Option 11 & Meridian 1

Intelligent Peripheral Equipment circuit card for Saudi Arabia

Description and Installation

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Contents

About this document

This document describes the functions and applications of the following circuit card that is available for use in Saudi Arabia:

- NTAG46AA Extended Flexible Central Office Trunk card.

For information on the other circuit cards, see the various card descriptions in the *Meridian 1 Planning & Engineering Guide*.

References

The following information is contained in the *Meridian 1 Planning & Engineering Guide*:

- System overview
- Capacity Engineering
- System engineering
- Power engineering
- Product compatibility
- Digital telephones engineering
- Summary of transmission parameters
- International loss and level plan
- M1250/2250 Attendant console description
- Meridian 1 telephones
- Circuit card descriptions

- Equipment identification information
- Installation planning
- Spares planning.

The following information is contained in the Meridian *1 Installation and Maintenance Guide*:

- System installation procedures
- Power monitor/common equipment auxiliary shelves
- Circuit card installation and testing
- Telephone and attendant console installation
- General maintenance information
- Fault clearing
- Hardware replacement
- Transmission testing capabilities.

The following information is contained in the *Software input/output guide*:

- X11 data administration
- Software conversion procedures
- X11 maintenance
- X11 system messages

The following information is contained in the *Software features guide*:

- descriptions of features
- packaging and implementation information
- feature operation information
- feature interactions.

Central office trunk circuit card

Functional description

The NTAG46AA Extended Flexible Central Office Trunk (XFCOT) card provides the interface between the Meridian 1 system and up to eight analog Central Office (CO) trunks. It can be installed in any PE slot that supports Intelligent Peripheral Equipment (IPE).

Common features

The NTAG46AA XFCOT card:

- Supports analog to digital and digital to analog conversion for 8 audio paths.
- Supports software selectable A/μ law operation.
- Interfaces each PCM digital signal to one DS30X channel in A10 format.
- Transmits and receives SSD signalling messages over a DS30X signalling channel in A10 format.
- Provides indication of board status via the faceplate mounted LED.
- Provides disabling of individual units or the entire board under software control.
- Provides outpulsing on-board, with downloadable make-to-break ratios during configuration.

- Provides loopback of PCM signals to DS30X for factory test and diagnostic purposes.
- Shows self-test pass indication with faceplate LED.
- Supports loop start signalling.
- Provides termination, and transhybrid balance impedance to match 600Ω.
- Provides flexible downloadable gain on a per system basis and pad switching on a per unit basis.
- Provides detection and reporting Busy tone to software for Busy tone Supervision.
- Provides detection and reporting Battery Reversals to software for Battery Supervision.
- Provides Malicious Call Trace

Physical description

Measurements

Each NTAG46AA XFCOT card measures as follows:

Height:	305 mm (12.0 in.)
Depth:	254 mm (10.0 in.)
Faceplate:	2.22 mm (7/8 in.)

Switch settings

There are no option settings on the NTAG46AA XFCOT card. All settings are configured in software.

Connections

The NTAG46AA XFCOT card has eight units. Each trunk unit on the card connects to the backplane through an 80-pin connector. The backplane is cabled to the input/output (I/O) panel, and the I/O panel is cabled to the cross-connect terminal. At the cross-connect terminal, each unit connects to external apparatus by tip and ring leads.

Hardware installation

Tables 1 to 3 provide cross connect information for the NTAG46AA Extended Flexible Central Office Trunk card.

Table 1 NTAG46AA XFCOT connections for NT8D37 I/O panel connectors A, E, K, R

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			A	E	K	R	
TO RO	26 1	W-BL BL-W	SLOT 0	SLOT 4	SLOT 8	SLOT 12	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 2 NTAG46AA XFCOT connections for NT8D37 I/O panel connectors B, F, L, S. (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			B	F	L	S	
TO RO	26 1	W-BL BL-W	SLOT 1	SLOT 5	SLOT 9	SLOT 13	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-O O-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 2 NTAG46AA XFCOT connections for NT8D37 I/O panel connectors B, F, L, S. (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			B	F	L	S	
TO RO	42 17	Y-O O-Y	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 0
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 1
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 2
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 3
	49 24	V-BR BR-V					

Table 3 NTAG46AA XFCOT connections for NT8D37 I/O panel connectors C, G, M, T. (Part 1 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			C	G	M	T	
T4 R4	26 1	W-BL BL-W	SLOT 2	SLOT 6	SLOT 10	SLOT 14	Unit 4
	27 2	W-O O-W					
T5 R5	28 3	W-G G-W					Unit 5
	29 4	W-BR BR-W					
T6 R6	30 5	W-S S-W					Unit 6
	31 6	R-BL BL-R					
T7 R7	32 7	R-O O-R					Unit 7
	33 8	R-G G-R					

Table 3 NTAG46AA XFCOT connections for NT8D37 I/O panel connectors C, G, M, T. (Part 2 of 2)

Lead Designations	Pin Numbers	Pair Colour	I/O Panel connector				Unit Number
COT			C	G	M	T	
TO RO	34 9	R-BR BR-R	SLOT 3	SLOT 7	SLOT 11	SLOT 15	Unit 0
	35 10	R-S S-R					
T1 R1	36 11	BK-BL BL-BK					Unit 1
	37 12	BK-O O-BK					
T2 R2	38 13	BK-G G-BK					Unit 2
	39 14	BK-BR BR-BK					
T3 R3	40 15	BK-S S-BK					Unit 3
	41 16	Y-BL BL-Y					
T4 R4	42 17	Y-O O-Y					Unit 4
	43 18	Y-G G-Y					
T5 R5	44 19	Y-BR BR-Y					Unit 5
	45 20	Y-S S-Y					
T6 R6	46 21	V-BL BL-V					Unit 6
	47 22	V-O O-V					
T7 R7	48 23	V-G G-V					Unit 7
	49 24	V-BR BR-V					

Self-test

When the card is installed, the red Light Emitting Diode (LED) on the faceplate flashes as the self-test runs. If the self-test completes successfully, the LED flashes three times, remains continuously lit until the card is automatically enabled (if it has been configured in software) after which the LED goes out. If the self-test fails, the LED will remain lit.

Trunk configuration

Route Data Block

Each trunk unit on the NTAG46AA XFCOT card is attached to a route with an associated route data block. Trunk timers are configured on a route basis.

Note: All prompts are defaulted except for those noted in Table 4. Default values are shown in brackets.

Table 4
LD 16 Route Data Block

Prompt	Response	Comments
REQ	NEW	Add a new data block to the system
TYPE	RDB	Define a new Route Data Block
CUST	0–99	Enter customer number
ROUT	0–511	Enter route number
TKTP	COT	Define trunk type as Central Office
ICOG	IAO	Incoming and Outgoing trunk
ACOD	XXXXxxx*	Trunk route access code
CNTL	YES	Change a trunk timer
TIMR	RGV 384	Ring Validation Timer, default = 640 ms
DTD	(NO) YES	Dial tone detector performed / not performed on this route. If YES, answer the following 2DT and XTDT prompts

* The ACOD must not conflict with the numbering plan. Up to 4 digits are normally allowed, up to 7 digits with Directory Number Expansion (DNXP) package 150.

Prompt	Response	Comments
2 DT	(NO) YES	Secondary Dial Tone
XTDT	(0)–7	Extended tone detector table number programmed in overlay 97. Must be the same value as that defined in LD 13 (Enter 0 if the table has not been programmed in LD 97)
NEDC	 (ORG) ETH	Near end disconnect control Originating end disconnect control Either end disconnect control
FEDC	 (ORG) ETH	Far end disconnect control Originating end disconnect control Either end disconnect control
CDR	(NO) YES	CDR trunk route. If YES, answer OAL and MR prompts.
OAL	(NO) YES	CDR on outgoing calls

Trunk Data Block

Use overlay 14 to configure each of the trunk units on the NTAG46AA XFCOT. Default values are shown in brackets in Table 5.

Table 5
LD 14 Trunk Data Block

Prompt	Response	Comments
REQ	NEW x	Define a new trunk unit, x is from 1–255
TYPE	COT	Central Office Trunk data block
TN	l s c u	Terminal number of the unit: Loop, Shelf, Card, Unit
CDEN	8D	Card density is 8D (octal)
XTRK	XCOT	Type is IPE COT (see note)
SIGL	LOP	Loop Start signaling
CLS	(DIP) DTN	Digitone signaling, (Digipulse)

Note: This prompt is required only for the first unit (unit 0) defined on each NTAG46AA card.

Technical description

Power requirements

Table 6 provides the power requirements for the NTAG46AA XFCOT card.

Table 6
NTAG46AA power requirements

V (volts)	I (mA) Idle	I (mA) Seize	I (mA) all units outpulsing
+15V (Note 1)	170	252	330
-15V (Note 1)	170	249	249
+8.5V (Note 2)	100	100	100
+5V	160	322	322

Note 1: Analog circuitry is powered with +/-12V generated from +/-15V

Note 2: 8.5V is regulated to provide 5V.

Environmental specifications

Table 7 provides the environmental specifications for the NTAG46AA XFCOT card.

Table 7
NTAG46AA environmental specifications

Parameter	Limit
Operating temperature	10 to +45 degrees C, ambient
Operating humidity	20 to 80% relative humidity
Storage temperature	-20 to +60 degrees C
Storage humidity	5 to 95% relative humidity

Transmission parameters

Loss values for the NTAG46AA XFCOT card will be programmable on a per system basis. This loss will be fixed once programmed in LD 97 and is not variable on a per call basis.

The available range of transmission loss will be as follows:

- Loss D/A : -5 dBm to +7.5 dBm
- Loss A/D : -10 dBm to +4 dBm

The minimum recommended loss values are as follows:

- Loss D/A will be greater than or equal to -3 dBm
- Loss A/D will be greater than or equal to 0 dBm

If losses less than this (more gain) are programmed, there is a risk of system instability due to an overall A-A gain through the system.

The tolerance for the above nominal values is + 0.3, -0.7 dB

Table 8 shows the pad code values to be programmed and Table 9 shows the administration prompts in LD 97.

Table 8
Predefined Static Loss Plan Download tables (Part 1 of 2)

	Saudi Arabia			
B34 Port Type	**Rx**	**dBr**	**Tx**	**dBr**
COTS	8	+4.0	18	-1.0
COTL	---	---	10	+3.0
DIDS	---	---	18	-1.0
DIDL	---	---	10	+3.0
T2WT	---	---	10	+3.0
— continued —				

Table 8
Predefined Static Loss Plan Download tables (Part 2 of 2)

	Saudi Arabia			
B34 Port Type	**Rx**	**dBr**	**Tx**	**dBr**
T2WN	---	---	10	+3.0
T2WV	12	+2.0	14	+1.0
T4WT	---	---	10	+3.0
T4WN	---	---	10	+3.0
T4WV	12	+2.0	14	+1.0
PAGT	---	---	---	---
RANR	---	---	---	---
ALUS	8	+4.0	18	-1.0
ALUL	8	+4.0	18	-1.0

Note: Pad code 16 and its corresponding dB gain 0.0 are shown as "--- ---" in the table to reflect what is seen when the table is printed in LD 97

Table 9
LD 97 SLPD prompts and responses

Prompt	Response	Description
REQ	CHG	Modify data block.
TYPE	LOSP	Loss Plan table creation or modification
NATP	(NO) YES	North American Transmission Plan Dynamic Pad Switching method (Dynamic Pad Switching is only supported on Generic XFCOT [NT5K16] packs.)

Table 9
LD 97 SLPD prompts and responses

Prompt	Response	Description
TTYP		Table Type to be installed or modified
	(STAT)	Static Loss Plan table
	DYNM	Dynamic Loss Switching table
STYP		Static Loss Plan Table to be used
	(PRED)	Predefined table
	CSTM	Customize Modify a table
	DISL	Disable Static Loss Plan Downloading
The following is prompted when TTYP = STAT and STYP = DISL		
PWD2		Level 2 Administrator password as defined in LD 17
The following is prompted when TTYP = STAT and STYP = PRED		
TNUM	1–28	Table number of one of the predefined Loss Plan tables
The following is prompted when TTYP = STAT and STYP = CSTM		
PWD2		Level 2 Administrator password as defined in LD 17
COTS	Rx Tx	COT short line
	8–39 0–31	Where: Rx = Relative Input/Output Level code for the Receive (A/D) direction Tx = Relative Input/Output Level code for the Transmit (D/A) direction

Table 9
LD 97 SLPD prompts and responses

Prompt	Response		Description
COTL	Rx	Tx	COT long line
	8–39	0–31	
DIDS	Rx	Tx	DID short line
	8–39	0–31	
DIDL	Rx	Tx	DID long line
	8–39	0–31	
T2WT	Rx	Tx	TIE 2-wire, CLS = TRC
	8–39	0–31	
T2WN	Rx	Tx	TIE 2-wire, CLS = NTC
	8–39	0–31	
T2WV	Rx	Tx	TIE 2-wire, CLS = VNL
	8–39	0–31	
T4WT	Rx	Tx	TIE 4-wire, CLS = TRC
	8–39	0–31	
T4WN	Rx	Tx	TIE 4-wire, CLS = NTC
	8–39	0–31	
T4WV	Rx	Tx	TIE 4-wire, CLS = VNL
	8–39	0–31	
PAGT	Tx		Paging trunk
	0–31		

Table 9
LD 97 SLPD prompts and responses

Prompt	Response		Description
RANR	Rx		RAN trunk
	8–39		
ALUS	Rx	Tx	Analog Line Card unit CLS = SHL
	0–31	8–39	
ALUL	Rx	Tx	Analog Line Card unit CLS = LOL
	0–31	8–39	

Table 10
LD 97 code to Relative Input/Output Level cross-reference

		Lines		Trunks				Lines		Trunks	
Code	**Level (dBr)**	**Rx**	**Tx**	**Rx**	**Tx**	**Code**	**Level (dBr)**	**Rx**	**Tx**	**Rx**	**Tx**
0	8.0	√			√	20	- 2.0	√	√	√	√
1	7.5	√			√	21	- 2.5	√	√	√	√
2	7.0	√			√	22	- 3.0	√	√	√	√
3	6.5	√			√	23	- 3.5	√	√	√	√
4	6.0	√			√	24	- 4.0	√	√	√	√
5	5.5	√			√	25	- 4.5	√	√	√	√
6	5.0	√			√	26	- 5.0	√	√	√	√
7	4.5	√			√	27	- 5.5	√	√	√	√
8	4.0	√	√	√	√	28	- 6.0	√	√	√	√
9	3.5	√	√	√	√	29	- 6.5	√	√	√	√
10	3.0	√	√	√	√	30	- 7.0	√	√	√	√
11	2.5	√	√	√	√	31	- 7.5	√	√	√	√
12	2.0	√	√	√	√	32	- 8.0		√	√	
13	1.5	√	√	√	√	33	- 8.5		√	√	
14	1.0	√	√	√	√	34	- 9.0		√	√	
15	0.5	√	√	√	√	35	- 9.5		√	√	
16	0.0	√	√	√	√	36	- 10.0		√	√	
17	- 0.5	√	√	√	√	37	- 10.5		√	√	
18	- 1.0	√	√	√	√	38	- 11.0		√	√	
19	- 1.5	√	√	√	√	39	- 11.5		√	√	

Note: √ indicates a valid code for a line or a trunk in either Tx or Rx mode.

Trunk types description

Each NTAG46AA XFCOT card supports:

- 8 individual trunk circuits
- Signalling and control
- Loop start operation
- Busy Tone Detection
- Malicious Call Trace

Individual Trunk Circuit

The XFCOT contains 8 individual trunk circuits. Each circuit will consist of one channel of a quad codec (B34), signalling and control relays, a signalling hybrid, transmission hybrid and audio transformer.

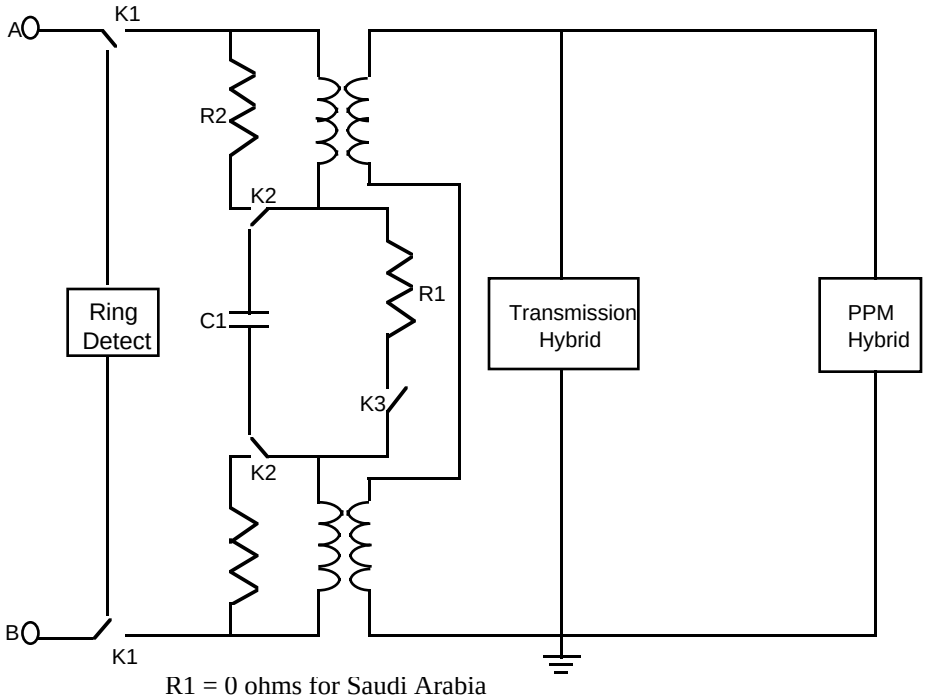
The signalling hybrid contains the relay control and detector circuits required to provide various unit functions. A ringing detector and a battery detector per unit is provided.

The transmission hybrid contains the circuitry to perform the following functions;

- 2 to 4 wire conversion and vice versa
- Transhybrid balance
- AC terminating impedance (600Ω)
- Tx / Rx Amplifiers

Figure 1 provides a block diagram of the trunk unit. All relays are shown in normal or unenergized positions.

Figure 1
NTAG46AA loop start signaling



R1 = 0 ohms for Saudi Arabia

Loop start signaling

Each unit on the NTAG46AA card supports loop start signaling for incoming and outgoing Central Office calls.

Idle state

In the idle state, the ringing detector is connected across the A and B wires, presenting a high impedance to the Central Office.

Far End Originated

Ringing voltage is applied to the A and B wires. If the ringing signal falls within the limits for detection, it will be detected within 100 ms of application. A message is sent to software to indicate that an incoming ring burst has been detected. The output of the ringing detector is debounced and timed in software. When the incoming ringing burst has been properly validated, a seize message is sent by S/W to the XFCOT. K1 and K3 change over, presenting a low loop impedance across the A and B wires.

Near End Originated

The PBX originates a call by activating K1 and K3, which switches out the ringing detector and presents a low loop impedance across the A and B wires. Address information is then sent to the CO, either as decadic pulses or DTMF voiceband signals. Relay K3 controls the DC path, and provides decadic outpulsing by opening and closing.

Near End Release

Relay K3 opens, thus breaking the DC loop. Relay K1 remains in the loop state, and capacitor C1 remains in circuit, thus presenting a low impedance AC path for metering pulses. After approximately 500 ms, relay K1 times out and changes over, breaking the AC path and re-inserting the ringing detector across the A and B wires.

Far End Release

A far end release will be detected by the Saudi Arabia XFCOT (in the form of a Battery Reversal or a Busy Tone Signal).

Features description

Card Lan

The Card Lan interface is a serial maintenance link between IPE cards and the CPU. An 87C52 microcontroller is used to implement Card Lan. The features are as follows:

- General Poll from XPEC or CPU
- DS30X Enable/Disable
- Board Status Report
- Self Test Status Report
- Factory Test Message
- Card Identification
- Report Configuration Data
- Report Firmware Version.

Card Lan uses a 9 bit serial bit stream at 19.2Kbps with the 9th bit signifying if the byte is address or data. A ‘1’ signifies an address byte and a '0' signifies a data byte.

Busy Tone Detection

Busy tone detection will be incorporated on-board on a per unit basis. There are restrictions associated with the Busy tone detection feature which are detailed in “Circuit card limitations” on page 34

Malicious Call Trace

Malicious Call Trace (MCT) enables users to activate a call trace at selected moments. A printed report is generated with information of called and calling party in the case of an internal call. For incoming calls the call trace should give information of the associated trunk and a special signal is sent to the CO.

The Enhanced MCT feature should operate functionally the same as it does now with MCT on Direct Inward Dialling. It will support special Call Trace Requests to the CO types used in Saudi Arabia.

The following types of CO's are supported:

- Ericsson: hookflash (90±40 msec.) – dial tone – digits "*39#";
- Schnedie: hookflash (150−500 msec.) – dial tone – digits "36".

Circuit card limitations

Detection of busytone during conference calls

There is a danger of the XFCOT interpreting a disconnect tone passed through the Meridian 1 from another CO connection as a valid far end disconnect. For example, in the case of a conference call which includes two trunks, the detector on Trunk A should not detect the disconnect tone provided when the far end party connected to Trunk B hangs-up. The system should clear-down trunk B and leave the call between Trunk A and the third party intact. However the busytone is passed digitally to Trunk A and arrives at the i/p of Trunk A's busytone detector due to reflections. The transhybrid balance circuit will attenuate the signal by 20 dB. This means that if conference pads are not used that at worst any busytone signal of ≥ -20 dB could be detected by Trunk A and a busytone signal of ≥ -10dB would be detected when transhybrid loss is at it's minimum of 20 dB.

If the problem does occur the recommended fix would be to disallow the busytone disconnect on conference calls involving two or more XFCOTs.

Trunk to Trunk Connections

Trunk to Trunk connections (e.g., CO to CO or TIE to TIE) are not supported with the recommended gain settings. This is because with the maximum allowable gain settings, they result in an overall gain through the system which could cause system instability.

Circuit card compatibility

Due to differences in system software configuration, this circuit card will not be compatible for use in systems which are already configured for use with the Generic XFCOT (NTCK16) circuit card or the XUT circuit card. If the circuit card is plugged into a system configured in this way, the circuit card will default to losses of -3dBm D/A and 0 dBm A/D and the downloadable gain feature will not operate.

Similarly, if a Generic XFCOT is installed in a system configured to support this new trunk, it will default to static losses of -3dBm D/A and 0 dBm A/D and the Dynamic pad switching feature will not operate. The restriction on trunk to trunk connections detailed in section 14.3 applies to all trunks in a system configured to support the new Downloadable gain XFCOT including the XUT and the Generic XFCOT.

Option 11 & Meridian 1

Intelligent Peripheral Equipment circuit card for Saudi Arabia

Description and Installation

Information is subject to change without notice. Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules, and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

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