
SL-1

Multifrequency Signaling for Socotel

Hardware and signaling description

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Reason for revision

90 11 02

This publication has been changed to add Group F (Phase 6) DOD Multifrequency Signaling for Socotel to Generic X11 Including Supplementary Features.

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General

Description

Multifrequency Signaling for Socotel is referred to as MFE, package number 135. It consists of Multifrequency Sender/Receiver circuit packs and optional software. It applies to software Generic X08 and Generic X11 Including Supplementary Features.

MFE is a signaling protocol that allows a SL-1 to communicate with a Public Exchange (Central Office) using Socotel signaling on DID/DOD trunks. A private network can be throughout in a public network. The DOD numbering plan is divided in two parts: calls to other installations which use a 6-digit plan and calls to special services which use a 2-digit plan. The difference is made by analyzing the first digit. The values of the first digit for special services are programmable.

N A tandem call to MFE outgoing trunk is supported, providing there are no access restrictions. The digits are outpulsed as soon as they are received.

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N MFE is not supported on ISDN PR, but MFE can tandem on either direction.

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N A call on a Electronic Switched Network (ESN) is able to access a MFE outgoing trunk.

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Limitation

The digits are outpulsed as soon as the customer dials them. If a very short time between two digits is required, this could create a problem but using the optional feature Delay Digit Outpulsing (DDO) overcomes that problem. Call set-up is delayed by the length of a timer.

Related documentation

This Northern Telecom Publication (NTP) provides an overall description of the MFE feature. Refer to the following NTPs for installation, administration and maintenance of MFE.

553-YYY1-210	Installation (YY depends on machine type)
553-2321-310	Feature Implementation (X08)
553-2311-105A2	Feature Description and Implementation (X11 Supplementary Features)
553-2321-311	Data Administration Input/Output (X08)
553-2311-311A1	Data Admin Input/Output (X11 Sup Feat)
553-2301-511	Maintenance Diagnostics Input/Output

Hardware

Physical

The MFE Sender/Receiver (S/R) circuitry is packaged as a printed circuit (NTD9464) of the following dimensions:

Length	12.5 in (320mm)
Width	10.0 in (254mm)
Depth	1.25 in (32mm)

The LED mounted on the faceplate indicates the status of the circuit pack (ON when disabled).

Either μ -law or A-law is available as determined by a jumper on the circuit pack (factory installed).

Functions

The M/F S/R pack provides the signaling interface between the Central Processing Unit (CPU) and the DID/DOD trunk. The appropriate trunk circuit pack will handle the line signaling on the trunk, whereas the MFE S/R will handle the multifrequency signaling according to the Socotel signaling specification. The signaling consists of code signals composed of two out of five frequencies (700, 900, 1100, 1300, 1500 Hz) or a control signal (acknowledge) composed of a 'control' frequency of 1900 Hz. It is capable of transmitting and receiving the Pulse Code Modulation (PCM) multifrequencies simultaneously on two channels.

Location

The MFE S/R mounts in any of the printed circuit slots of the peripheral equipment shelf.

Environmental considerations

The NTD9464 MFE S/R circuit pack must not be subject to an environment outside the following constraints:

	Ambient temperature	Relative humidity
Non-operating	0 to + 70° C	up to 90%
Operating	0 to + 35° C	20 to 80%

Signaling

Line signaling

Line signaling must be used to seize the equipment, supervise the call and release the call. It does not affect MFE register signaling but is necessary to complete a call.

MFE signaling is independent from the line signaling. Any line signaling method (2 wire E & M, 4-wire E & M, DX2, DX4, LOOP, 2-Mb/s and 1.5-Mb/s DTI) can be used with MFE.

Any trunk type between the SL-1 and a Central Office may be used as far as the Central Office is able to support MFE on this trunk.

Register signaling

MFE register signaling is used to communicate between a Meridian SL-1 and the Public Exchange. For DID, register signaling commences once the incoming trunk has been seized, seizure acknowledgement has been returned, if required, and an MFE S/R has been attached. The first signal (SEND) comes from the incoming side of the call requesting digits from the Public Exchange. For DOD, register signaling commences once the outgoing trunk has been seized, seizure acknowledgement has been received if required and an MFE S/R has been attached. The MFE signaling commences with the reception of a signal from the Public Exchange.

Signals are divided into two main groups, forward signals and backward signals. With DID, forward signals are those received from the Public Exchange, and backward signals are those sent to the Public Exchange. With DOD, forward signals are those sent to the Public Exchange, and backward signals are those received from the Public Exchange. The

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signals are sent over a speech path and are combinations of two out of five frequencies. Refer to Table 3-1. Forward and backward signals are comprised of the same frequencies.

Table 3-1
MFE frequency combinations

Signal number	Frequencies
1	700 + 900
2	700 + 1100
3	900 + 1100
4	700 + 1300
5	900 + 1300
6	1100 + 1300
7	700 + 1500
8	900 + 1500
9	1100 + 1500
10	1300 + 1500

Each signal is acknowledged by the control frequency which is set to 1900 Hz and cannot be varied. (There are six possible frequencies: MFE uses only five.) It is the only signal which is not a combination of frequencies. This control frequency indicates to the opposite side of the call that the signal has been received and its transmission can cease. The level at which each frequency is sent is determined in the trunk data, LD14. Frequencies of 700 and 900 Hz are sent at -10.5 dBm base level, 1100 and 1300 Hz at a level one dBm higher and 1500 Hz at a level still one dBm higher. The level for the control frequency (-7.0 dBm) is also determined here.

A signal corresponds to a certain combination of frequencies. However, signals are assigned to have certain functions determined by tables in data administration LD94. In this way the meaning of each forward signal from the Public Exchange can be deciphered and frequency

combinations corresponding to the desired functions can be sent as backward signals.

Table 3-2
MFE signals

Group 1	Signal number	Function mnemonic	Description
Forward Level 1	1-9	DGT1-DGT9	digit 1 to digit 9
	10	DGT0	digit 0
		ACOC	access code for a call to other installation
		ACSS	access code for a call to special services
Backward Level 1		SACD	send access code and digits
	2	SEND	send digits
	3	COMP	address complete, change to level 2
		TRAN	transit connection
		FAIL	failure, new attempt
		CONG	congestion
Backward Level 2	1	IDLE	station idle, charge call
	3	BUSY	station busy
	3	CONG	access denied or lack of resources
	3	OUTT	out of order

Forward signals

The forward Level 1 signals are sent by the Public Exchange to the SL-1 and DID/DOD trunks.

N Timers MFI and MFF, and other MFE table information are set in LD16 (Trunk Route).

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(a) DGT

These signals represent the ten digits (DGT1 to DGT0).

(b) ACOC

It is sent after the SACD signal has been received. It is followed by the first four digits of the called number.

(c) ACSS

It is sent after the SACD signal has been received. It is followed by the two first digits of the called number.

Backward signals

These are signals sent by the SL-1 to the Public Exchange. Refer to Table 3-2. The function of each signal is determined in LD94. The corresponding signal to be sent is retrieved from the MFE table in that program. One signal may be used for more than one function.

There are two levels of backward signals. The first is called Level 1 signals and is used to request information. The second level is called Level 2 signals which are used to indicate the state of the called party at the SL-1. Level 2 signals are always preceded by a Level 1 signal whose function is COMP.

Backward Level 1 functions

The Level 1 signals are as follows:

(a) SACD

It is the first signal received after the seizure of the trunk. After receiving this signal, the access code is sent (DGT1 or DGT5) followed by four or two signals for the first digits depending on the access code.

(b) SEND

A signal with this function is used to indicate to the Public Exchange that seizure was successful and transmission of digits should begin. Four or five group I signals, determined by the DGTS prompt in LD96, will be expected.

(c) COMP

This function indicates that the received digits have been translated into a DN, valid or invalid, and that the next signal sent will be a backward Level 2 signal indicating the state of the called DN. The Level 2 signal will be sent immediately after this signal has been properly acknowledged.

(d) TRAN

Its reception means that the Public Exchange had made a cut-through for the two installations. After the reception of this signal, the meaning of the SEND is changed (the last four digits will be sent).

(e) FAIL

This signal occurs when there is a failure. Make a new attempt.

(f) CONG

A congestion signal corresponding to this function is sent to the Public Exchange when one of the units involved in the connection has failed. It is only used if there is no Level 2 defined.

Background Level 2 functions

Level 2 signals indicate the state of the called DN. Different functions can be assigned to have the same signal. For example, the same signal can be used to represent busy and congestion.

To return corresponding tones with signals, the answer to the SGL prompt in LD16 (Trunk Route) must have been NO. In this case both the signal and the tone are indicative of the state of the called DN. Otherwise, if the reply to the SGL prompt was YES, an IDLE Level 2

signal is always returned and the tone alone indicates the called party status.

Vacant DN (VACC) and Out of Service (OUTT) signals are only used if the intercept treatment specified in LD15 (Customer Data) is other than recorded announcement or attendant. If the intercept is to the attendant or a recorded announcement then the signal returned will depend on their status.

The Level 2 signals are as follows:

(a) IDLE

The called party is idle and the call must be charged. Ringback tone is returned if SGL is NO. Otherwise the tone corresponding to the called party status is sent.

(b) BUSY

The called party is off-hook and busy tone is returned. If a busy trunk group is encountered then busy tone or overflow tone, as indicated by the customer intercept table, is returned.

(c) CONG

The unit at the receiving end of the call is 'access denied' or 'termination is unsuccessful' and the tone specified by the intercept table is returned.

(d) OUTT

The called extension is out of order and the tone specified by the intercept table is returned.

(e) VACC

The called extension does not exist and the tone specified by the intercept table is returned.

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