



AM-TR-NPL-000006

Technical Interface Integrated Business Network Attendant Console

To: All Interested Parties

Priority: N/A

Effective Date: December 1985

Issue Date: Issue #1, December 1985

Expires On: N/A

Training Time: N/A

Related Documents: N/A

Canceled Documents: N/A

Issuing Department: N/A

Distribution: N/A

Business Unit: N/A

Copyright © SBC Corporation, 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Table of Contents

1. Introduction	3
2. Scope	3
3. Terminology	3
4. Summary	4
5. Connection Requirements	5
5.1. Physical Connection Arrangement	5
5.1.1. Network Interface	5
5.1.2. Physical Connection	5
5.2. Electrical Interface Requirements	6
5.2.1. Voice Circuit	6
5.2.2. Data Circuit	6
5.2.3. AC Powering Requirements	7
5.3. Data Circuit Message Protocol	7
5.3.1. Byte Format	7
5.3.2. Error Detection	8
5.3.3. Alphanumeric display and The Related Buffers	8
5.3.4. Digit Collection Protocol	9
5.3.5. Transmitted Messages (see Appendix B)	12
5.3.6. Received Messages	15
5.4. Maintenance Related Characteristics	30
5.4.1. Loop Condition	31
5.4.2. Data Circuit	31
ATTACHMENT 1 - Attendant Console Operating Procedures	32
ATTACHMENT 2 - Transmitted Codes	46
ATTACHMENT 3 - ASCII Characters	49
ATTACHMENT 4 - Key and Lamp Codes Cross Reference	51

TECHNICAL REFERENCE NOTICE

This Technical Reference is published by Ameritech to inform the industry of a view of the generic requirements describing Ameritech's technical interface specifications for the Region's Technical Interface Integrated Business Network Attendant Console.

Ameritech reserves the right to revise this document for any reason, including but not limited to, conformity with standards promulgated by various agencies, utilization of advances in the state of the technical arts, or the reflection of changes in the design of any equipment, techniques or procedures described or referred to herein. Liability to anyone arising out of use or reliance upon any information set forth herein is expressly disclaimed, and no representations or warranties, expressed or implied, are made with respect to the accuracy or utility of any information set forth herein.

This document is not to be construed as a suggestion to any manufacturer to modify or change any of its products, nor does this document represent any commitment by Ameritech, any Ameritech Operating Company to purchase any product whether or not it provides the described characteristics.

Nothing contained herein shall be construed as conferring in implication, estoppel or otherwise any license or right under any patent, whether or not the use of any existing or later issued patent.

Ameritech does not recommend products and nothing contained herein is intended as a recommendation of any product to anyone.

This document contains generic requirements for the Technical Interface Integrated Business Network Attendant Console implementation. It has been written specifically for the Ameritech Region.

Document may be ordered from Ameritech by contacting the Document Order Center at (847) 248-4324.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

1. Introduction

This document is intended as an aid for the technical evaluation of an attendant console that will be directly connected to Ameritech Operating Company (AOC) provided Enhanced Business service on a DMS-100 or DMS-250 Northern Telecom switching machine. The functional and performance requirements contained herein represent the interface characteristics that customer provided equipment is required to meet to be compatible with the network interface provided by the AOC for the Business Services attendant console.

Equipment designers using this Interface Specification will be required to verify that their products will be in compliance with the most current Part 68 FCC rules and Regulations.

2. Scope

This interface specification applies to the interface between an attendant console and a northern Telecom, Digital Multiplex System switching machine used for Enhanced Business service. The network interface consists of the interface to one subscriber loop used for voice communication with two additional loops used for a full duplex data circuit.

The specification covers the connecting arrangements and the electrical characteristics for the network interface to the voice pair and four wire data circuit . Also defined is the protocol for the data circuit.

3. Terminology

AC	Attendant Console
C	Counter
CPSN	Current Processed Sequence Number
DB1	Display Buffer 1
DB2	Display Buffer 2
DBB	Digit Display Buffer
DMS machine1	Digital Multiplex System machine, a Northern Telecom
DSN	Digit Sequence Number
DSPC	Display Control
DST	Destination
DT&DR	Data Tip and Ring Transmit Pair

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

DT1&DR1	Data Tip and Ring Receive Pair
FSK	Frequency Shift Keying
IBN	Integrated Business Network
IPM	Interruptions Per Minute
LP	Lamp
LSB	Least Significant Bit
LMTR	Long Timer
MSB	Most Significant Bit
opcode	operation code
POTS	Plain Old Telephone Service
R	Ring
Rx	Receive
Sn	state for lamp number specified
SRC	Source
St	State
STMTR	Short Timer
T	Tip
Tx	Transmit

4. Summary

The Attendant Console enables a customer to have attendant controlled services on premises. The trunks and lines associated with the Enhanced Business service do not have direct terminations on the console. A virtual switched loop concept is used instead. An attendant is involved only for the length of time required to complete or otherwise dispose of a call. Each console is capable of utilizing up to six loops which allows the attendant voice access to calls routed to the console. Only one new call, however, is connected to the console at any one time. When the attendant completes action on a call, the call can be released from the loop in use, or the attendant can hold the call on loop and make the console available for new calls while still receiving call status information.

The console is designed to provide a basic set of features along with several undefined feature keys that can be used for special features provided to meet the needs of the individual customer.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

The console interfaces to the network via three tip and ring pairs. One pair is used for voice communication over the virtual loop. The other two pairs are used for an asynchronous, full duplex Frequency Shift Keying (FSK) four wire data circuit that is used for the transfer of signaling and supervision information between the attendant console and the DMS switching machine.

5. Connection Requirements

5.1. Physical Connection Arrangement

5.1.1. Network Interface

The network interface at this demarcation point consists of six wires to connect three subscriber logos to the terminal equipment (see Figure 1).

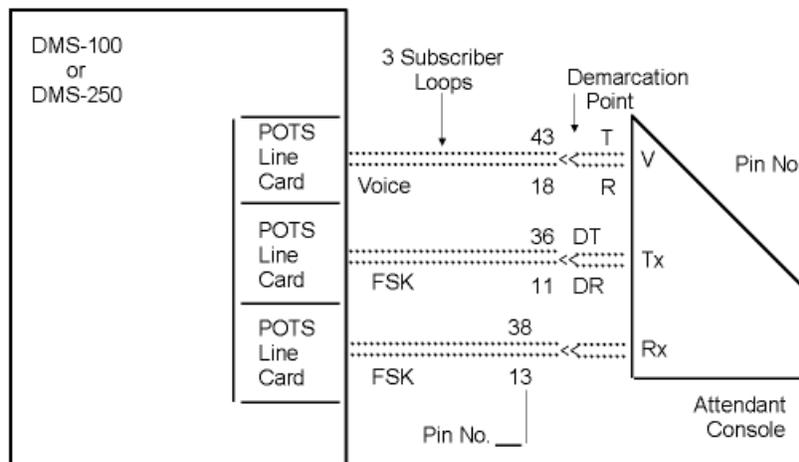


Figure 1 Attendant Console Physical Configuration

5.1.2. Physical Connection

The physical connection to the network is by the six leads as shown in Figure 1. The jack provided is a 50 position miniature ribbon jack as shown in FCC Rules and Regulations, Part 68, Subpart F, Figure 68.500(f)(1). The pin assignments for the jack are as indicated in Figure 1 above. The other pins will not be connected.

5.2. Electrical Interface Requirements**5.2.1. Voice Circuit**

The central office line card for the voice pair provides a balanced battery feed. The voltage supplied over the subscriber loop to the interface is nominally 52 volts, with a maximum limit of 56 volts and minimum of 48 volts.

The AC shall indicate when a handset or headset is connected by presenting the following characteristics to the network interface (the tip and ring pair used for voice communication):

Terminating Impedance	900 ohms (nominal)
D.C. Resistance (tip to ring)	440 Ohms \pm 5%

The AC shall present the following characteristics to the network interface when there is no handset or headset connected.

D.C. Resistance (tip to ring): 10M ohms (minimum)

Voice communication is passed over this interface in both directions as an analog voiceband electrical signal. The transmission requirements are similar to those for the Public Switched Network.

5.2.2. Data Circuit

The four wire network interface to the data circuit provides a full duplex asynchronous data link. The transmit and receive pairs are each fed from separate balanced battery feeds with characteristics that are the same as the voice pair battery feed. The terminations presented by the AC to the network interface shall provide DC blocking when the console is in service.

The idle states for the four wire data circuit interface are as follows:

For The Receive Pair (DT1, DR1) - mark frequency (2225) received

For The Transmit Pair (DT, DR) - mark frequency (1270) transmitted

The characteristics of the four wire modem interface are summarized below.

- In both Transmit and Receive modes

Frequency Shift Keying Nominally 300 bps

- 4-Wire Full Duplex Operation

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Input and Output Impedance Nominally 900 ohms

- Nominal Transmit and Receive frequencies:

Mode	Data	Frequency	
Transmit	Mark	1270 Hz	('1' bit)
Transmit	Space	1070 Hz	('0' bit)
Receive	Mark	2225 Hz	('1' bit)
Receive	Space	2025 Hz	('0' bit)

- In the test mode DT is connected to DR1 through a nominal resistance of 150 ohms and DR is connected to DT1 through a nominal resistance of 150 ohms, thereby providing a path for sealing current supplied from the line cards.
- In the normal operating mode the console four wire data circuit shall present a nominal 900 ohms Input and Out put Impedance with D.C. blocking.
- Transmit and Receive levels:

Mode	Level
Transmit	-13 dBm nominal
Receive	-13 dBm nominal to -25 dBm minimum

5.2.3. AC Powering Requirements

The AC shall be powered by a local commercial power source.

5.3. Data Circuit Message Protocol

The AC signaling and supervision are provided by the four wire data circuit. The messages send and received over the data circuit use the protocol outlined below.

5.3.1. Byte Format

An asynchronous, serial data transmission protocol is used. Each byte of a message consists of eight data bits preceded by a start bit and followed by a parity bit (even parity) plus one stop bit. Within each byte, the bits are sent or received in the order of increasing significance (bit 0 first). Start and stop bits have the same duration as data bits.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

5.3.2. *Error Detection*

The AC is required to check each incoming byte for the correct parity as well as each message for the correct number of bytes based on the first byte of a message which gives the op-code. Since each message has a known number of bytes as delivered here, it is the responsibility of the AC to verify that a received message meets the protocol requirements.

Failure of an incoming message to meet either of the two above requirements shall cause the AC to generate a message that indicates the receive message protocol has not been met. The message transmitted to indicate there was an error in the last received message is "DMS to AC Trouble" (see Appendix B). When the DMS machine receives this message the necessary action will be taken to determine the cause of the problem.

5.3.3. *Alphanumeric display and The Related Buffers*

The following outline of the characteristics of the AC display and the related buffers is given here since part of the protocol includes communication with the display related buffers.

The AC is equipped with sixteen alphanumeric character display to assist the attendant in call processing. The AC displays the contents of one of two buffers in the basic configuration or one of three buffers if the Display Control (DSPC) key option has been implemented. The key used for this option is one of the forty-two feature keys. The ring buffer, Digit Display Buffer (DDB) shown in Figure 2 (page 7) has a thirty-two alphanumeric character capacity and is used for the display of dial pad keying inputs by the AC operator. The display of information in this buffer always takes precedence over the other buffers. Therefore, only when the DDB is empty will the contents of either of the other two be displayed. See Section 5.3.4 for further details on how the DDB and the DMS machine interact. The second buffer, Display Buffer 1 (DB1) has a sixteen alphanumeric capacity. When the DSPC option is not provided the contents of DB1 is displayed on the Alphanumeric Display whenever the DDB is empty. The contents of DB1 can come from one of two sources. A message with sixteen ASCII characters can be sent by the DMS machine to DB1 or the DMS machine can request the contents of the DDB that is being displayed on the console to be transferred to DB1. The third buffer, Display Buffer 2 (DB2) has the same capacity as DB1. This buffer is only used when the DSPC key option is provided. If DB2 is available and there is information stored in it, the contents of DB2 will often be shown first. When the contents of DB2 is being displayed the lamp associated with the DSPC key is on. With the lamp on, if it is desired to look at the contents of DB1 the DSPC key is hit and the DSPC key lamp goes off. This indicates the contents of DB1 is now being displayed. Hence, it is possible to toggle the display back and forth between the contents of DB1 and DB2 by successively hitting the DSPC key. Information is placed in DB2 via a message, from the DMS machine, that contains sixteen ASCII characters.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

5.3.4. Digit Collection Protocol

The digit collection protocol is used as the means of transmitting digits, keyed into the AC dial pad, to the DMS machine while they are simultaneously being displayed on the Alphanumeric display of the AC. The protocol also provides a means for the DMS machine to keep the AC alphanumeric display up to date.

The DDB, as shown in Figure 2, has thirty-two locations for storing dial pad inputs keyed in by the console attendant.

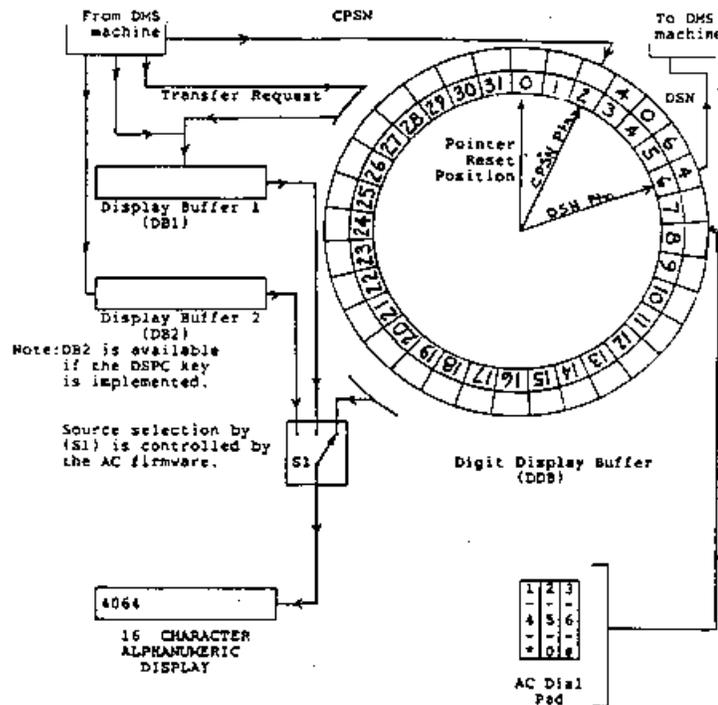


Figure 2 Display and The Related Buffers

Associated with each of the thirty-two locations of this ring buffer is a Digit Sequence Number (DSN), see Appendix B for codes sent. The use of the DSN enables the attendant console DDB

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

status to be transmitted to the DMS machine. The DMS machine can in turn alter the DDB contents and the related display by returning a Current Processed Sequence Number (CPSN). The CPSN indicates the digits that have been processed by the DMS machine and may therefore be erased from the DDB and the display. The AC therefore is responsible for displaying dial pad entries while the DMS machine controls their removal from the display. If at any time the number of digits in the DDB exceeds the capacity of the sixteen character alphanumeric display, the display should act like a moving window that displays the latest sixteen entries into the DDB. The entries into the ring buffer are made with the DSN incrementing by one up to a DSN of 31 at which time it wraps around with the next entry to the DDB having a DSN of 0.

The digit collection protocol uses the following variables to control what is transmitted in addition to the actual dial pad key hits.

LMTR (Long Timer)	When dial pad entries are made, as long as the number of digits in a keying sequence is equal to or less than the MIN (defined below) number of digits, the LTMR (5 seconds) is used. The timer is started when a dial pad key is hit and if it times out the DSN that is associated with the last entry is transmitted. If a dial pad key is hit before the timer times out, the timer is reset to zero and starts again.
STMR (Short Timer)	When the number of dial pad entries in a keying sequence exceeds the MIN number of digits the STMR (0.5 second) is used in the same manner as the LTMR is used.
MAX	Maximum number of digits that can be keyed in, in any one keying sequence before a DSN shall be transmitted.
MIN	Minimum number of digits that can be keyed in using the LTMR between successive dial pad entries. When the number of digits entered in any one keying sequence exceeds the MIN the AC shall switch to using the STMR between inputs.
ENDDIG	The dial pad key that shall be recognized by the DMS machine and the AC as an end of keying sequence indicator (usually the octothorpe key "#").
Counter (C)	For any given keying sequence the AC maintains a counter that starts at zero and is incremented by one for each digit entered. It is by comparing this count to MIN or MAX that the AC determines the necessary action to be taken.

When the ACI is initially powered the default values for MAX, MIN and ENDDIG shall be 31, 31 and octothorpe (#) key respectively. If an "AC Digit Collect Protocol Command" is received subsequently, the values for MIN, MAX and ENDDIG shall be altered as required. If the new MAX value has been exceeded by a keying sequence that is in progress when the new protocol command is received the current DSN pointer position shall be transmitted and the counter, C, is reset to zero.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

The flow chart shown in Figure 3 indicates how the digit collection protocol functions after the first digit is entered in a keying sequence.

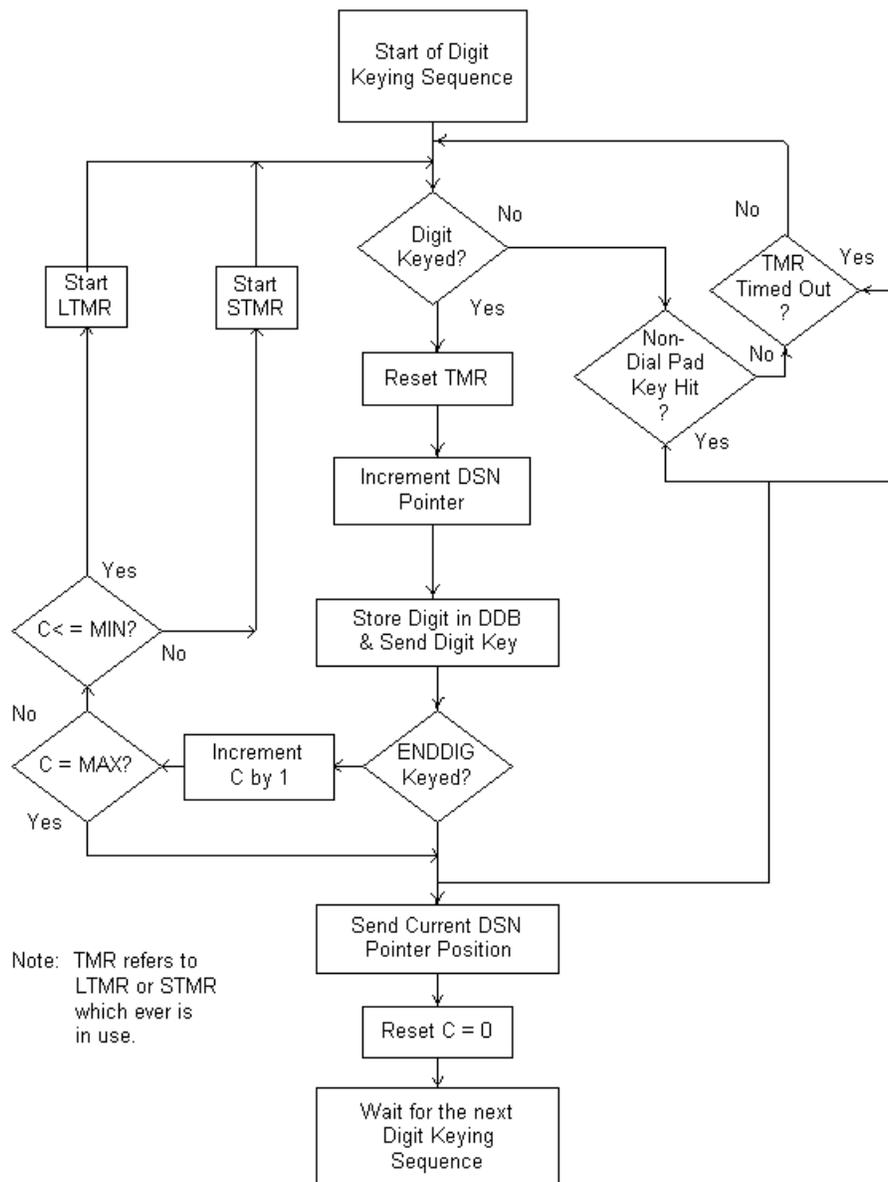


Figure 3 Flow Chart - Digit Collection Procedure

As An Example

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

The following example illustrates what occurs when the attendant enters digits on the AC dial pad.

	DDB Status	Last DSN Tx	Last CPSN Rx	Display	Comments
1		0	0	<input type="text"/>	This is the initial condition i.e. the display is blank.
2		4	0	2613	The attendant keys in the digits "2613".
3		6	0	261368	Before "2613" is processed the attendant enters digits "68".
4		6	4	68	The DMS machine has processed "2613" but not the other two digits entered.
5		6	6	<input type="text"/>	The digits "68" have been processed i.e. the display is blank.

5.3.5. Transmitted Messages (see Appendix B)

The messages transmitted by the AC to the DMS machine fall into two general categories. Those messages that are a direct result of some action taken by the operation of the AC fall into the first category i.e., depressing a feature key or a dial pad key, removing or inserting a headset or a handset in a jack. Those messages that are a direct result of a received message from the DMS machine fall into the second category i.e., error detected in the incoming message, request for loop around, etc.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

All transmitted messages may be sent with a start code following the message. The start code is used as a prompt to the DMS machine to act on the data it has received between the latest prompt and the one that preceded it.

The start codes can be suppressed if the DMS machine requests it (see received message sec. 5.3.6.27)

Loop Keys 1 to 6	The six loop key commands provide each loop key with a unique message that is sent to identify the virtual loop that is being accessed. The loop keys are used to answer calls, originate calls and extend calls. The keys are also used to re-unite excluded parties and to allow entry into a connection that has been placed in the hold state. Each loop key has two associated lamps; a Source (S) and a Destination (D) lamp. The S lamp indicates the calling party state. This is the attendant if the call is originated from the AC. The D lamp indicates the called party state.
Release Source Key	This command is used to release a calling party, release the Attendant from a busy or reorder signal, or correct a keying error made while dialing a source.
Release Destination Key	This command is used to release a called party, release the Attendant from a busy or reorder signal, or correct a keying error made while dialing a destination.
Signal Source Key	This command is used to signal a party on the source side of a loop. The signal sent by the DMS machine as a result of this command can be a momentary on-hook to another office (depending on trunk type) or ringing to a station or tone to an off-hook IBN station.
Signal Destination Key	This command is used to signal a party on the destination side of a loop. The signal the DMS machine sends as a result of this command is as stated for the signal source key.
Exclude Source Key	This command is used to temporarily exclude a calling party and to permit the Attendant to talk with a called party privately. The associated lamp state is ON while the feature is activated.
Exclude Destination Key	This command is used to temporarily exclude a called party and permit the Attendant to talk with a calling party privately. The associated lamp state is ON while the feature is activated.

Hold Key	This command is used to place one of the six virtual loops on which a call has been established in a hold state. Thereby the Attendant is able to continue receiving calls status information through the loop source and destination lamps while freeing the Attendant to originate or receive new calls on an idle loop key.
Release Key	This command is used to release calls from a loop. Sending this command makes the loop idle and makes the position available to receive new calls. The associated Release lamp is on when the AC is idle and available to receive calls. This command is also used to clear the display.
Night Service Key	This command is used to activate and to deactivate Night Service routing of all calls to the specified Night Service position which could be a station or another console.
Feature Keys	<p>The commands associated with the forty-two feature keys are provided as a means of implementing features to meet the customer's needs. The keys enable the DMS machine to assign such features as:</p> <ul style="list-style-type: none"> • Incoming Call Identification • Trunk Group Busy • Attendant Speed Calling • Attendant Call Detail Recording • Conference - 6 port • Busy Verification of Stations, etc.

NOTE: The specific commands and the associated features will be set forth in the applicable tariffs.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Headset or Handset Status (IN/OUT)	Whenever a handset or headset is inserted into the AC jack, the IN command shall be sent. If a handset or headset is removed for a period of time exceeding one minute the OUT command shall be sent. The status shall also be sent if the message requesting the headset or handset status is received. The signature of the voice pair termination shall change as required under Section 5.2.1 when the handset or headset status changes.
Dial Pad Keys	The commands associated with the twelve button dial pad are used for the entry of digits. The (*) key is used to enter pauses and the octothorpe (#) key is used to indicate the end of keying sequence. See the digit collection protocol for further details on how digit commands are sent.
Digit Sequence Number (DSN)	The DSN as shown in Appendix B can be a number from 31. The use of the DSN is given in the digit collect protocol description (Section 5.3.4)
Test Results (OK/FAIL)	These two commands are associated with a request received from the DMS machine for the AC to perform internal diagnostics and return the test results.
Test Key	This command is used to indicate to the DMS machine that the AC has been placed in a self test mode. The second time the command is sent indicates to the DMS machine that the AC has been taken out of the self test mode.

5.3.6. Received Messages

The following messages define the commands received by the AC from the DMS machine. In the case of each command the following parameters are given: opcode, format of the message, description of what the message shall do and the response if any, the AC is expected to the DMS machine. For each of the received messages, the response by the AC to the DMS machine shall be as outlined in Section 5.3.2 if an error is detected.

5.3.6.1. AC Clear All Command

opcode - 81 Hex
Format - 1 byte

81

Description

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

All the console lamps are cleared and the console buzzer is reset if it is on. Also all outputs are cleared with the exception of the digit collection which is not affected and the console display which is not cleared.

Response

None required.

5.3.6.2. Lamp Control Commands

The commands defined in Sections 5.3.6.3 to 5.3.6.10 are used to control the lamps on the AC. The following outline describes how the lamps are addressed and gives the possible states they can be placed in.

Lamp Selection

The lamps are divided into four groups with each group having a maximum of sixteen lamps. The following tables define which lamps are in which groups.

Lamp Group 0 Table

TABLE A

Lamp No.		Designation
0	0Hex	Loop 1, Source
1	1Hex	Loop 1, Destination
2	2Hex	Loop 2, Source
3	3Hex	Loop 2, Destination
4	4Hex	Loop 3, Source
5	5Hex	Loop 3, Destination
6	6Hex	Loop 4, Source
7	7Hex	Loop 4, Destination
8	8Hex	Loop 5, Source
9	9Hex	Loop 5, Destination
10	AHex	Loop 6, Source
11	BHex	Loop 6, Destination
12	CHex	Exclude Source
13	DHex	Exclude Destination
14	Ehex	Release
15	FHex	Call Waiting

Lamp Group 1 Table

TABLE B

Lamp No.		Designation
0	0Hex	Night
1	1Hex	Test
2	2Hex	Feature Key No. 1
3	3Hex	Feature Key No. 2
4	4Hex	Feature Key No. 3
5	5Hex	Feature Key No. 4
6	6Hex	Feature Key No. 5
7	7Hex	Feature Key No. 6
8	8Hex	Feature Key No. 7
9	9Hex	Feature Key No. 8
10	AHex	Feature Key No. 9
11	BHex	Feature Key No. 10
12	CHex	Feature Key No. 11
13	DHex	Feature Key No. 12
14	Ehex	Feature Key No. 13
15	FHex	Feature Key No. 14

Lamp Group 2 Table

TABLE C

Lamp No.		Designation
0	0Hex	Feature Key No. 15
1	1Hex	Feature Key No. 16
2	2Hex	Feature Key No. 17
3	3Hex	Feature Key No. 18
4	4Hex	Feature Key No. 19
5	5Hex	Feature Key No. 20
6	6Hex	Feature Key No. 21
7	7Hex	Feature Key No. 22
8	8Hex	Feature Key No. 23
9	9Hex	Feature Key No. 24
10	AHex	Feature Key No. 25
11	BHex	Feature Key No. 26
12	CHex	Feature Key No. 27
13	DHex	Feature Key No. 28
14	Ehex	Feature Key No. 29
15	FHex	Feature Key No. 30

Lamp Group 3 Table

TABLE D

Lamp No.		Designation
0	0Hex	Feature KeyNo. 31
1	1Hex	Feature KeyNo. 32
2	2Hex	Feature KeyNo. 33
3	3Hex	Feature KeyNo. 34
4	4Hex	Feature KeyNo. 35
5	5Hex	Feature KeyNo. 36
6	6Hex	Feature KeyNo. 37
7	7Hex	Feature KeyNo. 38
8	8Hex	Feature KeyNo. 39
9	9Hex	Feature KeyNo. 40
10	AHex	Feature KeyNo. 41
11	BHex	Feature KeyNo. 42
12	CHex	Not Used
13	DHex	Not Used
14	Ehex	Not Used
15	FHex	Not Used

Lamp States

The possible lamp states are shown in the table below.

Lamp State	Description	Binary Code		
		B2	B1	B0
OFF	Lamp Off	0	0	0
ON	Lamp On	0	1	1
20	Lamp Winking at 20 IPM (duty cycle 75% On and 25% Off)	1	1	1
60	Lamp Flashing at 60 IPM (duty cycle 50% On and 50% Off)	0	0	1
120	Lamp Winking at 120 IPM (duty cycle 75% On and 25% Off)	0	1	0

5.3.6.3. AC Set Lamp Command Group 0

opcode 82 Hex

5.3.6.4. AC Set Lamp Command Group 1

opcode 83 Hex

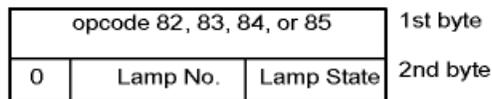
5.3.6.5. AC Set Lamp Command Group 2

opcode 84 Hex

5.3.6.6. AC Set Lamp Command Group 3

opcode 85 Hex

Format: The commands given in Sections 5.3.6.3 to 5.3.6.6 have the same format as follows: 2 bytes



Description

The first byte defines the group of lamps the command applies to and the second byte defines the lamp and it's state as follows:

Most Significant Bit always equals 0.

Next Four Bits define the lamp number given in binary (see Table A, B, C or D).

Three Least Significant Bits define the lamp state using the codes given in Table E using bits 82 to B0.

Response

None required.

5.3.6.7. AC Set Group 0 Command

opcode 86 Hex

Format - 9 bytes

opcode 86 H				1st byte
0	Lp.1 St.	0	Lp.0 St.	2nd byte
0	Lp.3 St.	0	Lp.2 St.	3rd byte
0	Lp.5 St.	0	Lp.4 St.	4th byte
0	Lp.7 St.	0	Lp.6 St.	5th byte
0	Lp.9 St.	0	Lp.8 St.	6th byte
0	Lp.11 St.	0	Lp.10 St.	7th byte
0	Lp.13 St.	0	Lp.12 St.	8th byte
0	Lp.15 St.	0	Lp.14 St.	9th byte
M7	M6 M5 M4	M3	M2 M1 M0	

Description

The lamps in group 0 as defined in Lamp Group 0, Table A of Section 5.3.6.2 are given the specified states. The possible lamp states are three bits wide as defined in Table E. For the even numbered lamps, bits M2-M0 correspond to bits B2-B0 of Table E. For the odd numbered lamps bits M6-M4 correspond to bits B2-B0 to Table E. The MSB and bit M3 of bytes 2 through 9 are always 0.

Response

None required.

5.3.6.8. AC Set Group 1 Command

opcode 87 Hex

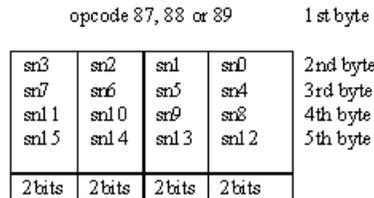
5.3.6.9. AC Set Group 2 Command

opcode 88 Hex

5.3.6.10. AC Set Group 3 Command

opcode 89 Hex

Format: The commands given in Sections 5.3.6.8 to 5.3.6.10 have the same format as follows:
5 bytes



Description

The lamps in the corresponding group are set to one of four possible states. The sn numbers given in the format outline above correspond to the lamp number in the lamp group. For each lamp two bits are used to define the lamp status. The possible lamp states correspond to four states defined in the Lamp States, Table E using the two LSB. The four possible are OFF, ON, 60 IPM and 120 IPM.

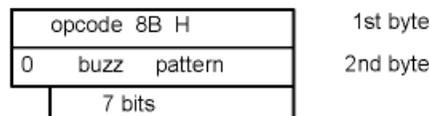
Response

None required.

5.3.6.11. AC Buzzer Command

opcode 8B Hex

Format - 2 bytes



Description

This command is used to control the AC buzzer. The second byte is used to define the buzz pattern. The MSB of the second byte is always zero. However, the AC shall treat the MSB as a one for the purpose of generating a buzz pattern. The eight bits of the second byte are then interpreted in sequence, starting with the MSB and working down to the LSB. Each bit represents

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

a set time interval that the buzzer is on or off. For example, if the second byte received were 00101010 the buzzer on-off pattern would be ON-OFF-ON-OFF-ON-OFF-ON-OFF. The time interval represented by each bit is nominally 213 milliseconds.

Response

None required.

5.3.6.12. AC Soft Reset Command

opcode 8C Hex

Format - 1 byte

8C

Description

This command shall cause the AC to perform a reset. The modem carrier shall remain on although a delay of 100 milliseconds shall be provided for the AC to re-initialize. During this period the DMS machine does not expect to receive new messages nor will it send new messages to the AC. The AC shall reset all lamps, the buzzer and the display shall be cleared. The DSN shall be reset to 0.

Response

None required.

5.3.6.13. AC Reset Command

opcode 8D Hex

Format - 1 byte

8D

Description

This command shall cause the AC to perform a reset. Lamps, buzzer and display are all cleared. The carrier is dropped towards the DMS machine while the reset is occurring. The DSN shall be reset to 0.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

NOTE: If there is a momentary loss of the FSK carrier on the receive pair (DT1, DR1), the AC shall initiate the reset procedure as defined above automatically.

Response

None required.

5.3.6.14. AC Query Headset Command

opcode 8E Hex

Format - 1 byte

8E

Description

The status of the headset or handset is to be returned to the DMS machine in the transmit channel when this message is received.

Response

See the transmitted messages for the headset or handset status codes.

5.3.6.15. AC Test Command

opcode 8F Hex

Format - 1 byte

8F

This command shall cause the AC to perform diagnostics and the results of the firmware diagnostics shall be transmitted back to the DMS machine.

Response

See the transmitted messages for the test OK and test fail codes. The response being returned by the AC nominally 5 seconds after the request is received.

5.3.6.16. AC Set Looparound Command

opcode 95 Hex

5.3.6.17. AC Reset Looparound Command

opcode FF Hex

Format: The commands given in Section 5.3.6.16 and 5.3.6.17 have the same format as follows:



Description

Upon receipt of **AC Set Looparound Command** by the AC, all subsequent received messages are to be transmitted back to the DMS machine. Key hits shall be ignored by the AC during looparound. The looparound shall be terminated when the AC receives the **AC Reset Looparound Command**. The **AC Reset Looparound Command** shall cause the AC to stop echoing received messages and to perform automatically the equivalent of **AC Soft Reset Command** as outlined previously.

Response

During the looparound all received messages shall be transmitted back to the DMS machine with the error detection scheme defined in Section 5.3.2 remaining in effect.

5.3.6.18. AC Digit Collect Protocol Command

opcode 96 Hex

Format - 4 bytes

opcode 96				1 st byte
0	0	0	MIN	2nd byte
0	0	0	MAX	3rd byte
0	0	0	0 ENDDIG	4th byte

This command is used by the AC to define the variables to be used with the digit collection protocol. The second byte uses the five LSB (MIN) to define the number of digits (in decimal a number between 0 and 31) that the AC is to collect before it switches from the long timer (LMTR) to the short timer (STMR). The third byte uses the five LSB (MAX) to define the maximum number of digits (in decimal a number up to 31) that can be collected before the DSN is sent along with the start code if they are being used. The digit collection protocol resets a counter back to zero at this time. The three MSB of bytes two and three are always zero. The fourth byte defines the dial pad key that is to be used to indicate an end of keying sequence. The four LSB correspond to the four LSB of the key code that is transmitted (see the transmitted dial pad codes in Appendix B) therefore byte four would be 00001010. The four MSB of byte four are always zero.

Response

None required.

5.3.6.19. Display Related Commands

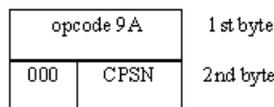
There are five display related commands the DMS machine can send to the AC. They are defined in Sections 5.3.6.20 to 5.3.6.24. For each of the five commands, one byte is used to transmit the Current Processed Sequence Number (CSPN). The CSPN is used by the AC to update the status of the DDB.

In addition to the description associated with each of the five display commands Section 5.3.6.25 give the logical sequence that the AC firmware shall follow for each of the commands.

5.3.6.20. AC Update Echoed Digits Command

opcode 9A Hex

Format - 2 bytes



Description

This command is used to update the AC display. All digits in the DDB with an associated DSN equal to or less than the five bit CPSN given in the second byte shall be cleared from the DDB. The three MSB of the second byte are always zeros.

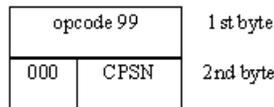
Response

None required.

5.3.6.21. AC Clear Display Command

opcode 99 Hex

Format - 2 bytes



Description

This command shall clear both DB1 and DB2. All digits in the DDB with an associated DSN equal to or less than the five bit CPSN given in the second byte shall be cleared from the DDB. The three MSB of the second byte are always zeros.

Response

None required.

5.3.6.22. AC Display DB1 Command

opcode 97 Hex

5.3.6.23. AC Display DB2 Command

opcode 98 Hex

Format: The commands given in Section 5.3.6.22 and 5.3.6.23 have the same format as follows:

18 bytes

opcode 97 or 98		1 st byte
0 0 0	CSPN	2nd byte
0	char 0	3rd byte
0	char 1	4th byte
0	char 2	5th byte
0	char 3	6th byte
0	char 4	7th byte
0	char 5	8th byte
0	char 6	9th byte
0	char 7	10th byte
0	char 8	11th byte
0	char 9	12th byte
0	char 10	13th byte
0	char 11	14th byte
0	char 12	15th byte
0	char 13	16th byte
0	char 14	17th byte
0	char 15	18th byte

Description

These commands are used to load up to sixteen ASCII characters into the AC display buffers, either DB1 or DB2. All digits in the DDB with an associated DSN equal to or less than the five bit CPSN given in the second byte shall be cleared from the DDB. The three MSB of the second byte are always zeros.

The possible seven bit ASCII characters that may be received are given in Appendix C. The MSB for bytes three to eighteen is always zero. In the case of **AC Display DB2 Command** the AC shall ensure that the contents of DB2 will displayed if the DDB is empty.

For both commands char 0 to char 15 represent the characters as they will be displayed from right to left respectively.

5.3.6.24. AC Save Dialed Digits Command

Format - 2 bytes

opcode 9b		1 st byte
0 0 0	CPSN	2nd byte

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Description

This command is used to copy the digits, in the DDB into DB1, that have an associated DSN equal to or less than the five bit CPSN given in the second byte of the command. The three MSB of the second byte are always zeros. If the DDB is empty prior to receiving this command DB1 is not touched. The final action taken is to update the AC display. All digits in the DDB, with an associated DSN equal to or less than the CPSN given in the second byte, shall be cleared.

Response

None required.

5.3.6.25. Display Control Logic

Described here is the action that the AC shall take and the set order the DMS machine assumes the AC is following when one of the five display related commands is sent to the AC. Note that the remarks relevant to DB2 only apply if the DSPC key option is implemented. A flag is used in association with DB2 and when the flag is "Set" this indicates that DB2 has second

priority relative to the DDB which has first priority at all times. When the flag is "Reset" DB1 has second priority relative to the DDB.

a) Procedure to Update DDB

Delete digits from DDB with DSN<=CPSN
DB2 flag → Reset
End Update DDB

b) AC Update Echoed Digits Command

Perform the procedure outlined in (a) above.

c) AC Clear Display Command

Perform the procedure outline in (a) above.
Clear DB1
Clear DB2

d) AC Display DB1 Command

Perform the procedure outlined in (a) above.
Store 16 ASCII characters in DB1.

e) AC Display DB2 Command

Perform the procedure outlined in (a) above.
Store 16 ASCII characters in DB2.
DB2 flag → Set

f) AC Save Dialed Digits Command

If DDB is not empty
Then clear DB1
Then clear DB2
digits in DDB with DSN <=CPSN store in DB1
END IF
Perform the procedure outlined in (a) above.

g) Display

The procedures defined in (a) to (f) above deal with modifying the contents and status of the display related buffers of the AC and not the actual display itself. What is displayed on the AC after receiving one of the commands given in (b) to (f) above is based on the following sequence the AC uses.

Clear Display
If DDB is not empty
Then display contents of DDB

Else IF DB2 flag Set
Then display contents of DB2

Else display contents of DB1

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

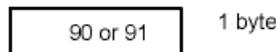
5.3.6.26. AC Send Starts Command

opcode 90 Hex

5.3.6.27. AC Suppress Starts Command

opcode 91 Hex

Format: The commands given in Section 5.3.6.26 and 5.3.6.27 have the same format as follows:



Description

These two commands define the transmit communications protocol that is to be used by the AC. The AC Suppress Starts Command is used to indicate to the AC that the Start Code should not be transmitted at the times the AC to DMS transmit protocol calls for them. An exception to this is when the AC sends the "DMS to AC Trouble: code which always should be followed by a Start Code. The AC Send Starts Command causes the Start Code to be sent when required as defined by the AC to DMS transmit protocol. If the start code was suppressed, then upon receiving the AC Send Starts Command an immediate Start Code shall returned to the DMS machine.

The default mode for the AC upon initial power up or after receiving either a Soft Reset Command or a Reset Command shall be to the send starts protocol.

Response:

See Section 5.3.5 Transmitted Messages

5.4. Maintenance Related Characteristics

The following AC characteristics are designed to allow the telephone operating companies to perform routine maintenance testing on the subscriber loops used for the AC. This enables the condition of the loop and the status of the AC to be determined.

5.4.1. Loop Condition

Evaluation of the condition of the three subscriber loops is made possible by the required signature of the AC interface as outlined in sections 5.2.1 and 5.2.2

.

5.4.2. Data Circuit

The data circuit is provided with several additional maintenance related features that are part of the message protocol.

5.4.2.1.

The loop around command enables the data circuit, both transmit and receive, to be checked from the switching machine.

5.4.2.2.

The diagnostics command that can be transmitted from the switching machine to the AC enables remote check out of the AC status.

5.4.2.3.

The self test mode that can be initiated by a command from the AC can be used to enable maintenance personnel to establish the AC human interface (lamps, keys etc.) is functional.

ATTACHMENT 1 - Attendant Console Operating Procedures**1.1. AC Human Interface**

The front panel of the AC has the following keys, lamps and display provided to enable the user to interact with the console.

- A 12-button keypad:
- Six loop keys. Each loop key has a Source lamp and a Destination lamp:
- A Calls Waiting lamp:
- A Release key and an associated lamp:
- A Hold key:
- A Night Service key and an associated lamp:
- A Console Test key and an associated lamp:
- An Exclude Source key and an associated lamp:
- An Exclude Destination key and an associated lamp:
- A Signal Source key and an associated lamp:
- A Signal Destination key and an associated lamp:
- A Release Source key and an associated lamp:
- A Release Destination key and an associated lamp:
- Forty-two feature keys and associated lamps.
- A 16-character alphanumeric display.

1.2. Functions of Keys and Lamps

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Keys and Lamps	Function
feature keys (42 keys)	Allow the console to perform the centrex features designated by the DMS central office.
exclude source key	Excludes a source party and permits the attendant to talk privately with a destination party. The associated lamp state is ON while the feature is activated.
exclude destination key	Excludes a destination party and permits attendant to talk privately with a source party. The associated lamp state is ON while the feature is activated.
signal source key	Sends a tone to the party that is off-hook or ringing to the party that is on-hook in the attendant's customer group on the source end of a loop.
signal destination key	Sends a tone to the party that is off-hook on ringing to the party that is on-hook in the attendant's customer group on the destination end of a loop.
release source key	Releases a source party from the console and allows input of new numbers. Releases the attendant from a busy or reorder tone on the source side of the loop. Cancels a keying sequence if made while dialing a source.
12-button keypad	Enters digits of a telephone number. Enters pauses by pressing the star key (*). Enters an end-of-keying sequence signal by pressing the octothorpe key (#).
release destination key	Releases a destination party from the console and allows input of new numbers. Releases the attendant from a busy or reorder tone on the destination side of the loop. Cancels a keying sequence if made while dialing a destination.
cw (call waiting) lamp	Indicates calls are in queue to be answered by an attendant.

loop keys (6 keys)	Answer a call. Originate a call. Re-enter a held loop.
s (source) lamp	Indicates the state of the source party.
d (destination) lamp	Indicates the state of the destination party.
hold key	Holds the call on the loop and leaves the console in an idle state. The Attendant continues to receive call status information through the held loop source and destination lamps while receiving new calls.
night service call	Activates night service which channels calls normally handled by an attendant to a designated night service number or other console in a control group or signals a station user to dial the trunk answer from any station (TAFAS) code to intercept a call. Deactivates night service.
console test key	Allows self tests to be performed by the attendant or maintenance personnel.
release key and assoc. lamp	Used to release calls from the loop and to clear the display. Operation of the key makes the loop idle and makes the position available to receive new calls. The associated release lamp is on when the Attendant Console is idle and available to receive calls.
display	The main purpose of the display is to present information that enables the Attendant to handle calls efficiently. The call handling is made up of the five following phases: <ul style="list-style-type: none"> • A Call Presentation phase: • A Dialing phase: • A Terminating phase: • A Held Call Re-entry phase • A Call Release phase.

Several of the keys on the console have a lamp or lamps associated with them. The state of the lamp off, on, wink, blink, or flash provides information on the status of a call. The following terms describe the types of lamp states.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Lamp State	Description
OFF	Lamp is dark
ON	Lamp is glowing steadily
WINK	Lamp winks slowly, 20 winks per minute
BLINK	Lamp blinks moderately, 60 blinks per minute
FLASH	Lamp flashes quickly, 120 flashes per minute.

Source, destination, and Call-waiting Lamp States.

The s (source) lamp provides information on the call status of the calling party or the source party originated by the attendant.

The d (destination) lamp provides information on the call status of the called or destination party.

The cw (call waiting) lamp indicates, by glowing steadily, that there are one or more calls waiting to be answered by an attendant. It flashes when calls have waited longer than a predetermined time for answer.

If you indicate a call while other calls are waiting in queue, only the s (source) lamp is on.

The following conditions further explain the lamp states on the console.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Lamp	State	Condition
s (source)	<p>OFF</p> <p>ON</p> <p>WINK</p> <p>BLINK</p> <p>FLASH</p>	<p>No source call is connected to or held on a loop.</p> <p>A source call is connected to a loop.</p> <p>The attendant is originating a call.</p> <p>The attendant has answered a new call or a call held on a loop.</p> <p>An off-hook source is held on a loop by pressing the hold key.</p> <p>An on-hook station is held on the console for recall by the attendant.</p> <p>The attendant is being alerted that a queued call is waiting for answer.</p> <p>The held source has recalled the attendant.</p>
d (destination)	<p>OFF</p> <p>ON</p> <p>WINK</p> <p>FLASH</p>	<p>No destination call is connected to or held on the loop.</p> <p>The attendant has an off-hook destination on the loop.</p> <p>An incoming call is extended, the destination is busy (camp-on and call waiting are not allowed), and the reorder tone is present. The destination lamp and reorder tone both turn off after two seconds.</p> <p>The destination is connected to an outgoing trunk and has answered.</p> <p>The attendant is waiting for the destination to answer.</p> <p>The attendant has answered a switchhook flash for a recall held on a loop.</p> <p>The attendant has answered a call transferred to the attendant. The transferring party remained off-hook.</p> <p>An incoming call has been extended, the destination has been rung and answered, and the hold key has been pressed.</p> <p>The destination is connected to an outgoing trunk without answer supervision.</p> <p>The call was previously held on a loop and is currently a no-answer recall.</p> <p>The attendant is alerted to a recall camp-on or recall call-waiting.</p> <p>The held destination has recalled the attendant.</p>

Copyright © SBC Service, Inc. 2000
 This document is protected by the U.S. Copyright laws.
 Any alteration to its text, contents, or presentation format is an infringement of SBC's Copyright rights.

Lamp(cont.)	State(cont.)	Condition(cont.)
cw (call waiting)	OFF	No calls are in queue.
	ON	One or more calls are in queue.
	FLASH	The call in queue has waited longer for answer than the predetermined threshold.

1.3. Functions of Keys and Lamps

Some of the characteristics associated with using the attendant console keys that have a designated application are described here. This is intended to help the designer understand the interaction between the AC operator and the DMS-100 machine. However, no reference is made to the messages that will appear on the display or to the various features that could be implemented using the forty-two feature keys. The feature keys, in conjunction with the DMS-100 software, can be used to provide optional features.

Definition of these optional features and the required user interaction with the AC will form part of the tariffs filed for each optional feature that is made available.

1.3.1. Selecting Calls

1.3.1.1. Queuing

All new incoming calls (and recalls) are placed in a queue, or waiting line, in order of their arrival.

the lit cw (call waiting) lamp alerts you that a call is in queue.

Several calls may be queued to a console, each call being a different type. A call may be answered by pressing

- a flashing loop key

Loop Key

In the case where none of the forty-two feature keys have been assigned specific features, calls are automatically queued to a loop key on a first-in, first-out basis. No priority can be assigned to specific types of calls except interposition calls. Holding a call on a loop allows you the flexibility of re-entering the call to perform additional attendant-assisted functions.

1.3.2. Recovering From Keying Errors

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

The attendant console provides a simple way to recover from a keying error. To cancel an incorrect string of digits, press the accessed loop key. If you make a keying error while in the process of extending a call, you can press the accessed loop key to cancel the string of digits or press the release destination key.

If you make a keying error while originating a call, press the accessed loop key to cancel the string of digits or press the release source key.

After the digit cancellation, re-enter the string of appropriate digits to complete the call.

1.3.3. Holding a Call

The DMS 100 console lets you place a call on hold manually or automatically. A maximum of six calls can be simultaneously held on a console. If all six loops have calls on hold, your console is unavailable to answer new calls. The call waiting lamp continues to provide information about calls in queue.

1.3.3.1. Manual Hold

A call is manually held on the console by pressing the hold key. After the key is pressed the console becomes idle. You are alerted to new calls in the queue.

1.3.3.2. Automatic Hold

Calls are automatically held on a loop when you press another loop key. Activating another loop key causes the console to remain busy. As a result, you can originate a call but are not alerted to new calls in the queue.

1.3.4. Answering Calls

Answering an incoming call:

Step	Comments
1	The console is idle. The lamp associated with the release key is on.
2	The console buzzes.
3	Press the loop key with the associated source lamp on.
4	The lamp associated with the release key is off. The source is connected to the console. Handle the call as requested by the source. Press the release key to release the call from the loop and the console. The lamps associated with the loop key are off. The console is idle. The lamp associated with the release key is on.

1.3.5. Extending Calls

After extending a call, you can listen for the ringback tone and wait for the destination to answer before pressing the release key, or you can press the release key immediately after entering digits. The second method allows you to process calls much quicker. If a destination is busy and camp-on or call waiting is not allowed, the system ignores the pressing of the release key.

1.3.5.1. Extending a call to a destination.

Condition: A destination is idle.

Step	Comments
1	The console is idle. The lamp next to the release key is on.
2	The console buzzes.
3	Press the loop key with the associated source lamp which is on.
4	The lamp associated with the release key is off. The source asks for a call to be extended.
5	Enter the destination's telephone number. The destination lamp blinks.
	Press the release key to connect the parties and release the call from the loop and the console. The source and destination lamps associated with the loop key are off. The Console is idle. The lamp associated with the release key is on.
	or
	Press the hold key to connect the parties and hold the call on the loop.
	The source and destination lamps associated with the loop key wink. The console is idle.

1.3.5.2. Extending a call for a held source.

Condition: The source is on-hook and connected to the loop

Step	Comments
1	Enter the destination's telephone number. The destination lamp associated with the loop key blinks. A ringback tone is heard. Wait for the destination to answer.
2	
3	The destination answers. The destination lamp associated with the loop key is on.
4	Press the signal source key to signal the source that the destination is on the loop. Wait for the source to answer.
	Press the release key to connect the parties and release the call from the loop and the console. The source and destination lamps associated with the loop key are off. The console is idle.
	or
	Press the hold key to connect the parties and hold the call on the loop. The source and destination lamps associated with the loop key wink. The Console is idle.
	The lamp associated with the loop key is on.

1.3.5.3. Extending a call to a busy destination

Step	Comments
1	The console is idle. The lamp associated with the release key is on.
2	The console buzzes.
3	Press the loop key with the source lamp on.
4	The lamp associated with the release key is off. The source asks for a call to be extended.
5	Enter the destination's telephone number. A busy tone is heard for two seconds. The destination lamp associated with the loop key turns off after two seconds.
6	The source is automatically reconnected. Continue the call according to the request of the source.
	Press the release key to release the call from the console. The source lamp associated with the loop key is off. The console is idle. The lamp associated with the release key is on.

1.3.6. Originating Calls

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

1.3.6.1. Originating a call to a source.

Condition: A source is idle.

Step	Comments
1	The console is idle. The lamp associated with the release key is on.
2	Press an idle loop key. The lamp associated with the release key is off. The source lamp associated with the loop key is on.
3	Enter the station's telephone number. A ringback tone is heard. Wait for the station to answer. The station answers and conversation can take place.
	Press the release key to release the call from the loop and the console. The source lamp associated with the loop key is off. The console is idle. The lamp associated with the release key is on.

1.3.6.2. Originating a call to a source and a destination.

Condition: A source and destination are idle. The console is idle. The lamp associated with the release key is on.

Step	Comments
1	Press an idle loop key. The lamp associated with the release key is off. The source lamp associated with the loop key is on.
2	
3	Enter the station's telephone number. A ringback tone is heard. Wait for the station to answer. The source asks for a call to be extended.
4	Enter the second station's telephone number. A ringback tone is heard. Wait for the station to answer. The station answers and becomes the destination. The source and destination lamps associated with the loop key are on.
	Press the release key to release the call from the loop and the console. The source and destination are connected. The source and destination lamps associated with the loop key are off. The console is idle. The lamp associated with the release key is on.

1.3.6.3. Originating a call to an attendant.

Condition: An attendant is available to receive incoming calls.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Step	Comments
1	The console is idle. The lamp associated with the release key is on.
2	Press an idle loop key. The lamp associated with the release key is off. The source lamp associated with the loop key is on.
3	Enter the attendant's extension number. A ringback tone is heard. Wait for the attendant to answer. The attendant answers and conversation can take place
	Press the release key to release the call from the loop and the console. The source lamp associated with the loop key is off. The console is idle. The lamp associated with the release key is on.

1.3.7. Transferring Calls

1.3.7.1 Transferring a call from one attendant to another.

Condition: The source is on a loop.

Step	Comments
1	Enter the attendant's extension number. A ringback tone is heard.
2	The attendant being called answers. The source is excluded automatically. The exclude source lamp is on.
3	Press the release key to connect the call to the new console and release the call from the present console. The source and destination lamps associated with the loop key are off. The console is idle. The lamp associated with the release key is on. The exclude source lamp is off.
2	The attendant being called answers. The source is excluded automatically. The exclude source lamp is on.
3	Press the release key to connect the call to the new console and release the call from the present console. The source and destination lamps associated with the loop key are off. The console is idle. The lamp associated with the release key is on. The exclude source lamp is off.

1.3.8. Two-Way Splitting

1.3.8.1. Establishing manual privacy for the source and destination.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Step	Comments
1	The console is idle. The lamp associated with the release key is on.
2	The console buzzes.
3	Press the loop key. The source lamp associated with the loop key is on.
4	The lamp associated with the release key is off. The Source asks for a call to be extended.
5	Press the exclude source key to exclude the source from the call. The lamp associated with the exclude source key is on.
6	Enter the new telephone number. A ringback tone is heard.
7	The destination answers. Conversation with the destination can take place. The destination lamp associated with the loop key is on.
8	Press the exclude destination key to exclude the destination and reconnect the source. The lamp associated with the exclude destination key is on.
	The attendant can alternate between the source and destination as required, excluding one or the other; both cannot be excluded simultaneously using these two keys.
	or
	Press the loop key to cancel exclusion and establish a three-way conversion. The source and destination lamps are on.
	or
	Press the release key to connect the source and destination and to release the call from the loop and the console. The source and destination lamps associated with the loop key are off. The console is idle. The lamp associated with the release key is on.
	or
	Press the hold key to hold the call on the loop. The source and destination lamps associated with the loop key wink. The console is idle.

1.3.9. Night Service

Night service routes calls to a predetermined treatment, such as a recorded announcement or another attendant console.

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Night service can be activated when the console is idle, with a call in queue, or with a call in progress. When night service is activated with a call in queue, the call is requeued to a controlling attendant's console. If a call is in progress when night services is activated, the call can continue. New calls receive the designated night service treatment.

If a call was released from a console prior to activating night service, the call will not be recalled to that console.

1.3.9.1. Activating night service

Step	Comments
1	Press the key designated for night service. The lamp associated with the release key is off. Night service is engaged for all consoles in the subgroup that have a headset or handset plugged into a console. The lamp associated with the night service key is on.
2	Unplug the headset or handset. If a headset or handset is not reinserted, all lamps turn off after one minute.

1.3.9.2. Deactivating night service

Conditions: Night service is activated. Neither a headset nor a handset is attached to the console.

Step	Comments
1	Plug in a headset or handset. The lamp associated with the night service key turns on. The console is unavailable for new calls. Calls may be originated from the console.
2	Press the night service key. The lamp associated with the night service key is off. The console is available for new calls.

ATTACHMENT 2 - Transmitted Codes

The following is a list of the codes transmitted by the AC to the DMS machine over the data circuit. All the codes are given in hexadecimal form. However, they are transmitted in binary form according to the format outlined in Section 5.3.1.

Function	Code (Hex)
Loop 1 Key-----	01
Loop 2 Key-----	02
Loop 3 Key-----	03
Loop 4 Key-----	04
Loop 5 Key-----	05
Loop 6 Key-----	06
Hold Key-----	0D
Release Key-----	0E
Exclude Source Key-----	0B
Exclude Destination Key-----	0C
Signal Source Key-----	09
Signal Destination Key-----	0A
Release Source Key-----	07
Release Destination Key-----	08
Night Service Key-----	1F
Dial Pad Keys 1-----	10
2-----	11
3-----	12
4-----	13
5-----	14
6-----	15
7-----	16
8-----	17
9-----	18
0-----	0F
*-----	19
#-----	1A
Feature Keys 1-----	21
2-----	22
3-----	23
4-----	24
5-----	25
6-----	26
7-----	27
8-----	28
9-----	29
10-----	2A
11-----	2B
12-----	2C

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Function	Code (Hex)
13-----	2D
14-----	2E
15-----	2F
16-----	30
17-----	31
18-----	32
19-----	33
20-----	34
21-----	35
22-----	36
23-----	37
24-----	38
25-----	39
26-----	3A
27-----	3B
28-----	3C
29-----	3D
30-----	3E
31-----	3F
32-----	40
33-----	41
34-----	42
35-----	43
36-----	44
37-----	45
38-----	46
39-----	47
40-----	48
41-----	49
42-----	4A
Start Code-----	1C
Headset or Handset In-----	1D
Headset or Handset Out-----	1E
Test OK-----	4F
Test Fail-----	50

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
 Any alteration to its text, contents, or presentation format is
 an infringement of SBC's Copyright rights

Function	Code (Hex)
Digit Sequence Number (DSN) 0-----	62
DSN 1-----	63
DSN 2-----	64
DSN 3-----	65
DSN 4-----	66
DSN 5-----	67
DSN 6-----	68
DSN 7-----	69
DSN 8-----	6A
DSN 9-----	6B
DSN 10-----	6C
DSN 11-----	6D
DSN 12-----	6E
DSN 13-----	6F
DSN 14-----	70
DSN 15-----	71
DSN 16-----	72
DSN 17-----	73
DSN 18-----	74
DSN 19-----	75
DSN 20-----	76
DSN 21-----	77
DSN 22-----	78
DSN 23-----	79
DSN 24-----	7A
DSN 25-----	7B
DSN 26-----	7C
DSN 27-----	7D
DSN 28-----	7E
DSN 29-----	7F
DSN 30-----	80
DSN 31-----	81
DMS to AC Trouble-----	61
Test Key-----	20

ATTACHMENT 3 - ASCII Characters

The following is a list of the valid ASCII characters that may be received by the AC as part of a message to one of the display buffers DB1 or DB2.

7 Bit ASCII		
	BINARY	HEX
A	1 000 001	41
B	1 000 010	42
C	1 000 011	43
D	1 000 100	44
E	1 000 101	45
F	1 000 110	46
G	1 000 111	47
H	1 001 000	48
I	1 001 001	49
J	1 001 010	4A
K	1 001 011	4B
L	1 001 100	4C
M	1 001 101	4D
N	1 001 110	4E
O	1 001 111	4F
P	1 010 000	50
Q	1 010 001	51
R	1 010 010	52
S	1 010 011	53
T	1 010 100	54
U	1 010 101	55
V	1 010 110	56
W	1 010 111	57
X	1 011 000	58
Y	1 011 001	59
Z	1 011 010	5A

7 Bit ASCII		
	BINARY	HEX
0	0 110 000	30
1	0 110 001	31
2	0 110 010	32
3	0 110 011	33
4	0 110 100	34
5	0 110 101	35
6	0 110 110	36
7	0 110 111	37
8	0 111 000	38
9	0 111 001	39
SP	0 111 000	20
!	0 100 001	21
“	0 100 010	22
#	0 100 011	23
\$	0 100 100	24
%	0 100 101	25
&	0 100 110	26
‘	0 100 111	27
(0 101 000	28
)	0 101 001	29
*	1 101 010	2A
+	0 101 011	2B
‘	0 101 100	2C
-	0 101 101	2D
.	0 101 110	2E
/	0 101 111	2F

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

7 Bit ASCII		
	BINARY	HEX
:	0 111 010	3A
;	0 111 011	3B
<	0 111 100	3C
=	0 111 101	3D
>	0 111 110	3E
?	0 111 111	3F
@	1 000 000	40
[1 011 011	5B
®	1 011 100	5C
]	1 011 101	5D
©	1 011 110	5E
_	1 011 111	5F

ATTACHMENT 4 - Key and Lamp Codes Cross Reference

The following table is designed to show the various keys on the Attendant Console along with the hex code that is sent to identify the particular key being depressed. Also shown are any associated lamps with the lamp group number and lamp number used for the received messages that control the lamps.

KEYS			LAMPS	
Key Function	Hex Code	Function	Lamp Grp. No.	Lamp Hex Code
Loop 1	01	SRC	0	0
		DEST	0	1
Loop 2	02	SRC	0	2
		DEST	0	3
Loop 3	03	SRC	0	4
		DEST	0	5
Loop 4	04	SRC	0	6
		DEST	0	7
Loop 5	05	SRC	0	8
		DEST	0	9
Loop 6	06	SRC	0	A
		DEST	0	B
RLS Dest.	07		No Assoc.	Lamp
RLS Src.	08		No Assoc.	Lamp
Sign. Src.	09		No Assoc.	Lamp
Sign. Dest.	0A		No Assoc.	Lamp
Exclude Src.	0B		0	C
Exclude Dest.	0C		0	D
Hold	0D		No Assoc.	Lamp
RLS	0E		0	E
Digit "0"	0F		No Assoc.	Lamp
"1"	10		No Assoc.	Lamp
"2"	11		No Assoc.	Lamp
"3"	12		No Assoc.	Lamp
"4"	13		No Assoc.	Lamp
"5"	14		No Assoc.	Lamp
"6"	15		No Assoc.	Lamp
"7"	16		No Assoc.	Lamp
"8"	17		No Assoc.	Lamp

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights

Proprietary

Key Function	Hex Code	Lamp Grp. No.	Lamp Hex Code
"0"	18	No Assoc.	Lamp
"4"	19	No. Assoc.	Lamp
"#"	1A	No. Assoc.	Lamp
Night	1F	1	0
Test	20	1	1
Feature 1	21	1	2
2	22	1	3
3	23	1	4
4	24	1	5
5	25	1	6
6	26	1	7
7	27	1	8
8	28	1	9
9	29	1	A
10	2A	1	B
11	2B	1	C
12	2C	1	D
13	2D	1	E
14	2E	1	F
15	2F	2	0
16	30	2	1
17	31	2	2
18	32	2	3
19	33	2	4
20	34	2	5
21	35	2	6
22	36	2	7
23	37	2	8
24	38	2	9
25	39	2	A
26	3A	2	B
27	3B	2	C
28	3C	2	D
29	3D	2	E
30	3E	2	F
31	3F	2	0
32	40	3	1
33	41	3	2
34	42	3	3
35	43	3	4
36	44	3	5
37	45	3	6
38	46	3	7
39	47	3	8
40	48	3	9
41	49	3	A
42	4A	3	B
No Assoc. Key / Call Waiting Lamp		0	F

Copyright © SBC Service, Inc. 2000

This document is protected by the U.S. Copyright laws.
Any alteration to its text, contents, or presentation format is
an infringement of SBC's Copyright rights