1	VIOL FEAT CODE	1 bit 7 bits
2	MSGCT PROC CODE	4 bits 4 bits
3 thru N-2	MESSAGE DATA	8 bits 8 bits 8 bits
N-l	ETX	8 bits
N	BCC	8 bits

The "FEAT CODE" character specifies which of the possible variable length feature messages formats (for example, 11 or 31 (T) for Housekeeper Status from Room) applies to the message data. The receiver sets the most significant bit of the FEAT CODE to a logical 1 when content errors as invalid encoding for characters interpreted as nibbles, invalid chracters for fields interpreted such as ASCII (T), invalid coverage paths (T), invalid station numbers and invalid feature and process codes exist in the message. Thus, this bit is the "VIOL" bit and indicates a message violation. The receiver returns the invalid message to the sender with the violation bit set (VIOL) after inserting its own correct message count into the message envelope. For example, a "check-in" message (FEAT CODE = 16 or 36 (T)) from the PMS to the Switch will be transmitted back to the PMS as a check-in violation message (FEAT CODE = 96 or (T) B6). Usually, content errors will occur if the sender's encoding algorithm fails or if an odd number of bit errors occur in the same position in different characters of the transmitted message.

The receiver of a violation message (for example, the original sender of the invalid feature message) has the responsibility to appropriately log the individual violation message(s) for later problem determination and correction.

Frame 2 (the MSGCT and PROC CODE nibbles) consists of two 4-bit encoded digits (Figures 2-3 and 2-4). The most significant 4 bits, the MSGCT field, represents a message counter. The counter is modulo (10) or (T) modulo (10) + 2. The message counter complements the ENQ in eliminating acceptance of duplicate messages. Such a possibility could occur if an ACK was corrupted to an NAK and the message retransmitted; the receiver is expected to notice the immediate repeated message count and will ACK the message but will not act on the data. The message counter is incremented by the sender with each new message, and not incremental

when retransmitting in response to an NAK from the receiver. If the message count is not what is expected by the switch, the switch logs an internal error and resets the message count to the received value. The message counter runs from 0 (encoded "A") through 9 in the normal mode or 2 through 11 in the transparent mode and is relative to the originator.

The "PROC CODE" nibble denotes a "process code." This code represents a specific action or processing for that feature message.

The (FEAT CODE, PROC CODE) notation is used throughout this document to denote a feature message (FEAT CODE) with processing actions (PROC CODE). For instance, (13,1) denotes a message waiting lamp feature, with PROC CODE= 1 implying that the Switch is to turn on the message waiting lamp for an indicated Room Station Number (RSN).

The MESSAGE DATA fields, frames 3 through N-2 in the message layout, consist of two 4-bit encoded digits (T) per 8-bit character, called "nibbles," with encodings or 8-bit ASCII characters. In all message feature but one. part of the MESSAGE DATA information is the Switch Room Station Number. Additional processing information may also be passed according to the message feature type.

Null characters are used to pad out message characters where no more data or name characters exist. Definitions of null characters used by the normal and transparent mode are explained below.

The following encoding rules apply to all message frames (any frame between the STK and ETX) in the "normal" mode.

- The binary nibble 1010 is the encode in MESSAGE DATA fields for the 0000 nibble; this prevents MESSAGE DATA octets such as 0x02, 0x03, 0x05, and 0x06 from being confused with STX, ETX, ENQ, and ACK, respectively (for example, message text frame that has value 0x03 would be transmitted as 0xa3).
- The 0xff denotes a null character (not the standard ASCII null character 0x00) and will be used to pad out message characters . In a frame with only one 4+bit information digit the null "0xf" nibble pads the most significant 4-bit field.
- Leading zeros (encoded 0xa) are used for nibbles of data items that are lower in value than the allotted space; for example, Room Station Number 305 will be sent as a3a5.
- Tne BCC 8-bit octet does "not" follow the 0x0 -> 0xa encoding rule and thus may be 0x02, 0x03, 0x15, etc. - it maybe assumed always that the character received immediately after an ETX is the BCC for the transmitted message.

For the transparent mode, the following encoding rules apply to all message frames (any frame between the STX and EIX).

- The DLE character must precede any character valued 0x00 to 0x1f in the message text.
- Leading zeros are used for nibbles of data items that are lower in value than the allotted space; for example, Room Station Number 305 will be sent as 00305.
- The 0xff denotes a null character (not the standard ASCII null character 0x00) and will be used to pad out frames. In a frame with only one 4-bit information digit the null nibble pads the most significant 4-bit field Name characters. however, will be filled with ASCII space chraacter 0x20 for padding the field.
- The BCC 8-bit octet always follows immediately after an ETX. Any transmitted DLE characters are included in the BCC.

Figure 2-8 shows the message format key and as shown previously, Figures 2-6 and 2-7 show examples of messages using "normal" and "transparent" modes. Figures 2-9 through 2-16 show the message formats for each of the feature codes (identified as either normal or transparent).

Many of the teature messages require that a “station number” be specified. This 4-digit or (T) 5-digit number is always the Switch station number and usually correlates identically with the hotel room number. For cases where the hotel room/room station number do “not” correlate, the PMS has the responsibility to perform the room-to-station number mapping for all messages sent or received over the data link.

The usage of various (feature, process) messages and any message responses is discussed in Operation, Section 3.

2.6.1 Message Text Ordering

The extension, housekeeper digits, coverage path, and name fields consist of several nibbles or characters which have a defined ordering. Extensions consist of 5 nibbles which are mapped from the least significant digit to the most significant digit (“backwards ordering”). For example, the extension 54321 maps to STA5 STA4 STA3 STA2 STA1 symbols used in Figures 2-9 through 2-16. The housekeeping digits and the coverage path number use the reverse of the ordering used for station digits (“forward ordering”). Thus, if the user dials the housekeeper FAC followed by “123456,” these digits map to DIC1 DIG2 DIG3 DIG4 DIG5 DIG6 symbols used in Figures 2-9 and 2-10. Similarly, if coverage path 123 is used in a message, this number maps to CP1 CP2 CP3 symbols used in Figures 2-12, 2-14, and 2-7.

The name characters are ordered as the name is spelled (“forward ordering”) and is left justified and padded with space characters as necessary. Thus, the name “abc” maps to the symbols used in Figures 2-12, 2-13 and 2-14 as follows: NAME CHAR1 = ‘a’, NAME CHAR2 = 'b’, NAME CHAR3 = ‘c’, and NAME CHAR4 thru NAME CHAR15= ' ' (all blanks).

STX - Start of Text (0x02)

FEAT COD - Feature Code

MSGCT - Message Count

PROC - Process Code

STA1->STA5 - Room Station Number (RSN) Digit

DIG1->DIG6 - Information Digits

NULL - Padding Character

NAME CHAR 1->NAME CHAR 15 - ASCII Encoded Characters of the Guest Name.
Valid Entries 0x20->0x7E

CPl ->CP3 - Call Coverage Path Digits

MSGW - Message Waiting Lamp Status Indication

RESTRICTION LEV - Restriction Level

V/O - Vaccant or Occupied Room Status

STF1>STF5 - "From" Room Station Number in Room Change/Swap Message

RR - Link Release Request Code

ETX - End of Text (0x03)

BCC - Block Check Code

Figure 2-8. Message Format Key

FRAME NO.	(13) MESSAGE WAITING	(T) (33) MESSAGE WAITING
0	STX	STX
1	13	33
2	MSGCT PROC *	MSGCT PROC *
3	STA2 STA1	STA2 STA1
4	STA4 STA3	STA4 STA3
5	ETX	NULL STA5
6	BCC	ETX
7		BCC

* PROCESS CODES

1: Enable (to PBX)

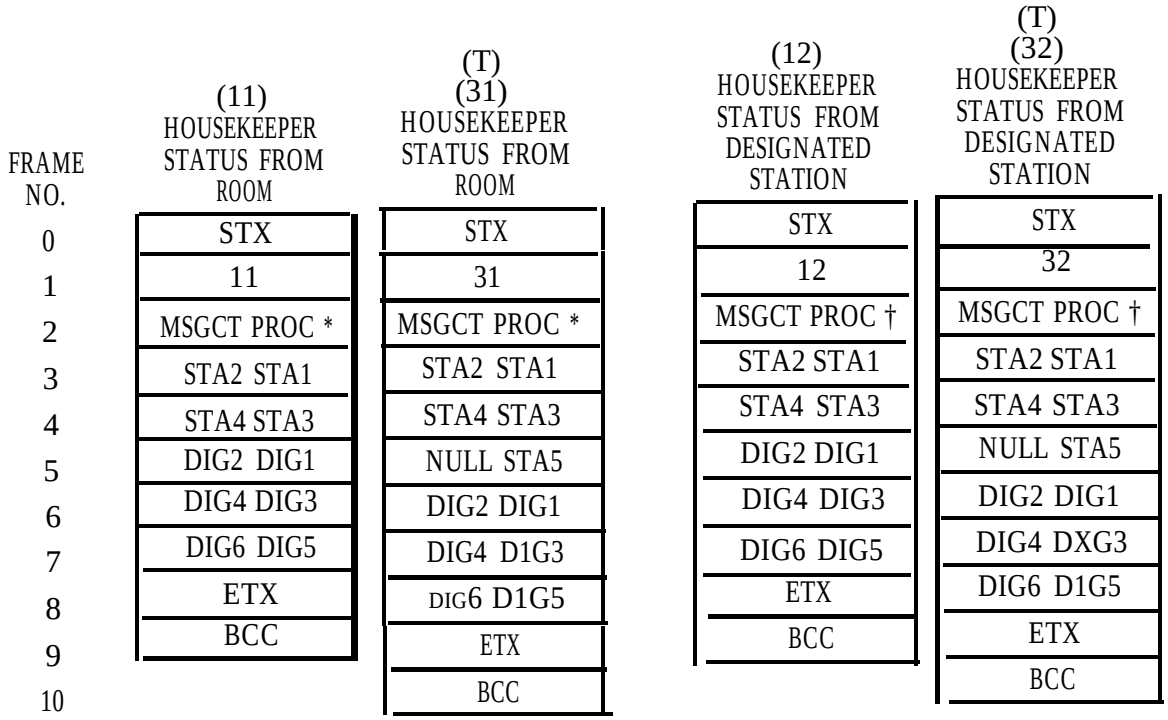
2: Clear (to PBX)

3: PBX enable (to PMS)

4: PBX clear (to PMS)

5: Lamp was already ON or is still on due to another message type (LWC, for example).

Figure 2-9. Message Waiting Message Formats



* PROCESS CODES

1 thru 6:

PMS Interpreted

8: Content/state error

9: Content/state valid

† PROCESS CODES

1 thru 4:

PMS Interpreted

8: Content/state error

9: Content/state valid

Note: DIGn: optional additional information digits (0-6) (padded with null encode for digits not used)

Figure 2-10. Housekeeper Status Message Formats

FRAME NO.	(16) CHECKIN/OUT
0	S T X
1	1 6
2	MSGCT PROC *
3	STA2 STA1
4	STA4 STA3
5	NULL NULL
6	ETX
7	BCC

FRAME NO.	(T) (36) CHECK IN
0	S T X
1	3 6
2	MSGCT PROC
3	STA2 STA1
4	STA4 STA3
5	NULL STA5
6	CP2 CP1
7	NULL CP3
8	NAME CHAR 1
9	2
10	3
11	4
12	5
13	6
14	7
15	8
16	9
17	10
18	11
19	12
20	13
21	14
22	15
23	NULL NULL
24	NULL NULL
25	NULL NULL
26	NULL NULL
27	NULL NULL
28	E T X
29	B C C

(T) (46) CHECKOUT
S T X
4 6
MSGCT PROC ‡
STA2 STA1
STA4 STA3
NULL STA5
E T X
B C C

* PROCESS CODES

1: Checkin RSN (to PBX)
2: Checkout RSN (to PBX)
5: Checkout complete for RSN message waiting lamp not on. (to PMS)
6: Checkout complete for RSN message waiting lamp was on. (to PMS)
7: Checkout message received no action taken. room already vacant (to PMS)
8: Checkin message received. no action taken, roofs already occupied (to PMS)

† PROCESS CODES

1: Checkin RSN (to PBX)
2: Checkin message received, no action taken, room already occupied (to PMS)

‡ PROCESS CODES

1: Checkout RSN (to PBX)
2: Checkout complete for RSN message waiting lamp not on. (to PMS)
3: Checkout complete for RSN message waiting lamp was on. (to PMS)
4: Checkout message received no action taken. room already vacant (to PMS)
5: Checkout complete for RSN message waiting lamp is on due to another message type.

§ For future enhancements

Figure 2-11. Check-in/ Out Message Formats

FRAME NO.	(15) CONTROLLED RESTRICTION
0	S T X
1	1 5
2	MSGCT PROC *
3	STA2 STA1
4	STA4 STA3
5	RESTRICTION LEV
6	NULL NULL
7	NULL NULL
8	E T X
9	B C C

(T) (35) CONTROLLED RESTRICTION
S T X
3 5
MSGCT PROC *
STA2 STA1
STA4 STA3
NULL STA5
RESTRICTION LEV
E T X
B C C

* PROCESS CODES

1: Set restriction level (to PBX)

2: PBX entry (to PMS)

Note:

Restriction level: One of eight (0-7) possible restriction level codes

0 : Restore line to non-restriction state
1 : Set outward restrictions
2 : Set station-to-station restriction
3 : Set outward and station-to-station restriction
4 : Set total restriction
5 : Set termination restriction
6 : Set outward and termination restriction
7 : Set station-to-station and termination restrictions

Figure 2-12. Controlled Restriction Message Formats

FRAME NO.	
0	STX
1	17
2	MSGCT PROC *
3	STA2 STA1
4	STA4 STA3
5	NULL V/O
6	NULL MSGW
7	RESTRIVTION LEV
8	NULL
9	NULL
10	NULL
11	ETX
12	BCC

* PROCESS CODES

1: Request image (information)
2: Image response
3: PMS image (DB swap)
4: PBX image (DB swap)

(T)
(37)

FRAME NO.	ROOM DATA IMAGE
0	STX
1	37
2	MSGCT PROC *
3	STA2 STA1
4	STA4 STA3
5	NULL STA5
6	NULL V/O
7	NULL MSGW
8	RESTRICTION LEV
9	CP2 CP1
10	NULL CP3
11	NAME CHAR 1
12	2
13	3
14	4
15	5
16	6
17	7
18	8
19	9
20	10
21	11
22	12
23	13
24	14
25	15
26	NULL NULL †
27	NULL NULL †
28	NULL NULL †
29	NULL NULL †
30	NULL NULL †
31	ETX
32	BCC

†For future enhancements

Figure 2-13. Room Data Message Formats

FRAME NO.	(20) ROOM CHANGE/ SWAP	(T) (30) ROOM CHANGE/ SWAP
0	S T X	S T X
1	2 0	3 0
2	MSGCT PROC *	MSGCT PROC *
3	STA2 STA1	STA2 STAl
4	STA4 STA3	STA4 STA3
5	STF2 STF1	NULL STA5
6	STF4 STF3	STF2 STF1
7	E T X	STF4 STF3
8	B C C	NULL STF5
9		E T X
10		B C C

* PROCESS CODES

1: Room change (from PMS)

2: Room swap (from PMS)

3: Room change/swap performed but an error was detected (switch to PMS)

Note: STA represents "change to" RSN
whereas STF represents "change from" RSN

Figure 2-l4. Room Change/Swap Message Formats

(T)
(38)

FFAME NO.	GUEST INFORMATION INPUT/CHANGE
0	S T X
1	3 8
2	MSGCT PROC *
3	STA2 STA1
4	STA4 STA3
5	NULL STA5
6	CP2 CP1
7	NULL CP3
8	NAME CHAR 1
9	2
10	3
11	4
12	5
13	6
14	7
15	8
16	9
17	10
18	11
19	12
20	13
21	14
22	15
23	NULL NULL †
24	NULL NULL †
25	NULL NULL †
26	NULL NULL †
27	NULL NULL †
28	E T X
29	B C C

† For future enhancements

***** PROCESS CODES

1: Change/input data (to PBX)
2: Change/input completed as requested (to PMS)
3: Change/input received, no action taken, RSN vacant (to PMS)
4: Change/input received, no action taken, information stored the same for RSN (to PMS)

Figure 2-15. Guest Information Input/ Change Message Format

FRAME NO.	(70) STATUS INQUIRY
0	STX
1	7 0
2	MSGCT PROC *
3	NULL RR
4	ETX
5	BCC

* PROCESS CODES

F NOP test ("are you there")
O NOP test response
no uncommunicated
status changes
1 NOP test response,
PBX has uncommunicated
status change, initiate
data base swap
2 NOP test response, memory
reinitialized, initiate data
base swap for vacant rooms
and occupied rooms with active
restriction and/or message
waiting lamp
3 Data base swap initiated
4 Data base swap completed
5 Request data link release
6 Data link release confirmed

Note: Reason codes (RR) are described in Section 3 under "Release of Data Link for Maintenance (Function Codes 5,6)".

Figure 2-16. Status Inquiry Message Format

3. OPERATION

3.1 General

This section discusses the operations associated with each feature message. The set of feature messages actually used may vary among various PMS system applications. Discussed for each feature message will be general operation, summary of the process codes defined and their uses, and Switch and/or PMS considerations:

The abbreviations used throughout this section are:

RSN	Switch Room Station Number - station Room Station Number assigned in the Switch for a guest room
HR	Housekeeper Status originated from Room
HD	Housekeeper Status originated from a Designated Station
MW	Message Waiting status change
CR	Controlled Restriction
CK	Check-in/check-out
RI	Room Image message
RC	Room Change/Swap
GI	(T) Guest Information Input/Change
SI	Status & Inquiry

The feature codes available are summarized in Table 3-1.

TABLE 3-1. Feature Message Summary

Operational Feature	Feature Code	Purpose
Housekeeper Status-Room (HR)	11 (T) 31	Communicate housekeeper -dialed status changes originated from room
Housekeeper Status-Remote status Designated Station (HD)	12 (T) 32	Communicate housekeeper -dialed changes originated from a designated station
Message Waiting (MW)	13 (T) 33	Communicate message waiting lamp status changes
Controlled Restriction (CR)	15 (T) 35	Communicate changes in room station calling restictions placed on RSN
Check-in/out (CK)	16 (T) 36 (T) 46	Communicate room check-ins and check-outs Check-in when using Guest Name Display Check-out when using Guest Name Display
Room Data Image (RI)	17 (T) 37	Exchange status information for a Room Station Number (RSN)
Guest Name Input/Change (GI)	(T) 38	Communicates Guest Name or coverage path Information changes
Room Change/Swap (RC)	20 (T) 30	Perform room change or swap operations between two rooms
Status Inquiry (SI)	70	Data link maintenance

The following sections describe each of the feature codes: general operations, process codes, and implied Switch and PMS actions.

3.2 Housekeeper Status [Feature Codes 11, 12 and (T) 31, 32]

3.2.1 General

Housekeeper Status enables the on-line tracking of the housekeeper services and room state changes. Six process codes for dialing from room stations and four process codes for dialing from designated station lines, each with up to six additional information digits available for room state changes and/or auxiliary processing such as housekeeper tracking, etc.

Four feature messages are available: 11 (HR) implying a status update call originated from the affected RSN, and 12 (HD) implying a status update call for a 4-digit RSN originated remotely from one of the possible room stations designated for that purpose (known as designated stations.) (T) Feature codes 31 (HR) and 32 (HD) will be used with up to 5 digit extensions.

The housekeeper status message feature capability is optional via the Switch installation translation parameters.

3.2.2 Message Summaries (also see Figure 2-9)

Housekeeper Status From Room [Feature Code 11 or (T) 31]

Process Code	Message Direction	Indications
1 thru 6	Switch to PMS	The associated feature access code was dialed from the room station number indicated. Message may include up to 6 digits in addition to the access code.
8	PMS to Switch	PMS rejects the validity of the message text or an invalid state change was indicated
9	PMS to Switch	PMS accepts the status change.

Housekeeper Status From Designated Station [Feature Code 12 or (T) 32]

Process Code	Message Direction	Indications
1 thru 4	Switch to PMS	The associated feature access code and the indicated station number were dialed from a designated station (with up to 6 additional digits)
8	PMS to Switch	PMS rejects the message
9	PMS to Switch	PMS accepts message

3.2.3 Operational Considerations (act-pms)

Feature Access Code/Message Process Code Correlation

The feature access code (FAC) determines the process code for either room or designated station originated calls. The correlation between a FAC and the process code is specified by the relative numbering of the FAC in the Switch installation transition. The meanings of the process codes (for example, that process code *11 means “housekeeper in room”) are assigned by the PMS. For futher clarification refer to Implementation Manual.

Example FAC	Possible Definition
*11	Housekeeper in Room
*22	Room Clean-vacant
*33	Room Clean-occupied
*44	Room Not Clean-Vacant
*55	Room Not Clean-Occupied
*66	Room Clean-Needs Inspection

Switch Originating Dialing Procedures

The dialing procedures for the housekeepers are determined by the Switch installation translation. The assignable items are:

1. Feature access codes (6 possible for room originated updates, 4 possible for designated station originated updates) which correlate with PMS feature message process codes
2. Station numbers capable of remote housekeeper status change [designated station(s)]
3. Number of additional information digits (for example, number of Housekeeper ID digits) to be dialed and transmitted to the PMS (the same number of ID digits are used for either room or remote designation station).

The Housekeeper Status messages can carry, in addition to the affected station number, from zero to six arbitrary variable digits entered by the caller via the touch-tone or rotary dial. With 0 additional information digits specified in Switch translation, the dialing sequences are:

for room originated	FAC only
for remote status change (des. station):	FAC+ (dial tone)+ affected station

If the number of additional digits specified in Switch translation is nonzero (1 through 6) another dial tone is returned to the caller after the “standard” dialing sequence. The caller can then dial up to the number of digits specified (extra dialed digits are ignored). For room originated call, for instance, the dialing sequence would be:

Housekeeper in Room

FAC + (dial tone) + 1 through 6 additional digits

Designated Station

FAC + (dial tone) + digits of affected station + (dial tone) + 1 through 6 additional digits

These additional digits can represent a Housekeeper ID number and/or a dialed status of the room or special request to the PMS. The dialed digits will be entered in the DIG1 through DIG6 fields (see Figure 2-9) or the transmitted Housekeeper Status feature message, for interpretation by the PMS.

If the Switch's translation define the number of additional digits to be less than six, the digits will be placed starting at nibble DIC1 and the unused nibbles of the fixed length message will be padded out. If 0 additional digits are specified, all six DIG fields will be transmitted as nulls.

If an incomplete dial time-out occurs, no message will be sent to the PMS and intercept tone will be returned to the caller. If an incomplete sequence is dialed and the Housekeeper hangs up no message will be sent to PMS.

PMS Response to Housekeeper Status Feature Message

After the housekeeper dialing sequence is completed, the feature message, (11, 1-6), (T) (31,1-6), (12,1-4), or (T) (32,1-4), formatted with the affected RSN and any additional dialed digits, is sent to the PMS.

The PMS must interpret the received message information and return the message to the Switch within a 4-second interval. The message text returned to the Switch must be identical to the message received, with the exception of the message count and process code. The process code returned must be 8 (signifying rejection of the received message) or 9 (signifying acceptance of the received message information).

Switch Response to PMS Returned Messages

After the initial originating dialing sequence and message transmission to the PMS, the Switch awaits the PMS returned message for a 4-second period. The Switch will (provided the caller remains off-hook) return a tone as follows to signify the completion status of the status update:

Reorder tone: if no valid process code 8 or 9 message response arrives from the PMS before the 4-second interval

Confirmation tone: if a Content Valid (process code 9) message response is received

Intercept tone: if a reject (process code 8) message response is received from the PMS.

If the caller goes on-hook (hangs up) before the time-out period or before the housekeeper status response message is received from the PMS, the received response message is ignored by the Switch.

Failure Considerations

In the case of a data link or PMS failure (communication is severed), the Switch will internally log message data, which would have been sent to the PMS for that call, using the "list pms-down" report available from the SAT. The message will have the following format:

Extension	Event	Reason	Time
XXXX	from room, code x	PMS link-out	xx:yy am
or	or	or	or
[(T) XXXXX]	from stn, code x	PMS link-out	xx:yy pm

Messages can also be routed to the optional PMS Log printer in the following format:

PMS dd/mm/yy hh:mm xxxx FROM ROOM:Code x PMS link out of Service

or

PMS dd/mm/yy hh:mm xxxx FROM STATION:Code y PMS link out of Service

Note: x ranges from 1 through 6 and y ranges from 1 through 4.

For Generic 1.1, the caller is always given confirmation tone if printer is up, assuming that later on immediate manual entry into the PMS can be done from the printed copy or " list pms down" log. The caller is given reorder tone if the printer is unvailable. For System 75 R1V3, the system returns confirmation tone independent of the printer state.

Housekeeper Status data will not be stored in the Switch. Therefore, during Switch failure no room status information is included in the data base update procedure. Upon PMS failure, the data backups are the internal Switch logging ("list pms down") and the optional printer output (PMS Log).

3.2.4 Operational Considerations (act-nopms)

With the feature inactive, the Switch will not send houskeeper information to the PMS. However, this information will be logged on the PMS Log printer if a printer is available. The message will be printed as " Feature active nopms". The Switch will ACK message from the PMS for Housekeeper status, however, the Switch will send a violation message to the PMS and not act on the received message.

3.3 Message Waiting [Feature Code 13 or (T) 33]

3.3.1 General

The Message Waiting feature turns on and turns off message waiting lamps in a room station on commands from on the voice terminals (with notification to the PMS), or upon receipt of messages from the PMS. This feature only controls message status controlled by the PMS. Leave Word Calling or AUDIX messages that activate MWL are not communicated to the PMS from the Switch.

The feature code for the Message Waiting message is 13 or (T) 33 with four or (T) five process codes defined.

3.3.2 Message Summary (also see Figure 2-10)

Process Code	Message Direction	Indications
1	PMS to Switch	Turn on lamp of room station indicated.
2	PMS to Switch	Turn off lamp of room station indicated.
3	Switch to PMS	Lamp of room station indicated has been turned on via voice terminal entry.
4	Switch to PMS	Lamp of room station indicated has been turned off via voice terminal entry.
(T)5	Switch to PMS	Lamp of room voice terminal indicated was already on or is still on due to another message type (for example, LWC).

3.3.3 Operational Considerations

The message waiting feature message(s) will be sent and/or received and interpreted based on the Switch installation parameter setting for the message waiting communication feature. The possibilities are:

1. Feature active in Switch with no PMS communication **(act-nopms).**
2. Feature active in Switch with communication enabled on Switch changes and acts on valid PMS change requests **(act-pms).**

With message waiting communication feature active, the operational considerations are:

1. The message waiting status for each room station will be stored in Switch memory.
2. When a change in message waiting state for a room station is entered via a Switch voice terminal, the (13,3) or (T) (33,3) lamp turned on, or (13,4) or (T) (33,4) lamp turned off, message will be sent to the PMS with the Room Station Number indicated.
3. Upon receipt in the Switch of a (13,1) or (T) (33,1)turn on lamp, or (13,2) or (T) (33,2) turn off lamp message, the appropriate lamp status change will be made by the Switch. (T) If the lamp is on due to another message type and a (T) (33,1) or (T) (33,2) is sent to the PBX the PBX will return (T) (33,5).
4. When a (16,2) or (T) (46,1) room check-out message is received from the PMS, a (16,6) or (T) (46,2) check-out complete message will be sent to the PMS if the room station had the lamp on due to the PMS component of the message waiting lamp, and a (16,5) or (T) (46,3) message if the message waiting lamp is off. (T) A (46,5) is sent if the message waiting lamp is on due to another message type (for example, LWC). The PMS component of the message waiting lamp for the RSN will always be in the off state after the (16,2) or (T) (46,1) message has been processed. Subsequent status inquires will report that the lamp is off (that is, the PMS component is off) even if the lamp is on due to AUDIX or LWC, which are not supported through this interface.
5. With the message waiting communication feature disabled (act-nopms), the Switch does not send message waiting messages to PMS. If the PMS sends message waiting messages to the Switch, the Switch will ACK the message. However, the Switch will send a violation message to the PMS and not act on the received message.

PMS Considerations

If the PMS does not store message waiting data, the Room Data Image for the Room Station Number can be requested to obtain the current status as discussed in Section 3.6, Room Data Image. However, if the Switch re-initializes after a failure, this information may be incorrect.

3.4 Controlled Restriction [Feature Code 15 or (T) 35]

3.4.1 General

This feature enables a guest room station line to be restricted using selected origination and/or termination capabilities either from Switch terminals (with communication to the PMS), or on receipt of feature message 15 or (T) 35 from the PMS.

The feature code for the Controlled Restriction message is 15 or (T) 35, with two process codes available.

3.4.2 Message Summary (also see Figure 2-11)

Process Code	Message Direction	Indications
1	PMS to Switch	Set indicated restriction for indicated mom station number
2	Switch to PMS	Restriction has been set as indicated for indicated room station number via Switch terminal entry.

3.4.3 Operational Considerations

The controlled restriction message communication with the PMS is based on the Switch installation parameters. The possibilities are:

1. The feature is active in the Switch with no communication with the PMS **(act-no pms).**
2. The feature is active in the Switch and communication with the PMS is active; in this configuration the change can be initiated from either a voice terminal on the switch (with notification of the change to the PMS) or from the PMS (with a request sent to the Switch to impose the specified restriction level) **(act-pms).**

Switch Operations (act-pms)

RSN and new restriction level will be sent to the PMS for changes to single user-controlled restriction levels.

When a (15,1) or (T) (35,1) message is received from the PMS, the restriction change indicated will be implemented on the indicated room station, overriding any previous single user-controlled restriction.

The controlled restriction level codes and the action indicated are:

Level	Action
00	No restrictions placed on room station.
01	Outward restricted, which denies all local and toll calling from the room voice terminal.
02	Station-to-station restricted, which denies all calls to/from other stations (both administrative and guest rooms).
03	Outward and station-to-station restriction (both levels 01 and 02 above in effect).
04	Total restriction, which denies all calls from and to the room station (effectively cuts off the room station).
05	Termination restriction, which denies all calls to the room station.
06	Outward and termination restriction (levels 01 and 05 both in effect).
07	Station-to-station and termination restriction (levels 02 and 05 both in effect).

When a controlled restriction is set on a room station, denied outward, termination, station-to-station, and origination calls are routed to the translated intercept treatment.

The Switch will automatically remove previous single user-controlled restrictions and impose controlled outward restriction on room check-out and remove controlled outward restriction on room check-in. No (15,2) or (T) (35,2) message is sent from the Switch to the PMS for the automatic change.

If the Controlled Restriction Communication feature is active for the PMS, only manual changes made from a voice terminal for a **single** room will be sent to the PMS. Group controlled restrictions will not be communicated to the PMS. Modification of user-controlled restrictions do not affect the values of group-controlled restrictions.

PMS Considerations— If the PMS stores controlled restrictions and sends a restriction message altering the level of restriction on a station, the PMS must also change its stored restriction level.

Switch Operations (act-nopms)

With the feature translated as act-nopms, the Switch will not send controlled restriction messages to the PMS. If the PMS sends control restriction messages to the Switch, the Switch will acknowledge the messages. However, the Switch will send a violation message to the PMS and not act on the received message.

3.5 Check-in/Out (Feature Code 16 or (T) 36, 46)

3.5.1 General

This message does not represent a unique feature but rather is a convenient device for invoking a sequence of functions commonly performed when a guest checks in or checks out of a room. It is expected that each check-in or check-out performed in the PMS will immediately be transmitted to the Switch*. Upon reception of the check-in/check-out message, the Switch performs a sequence of operations based on its feature definitions.

The transmission of the check-in, check-out feature messages from the PMS is not an optional Switch installation parameter, but is assumed a standard feature for Switch operational integrity if the PMS is controlling room status.

The Switch requires the check-in/check-out notification from the PMS to perform the appropriate internal status changes for that guest room for message waiting lamp status, wakeup request, and controlled restriction level. For (T), the switch also performs changes to the Guest Name and call coverage path numbers. Failure to communicate check-in or check-out information could result in invalid message waiting lamp status, the guest being unable to originate room station calls, the guest receiving an unrequested wakeup call (or no wakeup call at all) and (T) erroneus guest names and call coverage paths. Immediate notification to the Switch from the PMS is necessary to prevent these sources of guest dissatisfaction.

The feature code 16 for check-in/check-out messages will use six process codes. (T) will use feature code 36 for check-in with 2 process codes and 46 for check-out with 5 process codes.

* The check-in message should also be sent if a guest is reinstated after having checked out initially.

3.5.2 Message Summary (also see Figure 2-12)

Feature Code 16

Process Code	Message Direction	Indications
1	PMS to Switch	Switch 15 to perform the functions associated with check-in for the indicated RSN.
2	PMS to Switch	Switch is to perform the functions associated with check-out for the lndicated RSN.
5	Switch to PMS	Check-out functions were completed for the indicated RSN and the message waiting lamp was not on.
6	Switch to PMS	Check-out functions were completed for the indicated RSN and the message waiting lamp was on.
7	Switch to PMS	Confirmation of receipt of check-out message; no action was taken because the indicated RSN was already vacant.
8	Switch to PMS	Confirmation of receipt of check-in message; no action was taken because the indicated RSN was already occupied.

(T) Feature Code 36

Process Code	Message Direction	Indications
1	PMS to Switch	Switch is to perform the functions associated with check-in for the indicated RSN.
2	Switch to PMS	Confirmation of receipt of check-in message; no action was taken because the indicated RSN was already occupied.

(T) Feature Code 46

Process Code	Message Direction	Indications
1	PMS to switch	Switch is to perform the functions asssociated with check-out for the indicated RSN.
2	Switch to PMS	Check-out functions were completed for the indicated RSN and the message waiting lamp was not on.
3	Switch to PMS	Check-out functions were completed for the indicated RSN and the message waiting lamp was on.
4	Switch to PMS	Confirmation of receipt of check-out message; no action was taken because the indicated RSN was already vacant.
5	Switch to PMS	Check-out functions were completed for the indicated extension and message waiting lamp is still on due to another message type.

3.5.3 Operational Considerations

The Switch will maintain a vacant/occupied status for each RSN. The two possible states for a room are vacant (Switch status "vacant") or occupied (Switch status "occupied"). These two Switch states will be updated by the receipt of the check-in and check-out messages from the PMS. Under normal operation check-in and check-out will not be performed on Switch terminals. These functions will only be done on the PMS terminals. The PMS is required to send each check-in/check-out irnmediately to the Switch to support the PMS data link and associated Switch operations.

Switch Actions

When a room check-in message (16,1) or (T) (36,1) is received from the PMS, the status of that room will be set to Occupied. This change will (if the associated function is active in the Switch):

- Deactivate conrolled outward restriction
- (T) Store guest name
- (T) Store call coverage path
- (T) Remove Leave Word Calling (LWC) messages.

When a room check-out message (16,2) or (T) (46,1) is received from the PMS, the status of that room will be set to Vacant. This change (if the associated function is active in the Switch) will also:

- Turn off the message waiting lamp PMS component for the indicated RSN
- Clear any existing wakeup entry for the room
- Cancel any current controlled restriction and activate Controlled Outward Restriction
- (T) Remove guest name
- (T) Set call coverage to "Default Coverage Path for Client Room" field value
- (T) Check for other message types and return (46,5) if found.

Other Considerations

The Check-out Confirmed-Room Already Vacant (16,7) or (T) (36,4) and the Check-in Confirmed-Room Already Occupied (16,8) or (T) (36,2) messages will be sent to the PMS when a check-out request is received for a vacant room and a check-in request is received for an occupied room respectively. (T) A Check-out Confirmed-Other message type (46,5) will be sent to the PMS if the room's message lamp is on due to a non-PMS message. These are not counted as error or invalid conditions by the Switch.

The name characters are ASCII and must be between 0x20 (space character) and 0x7e (tilda character) in value. If the name consists of less than 15 characters, the name field must be left justified by padding the remaining characters with the space (0x20) character.

The data portion or the coverage path field in the check-in message for the transparent PMS protocol consists of three Binary Coded Decimal BCD characters representing the hundreds, tens, and unit digits with the followinq valid values:

0	- no coverage is provided for the station
1->600	- coverage path used
0xbbb	- coverage path value of "Default Coverage path For Client Rooms" field on switch is used.

Failure Consuderations

When loss of communication with the PMS occurs due to failure of the data link or the PMS, the Switch will enable the check-in/cneck-out so that a Switch terminal can be used for check-in and check-out. Check-in and check-out on the Switch terminal will perform the functions outlined above except Guest Name and call coverage path information which can be entered later using Guest Information Input/Change messages from the PMS or the data base swap can fill in. Manual check-in/check-out always sets the coverage path to "Default Coverage-Path For Client Rooms."

During the recovery procedure the RSN's occupancy status specified by the PMS in the (17,3) or (T) (37,3) room image message may be different from the Switch status for the indicated room, implying a check-in or check-out be performed for that RSN in the Switch for synchronization.

3.6 Room Data Image [Feature Code 17 or (T) 37]

3.6.1 Generel

This message type provides a means for sending and receiving the set of pertinent status items for a particular RSN to or from the other system. Two of the process codes are provided for "informational exchange" about the switch' status and do not imply that status changes are to be performed. The other two process codes are provided for the "data base exchange" recovery procedure and can imply status changes in either or both systems.

Four process codes are provided, two of which are optionally used, while the other two are necessary for recovery initialization and synchronization.

3.6.2 Message Summary (also see Figure 2-13)

Process Code	Message Direction	Indications
1	PMS to Switch	Request to send the data image for indicated room for informational purposes only
2	Switch to PMS	Response to received process code 1 message
3	PMS to S witch	Data Base Update status information and/or request for Switch status.
4	Switch to PMS	Data Base Update Switch status response to process code 3.

3.6.3 Operational Considerations

Process codes 1 and 2 are used in the information exchange mode. The PMS will request status items from the switch by sending a (17,1) or (T) (37,1) message, the switch will reply with pertinent data by returning a (17,2) or (T) (37,2) message. The (17,1) or (T) (37,1) does not imply or dictate any status change to the receiving system. The PMS may initiate a (17,1) or (T) (37,1) request at any time.

Process codes 3 and 4 are reserved for the data base exchange procedure only. The switch will acknowledge but not process the message and return violation messages if they are sent at any other time. The data base "swap" procedure is defined as the message sequence between and including the transmission of the (T) (70,3) data base exchange "start" message and the transmission of the (T) (70,4) data base exchange "end" message (both originated by the PMS). The (T) (70,3) message signals the start of data base synchronization. Then, for each room, a (17,3) or (T) (37,3) message is sent by the PMS specifying current PMS status data and/or requesting Switch status data. The Switch will process the (17,3) message and return a (17,4) or process a (T) (37,3) and return a (T) (37,4) message containing any requested Switch status. Thus the exchange constitutes a synchronization of the two systems' data bases for a particular room. After the (17,3) and (17,4) or (T) (37,3) and (T) (37,4) exchange for all rooms, the (70,4) message from the PMS signals the end of the data base synchronization procedure.

The Feature Code 17 or (T) 37 Room image feature message has the item fields shown in Table 3-2:

TABLE 3-2 Room Image Feature Message Item Fields

Fields	Values
Room Status Number (RSN)	Room Status Number
*Occupied/Vacant Status	0= Vacant, 1= Occupied
*Message Waiting Lamp Status	0= Off, 1 = On
*Controlled Restriction Level Code	See Figure 2-12
(T) Guest Name	Name String
(T) Call Coverage Path Number	1-600*, "0xbbb"

* Can also take null values as described below.

The name characters are ASCII and must be between 0x20 (space character) and 0x7e (tilda character) in value. If the name consists of less than 15 characters, the name field must be left justified by padding the remaining characters with the space (0x20) character.

The coverage path field in the room data image message for the transparent PMS protocol mode consists of three Binary Coded Decimal BCD characters representing the hundreds, tens, and unit digits with the following valid values:

0	- no coverage is provided for the station
1-> 600	- coverage path used
0xbbb	- coverage path value of ”Default Coverage path For Client Rooms” field on switch is used (see Note)
0xfff	- "null" coverage path value used in room data image message only to request coverage path value stored on switch for an extension.

There are two types of room messages: status request (process codes 1 and 3) and status response (process codes 2 and 4). If the switch receives a status request message, it appropriately processes it and returns a status response message. Appropriate processing depends on the values received in the status fields of the status request message.

If a status quest message with process code 1 is received at the switch, for any that field that is null (0xf in non-ASCII fields and by 0x3f in ail bytes of ASCII fields), the switch fills in the corresponding field in the status response message with the internal data associated with that field or a null if status is unavailable. For all fields that are non-null, the non-null value that was received is ignored, but is returned in the corresponding field of the response message. The status response message with process code 2 is then transmitted to the switch.

If a status request message with process code 3 is received at the switch, for any field that is null, the switch fills in the corresponding field in the status response with the data associated with that field or a nuIl if status is unavailable. For all fields that are non-null, the switch will update is internal data with the received vailues, place a null in the corresponding field in the status response message and transmits the response message with process code 4.

Note that a field is reserved in the room image message for each status item possible in a data link configuration, even though not all the feature messages may be activated. The switch will ignore any request for status or implied change for any field for which normal status changes are not communicated. For instance, if the controlled restriction (15,x) feature message is not enabled in a particular data link configuration, the controlled restriction field in the room image message is likewise inactive.

Table 3-3 provides a listing or room image messages and the examples which follow show the typical use of the room image exchange.

TABLE 3-3. Data Field Interpretation for Room Image Messages

Message	Direction	Status Field Specification	
		Null	Non-Null
(17,1) (T) (37,1)	PMS to Switch	Status request	Ignored
(17,2) (T) (37,2)	Switch to PMS	No status available	Returned status
(17,3) (T) (37,3)	PMS to Switch	Status request	PMS status; Switch should set its status
(17,4) (T) (37,4)	Switch to PMS	Either no status available or status has been updated	Switch status returned

Examples

The following figure shows a sample informational request for a room, originated by the PMS. The Switch has the room as occupied, no message waiting Guest Name "Smith,J" and call coverage path 1. All feature messages except the controlled restriction communication are active.

INFORMATIONAL EXCHANGE

Originator	Message	Occ/Vac	Msg.Wait	Cntrl.Res.	Guest Name	Call Cov. Path
PMS	(T) (37,1)	Null	Null	Null	Null*	Null
Switch	(T) (37,2)	1	0	Null†	Smith,J**	001

*A Null for a Guest Name field is 15 question mark characters (0x3f).

**Remaining chracters in this field will be padded with ASCII space (0x20).

†In the example, the Controlled Restriction Communication was not enabled; therefore, the Switch has no information available for request.

Using the same system configuration used for the example above, the (T) (37,3) and (T) (37,4) exchange for data base update purposes might be:

ROOM SYNCHRONIZATION EXCHANGE

Originator	Message	Occ/Vac	Msg.Wait	Cntr.Res.	Guest Name	Call Cov. Path
PMS	(T) (37,3)	1*	1	Null	Smith,J	001
Switch	(T) (37,4)	Null	Null	Null†	Null**	Null

*The PMS must always provide the occupied / vacant status.

**A Null for a Guest Name field is all question marks (0x3f).

†In the example, the Controlled Restriction Communication was not enabled; therefore, the Switch has no information available for request.

The Switch will set the status of the room to occupied, with message waiting lamp on.

PMS Considerations for Process Code 3

Process code 3 sent from the PMS and the associated process code 4 sent from the Switch constitute an individual "room data base exchange" for the purpose of data base update after a detected failure.

Process code 3 provides a means for the PMS to send the Switch the current valid data stored in the PMS and request the current valid data stored in the Switch for purposes of data base update during the recovery procedure after a failure.

The PMS should insert its current status values in the occupied / vacant field because PMS is considered the "master". The PMS is always considered the source for room occupied / vacant status. The master source for message waiting lamp status, controlled restriction status, guest names and call coverage path number may vary based on a particular operating environment. If the PMS wishes to receive the current Switch data for message waiting lamp status, controlled restriction. (T) guest name or call coverage path number, the PMS must place nulls in the appropriate positional fields of the (17,3) or (T) (37,3) message, requesting Switch response, if applicable.

Switch Actions Upon Receipt of Room Image With Process Code 3

The Switch will change its data base to the passed values in the (17,3) or (T) (37,3) message from the PMS for non-null, active fields. Switch status will be returned in the null, active fields.

The Switch processing is done in the following sequence:

1. Perform any umplied occupied / vacant status change (see detailed description below).
2. Process individual status fields for message waiting lamp status, controlled restriction status (T) call coverage path and (T) Guest Name.
3. Return status for any requested active fields.

Vacant to occupied or occupied to vacant transitions as implied in the received (17,3) or (T) (37,3) message will perform the corresponding check-in or check-out operations in the Switch as follows:

- Vacant to Occupied (PMS has occupied, Switch has vacant)

  1. The standard check-in operations for controlled restriction, with no status change of either the message waiting lamp status or wakeup status; the status of the room station in the *5* witch is set to Occupied; active fields in the process code 3 *message* for status items from the PMS will then override the Switch status (for example, a non-null message lamp field will override Switch status if the message waiting message feature is active).
  2. The process code 4 (room image recovery response) will then be sent to the PMS with Switch status items supplied for the null fields (T) (and '?' fields for Guest Name characters) in the received process code 3 message, and nulls in the received active fields.

- Occupied to Vacant (PMS Vacant, Switch Occupied)

  1. The status of the room station in the Switch is set to Vacant.
  2. Outward Restriction will be placed on the room station.
  3. Since the possibility exists that a manual check-in was done through the Switch which may not have yet been entered in the PMS after a PMS failure, the wakeup and message waiting lamp status settings are **not** reset in the Switch.
  4. Any active fields in the received process code *3* message from the PMS for the indicated Room Station Number will override the Switch status.
  5. The process code 4 message is returned to the PMS with nulls in the received active fields, and with data supplied in received null fields.

PMS Actions for Room Image Complement Message (Process Code 4)

Process code 4 is sent from the Switch to the PMS and provides the complement data image in response to the process code 3 image sent from the PMS. It is assumed that the PMS will update its status accordingly for the active fields returned from the Switch.

3.7 Room Change/ Room Swap [Feature Code 20 or (T) 30]

3.7.1 General

The Room Change/Room Swap feature message is used by the PMS to notify the Switch that a Room Change or a Room Swap has been made between two rooms. A room change message will be transmitted to the Switch when a guest in an occupied room wishes to be moved to a different vacant room. A room swap message will be transmitted when guest status information should be exchanged between two occupied rooms. It is expected that each Room Change/Room Swap performed in the PMS will immediately be transmitted to the Switch. This feature message is provided to allow automatic wakeup entries, message waiting indicators for PMS activation, room station controlled restrictions and room status to be assigned to the correct room. (T) Also, guest names and call coverage information will be assigned to the correct room.

Athough feature operations (for example, check-in and check-out) could be used to partially simulate this operation, the functions performed on the switch will not be exactly the same. For example, an automatic wakeup request would not automatically be mend if a check-out/check-in sequence is used.

3.7.2 Message Summary (also see Figure 2-14)

Process Code	Message Direction	Indications
1	PMS to Switch	Room Change to STAn from STFn
2	PMS to Switch	Room Swap between STAn and STFn
3	Switch to PMS	Room Change/Swap performed but an error was detected in room status.

Operational Considerations

Process code 1 is used for the room change message. When the message is received, the Switch will transfer the automatic wakeup entry, do not disturb, and PMS type message waiting, controlled restrictions as well as (T) Guest Name, and call coverage path from the old room to the new room. If the new room is not vacant (Switch status "vacant") or the old room is not occupied (Switch status "occupied"), the Switch will return the message with a process code of 3 indicating that the change was performed but the status states were inconsistent. The **room change** will effect the following status states:

- Room Status - Change the old room in the Switch to vacant and the new room to occupied.
- Wakeup - move the old room wakeup entry to the new room canceling any existing entry. If the oId room has no entry, leave any existing entry for the new room intact.
- Message Waiting - Turn on the message waiting for the new room if the old room or the new room has a message waiting on.
- Controlled Restriction - Move the old room controlled restiction to the new room. If the old room is vacant with outward restrction (and Controlled Outward Restriction active), the new room should have no restriction.
- (T) Replace the coverage path number of the new room with the guests call coverage path number and change the old room to the default path. However, if the room state of the old and new rooms are not occupied and vacant, respectively; the coverage path is swapped instead. Thus, in the event of an error, repeating the operation returns the room to its original state.
- (T) Change the guest name in the old room to the new room and blank out in the old room guest name. However, if the room state of the old and new rooms are not occupied and vacant, respectively; the name information is swapped. Thus, in the event of an error, repeating the operation returns the room to its original state.

Process code 2 is used for the **room swap** message. When the message is received, the Switch will swap the automatic wakeup entry, message waiting, controlled restriction, (T) Guest Names and call coverage path numbers between room 1 and room 2. Since a normal swap is from an occupied room to an occupied room, both rooms should be occupied. If other status states are present, the swap will be performed changing both rooms to the occupied state, with the exception that outward restriction in a vacant room will be changed to no restriction. The Switch will also return the message with the process code of 3, indicating that the swap was done but the status states were inconsistent.

3.8 (T) Guest Information Input/ Change (Feature Code 38)

3.8.l General

Guest Information Input: Change (GI) messages allow changes to or inputs of Guest Information (Guest Name and Call Coverage Path) after the check-in of the associated RSN has been completed. The message can be used to input a name and tail coverage path subsequent to check-in, change an incorrect guest name, and/or alter the call coverage path number. Refer the implementation example in Section 1.2.2.

The feature code encode for Guest Information Input/change message is 38, with four process codes defined.

3.8.2 Message Summary (also see Figure 2-14)

Process Code	Message Direction	Indication
1	PMS to Switch	Change/ Input the following Guest Name and Call Coverage Path Number for RSN.
2	Switch to PMS	Change/ Input Complete as requested for RSN.
3	Switch to PMS	Change/ Input Received, No Action Taken, RSN Vacant.
4	Switch to PMS	Change/Input Received, No action Taken, Information the Same as stored for RSN.

3.8.3 Operational Considerations

All 15 name characters in the name field must be printable ASCII codes 0x20—0x7E. If the name consists of less than 15 characters, the name must be left justified by padding with ASCII space character 0X20. These characters may consist of "Unknown" or "To Be Decided" if the name is not known.[4] When sending the (T) Guest Information Input/Change (38) message to alter a guest name or call coverage path number, the PMS must send both the Name and Call coverage number even if only one or the other is being changed /input.

One of three responses will be returned when the PMS sends a G1 message to update or input the guest information. When the PMS sends the Switch a (T) (38,1) message, the Switch will try to perform the input or change the information. If the change/input is successful, the Switch will return a (T) (38,2) to the PMS. If the PMS sends a (T) (38,1) for a RSN that is Vacant, the Switch will acknowledge the receipt of the message with (T) (38,3) to the PMS, but will not change any data for that RSN. If the PMS sends a (T) (38,1) for an RSN but the data stored within the Switch for that RSN is the same as sent, the Switch will return a (T) (38,4) message acknowledging the receipt of the message without changes.

The name characters are ASCII and must be beween 0x20 (space character) and 0x7e (tilda character) in value. If the name consists of less than 15 characters, the name field must be left justified by padding the remaining charactes with the space (0x20) character.

4. This feature allows a Hotel to pre-register a guest without having to know the guest name. This is used in those situations when corporations (e.g., Airlines) reserve rooms for employees without providing the actual employee name.

The coverage path field in the guest information input/change message for the transparent PMS protocol mode consists of three Binary Coded Decimal BCD characters representing the hundreds, tens, and unit digits with the following valid values:

0	- no coverage is provided for the station
1->600	- coverage path used
0xbbb	- coverage path value of "Default Coverage path For Client Rooms" field on switch is used.

3.9 Status Inquiry and Failure Management (Feature Code 70)

3.9.1 General

The Status Inquiry and Failure Management message type services the general data link maintenance activity. Eight process codes are defined which permit the two systems to maintain a dialogue on the state of the data link. No station number or other data is needed.

3.9.2 Message Summary (Also See Figure 2-13)

Process Code	Message Direction	Indications
NULL(F)	PMS to Switch	Heartbeat message; must be issued by the PMS within every LIT interval and no more often than 500 ms.
0	Switch to PMS	Acknowledgement of NOP " are you there" message from the PMS, indicating that the Switch has had no changes that were not communicated to the PMS and has not initialized. Note that while in the "normal mode" the process code 0 is encoded as an A in the message frame sent to PMS (see Figure 2-6) This message will be sent **only** in response to a (70,F) message from the PMS.
1	Switch to PMS	NOP acknowledgement indicating that at least one non-communicated change in the Switch has occured during a communications failure; the PMS must initiate a data base exchange.
2	Switch to PMS	NOP acknowledgement indicating that the Switch had failed and the status memory has been initialized; the PMS must initiate a data base exchange.
3	PMS to Switch	Start of data base room exchange; the PMS will be sending a room image message for each room requiring status synchronization.

4	PMS to Switch	End of data base exchange
5	Switch to PMS or PMS to Switch	Release of the data link is requested for maintenance activity; process code 6 is confirmation
6	Switch to PMS or PMS to Switch	Release of the data link confirmed; all necessary actions have been taken

3.9.3 Operational Considerations

The primary purpose of the Status & Inquiry messages is to indicate to both systems if the data link interface is "up" - capable of normal communications - or "down".

The general philosophy of data link failure recognition and subsequent recovery is based on the following points:

- Either system may recognize a failure as defined below and the Switch may request or the PMS may initiate a data base synchronization procedure (the room image exchange) once the physical link is re-established.
- The PMS system has control of when a data base exchange will be initiated, which room stations will be included in the exchange, and which status items will be supplied to the Switch for update for each room. However, after the Switch requests a Database Swap (70,1) or (70,2) the Switch will not process other messages except Status Inquiry (70,F) until a (70,3) data swap begin message is sent by the PMS. Switch will acknowledge the message but will not change any stored information. Also, the Switch will continue to use (70,1) or (70,2) status inquiry message util the PMS sends a (70,3) data base message.
- The NOP Status & Inquiry message (70,F) must be sent to the Switch at an internal not sooner than every 500 ms and not more than the administered "Link Idle Timeout (LIT)" parameter; the receipt of this message informs the Switch that the PMS is operational in case no other traffic has been received, and also provides the Switch the stimulus to inform the PMS if the Switch has detected a failure (via returned process codes 1 or 2).
- The LIT must be administered consistently between the PMS and Switch.

Recognition of Data Link Failure

Either system may recognize a loss of communication by one or more of the following occurrences:

- Lack of traffic within the LIT interval. The switch recognizes this by lack of any message received from the PMS within the period. The PMS recognizes it when it does not receive a (70,0), (70,1), or (70,2) message within the LIT immediately following its transmittal of a (70.f) message.
- When PMS drops DTR
- When Switch drops DSR.
- Other conditions, such as unavailability of buffers or queuing capability, which result in an inability to communicate the status change message.
- Dropping of data link for maintenance requested and confirmed.

A data link failure will necessiate a data base room exchange recovery procedure if any implied status change cannot be communicated to the other system and cannot be queued for later

transmission. Note that even with a detected data link failure, a data base recovery exchange is not necessarily needed if there has been no implied status changes lost (not transmitted or queued).

In addition to the above data link failures, the switch keeps track of erroneous events and drops the link if the internal switch counter goes over 50. The counter is incremented by 1 for any of the following events and decremented by 1 whenever a good message is received from the PMS.

1. (T) A control character was received without a DLE in front of it.
2. A non control character was received outside of the STX/ETX frame.
3. An ETX was received when a message was not being received.
4. An ACK ENQ, NAK, or STX was detected in the middle of a message.
5. An unexcepted ACK, or NAK was received.
6. PMS sent a STX before we acknowledged the last message.
7. The message test of an incoming message was < 2 bytes.
8. The message count for a message was the same as for the last message.
9. ACK/NAK was never received after ENQs were transmitted (and retransmitted).
10. Exceeded maximum re-transmission of a message.
11. BCC timer expired.

Release of Data Link for Maintenance (Function Codes 5,6)

Either system may request a temporary release of the data link for maintenance purposes by transmitting a (70,5) Data Link Release Request message to the other system. The receiving system should perform any processing required and return the (70,6) Data Link Release Confirmed message as soon as possible. If (70,6) is not returned within 5 seconds, the sender will stop the protocol or bring clown the link.

During Switch maintenance the PMS may continue to send (70,F) Status Inquiry messages, provided that EIA pin 6 (Data set Ready) from the Switch is in the “on” state. The Switch will put EIA pin 6 on and respond to (70,F) messages when maintenance is completed.

While the data link is released on request of the PMS, the Switch will continue to attempt to read (70,F) messages from the PMS. EIA pin number 20 (Data Terminal Ready) in the "off" state from the PMS will indicate that reads should not be attempted. When EIA pin 20 is on and a (70,F) message is received from the PMS, the Switch will assume that PMS maintenance is over and communication can be resumed. However, if messages other than status inquiry messages are transmitted, the switch will ignore the messages and bring down the link if 10 or more such messages are received.

The Switch will attempt to send a (70,5) when "test pms-link long" or "busyout pms-link" commands are issued on the System 75 SAT or DEFINITY Manager I. If either the PMS or Switch sends the message with a process code 5 to request the release of the data link, the release reason field is filled in as follows (T):

Reason Code	Indication
1	one flushed messages
2	excessive protocol violations
3	excessive violation messages*
4	can't receive messages
5	craft demanded maintenance
6	system demanded maintenance*
7	10 protocol startup violations
F	Reason code not provided/support

(T) *Currently, DEFINITY G1.1 does not send a (T) (70,5) for excessive violation messages, system demanded maintenance, and processor element interchange ("hot start"). However, these functions may be implemented in the future.

Switch Operations During Loss of Communication

The Switch will continue to support the basic telecommunications functions if the data link or PMS becomes unavailable. Upon detection of a data link failure, the Switch will automatically switch to the "Link Failed Mode" to perform the following tasks:

- Enable check-in/check-out on the Switch terminals.
- Journal any dialed housekeeper/status information to the optional PMS log printer for later or immediate entry into the PMS system (or return reorder tone to housekeeper status calls if the housekeeper PMS Log Printer not available).
- Log events normally sent to PMS in an audit trial, accessed by "list pms-down" command.
- Continue to support basic telecommunications.
- Continued support of message waiting and/or controlled restriction.

The Switch wil1 continue to attempt to receive messages from the PMS during data link failure. If a message is received from the PMS with no missed status change communications within the Switch, data link operation will resume normally with no data base exchange requested by the Switch. (T) If during data link failure the Switch processes a status change which normally would have been sent to the PMS, the Switch sets itself to return a (70,1) ((70,2) if the link failure was due to a switch restart) responses to all (70,F) message received from the PMS until a (70,3) message is received. (T) The receipt of a (70,1) response from the Switch to a (70,F) will indicate to the PMS that a data base image exchange should be initiated for data base synchronization.

PMS Operations During Loss of Communication

During the loss of communication, it is expected that the PMS will continue to operate normally, accepting check-ins and check-outs, etc. The PMS can queue the changes which normally would be sent to the Switch in anticipation of resumption of communication. These changes should be queued *in* such a way that order of receipt in the PMS will be maintained.

In the case where the PMS remains operational during a data link failure, the PMS should continue sending the (T) (70,F) Status Inquiry message as long as the PMS is ready to resume communication.

Recovery from Loss of Communication

In the case of a PMS failure, it is assumed that check-ins/check-outs may need to be done manually, and entered into the PMS system at a later time when the system is again operational. The PMS should not resume transmission of the (T) (70,F) Status Inquiry message to reestablish communication until the data base has been brought to as current a status as possible. This is to prevent the transmission of incorrect data prematurely via the data base exchange update procedure to the Switch.

In the case where the PMS has remained operational during a data link failure, the PMS should continue to attempt to send the Status & Inquiry (T) (70,F) messages. A Status & Inquiry response (one of process codes 0,1,2) from the Switch will indicate that communication has been reestablished.

A "process code 0" response indicates that the Switch has had no status changes during the data link failure period and that the Switch has automatically switched back to the normal operating mode "data link active" (check-in/check-out disabled).

A Switch response of "process code 1" indicates that the Switch has had at least one uncommunicated status change and that the PMS should initiate a data base room image exchange to synchronize the data bases.

A Switch response of "process code 2" indicates that the Switch has failed and that status memory has been initialized, with each room station in the following status:

Room Status = Occupied
Controlled restriction level = non-restricted state
Message Waiting Lamp = off
(T)
Guest Name = BLANK
Call Coverage Path = No coverage

In response to the receipt of a status inquiry message that has a process code of 1 or 2, the PMS must immediately initiate a data base swap. The data base swap must include either: (1) All rooms or (2) Vacant rooms plus occupied rooms with (a) message waiting, (b) restrictions, (c) non-empty name fields, or (d) (T) coverage paths.

The Data Base Exchange Procedure

If the Switch has recognized the reestablishment of communication and responded with either a (T) (70,1) or (T) (70,2) message to the PMS, the Switch will not process any message type received from the PMS **except** Status & Inquiry messages until the PMS initiates the data base exchange procedure.

The PMS system has control or when a data base exchange will be initiated, which room stations will be included in the exchange, and which status items will be supplied to the Switch for update for each room. However, after the Switch requests a Database Swap (70,1) or (70.2) the Switch expects the data base swap to start. For G 1.1, if the PMS sends 10 messages that are not status inquiry messages before sending the (70,3) message, the Switch will log an error, attempt to send a (70,5) message, and eventually tear-down the link. The Switch will continue to use (70,1) or (70,2) status inquiry message until the PMS sends a (70,3) data base message.

The PMS indicates the start of the data base room exchange by transmitting a (T) (70,3) Status & Inquiry message to the Switch. The receipt of the (T) (70,3) message in the Switch indicates to the Switch that (1) a data base room exchange will commence, and (2) that transmission of normal status changes can be reinitiated.

After transmission of the (T) (70,3) message, the PMS should then transmit the room data exchange image message (17,3) or (T) (37,3) for each room for which synchronization is required. Note that some time delay rnay be necessary between each room data image message so that the maximum message rate for the data link is not exceeded, and to provide ”space” for normal status change feature messages.

The Switch will process each room data umage (17,3) message and return the complement room data image message (17,4) in response as soon as the LAT time-out. This allows the PMS to use “ENQ” characters (see Feature Message Description for Room Data Image Message, Section 3.7). Section 3.6 (Name Registration Message Feature), Section 3.5 (Check-in/Check-out Message Feature), and Section 3.7 (Room Data Image Message Feature) also describe Switch handling.

As mentioned previously, normal feature messages may be sent or received during the data base room image exchange procedure. Care should be taken to insure that the most current status is always presented via message sequence for a particular room to the Switch. For example, a status change via PMS terminal may occur simultaneously with the access of the data for the room data image message for that particular room. If the Switch were to receive the "new" individual feature message, then the room data image with the "old" status value, the Switch would set its status to the "old" status value, leaving the two data bases out of synchronization. Correct message sequencing and data access should be done to eliminate this possibility. The PMS can assume that the Switch will send the most current individual status change or most current data in the (17,4) or (T) (37,4) message response.

When the data base exchange room image (17,3) or (T) (37,3) messages have been sent and returned (17,4) or (T) (37,4) respectively messages processed by the PMS for all rooms requiring synchronization, the PMS indicates the end of the data base update procedure by transmitting a (T) (70,4) message to the Switch.

The receipt of a (T) (70,4) message is necessary for the Switch, since the Switch has a threshold of three data base synchronization procedures that are started, but unable to complete due to succeeding data link failures. This may be the case where intermittent, yet persistent, problems exist which preclude the basic data base update procedure from ever completing, leaving the data link in a continual failure/recovery (thrashing) slate. After a link drop causes the count to be exceeded, the Switch logs an error. Two test commands that try to establish the link are:

test PMS-link -> tries to bring the link back up

test PMS-link long -> tries to bring the link down then back up

The PMS may initiate a data base exchange procedure at any time provided that a data base update procedure is not currently active. If such a situation arises (either by error detection within the PMS or by receipt of a (T) (70,1) or (T) (70,2) Status Inquiry response from the Switch) the PMS should send a (T) (70,4) Data Base Exchange Complete message before restarting the procedure.

Here is an example of the status inquiry (SI) message activity that might occur to initialize the data link communication (the process code follows the SI):

ORIGINATOR OF MESSAGE	MESSAGE	EXPLANATION
PMS	(T) 70 F (null)	"Are you there Message"
Switch	Ack	
Switch	(T) 70 1 or	Message indicating that data
	(T) 70 2	base swap should begin
PMS	Ack	
PMS	(T) 70 3	Start data base exchange
Switch	Ack	
		(Room Images)
PMS	(T) 70 4	End of data base exchange
Switch	Ack	
(normal traffic)		

4. REFERENCES

1. AT&T System 75 R1V3 Implementation Manual, 555-200-652.
2. DEFINITY® Communications System Ceneric 1—Implementation, 555-204-654
3. DEFINITY® Communications System Generic 1, and System 75—Hospitality Operations, 555-200-723.
4. DIMENSION® PBX Feature Package 9 and 11, Property Management System Data Link Interface Specification, AT&T Technical Publication PUB42707.
5. EIA standard RS232C, Interface between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange, Engineering Department, Electronic Industries Association, August 1969.
6. EIA standard RS404, For Start-Stop Signal Quality Between Data Terminal Equipment and Non-Synchronous Data Communications Equipment, Engineering Depatment, Electronic Industries Association, 1967.
7. AT&T System 75 Maintenance, 555-200-105
8. DEFINITY® Communications System Generic 1—Maintenance, 555-204-105
9. AT&T System 75 Installation and Test, 555-200-104
10. DEFINITY® Communications System Generic 1—Installation and Test, 555-204-104