CLASS ^{SM} AND CLASSPLUS SERVICES INTERFACE SPECIFICATION

Reference: NIS S107-1, Issue 0.2

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Abstract:

This specification provides requirements for transmission of data from a DMS-100 to Customer Premises Equipment (CPE) over the local loop. Currently, this interface is used for the following DMS-100 CLASS ^{SM} and CLASSPLUS features:

- Calling Number Delivery,
- Dialable Number Delivery,
- Long Distance Indicator Delivery
- Calling Name Delivery, and
- Visual Message Waiting Indication
- Spontaneous Call Waiting Identification

Based on this document manufacturers can design products for these features.

This specification is based on the Bellcore Technical Reference, TR-TSY-000030, Issue 1, dated November 1988. Bellcore's specification defines standard signalling and protocol requirements, and standard parameters types and message types for use over this interface.

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1. INTRODUCTION

1.1 Purpose

This specification provides requirements for transmission of data from a terminating DMS-100 (ie. DMS-100 to which the called party is connected) to Customer Premises Equipment (CPE) over the voice path. Currently, this interface is used for the following DMS-100 CLASS ^{SM} and CLASSPLUS features:

- Calling Number Delivery,
- Dialable Number Delivery,
- Long Distance Indicator Delivery
- Calling Name Delivery, and
- Visual Message Waiting Indication
- Spontaneous Call Waiting Identification

Based on this document manufacturers can design products for these features.

1.2 Scope

The DMS-100 Calling Number Delivery, Dialable Number Delivery, Long Distance Indicator Delivery, and Calling Name Delivery features provide Calling Party related information to the terminating CPE for each incoming call. During the silent period after the first power ringing cycle or during the transmission of the call waiting tone, the Calling Party related data is sent from the DMS to the CPE using the protocol described in Bellcore's TR-TSY-000030 (see Ref. 1, page 25) for on-hook signaling and this document for off-hook signaling. The data can either be sent in a Single Data message or a Multiple Data message, depending on the particular feature.

The DMS-100 Visual Message Waiting Indication feature indicates to the CPE that it should notify the user that a message is waiting, and provides the CPE with relevant display information on the message waiting event. For this feature, the DMS supports the option to transmit the message waiting data to the CPE with or without application of power ringing. In either case, the procedures used to transmit the message waiting data, are also based on the data transmission protocol described in TR-TSY-000030. As for the features previously described, the message waiting data can either be sent in a Single Data message or a Multiple Data message and data transmission will only occur when the CPE is in an on-hook state.

This DMS-100 data interface specification includes the following:

- physical, datalink, and presentation layer requirements for data transmission between DMS-100 and called CPE for both on-hook and off-hook signalling.

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This specification excludes the following:

- standard requirements for CPE connection to the DMS-100 switch (see Ref. 2, page 25).

- requirements for data transmission from CPE to the DMS-100 switch.

- switch to switch signalling requirements

Orginating DMS

Terminating DMS

DATA INTERFACE Specified in this report.

Calling Party CPE

Called Party CPE
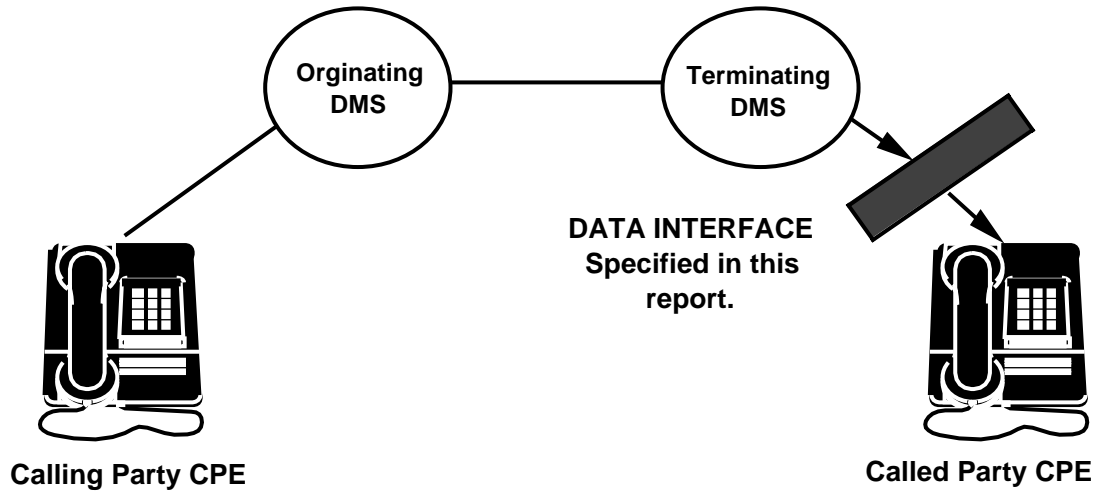
2. PHYSICAL LAYER REQUIREMENTS

2.1 Switch-to-CPE Signalling

The DMS-100 data signalling interface conforms to requirements specified in the Bellcore TR-TSY-000030.

In addition, DMS is capable of inter-working with all ringing frequencies and not just 20Hz as described in TR-TSY-000030. For data transmission over this signalling interface, ringing frequencies other than 20Hz will be used only when there is a long enough silent interval to allow transmission of the required data.

For information on general electrical characteristics associated with the connecting terminal equipment to the switched network the CPE manufacturer should refer to PUB 61100, "Description of the Analog Voiceband Interface between the Bell System Local Exchange Lines and Terminal Equipment" (see Ref. 2, page 25).

2.2 Protocol

The protocol used for the DMS data transmission over this signalling interface is fully described in TR-TSY-000030 and is supported in both on-hook and off-hook modes.

2.3 Timing and Tolerances

2.3.1. On-hook Signalling

This section discusses timing and tolerance requirements for this interface at the DMS. These requirements apply when the customer's line is in the on-hook state.

When the customer's line is in an on-hook state, data transmission can occur as soon as a voice path is established. For data transmission that does not require ringing the customer's line, data will be transmitted at any time over the voice path. For data transmission that is transmitted along with ringing, data is sent during the silent interval between the first and second power ringing signals. A sequence of single data messages and/or multiple data messages could be transmitted within this silent interval.

On the DMS, this silent interval varies depending on the type of ringing which is applied on the customer's line. On the DMS, the silent interval between the first and the second power ringing signals will range from 2 - 4 seconds. The DMS is able to transmit data for all silent intervals in the above range.

Data transmission over the signalling interface will not begin until 600 ms ($\pm$32 ms) after the end of the first power ringing cycle.

The length of the time between ring bursts within distinctive ringing patterns is noted in TR-TSY-000030 to vary among switching systems. On the DMS, such time intervals may in some cases range up to 650 ms and are not limited to a maximum of 500 ms as indicated in TR-TSY-000030.

(It should be noted that the 650ms figure discussed here and the 600 ms($\pm$32ms) discussed in the previous paragraph are totally independent; the former figure is a maximum silent interval between ring bursts within a distinctive ringing pattern, while the latter is a guard time following the end of the first ringing cycle. The figures are similar but unrelated.).

Details on general data transmission requirements are provided in Bellcore's TR-TSY-000030.

2.3.2. Off-hook Signalling

This section discusses timing and tolerance requirements for this interface at the DMS. These requirements apply when the customer's line is in the off-hook state.

When the customer's line is in an off-hook state, data transmission can occur at any time. The data will be made up of between 1 and n messages with the type of messages being any of the currently defined message types. There is no restriction on the duration of the data transmission.

When a message is sent, the DMS will send between 64 and 100 ms of mark (logical 1) which will condition the receiver for data. There will be no channel seizure signal as designed for the on-hook case.

It will be up to the services using this off-hook capability to provide the requirements of the CPE. It is recognized that it is difficult for the CPE to recognize the mark or conditioning tone in the presence of speech therefore the DMS will usually proceed the start of data transmission with a burst of a standard DTMF tone. This tone and the required handshake are described in the FSDs for the features requiring off-hook transmission. When these interfaces become standardized they will be described in the next release of this document. Currently, see FN AG2073 for more information relating to Spontaneous Call Waiting IDentification.

The maximum interrupt timing requirements for the data and mark signal, as set by TR-TSY-000030 for on-hook signaling will also apply for off-hook signaling.

2.4 Error Detection

Error detection capability for both on-hook and off-hook signalling is provided for this interface as per requirements in Bellcore's TR-TSY-000030.

2.5 Maintenance and Testing

2.5.1. Automated System Maintenance

The DMS performs routine tests on transmission capability. However, the DMS does not support routine tests to verify transmission levels or timing sequences.

2.5.2. Manual System Maintenance

When an end-user/craftperson initiates a station ringer test over this interface, the DMS-100 will send a "Test for Calling Number Delivery" message to the CPE. The parameters within this message are currently the date, time, and digits "0123456789". (See section 3.3.2 for more details).

2.6 Abnormal Conditions

2.6.1. Change of state from on-hook to off-hook

If the called party answers the incoming call before or during the on-hook data transmission (whether power ringing is applied or not), normal ring trip occurs. The data transmission is then stopped. For the Calling Number, Dialable Number, and Calling Name display features, the DMS-100 will not attempt to transmit or retransmit the data message once the called party has gone off-hook.

For the Visual message Waiting Indication service, if an off-hook condition is detected, then data transmission will abort, and the DMS-100 will periodically retest the state of the line until the on-hook condition is found. Then data transmission will be reattempted.

2.6.2. Change of state from off-hook to on-hook

If the state of the terminal goes from off-hook to on-hook during off-hook transmission, the data transmission is aborted and the DMS will not try to retransmit with on-hook signalling.

2.6.3. Data transmission over loop carrier systems

For on-hook and off-hook signalling over subscriber loop carriers, the DMS will treat the lines as if there is no loop carrier.

3. DATALINK and PRESENTATION LAYER REQUIREMENTS

3.1 Single Data and Multiple Data Message Formats

The layout of both the Single and Multiple data messages is provided in TR-TSY-000030, Figure 1 and Figure 2. These messages can be sent during either the on-hook or off-hook signalling mode. The formats are reproduced here for the reader's convenience:

```
h g f e d c b a
```

CHANNEL SEIZURE SIGNAL
CARRIER SIGNAL
MESSAGE TYPE WORD
MESSAGE LENGTH WORD
DATA WORD (S)
CHECK SUM WORD

Figure 1. Single Data Message Format

The DMS-100 supports the following standard Single data message types:

Bit position	Message type	Meaning
hgfedcba	00000100	Calling Number Delivery Info
hgfedcba	00000110	Message Waiting Indicator

Note that the value for Message waiting Indicator is different that the value shown in TR-TSY-000030. The value which is being used is shown above and will be supported by the DMS-100. At this time, the DMS-100 does not support the "Message Desk Information" message type (value 00001011) defined in TR-TSY-000030.

h g f e d c b a

```
┌─────────────┐
│  CHANNEL    │
│  SEIZURE    │
│  SIGNAL     │
├─────────────┤
│  CARRIER    │
│  SIGNAL     │
├─────────────┤
│  MESSAGE    │
│  TYPE       │
│  WORD       │
├─────────────┤
│  MESSAGE    │
│  LENGTH     │
│  WORD       │
├─────────────┤
│  PARAMETER  │
│  TYPE       │
│  WORD       │
├─────────────┤    Parameter 1
│  PARAMETER  │
│  LENGTH     │
│  WORD       │
├─────────────┤
│  DATA       │
│  WORD (S)   │
├─────────────┤
│  PARAMETER  │
│  TYPE       │
│  WORD       │
├─────────────┤
│  PARAMETER  │    Parameter N
│  LENGTH     │
│  WORD       │
├─────────────┤
│  DATA       │
│  WORD (S)   │
├─────────────┤
│  CHECK      │
│  SUM        │
│  WORD       │
└─────────────┘
```
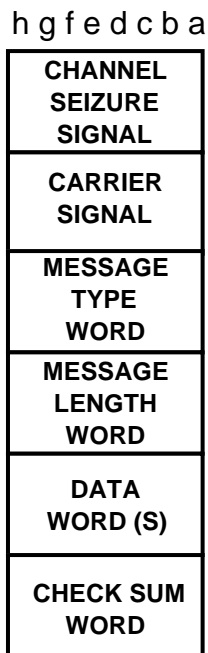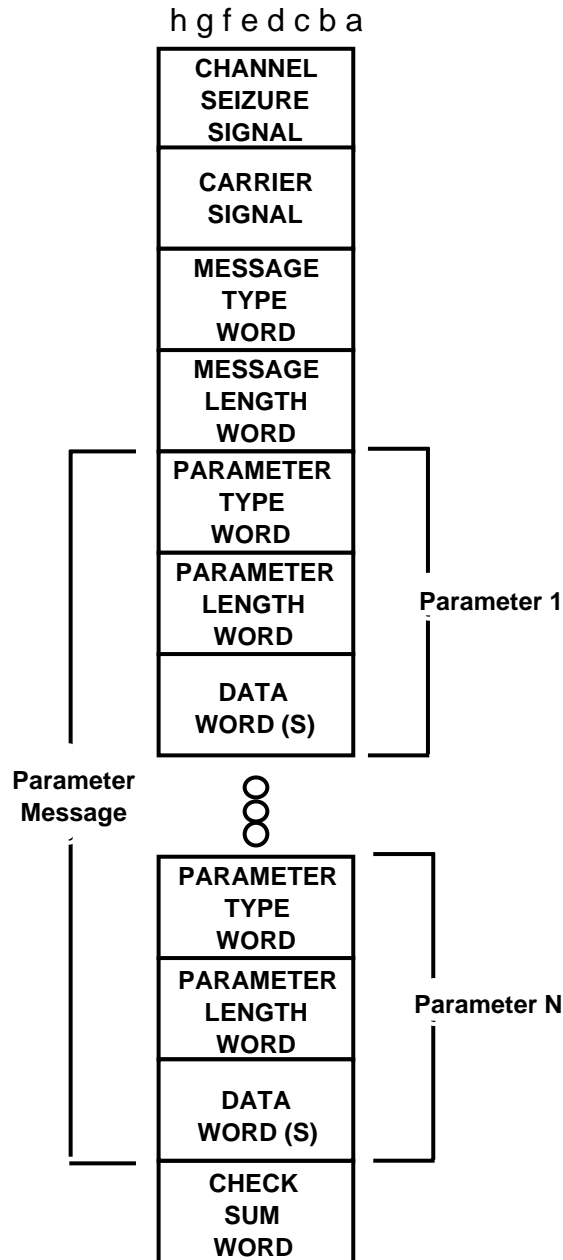
Parameter Message

Figure 2. Multiple Data Message Format

The DMS-100 supports the following standard Multiple data message types:

Bit position	Message type	Meaning
hgfedcba	10000000	Call Setup
hgfedcba	10000001	Test for Calling Number Delivery
hgfedcba	10000010	Message Waiting Notification
hgfedcba	10000011	Terminal Interface

For both the Single Data message and the Multiple Data message during on-hook signalling, the Channel Seizure Signal is composed of 30 continuous bytes of octal 125 (i.e. 01010101). This can also be stated as 250 ms of the Frequency Shift Keying (FSK) signal shaped as a 600Hz square wave. Also, for both messages, the Carrier signal is composed of 150 ± 25 ms of mark (logical 1).

During off-hook signaling, the DMS will only send a carrier signal of all logical ones (mark), before the data. The DMS will not send the Channel Seizure signal which is required for on-hook signaling. This is to provide as short as possible signalling duration when sending data with the loop in a off-hook state.

3.2 Single Data Message Contents

3.2.1. "Calling Number Delivery" Message Type

The message type parameter is coded as 00000100 as specified in TR-TSY-000030.

The Data content of this message is as follows:

- Month
- Day
- Hour
- Minutes
- Directory Number which may be one of:
  - "P" ("Private" indicator)
  - "O" ("Out-of-Area" indicator)
  - 10 digit calling directory number

The length of this message varies from 9 to 18 bytes. The first eight bytes of data contain the date (month and day) and local time (hour and minutes), each

comprised of two characters (see below). Byte nine is the first of up to ten additional bytes for the Directory Number information (10 digits or "P" or "O").

- <u>Month</u> is coded as follows:

  01   - JANUARY
  02   - FEBRUARY
  03   - MARCH
  04   - APRIL
  05   - MAY
  06   - JUNE
  07   - JULY
  08   - AUGUST
  09   - SEPTEMBER
  10   - OCTOBER
  11   - NOVEMBER
  12   - DECEMBER

Where 01 is coded in ASCII (no parity) over two bytes as 00110000 and 00110001, and 12 is coded as 00110001 and 00110010.

- <u>Day</u> is coded as 01 to 31, where 31 is coded in ASCII over two bytes as 00110011 and 00110001.

- Hour/Minutes are coded in Military Local Time. Hour is coded as follows:

  00   =   Midnight
  01   =   1 AM
  12   =   NOON
  13   =   1 PM
  23   =   11 PM

Minutes are coded as 00 to 59.

- the directory number information is coded as follows:

  - Digits are coded in ASCII (no parity) as follows:

  0 = 00110000
  1 = 00110001
  2 = 00110010
  •
  •
  •
  9 = 00111001

  - "O" and "P" are coded in ASCII (no parity) as "01001111" and "01010000" respectively.

• Examples of encodings for the Calling Number Delivery Information   type Single Data message are provided in the Appendix.

3.2.2. "Message Waiting Indicator" Message Type

The message type parameter is coded as 00000110.

The Message Length value is always 3 (00000011). The 3 VMWI data bytes (ASCII characters, no parity) consist of either "BBB" for "activate" or "ooo" for deactivate, where "B" is coded "01000010" and "o" is coded "01101111".

Examples of encoding of this message are provided in the Appendix.

3.3 Multiple Data Message Contents

3.3.1. "Call Setup" Message Type

The message type parameter is coded as 10000000, as specified in TR-TSY-000030.

The data content of this message is composed of a number of optional parameters. Any of these parameters may be included in this message according to the rules specified in TR-TSY-000030.

Changes to the message contents described here will be publicly disclosed as required.

The parameters currently defined in TR-TSY-000030 are as follows:

PARAMETER TYPE VALUE	PARAMETER NAME
1	TIME
2	DN of CALLING LINE (CLID)
3	DIALABLE DN (DDN)
4	REASON FOR ABSENCE OF CLID/DDN
5	REASON FOR REDIRECTION
6	CALL QUALIFIER
7	NAME
8	REASON FOR ABSENCE OF NAME

- All parameters are optional; this parameter list may be extended in the future as new services are defined.

- Parameters 2 and 4 are mutually exclusive.
- Parameters 3 and 4 are mutually exclusive.
- Parameters 7 and 8 are mutually exclusive.

Each parameter is defined on the DMS-100 as follows:

a) <u>Time Parameter:</u>

This parameter contains the time and the date of the incoming call.

```
        h  g  f  e  d  c  b  a
      ┌─────────────────────────┐
BYTE 1│   TIME PARAMETER CODE   │
      ├─────────────────────────┤
    2 │    PARAMETER LENGTH     │
      ├─────────────────────────┤
    3 │                         │
      │──        MONTH          │
    4 │                         │
      ├─────────────────────────┤
    5 │                         │
      │──         DAY           │
    6 │                         │
      ├─────────────────────────┤
    7 │                         │
      │──        HOUR           │
    8 │                         │
      ├─────────────────────────┤
    9 │                         │
      │──       MINUTE          │
   10 │                         │
      └─────────────────────────┘
```
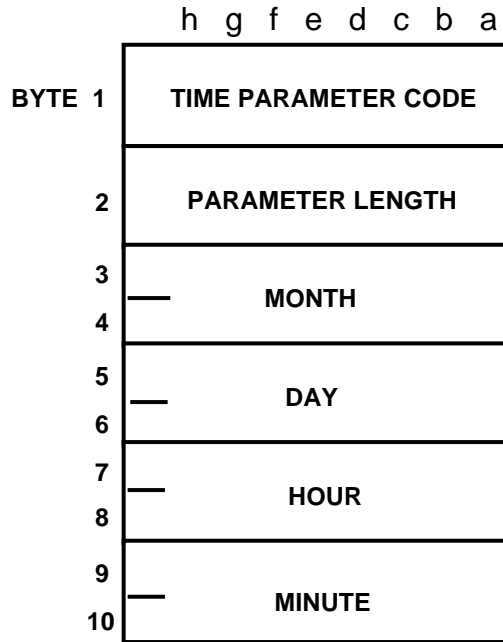
Figure 3. Parameter TIME

- bit "a" is the least significant bit and is first to be transmitted.
- The parameter code is 1 (00000001).
- The parameter length is coded in binary and is always 8 (00001000).
- <u>Month, Day, Hour,</u>and <u>Minute</u> are coded as described in section 3.2.1.

b) <u>Calling Party Number (or Calling Line Id) Parameter</u>

This parameter contains the ten digit directory number of the calling party.

h g f e d c b a

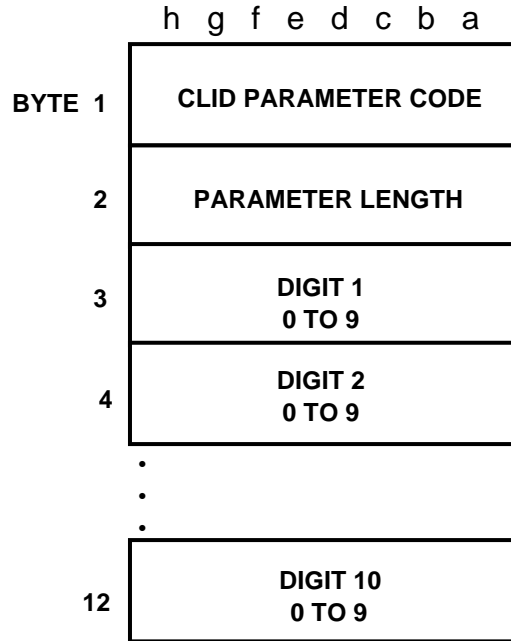|	
BYTE 1	**CLID PARAMETER CODE**
2	**PARAMETER LENGTH**
3	**DIGIT 1** **0 TO 9**
4	**DIGIT 2** **0 TO 9**
12	**DIGIT 10** **0 TO 9**

Figure 4. Parameter CLID

- bit "a" is the least significant bit and is first to be transmitted.
- The parameter code is 2 (00000010).
- The parameter length is coded in binary and is always 10 (00001010).
- Digits are coded in ASCII (no parity) as follows:

   0 = 00110000
   1 = 00110001
   2 = 00110010
   •
   •
   •
   9 = 00111001

c) <u>DDN Parameter</u>

This is the number which the Called party must dial in order to set a call up to the Calling party.

h g f e d c b a

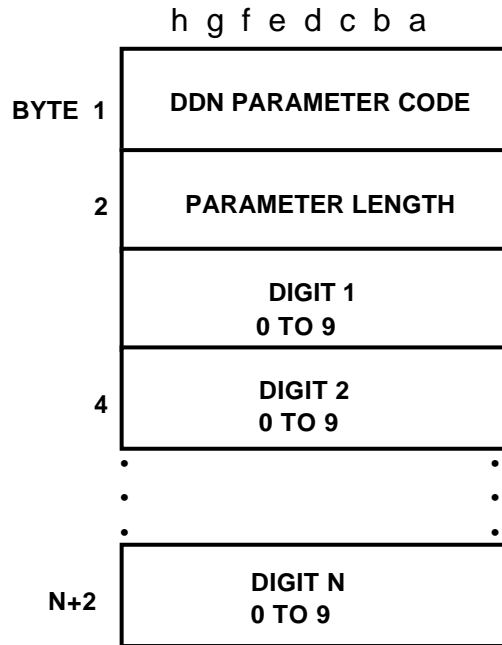| BYTE 1	DDN PARAMETER CODE
2	PARAMETER LENGTH
	DIGIT 1 0 TO 9
4	DIGIT 2 0 TO 9
N+2	DIGIT N 0 TO 9

Figure 5. DDN PARAMETER

- bit "a" is the least significant bit and is first to be transmitted.
- Parameter code is 3 (00000011).
- Parameter length ranges from 1 to N (currently, maximum N on DMS is N=24).
- Digits are coded in ASCII (no parity) as follows:

0 = 00110000
1 = 00110001
2 = 00110010
•
•
•
9 = 00111001

d) "Reason for Absence of DN" Parameter:

This parameter contains the reason why the calling party ten digit or dialable DN is not available for delivery to the called CPE. The two possible reasons are 'O', indicating that the number was not available, and 'P', indicating that the calling number was suppressed.

The parameters Calling Party Number, Dialable Directory Number, and Reason for Absence of DN are not compatible at the application level. If more than one of these parameters are found in a multiple data message, then the CPE should use the first parameter found and ignore the others.

h g f e d c b a

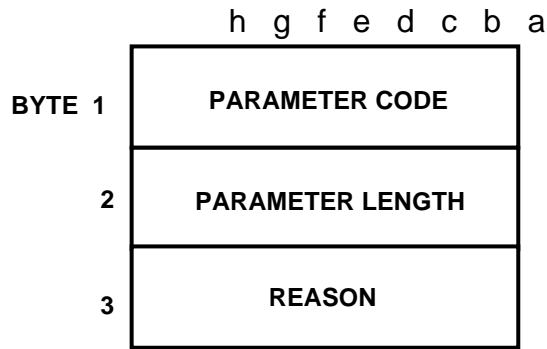|	
BYTE 1	PARAMETER CODE
2	PARAMETER LENGTH
3	REASON

Figure 5. PARAMETER Reason for Absence of Directory Number (DN)

- bit "a" is the least significant bit and is first to be transmitted.
- Parameter Code is 4 (00000100).
- Parameter Length is coded in binary and is always 1 (00000001).
- Reason is coded in ASCII (no parity) as:
  "O": out of area = 01001111
  "P": Private = 01010000.

e)   Reason for Redirection Parameter:

This parameter is used to indicate that the incoming call is a forwarded call. This allows the terminal to qualify the call announcement by a forwarding mnemonic. The mnemonic is based on the value of the code. The parameters after this parameter will refer to the base station, while parameters before this one will refer to the calling party.

This parameter is currently not supported on DMS but is described here for planning purposes.

h g f e d c b a

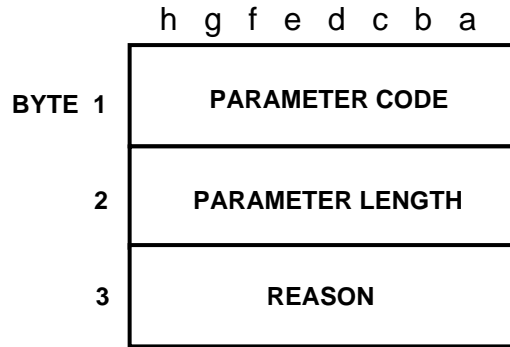|	
BYTE 1	**PARAMETER CODE**
2	**PARAMETER LENGTH**
3	**REASON**

Figure 7. PARAMETER Reason for Redirection

- bit "a" is the least significant bit and is first to be transmitted.
- Parameter code is 5 (00000101).
- Parameter length is coded in binary and is always 1 (00000001).
- Reason is coded in binary as follows:

00000000 = Call Forward Universal
00000001 = Call Forward Busy
00000010 = Call Forward Don't Answer
and other values are spares.

f)   Call Qualifier

This parameter provides additional information on a call.

```
           h g f e d c b a
          ┌─────────────────┐
BYTE  1   │  PARAMETER CODE │
          ├─────────────────┤
      2   │ PARAMETER LENGTH│
          ├─────────────────┤
      3   │    QUALIFIER    │
          └─────────────────┘
```

Figure 8. PARAMETER Call Qualifier

- bit "a" is the least significant bit and is first to be transmitted.
- Parameter code is 6 (00000110).
- Parameter Length is coded in binary and is always 1 (00000001).
- Qualifier is coded in ASCII (no parity) and currently has only two meanings:

  L : Long Distance Indicator = '01001100'
  R : Ringer test indicator   = '01010010' (value not currently
                                                supported)

g) <u>Name Parameter:</u>

This parameter provides the NAME of the calling party.

The currently assigned length for this parameter is 1-15 characters. The maximum length may be increased in the future.

The NAME may include any displayable ASCII character.

The intent is to provide NAME in a format ready for display, without requiring modification / formatting in the CPE before display.

h g f e d c b a

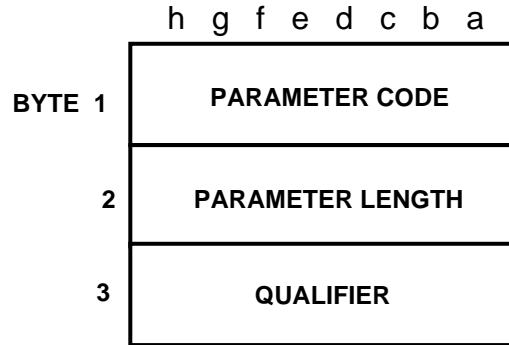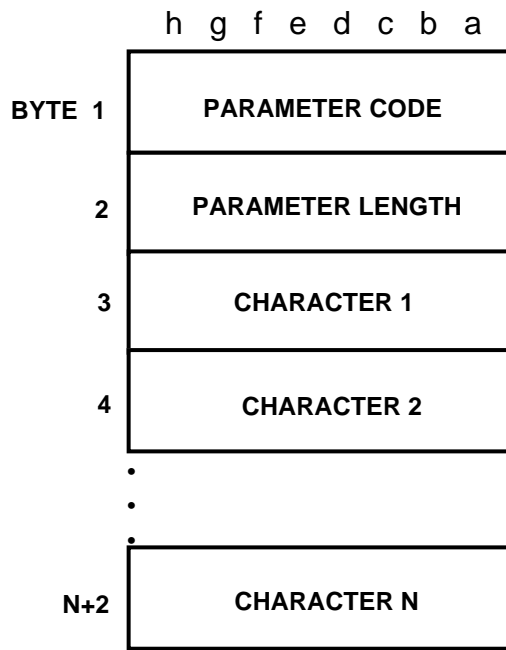|	
BYTE 1	PARAMETER CODE
2	PARAMETER LENGTH
3	CHARACTER 1
4	CHARACTER 2
N+2	CHARACTER N

Figure 10. Parameter NAME

- bit "a" is the least significant bit and is first to be transmitted.
- Parameter Code is 7 (00000111).
- Parameter Length is coded in binary between 1 and N (currently, maximum N on DMS is N=15 for a Name).
- Characters for Name are ASCII (no parity bit).

h)   "Reason for Absence of Name" Parameter:

This parameter contains the reason why the calling party name is not available for delivery to the called CPE.   The two possible reasons are 'O', indicating that the name was not available or out of area; and 'P', indicating that the calling name was suppressed.

The parameters Calling Party Name, and Reason for Absence of Name are not compatible at the application level. If more than one of these parameters are found in a multiple data message, then the CPE should use the first parameter found and ignore the other.

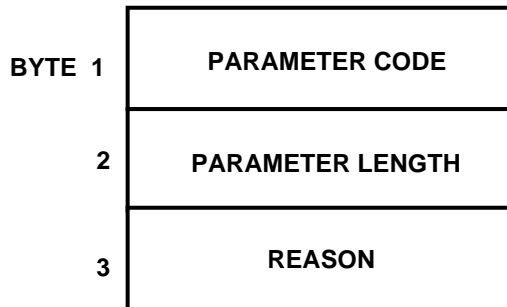|	
BYTE 1	**PARAMETER CODE**
2	**PARAMETER LENGTH**
3	**REASON**

**Figure 5. PARAMETER Reason for
Absence of Name**

- bit "a" is the least significant bit and is first to be transmitted.
- Parameter Code is coded in binary and is always 8 (00001000).
- Parameter Length is coded in binary and is always 1 (00000001).
- Reason is coded in ASCII (no parity) as:
  "O": Out of Area = 01001111.
  "P": Private = 01010000.

_____

The following are examples of use of these parameters in the Call Setup message:

a) for delivery of a Dialable DN, the following parameters are used:

- Time Parameter.
- DDN Parameter.

b) for delivery of a basic Calling Number, the following parameters are used:

- Time Parameter.
- CLID Parameter.

c) to indicate that the Calling information was unavailable or suppressed:

- Time Parameter.
- Reason for absence of DN Parameter
  (with the reason appropriately set to either 'O' or 'P')

d) for delivery of the Calling Name alone:

- Time Parameter.
- Name Parameter.

e) for delivery of the Calling Name and a basic Calling Number:

- Time Parameter.
- CLID Parameter.
- Name Parameter.

f) for delivery of the Calling Name and a Dialable DN:

- Time Parameter.
- DDN Parameter.
- Name Parameter.

g) for delivery of the Calling Name and an indication that the DN was suppressed:

- Time Parameter.
- Reason for absence of DN Parameter
  (with the reason set to 'P').
- Name Parameter.

h) to indicate that the Calling Name was unavailable:

- Time Parameter.
- Reason for absence of Name Parameter
  (with the reason set to 'O').

i) to indicate that the Calling Name and DN were suppressed:

- Time Parameter.
- Reason for absence of Name Parameter
  (with the reason set to 'P').
- Reason for absence of DN Parameter
  (with the reason set to 'P').

In all above cases, the Call Qualifier field may also be included
to indicate that the call is "Long Distance", if required.

Examples of message encodings for cases (e) and (g) are provided in
the Appendix.

3.3.2. "Test for CND" Message Type

The message type parameter is coded as 10000001, as specified in TR-TSY-000030.

The data content of this message is composed of a number of optional
parameters. These parameters are the same as those defined in section
3.2.3.1 for the Call Setup message type.

Any valid parameters may be included in this message according to the
rules specified in TR-TSY-000030.

Currently the DMS-100 will transmit the following data items in the test
message:

a) Time parameter.
b) Calling Party Number parameter, set to "0123456789".

An example of encoding for this message is provided in the Appendix.

3.3.3. "Message Waiting Notification" Message Type

The message type parameter is coded as 10000010 as specified in TR-TSY-000030.

The data content of this message currently consists only of the Message Waiting Status (ie. indication of activation/deactivation, see parameter 11 below). The other parameters are to be defined at a later time. Possible uses would be to incorporate the Message Desk's Name that is setting the VMWI, the calling name, and/or the calling number.

PARAMETER TYPE VALUE	PARAMETER NAME
9	**For Future Use**
10	**For Future Use**
11	**MESSAGE WAITING STATUS**

Parameter 11 is *proposed* here as additional optional generic parameter for messages in the Multiple Data format. This parameter is not currently defined in TR-TSY-000030 and is subject to telco review and acceptance before being standardized.

The Northern Telecom proposed layout for this parameter is given on the next page. This layout is provided for planning purposes only and may change through the course of development. The layout is as follows:

a) Message Waiting Status

This parameter is used to indicate that the CPE message waiting lamp should be turned on/turned off.

```
          h  g  f  e  d  c  b  a
        ┌─────────────────────────┐
BYTE 1  │     PARAMETER CODE      │
        ├─────────────────────────┤
   2    │    PARAMETER LENGTH     │
        ├─────────────────────────┤
   3    │  MESSAGE WAITING STATUS │
        └─────────────────────────┘
```
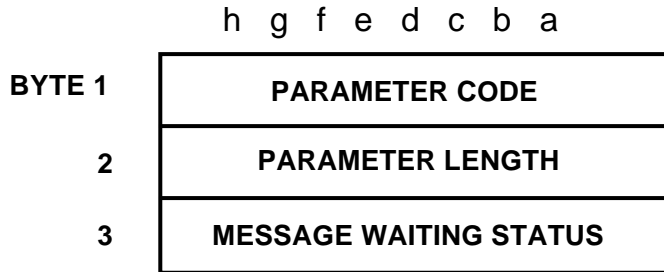
Figure 11. PARAMETER Message Waiting Status

- bit "a" is the least significant bit and is first to be transmitted.
- parameter code is 11 (00001011).
- parameter length is always 1 (00000001).
- the Message Waiting status is coded in binary as follows:

   Turn on: 11111111
   Turn off: 00000000

Intermediate values may be used in future applications.

Even though this parameter is defined for the Message Waiting message type, it can also be used in other message types (ie. the call setup message). This will allow the DMS -100 to send one message to update the display during call termination (calling number or name), and turn on or off the Visual Message Waiting Indicator.

3.3.4. "Terminal Interface" Message Type [1]

The message type parameter is coded as 10000011. This message type is a new addition to the existing three message types defined in TR-TSY-000030. This message is sent to deliver call and non-call related information to the CPE, except during call setup. During call setup, the call setup message type is used. The data content of this message is composed of a number of optional parameters. The existing parameters (1 through 8), already defined for call setup message, can be used in the message. Also, the new data parameter (defined below) may be used in this new message type, although, a call setup parameter and the display parameter can not be included in the same message.

The new data parameter and the existing parameters are mutually exclusive. A terminal interface message will not have both the display data parameter and a call setup parameter in the same message. If this does occurs, the CPE should only accept parameters of the first type found (call setup or display) and ignore the parameters of the other type.

When a message is received with a call setup parameter, this information should be displayed as if an incoming call was being made. In actuality, there is not a new incoming call, but the display needs to be updated. An example of this is when the second call waiting tone is delivered to the CPE. The calling information is sent, but the CPE should not record it as a new call.

When a message is received the CPE will clear the display and display the new information.

The existing parameter types 1 through 11 are defined above. The new parameter is defined below.

PARAMETER TYPE VALUE	PARAMETER NAME
12	**DISPLAY DATA**

Parameter 12 is *proposed* here as an additional optional generic parameter for messages in the Multiple Data format. This parameter is not currently defined in TR-TSY-000030 and is subject to telco review and acceptance before being standardized.

---

[1] NOTE: This new message type and display parameter will not be supported in the first release of Spontaneous Call Waiting Identification feature.

The Northern Telecom proposed layout for this parameter is given below. This layout is provided for planning purposes only and may change through the course of development. The layout is as follows:

a) Display Data

This parameter is used to display alphanumeric characters from the ASCII character set. This parameter is being specifically designed to be compatible with the following CPE displays; 1 X 16, 2 X 16, 1 X 24, 2 X 24, 1 X 32, and 2 X 32. This parameter is compatible these by allowing a message to be formatted such that the CPE display characters do not need to be known.

The parameter is designed to allow maximum flexibility for the CPE display and allow only a single interface from the switch.

```
                 h  g  f  e  d  c  b  a
              ┌─────────────────────────┐
   BYTE 1     │      PARAMETER CODE      │
              ├─────────────────────────┤
      2       │     PARAMETER LENGTH     │
              ├─────────────────────────┤
      3       │       CHARACTER 1        │
              ├─────────────────────────┤
      4       │       CHARACTER 2        │
              └─────────────────────────┘
                •                      •
                •                      •
              ┌─────────────────────────┐
   N+2        │       CHARACTER N        │
              └─────────────────────────┘
```
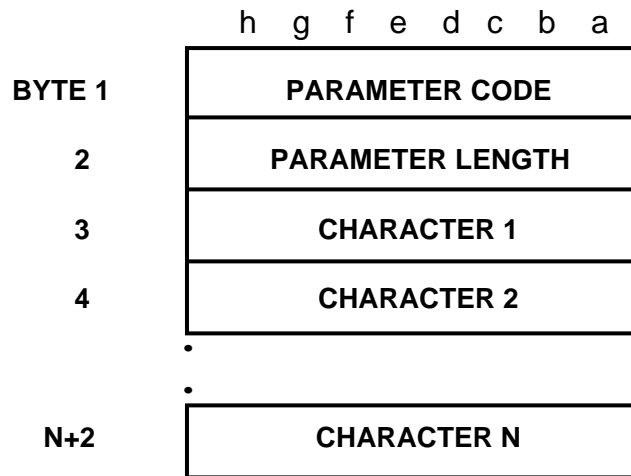
Figure 12. PARAMETER Display Data

- bit "a" is the least significant bit and is first to be transmitted.
- parameter code is 12 (00001100).
- parameter length is coded in binary between 1 and N (currently, maximum N on DMS is N=32).
- At most two parameters will be sent in one terminal interface message (i.e. maximum of two instances of this parameter).
- the data portion is defined as follows:

The data portion is made up of from 1 to 30 alphanumeric characters and from 0 to 2 delimiters. A delimiter is defined as a ASCII tab (Hexadecimal

'09') and they allow the CPE to easily display the alphanumeric characters on their displays.

```
|---     part 1      ---|---      part 2       ---|
PUSH THE 9 KEYØTO ADDØA NAME
|---              part A              ---| part B  |
```

Where Ø represents a delimiter.

Figure 13 Display Data with Delimiters

See example 6 in the appendix, for how the above message (figure 13) is encoded and how the message can be displayed.

16 Character displays:
The first delimiter is used by CPE with displays with only 16 characters. This delimiter divides the parameter into two parts. Each part can at most be 16 characters in length (See figure 13). This is to allow the CPE which have displays of 16 characters to be able to partition the information. The first part can be placed on the first line and the second part on the second line or the first part on the first line and the second part hidden until a button is pressed to see the extra information. This latter methods allow CPEs to toggle back and forth, thereby viewing the complete data from a parameter within a 1 X 16 character display. When the data from the data display parameter is display by the CPE, the delimiters are replaced by spaces.

The CPE when receiving this message, could display the information (shown in figure 13) as follows:

First line - **PUSH THE 9 KEY**

Hidden from view or displayed on next line would be - **TO ADD A NAME**

24 Character displays:
The second delimiter is used by displays with 24 characters. The second delimiter divides the parameter into at most 24 characters to the left of the delimiter or part 'A' and the rest of the data to the right of the delimiter or part 'B' (See figure 13). The CPE is then able to view the information in a similar manner as explained above. The first part can be placed on the

30

first line and the second part either in the second line or hidden until a more information button is pressed. When the data from the data display parameter is display by the CPE, the delimiters are replaced by spaces. If the delimiters are consecutive characters, then only one delimiter will be sent.

The CPE when receiving this message, could display the information (shown in figure 13) as follows:

First line - **PUSH THE 9 KEY TO ADD**

Hidden from view or displayed on next line would be - **A NAME**

32 Character displays:
For displays that are 32 characters in length, CPE would only need to replace the delimiters with spaces and display the message.

The CPE when receiving this message, could display the information (shown in figure 13) as follows:

PUSH THE 9 KEY TO ADD A NAME

4. REFERENCES

1. TR-TSY-000030 - Bellcore, SPCS/Customer Premises Equipment Data Interface, Issue 1, November 1988.

2.   "Description of the Analog Voiceband Interface between the Bell System Local Exchange Lines and Terminal Equipment", PUB 61100, January 1983.

5. APPENDIX:

Examples of message encoding for the Single
Data message and for the Multiple Data message.

Example 1a: Encoding of the Calling Number Delivery Information Single
Data message, when date, time, and a DN are sent to the
CPE.

Field Name	Actual Data	Translation	
Message type	00000100	Calling Number Delivery info	
Message length	00010010	18	
Data	00110000	0	
	00110100	4	April
	00110000	0	
	00110001	1	1st
	00110001	1	
	00110110	6	16 HRS
	00110011	3	
	00110110	6	36 Minutes
	00110110	6	
	00110001	1	
	00110011	3	Area code 613
	00110101	5	
	00110101	5	
	00110101	5	
	00110001	1	
	00110010	2	
	00110001	1	
	00110010	2	555-1212

Example 1b: Encoding of the Calling Number Delivery Information Single
Data message, when date, time, and a Privacy indicator are
sent to the CPE.

Field Name	Actual Data	Translation	
Message type	00000100	Calling Number Delivery info	
Message length	00001001	9	
Data	00110000	0	
	00110100	4	April
	00110000	0	
	00110001	1	1st
	00110010	2	
	00110001	1	21 HRS
	00110101	5	
	00110110	6	56 Minutes
	01010000	P	Letter P

Example 1c: Encoding of the Calling Number Delivery Information Single
Data message, when date, time, and an out-of-area indicator
are sent to the CPE.

Field Name	Actual Data	Translation	
Message type	00000100	Calling Number Delivery info	
Message length	00001001	9	
Data	00110000	0	
	00110100	4	April
	00110000	0	
	00110001	1	1st
	00110000	0	
	00111001	9	9 Hrs
	00110101	5	
	00110000	0	50 Minutes
	01011111	Letter O	

Example 2a: Encoding of the Message Waiting Indicator Single Data
message, when activation is specified to the CPE.

Field Name	Actual Data	Translation
Message type	00000110	Message Waiting Indicator
Message length	00000011	3
Data	01000010	Letter B
	01000010	Letter B
	01000010	Letter B

Example 2b: Encoding of the Message Waiting Indicator Single Data
message, when deactivation is specified to the CPE.

Field Name	Actual Data	Translation
Message type	00000110	Message Waiting Indicator
Message length	00000011	3
Data	01101111	Letter o
	01101111	Letter o
	01101111	Letter o

Example 3a: Encoding of the Call Setup Multiple Data message when parameters Time, Calling Line Identification, and Name are sent to the CPE.

This message indicates to the CPE that the phone was rung at 12:35 PM on April 5, the calling number was 919-555-1212 and the person calling was John Doe.

Field Name	Actual Data	Translation
Message type	10000000	Call Setup msg
Message length	00100000	32
Parameter type	00000001	Time parameter
Parameter length	00001000	8
Data	00110000	0
	00110100	4 - month
	00110000	0
	00110101	5 - Day
	00110001	1
	00110010	2 - Hour
	00110011	3
	00110101	5 - Minute
Parameter type	00000010	Calling line identification
Parameter length	00001010	10
Data	00111001	9
	00110001	1
	00111001	9
	00110101	5
	00110101	5
	00110101	5
	00110001	1
	00110010	2
	00110001	1
	00110010	2
Parameter type	00000111	Name
Parameter length	00001000	8
Data	01001010	J
	01001111	O
	01001000	H
	01001110	N
	00100000	space
	01000100	D
	01001111	O
	01000101	E

Example 3b: Encoding of the Call Setup Multiple Data message when parameters Time, Reason for Absence of DN , and Name are sent to the CPE.

This message indicates to the CPE that the phone was rung at 12:35 PM on April 5, the calling number was Private and the person calling was John Doe.

Field Name	Actual Data	Translation
Message type	10000000	Call Setup msg
Message length	00010111	23
Parameter type	00000001	Time parameter
Parameter length	00001000	8
Data	00110000	0
	00110100	4 - month
	00110000	0
	00110101	5 - Day
	00110001	1
	00110010	2 - Hour
	00110011	3
	00110101	5 - Minute
Parameter type	00000100	Reason for absence of DN
Parameter length	00000001	1
Data	01010000	P
Parameter type	00000111	Name
Parameter length	00001000	8
Data	01001010	J
	01001111	O
	01001000	H
	01001110	N
	00100000	space
	01000100	D
	01001111	O
	01000101	E

Example 4: Encoding of the "Test for CND" Multiple Data
message.

Field Name	Actual Data	Translation
Message type	10000001	"Test for CND" message
Message length	00010110	22
Parameter type	00000001	Time parameter
Parameter length	00001000	8
Data	00110000	0
	00110100	4 - month
	00110000	0
	00110101	5 - Day
	00110001	1
	00110010	2 - Hour
	00110011	3
	00110101	5 - Minute
Parameter type	00000010	Calling line identification
Parameter length	00001010	10
Data	00110000	0
	00110001	1
	00110010	2
	00110011	3
	00110100	4
	00110101	5
	00110110	6
	00110111	7
	00111000	8
	00111001	9

Example 5:   Terminal Interface message with the name and number call
setup parameters

The CPE when receiving this message would display the name
and number as if this was a call setup message.

Field Name	Actual Data	Translation
Message type	10000011	Terminal Interface message
Message length	00100000	22
Parameter type	00000010	Calling line identification
Parameter length	00001010	10
Data	00111001	9
	00110001	1
	00111001	9
	00110101	5
	00110101	5
	00110101	5
	00110001	1
	00110010	2
	00110001	1
	00110010	2
Parameter type	00000111	Name
Parameter length	00001000	8
Data	01001010	J
	01001111	O
	01001000	H
	01001110	N
	00100000	space
	01000100	D
	01001111	O
	01000101	E

Example 6:   Terminal Interface message with a display data parameter

The CPE when receiving this message, would display the information as follows:

16 character wide - PUSH THE 9 KEY

Hidden from view or displayed on next line would be
TO ADD A NAME

24 character wide - PUSH THE 9 KEY TO ADD

Hidden from view or displayed on next line would be
A NAME

Field Name	Actual Data	Translation
Message type	10000011	Terminal Interface message
Message length	00011110	30
Parameter type	00000001	Display Data parameter
Parameter length	00011100	28
Data	01010000	P
	01010101	U
	01010011	S
	01001000	H
	00100000	space
	01010100	T
	01001000	H
	01000101	E
	00100000	space
	00111001	9
	00100000	space
	01001011	K
	01000101	E
	01011001	Y
	00000101	delimiter
	01010100	T
	01001111	O
	00100000	space
	01000000	A
	01000100	D
	01000100	D
	00000101	delimiter
	01000000	A
	00100000	space
	01001110	N
	01000000	A
	01001101	M
	01000101	E