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DIGITAL SWITCHING SYSTEMS

DMS-100 FAMILY INTEGRATED BUSINESS NETWORK SERVICE MERIDIAN M5009 BASIC (9 BUTTON) BUSINESS SET DESCRIPTION, INSTALLATION AND MAINTENANCE

*DMS-100 AND MERIDIAN ARE TRADEMARKS OF NORTHERN TELECOM

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1. INTRODUCTION

GENERAL DESCRIPTION

1.01 The Business Set is designed for direct connection, through a non-loaded subscriber loop pair, to the Northern Telecom DMS-250, DMS-100, or Meridian SL-100 Digital Switching systems.

1.02 The M5009 Basic Business Set is loop powered and will work with a maximum loop length of 4,572 m (15,000 ft) of 26 AWG standard twisted pair telephone wires, subject to Line Engineering rules (297-2011-180).

1.03 The service provided by the Business Set substitutes low-level signals passed over a half-duplex, above-voiceband signaling channel for the traditional loop signaling (dial pulse) or inband tone signaling (DTMF tones) on a conventional subscriber loop. In addition to signaling and supervision, messages on the above-voiceband signaling channel include signals for implementing the many special features available on the Business Set.

1.04 The M5009 Business Set offers a choice of selected key and system features; it has 3 fixed keys, a dial pad consisting of 12 fixed keys, 8 programmable feature and/or directory number keys with LCD indicators, 1 programmable feature key without an LCD indicator (key # 9, in topmost position) and is equipped with a speaker for alerting tones, on-hook dialing and intercom.

PHYSICAL CHARACTERISTICS

1.05 Fig. 1-1 shows the dimensions and main components of the Meridian M5009 Business Set. The set comes in three different colors:

(a) Chameleon-grey (NT4X35AA, NT4X35CA, NT4X35EA)

(b) BTS light-grey (NT4X35BA, NT4X35DA, NT4X35FA)

(c) Black (NT4X35GA, NT4X35HA, NT4X35JA)

OTHER DOCUMENTATION

1.06 Other information pertaining to Business Sets can be found in the following documents:

297-2001-100	Integrated Business Network (IBN) - Description
297-1001-114	Operational Measurements (OM)
297-1001-250	Testing and Acceptance for Initial Installation
297-1001-310	Table Editors User Guide
297-1001-518	Operational Measurements - Man-Machine Interface

297-2011-180	DMS-100 Business Set - Line Engineering Rules
P0669369	Business Set User Guide (English, Canadian edition)
P0683227	Business Set User Guide (English, U.S. edition)
P0672721	Business Set User Guide (French)

Fig. 1-1
M5009 Business Set - Features and Dimensions

Fig. 1-1
M5009 Business Set - Features and Dimensions

- Maximum acceleration 15/m/s/s.

Shock

2.08 *Packaged:* The Business Set within its packaging is designed to withstand normal handling during shipment.

2.09 *Unpackaged:* The telephone and the handset are designed to withstand accidental dropping during normal use, without sustaining damage, as follows:

- Telephone: when dropped on any face or corner from a height of 750 mm (30 in).

- Handset: when dropped from a height of 1.5 m (5 ft).

LINE ENGINEERING

2.10 The M5009 Business Set operates to its full potential through twisted pair wiring on transmission lines selected by the rules given in 297-2011-180.

3. OPERATION AND FEATURES

**M5009 BASIC
OPERATIONS**

**Making a Call and
Accessing Features**

3.01 The M5009 Business Set can be used to make voice calls and operate selected DMS-100 or Meridian SL-100 features. All supported features can be accessed via the keys provided on the M5009 Business Set. For further details on software requirements, refer to 297-2011-100 and 297-1001-310 respectively. Dial pad, DN, and feature key layout is shown in Fig. 1-1.

> *Note:* The M5009 Business Set can not be assigned as a maintenance set.

3.02 Detailed descriptions of how to dial and how to answer a call, and how to access the various features are given in the User Guide which is shipped with each telephone. Refer to the User Guide before attempting to operate the Meridian M5009 Business Set.

Peripheral Equipment

3.03 The M5009 Business Set interfaces with the business set (6X21AC) line card in the Line Concentrating Module (LCM) of the DMS100/Meridian SL-100 Central Office (CO) equipment. The 6X21AC supports one business set per line card.

Acoustics

3.04 A speaker is used for alerting tones, call monitoring (on-hook dialing) and intercom.

Power

3.05 The M5009 Business Set is entirely loop powered by a balanced 440 Ohm battery feed from the switching equipment. The switch battery voltage supplied to the loop is nominally 52 V dc, with a minimum of 42.75 and a maximum of 56 V dc.

3.06 The current drawn from the loop is 16 ± 1 mA when the set is active. The current drawn from the loop when the set is inactive is 8.4 ±0.8 mA.

**DESCRIPTION OF
FEATURES**

Keys

3.07 The M5009 Business Set (Fig. 1-1) is characterized by the following:

(a) There are 15 fixed keys with no LCD indicators, assigned as:

- Release key (1)

- Hold key (1),

- Volume up/down key (1), and

- Dial pad keys (12).

(b) There are eight (8) assignable key/LCD indicator pairs.

(c) There is one (1) assignable key (# 9) without a functioning LCD indicator.

3.08 LCD indicators used with DN keys support four (4) key/LCD states as follows:

FUNCTION	LCD STATE
Idle	Off
Ringing (or "Feature Pending")	Flashing at 60 interruptions per minute (IPM)
Hold	Winking at 120 IPM
Active	On

Basic Features

3.09 Every Business Set has the following basic features:

(a) *Automatic Prime DN selection:* allows the user to select the prime DN (i.e., the DN assigned to the 1st key) by going off-hook to answer a call without pressing a DN key.

(b) *On-hook Dialing:* allows a call to be dialed by selecting a line and dialing the number without lifting the handset. The handset must be lifted once the called party answers.

(c) *Listen On Hold:* can be activated by pressing the hold key (associated LCD flashing), placing the handset back in its cradle, and re-selecting the line to be monitored (associated LCD on).

(d) *Alerting Tones:* Warble tone sounds when telephone is on-hook, 500 Hz local buzzer tone sounds when telephone is off-hook.

FEATURES OPERATION

Fixed Keys

3.10 The fixed keys on the M5009 Business Set provide these permanent functions: call Hold, call Release, Volume Control, and dialing.

3.11 *Dialpad.* Before a call is established, no tone-feedback is provided when the dialing keys are being pressed. After a call has been

established, end-to-end signaling using CO generated DTMF tones is enabled.

3.12 *Hold.* The HOLD function has two modes of operation, manual and automatic. With the user engaged in a call, the call can be put on hold either by pressing the HOLD key or by pressing another DN key. In either case the DN LCD changes from ON to "winking" and the user is free to answer or make another call.

3.13 *Release.* The RLS (release) key performs a similar function as going on-hook, i.e. when pressed, it terminates a call. The DN LCD associated with the released call changes from the ON state to the OFF state, but the status of the Set remains "off hook" to the switch.

3.14 *Volume Control.* The loudness of any sound which comes through the speaker (i.e. ringing, dial tone, busy tone and on-hook monitoring) is controlled by one key with two toggle positions. Tapping the key at the right hand side will increase the volume, tapping it at the left hand side will decrease it. The volume changes in steps, each time the key is released.

3.15 The volume for alerting tones can only be adjusted while alerting is in progress and is automatically stored at the new level. The on-hook monitor volume level can be adjusted while monitoring. Storing of this level for further calls can be accomplished by depressing both sides of the volume toggle switch simultaneously after the required level has been reached. If this is not done, the monitoring volume level will return to the previously stored setting for the next call.

3.16 If the M5009 Business Set is disconnected from the line and then reconnected, all volume settings will return to the original default values (mid-point setting for alerting tones and minimum setting for on-hook monitoring).

3.17 The feature keys can be assigned a subset of a number of features. Examples of some of the available features are given as follows:

- Automatic Dial (AUD)
- Automatic Line (AUL)
- Busy Override (EBO)
- Call Basic Queuing (CBQ)
- Call Forward (CF)
- Call Park (PARK)
- Call Pickup (CPU)

- Call Waiting (CWT)
- Directed Call Park (DCP)
- Directory Numbers (DN)
- Group Intercom (GIC)
- Individual Business Line
- Intercom (ICM)
- Make Set Busy (MSB)
- Malicious Call Hold (MCH)
- Message Waiting (MWT)
- Multiple Appearance Directory Numbers (MADN)
- Privacy Release
- Ring Again (RAG)
- Set Busy Indicator (SBI)
- Speed Calling (SCS, SCL, or SCI)
- 3-Way Calling/Call Transfer (TWC/CXR)
- 6-Port Conference

3.18 *Local Tones.* A locally generated buzzer (500 Hz) tone is utilized for call waiting and off-hook alerting. All other telephony tones are provided by the switching equipment from a Tone Card.

3.19 *Tone Characteristics.* The various tones heard on the M5009 Business Set are defined as follows:

TONE	CHARACTERISTIC
Ringing	Interrupted warble tone, typically 2 seconds on, 4 seconds off
Busy	Interrupted tone, 1 second on, 1 second off
Call Waiting	Short burst of buzzer tone (500 Hz), 10 second intervals
Confirmation	Three short bursts of tone, not repeated (informs user that feature requested has been implemented. This tone is present only when the feature access code is dialed)
Dial	Continuous tone (consisting of 2 frequencies)
Reorder	Interrupted tone, 1/2 second on, 1/2 second off (informs user of unavailable feature, all trunks busy, illegal code etc.)
Ring Again	

Short burst of buzzer tone (500 Hz), once only (informs user that previously busy station or trunk line is now free)

Special Dial

Three short bursts of dial tone, followed by continuous dial tone (informs user that dialed feature, e.g. call forwarding, has been activated and further digits [e.g. station directory number to which calls are to be forwarded] can be dialed).

4. INSTALLATION PROCEDURES

M5009 BUSINESS SET

Unpacking or Packing

4.01 Use proper care while unpacking any M5009 Business Set. Check for damaged containers so that appropriate claims can be made to the transport company for items damaged in transit.

4.02 If a telephone has to be returned to the factory, ascertain that it is packed in the appropriate container as shown in Fig. 4-1 to avoid damage during transit. Remember to include all loose parts (e.g. cords and handset) in the shipment.

Preparations

4.03 Installation requires plugging in the cords to the TELADAPT* jacks that are accessible at the base of the telephone. Cord restraining tabs are provided for security (See Fig. 4-2). Make the necessary connections to the Teladapt connecting block (Tip [+] green lead and Ring [-] red lead), and plug the line cord into the Teladapt jack. Proceed in steps as given in Chart 4-1.

DUMMY REGION ADDED FOR ,ftn. TAG.
* TELADAPT is a trademark of Northern Telecom Limited.

Chart 4-1
M5009 BUSINESS SET INSTALLATION

| STEP | PROCEDURE |

1   Place telephone in work area (close to line cord connecting block) upside down on a number of sheets of soft, clean paper on solid, level work surface to prevent damage to movable keys and telephone face.

2   Connect handset cord 4-conductor Teladapt connectors to handset and to the telephone. The Teladapt connectors have a latch-tab which ensures correct alignment and prevents the cord from being pulled out inadvertently during service. Ascertain that this latch tab is firmly snapped into place.

3   After connecting handset cord to connector in base of set, route the cord through channel and past restraining tabs in base of telephone (Fig. 4-2).

4   Connect line cord to connector in base and push under restraining tabs in line cord channel of telephone base (Fig. 4-2).

5   Turn telephone right side up and place in final workstation position.

6   Print directory number on designation card, remove number lens by inserting a paper clip end in the hole at the side and levering upwards, insert designation card, and snap lens with card back into place.

Chart Continued   --------------------------------

Chart 4-1 Continued
M5009 BUSINESS SET INSTALLATION

STEP	PROCEDURE
7	Designate button labels for key designations.
8	Fold labels, insert inside plastic button cover, and snap button cover over movable key, pressing down on key, as required. Repeat for all keys.
9	Insert line cord Teladapt connector into connecting block and ascertain that is has securely snapped into place.
10	Wait a minimum of 20 seconds to allow for proper power-up before using the Business Set. This completes the installation.

Fig. 4-1
Unpacking or Packing the M5009 Business Set

Fig. 4-2
View of Jacks and Tabs at Base of Telephone

5. VERIFICATION PROCEDURES AND MAINTENANCE

VERIFICATION TEST ROUTINES

5.01 These are acceptance tests. If the criteria outlined in the Line Engineering Rules (297-2011-180) are observed, impulse noise, background noise and crosstalk compatibility problems are unlikely. The loop check should be performed, the telephone installed, and the Tip/Ring polarity should be checked before attempting to establish a communication path to another telephone and going through the different call routines (enabled features) while observing and verifying the responses at the set. Key/LCD Indicators can be tested with the "Station Ringer Test" in accordance with Chart 5-1.

MAINTENANCE

5.02 Maintenance of the Business Set is restricted to replacement of the set and other field replaceable items as tabulated in Part 6 (Ordering Information).

LOOP CHECK

5.03 Loop and linecard tests must be performed at the switching equipment (ref. 297-2011-180). It is assumed that loops and linecards have been checked out prior to the installation of any Business Sets.

5.04 Verify that the loop resistance is $\leq$ 1230 Ohm, and that the loop loss is $\leq$ 24 dB at 8 kHz.

POLARITY CHECK

5.05 The M5009 Business Set is polarity sensitive. If problems arise when the set is to be put into service, proceed as follows:

(a) If the set does not respond (no dial tone) after 20 seconds, check polarity of the tip and ring leads (tip + , ring -).

(b) If tip and ring lead reversal does not solve the problem, restore tip and ring to original polarity and change the set.

STATION RINGER TEST

5.06 The Station Ringer Test (SRT) tests the hardware of the M5009 Business Set and can be performed by the installer or repairman at the site with no involvement of the Central Office personnel.

Test Set-Up

5.07 With the handset on hook and all LCD indicators off, press the prime directory number (prime DN) key and dial the 3 to 14 digit access code. The access code consists of a one to seven digit number which is assigned by the telephone company according to local preferences, followed by the last two to seven digits of the prime DN assigned to the telephone to be tested. In North America, the access code usually consists of the number 57, followed by the last five digits of the prime DN. If the required digits are dialed incorrectly, a REORDER tone will sound which makes it necessary to press the RELEASE key and start again. If all digits are correct, all LCD indicators at the set, except the LCD associated with key 9 (topmost key on telephone) will light up. The test can now proceed in accordance with Chart 5-1.

> *Note:* The system will not attempt to restore any LCD to its pre-test state. The LCDs will be OFF at the end of the test, with features in the same state as before the test. A background audit restores all feature indicators at its next occurrence (audit intervals are switch and load related). Any newly activated features after termination of the test procedure will be indicated normally. No incoming calls can be received for the duration of a Station Ringer Test. In order to prevent prolonged line blockages, this test is limited to a 7 minute interval after which the line will automatically be restored to normal and the test terminated.

Chart 5-1
STATION RINGER TEST - KEY SEQUENCES

- Perform operations in the order as given in this Chart.

- Operate key or switch as given in the "Key or Switch" column. The response must be as given in the "Response" column. LCD and key numbering are given in Fig. 5-1.

- The column headed "Messages Used" indicates the messages generated to produce the correct response.

Note: Key # 9 has no associated, working LCD indicator. In all cases where "All LCDs ....." is given, the LCD window # 9 remains OFF.

| | **KEY OR SWITCH** | | |
STEP	**OPERATED**	**RESPONSE OBSERVED**	**MESSAGES USED**
1	Handset OFF-HOOK	All LCDs FLASH	LCD indicator FLASH
2	Handset ON-HOOK	All LCDs WINK	LCD indicator WINK
3	Handset OFF-HOOK	All LCDs ON	LCD indicator ON
4	Handset ON-HOOK	All LCDs OFF	LCD indicator OFF
5	Dial Pad key 1	LCD 1 ON	Soft Reset, LCD ON
6	Dial Pad key 2	LCD 2 ON	Soft Reset, LCD ON
7	Dial Pad key 3	LCD 3 ON	Soft Reset, LCD ON
8	Dial Pad key 4	LCD 4 ON	Soft Reset, CLD ON
9	Dial Pad key 5	LCD 5 ON	Soft Reset, LCD ON
10	Dial Pad key 6	LCD 6 ON	Soft Reset, LCD ON
11	Dial Pad key 7	LCD 7 ON	Soft Reset, LCD ON
12	Dial Pad key 8	LCD 8 ON	Soft Reset, LCD ON
13	Dial Pad key 9	LCDs 1 & 8 ON	Soft Reset, LCD ON
14	Dial Pad key 0	LCDs 2 & 8 ON	Soft Reset, LCD ON
15	Dial Pad key *	All LCDs ON	Soft Reset, LCD ON
			Save Indicator Status
16			

Chart Continued --------------------------------

Chart 5-1 Continued
STATION RINGER TEST - KEY SEQUENCES

Dial Pad key #		All LCDs OFF	Soft Reset
17	Feature key 1	LCD 1 ON	Soft Reset, LCD ON
18	Feature key 2	LCD 2 ON	Soft Reset, LCD ON
19	Feature key 3	LCD 3 ON	Soft Reset, LCD ON
20	Feature key 4	LCD 4 ON	Soft Reset, LCD ON
21	Feature key 5	LCD 5 ON	Soft Reset, LCD ON
22	Feature key 6	LCD 6 ON	Soft Reset, LCD ON
23	Feature key 7	LCD 7 ON	Soft Reset, LCD ON
24	Feature key 8	LCD 8 ON	Soft Reset, LCD ON
25	Feature key 9	LCDs 1 & 8 ON	Soft Reset, LCD ON
26	RELEASE key	LCDs 2 & 8 ON	Soft Reset, LCD ON
27	HOLD key	Dial Tone. LCDs 1 to 5 ON	Soft Reset. Turn On Tip/Ring to Speaker. LCD ON
28	Vol. UP	Volume Up	None (Test Voice Volume Control)
29	Vol. DOWN	Volume Down	None (Test Voice Volume Control)
30	Handset OFF-HOOK	Dial Tone from Handset only. All LCDs flash.	Turn Off Tip/Ring to Speaker, Turn on Handset. LCD flash.
31	Handset ON-HOOK	Dial tone switches to Handsfree speaker. All LCDs wink.	Turn on Tip/Ring to Speaker. Turn off Handset. LCD wink.
32	HOLD key	1 second buzz (500 Hz). LCDs 6 to 8 ON	Turn On/Off Alert B, LCD ON
33	HOLD key	Ringing. All LCDs OFF	None (Ring tone from CO)
34	Vol. UP	Volume UP	None (Test Ring Volume Control)
35	Vol. DOWN	Volume DOWN	None (Test Ring Volume Control)
36	HOLD key	-	Hard Reset

Fig. 5-1
Key and LCD Identification for Tests - M5009 Business Set

6. ORDERING INFORMATION

REPLACEMENT PARTS   **6.01** The M5009 Business Set has few field replaceable parts. The handset, handset cord, line cord equipped with Teladapt connectors, key lenses and labels can be changed.

6.02 If a Business Set fails to function properly, or if mechanical breakage occurs, do not attempt to effect repairs in the field. Return the unit to the manufacturer. For proper packing procedures, refer to Part 4 (Installation Procedures).

Table 6-A
MERIDIAN M5009 BUSINESS SET STOCKLIST OF FIELD REPLACEABLE PARTS

DESCRIPTION	ORDERING CODE	ENGINEERING CODE
Meridian M5009 Basic Business Set, Chameleon-grey, made in Canada for Canadian sales	B0225491	NT4X35AA
Meridian M5009 Basic Business Set, BTS light-grey, made in Canada for Canadian sales	B0225492	NT4X35BA
Meridian M5009 Basic Business Set, Black, made in Canada for Canadian sales	B0226823	NT4X35GA
Meridian M5009 Basic Business Set, Chameleon-grey, made in Canada for U.S. sales	B0225493	NT4X35CA
Meridian M5009 Basic Business Set, BTS light-grey, made in Canada for U.S. sales	B0225494	NT4X35DA
Meridian M5009 Basic Business Set, Black, made in Canada for U.S. sales	B0226824	NT4X35HA
Meridian M5009 Basic Business Set, Chameleon-grey, made in USA for U.S. sales	B0225495	NT4X35EA
Meridian M5009 Basic Business Set, BTS light-grey, made in USA for U.S. sales	B0225496	NT4X35FA
Meridian M5009 Basic Business Set, Black, made in USA for U.S. sales	B0226825	NT4X35JA
Card, Key Button Labels	P0660224	P0660224
Card, Station Number	P0665352	P0665352

Table Continued   --------------------------------

Table 6-A Continued
MERIDIAN M5009 BUSINESS SET STOCKLIST OF FIELD REPLACEABLE PARTS

Handset Assembly, Chameleon-grey, for NT4X35AA, CA, and EA	A0324416	NT1F04BA-35
Handset Assembly, BTS light-grey, for NT4X35BA, DA, and FA	A0324417	NT1F04BA-93
Handset Assembly, Black, for NT4X35GA, HA, and JA	A0330895	NT1F04BA-03
Handset Cord, 2.8 m (9 ft) long, Chameleon-grey, for NT4X35AA, CA, and EA	A0327131	NE-H4DUQC-35
Handset Cord, 2.8 m (9 ft) long, BTS light-grey, for NT4X35BA, DA, and FA	A0318332	NE-H4DUQC-93
Handset Cord, 2.8 m (9 ft) long, Black, for NT4X35GA, HA, and JA	A0327133	NE-H4DUQC-03
Label, Button Cover, Clear	P0637674	P0637674
Label, Button Cover, Green	P0657710	P0657710
Lens, Station Identification	P0652720	P0652720
Line Cord, silver-grey, 2.3 m (7.5 ft) long	A0274382	NE-D6QT-87