NLite E
6-38 GHz SONET DIGITAL RADIO SYSTEM

Section I DESCRIPTION

CONTENTS

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CONTENTS

1. GENERAL DESCRIPTION

This section provides descriptive information on the NLite E radios which are used for the wide/narrow band point-to-point digital microwave radio links.

The Indoor Unit (IDU) provides digital SDH (1 × STM-1) and/or LAN (2P × 10/100BASE-T(X), 4P × 10/100BASE-T(X) or 1P × 1000BASE-SX/ 1000BASE-T) signal transmission by the change of the data signal interface card. It can select the modulation method 32QAM/128QAM, by software selection depending on the transmission capacity that is configured in the modulator/demodulator unit.

The Outdoor Unit (ODU) can be applied for a wide range of RF frequency bands from 6/7/8/10/11/13/15/18/23/26/32/38 GHz.

Applications using the following redundancy configurations, Unprotected (1+0), 2 × (1+0)*1, Protected (1+1), 2 × (1+1)*1 are available for NLite E radio systems.

*Notes: *1; XPIC*

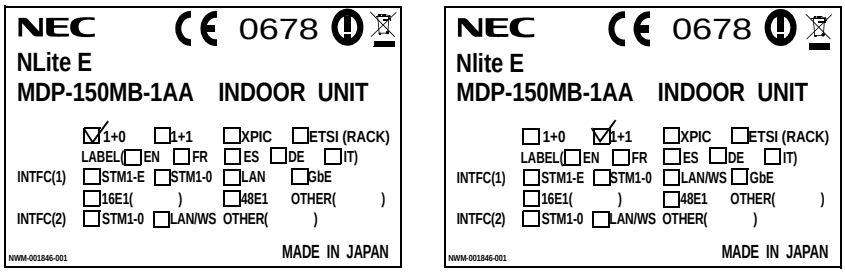
Cross Polarization Interference Canceller (XPIC) system is applied for dual polarized systems using the same frequency in 2 × (1+0) and 2 × (1+1) configurations.

ATTENTION: TO REMAIN COMPLIANT WITH FCC PART 15 RULES INSTALLERS MUST UTILIZE SHIELDED CABLE WHEN CONNECTING TO THE “XPIC CTRL” CONNECTOR.

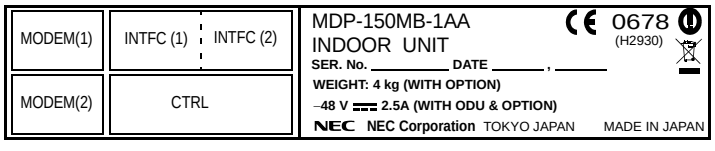
ATTENTION: TO REMAIN COMPLIANT WITH FCC PART 15 RULES INSTALLERS MUST UTILIZE SHIELDED CABLE WHEN CONNECTING TO THE “SC IN/OUT” CONNECTOR.

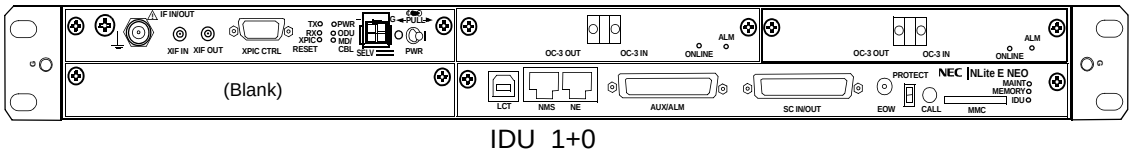
PASOLINK NEO

IDU Package Label

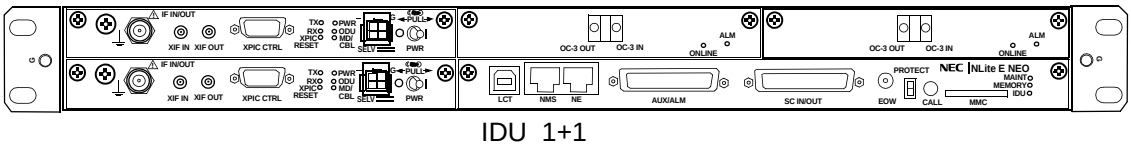


IDU Name Plate



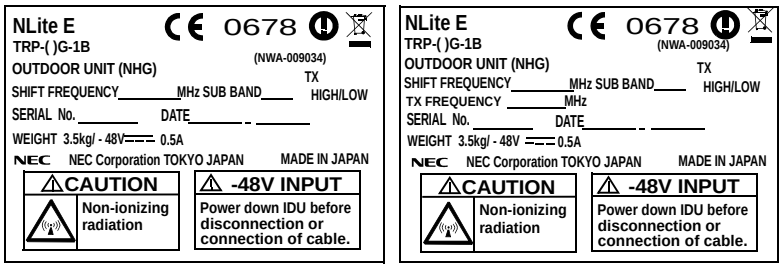


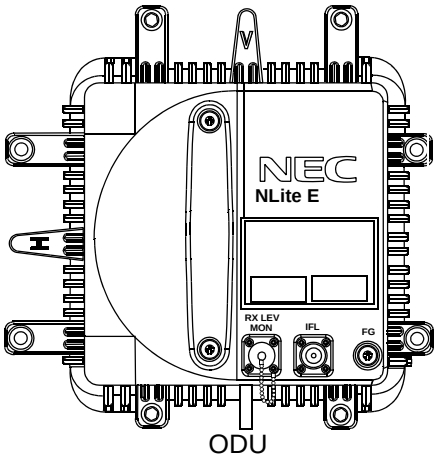
IDU 1+0



IDU 1+1

ODU Name Plate





ODU

2. SYSTEM CONFIGURATION AND CHARACTERISTICS

This section provides outline of the system configuration, system performance, RF channel plan, external alarm items and House keeping input/output, and power supply.

2.1 System Configuration

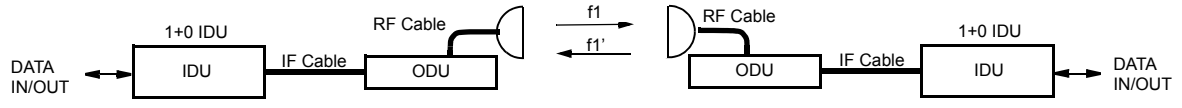
The system consists of the MDP-150MB-1AA Modulator-Demodulator (Indoor Unit (IDU)) and TRP-(*1)G-1B Transmitter-Receiver (Outdoor Unit (ODU)), Hybrid Combiner/Divider*2 or Orthogonal Mode Transducer (OMT)*3 and the antenna.

The TRP-( )G-1B is available with frequency bands of 6 GHz to 38 GHz.

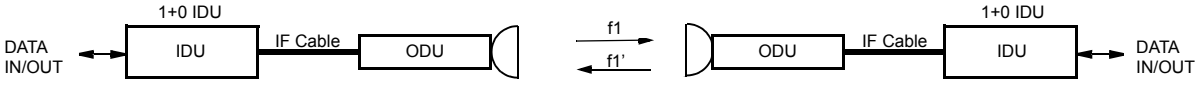
*Notes: *1:ODU Type depends on the frequency band used, such as TRP-(13)G-1B is applied for 13 GHz band.*

**2:The Combiner/Divider is used in (1+1) single antenna configuration for antenna direct mount type ODUs.*

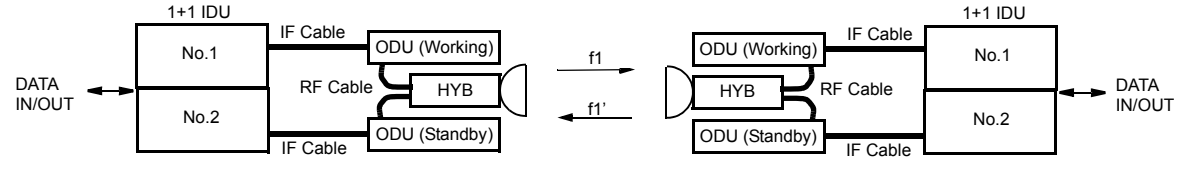
**3:The OMT is used in XPIC systems with antenna direct mounting ODUs.*



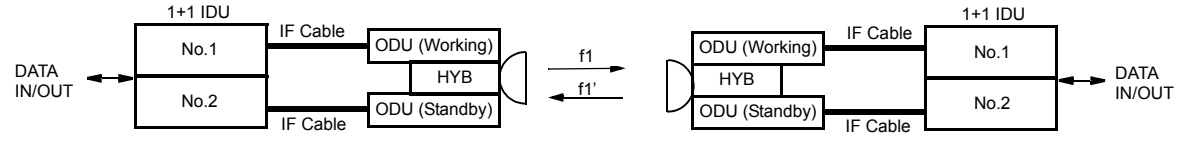
1+0 with Waveguide/Coaxial Cable Connection



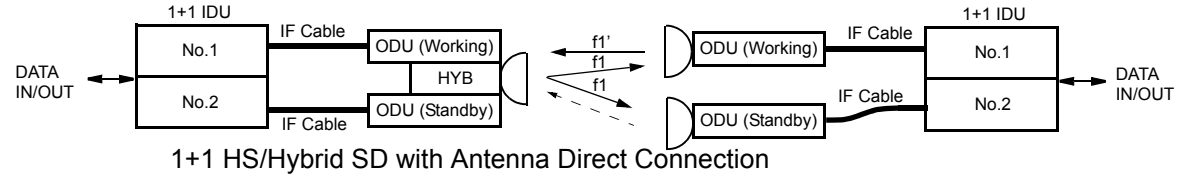
1+0 with Antenna Direct Connection



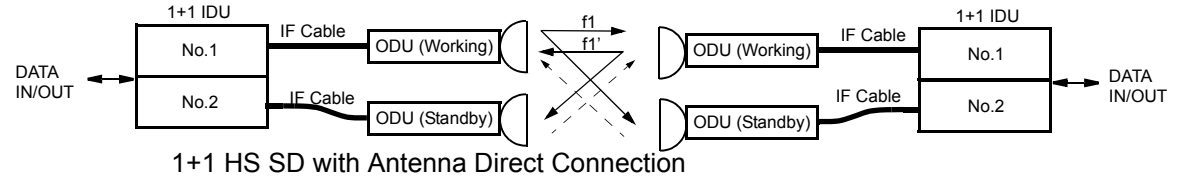
1+1HS/HS with Coaxial Cable Connection



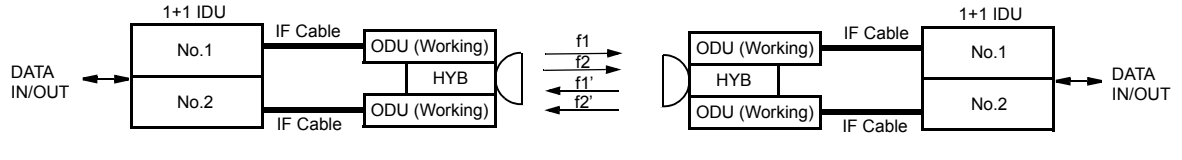
1+1 HS/HS with Antenna Direct Connection



1+1 HS/Hybrid SD with Antenna Direct Connection

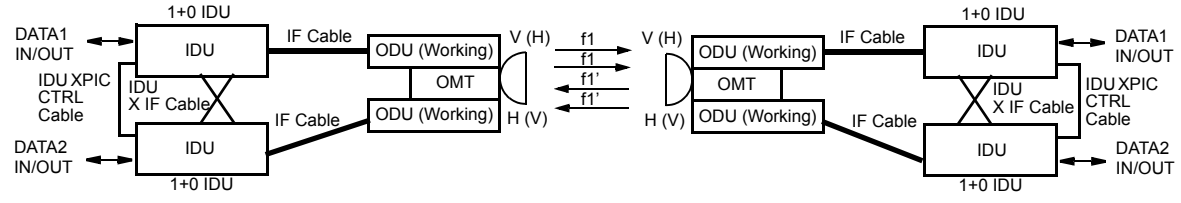


1+1 HS SD with Antenna Direct Connection

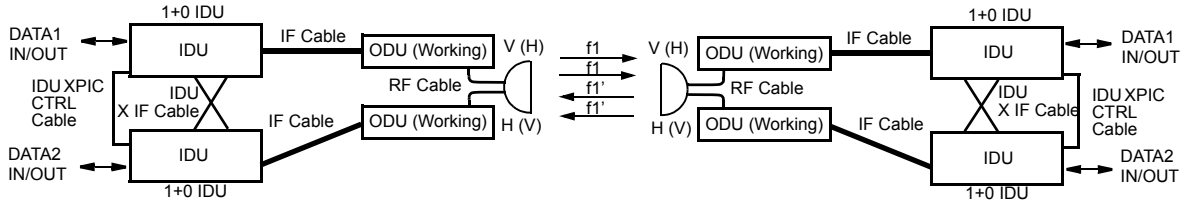


1+1 Twin-path FD with Antenna Direct Connection

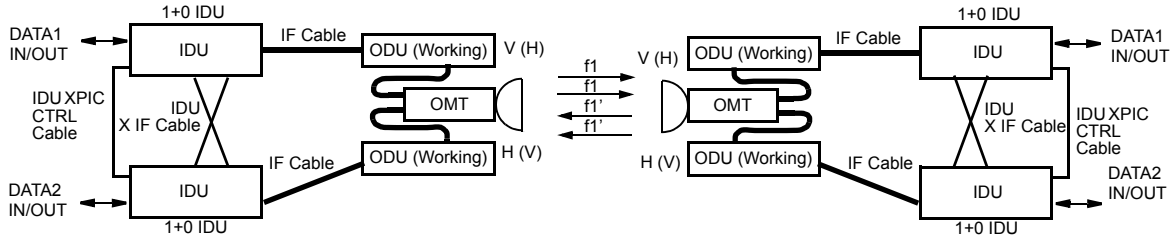
Fig. 2-1 Protected/Unprotected System Configuration (1/2)



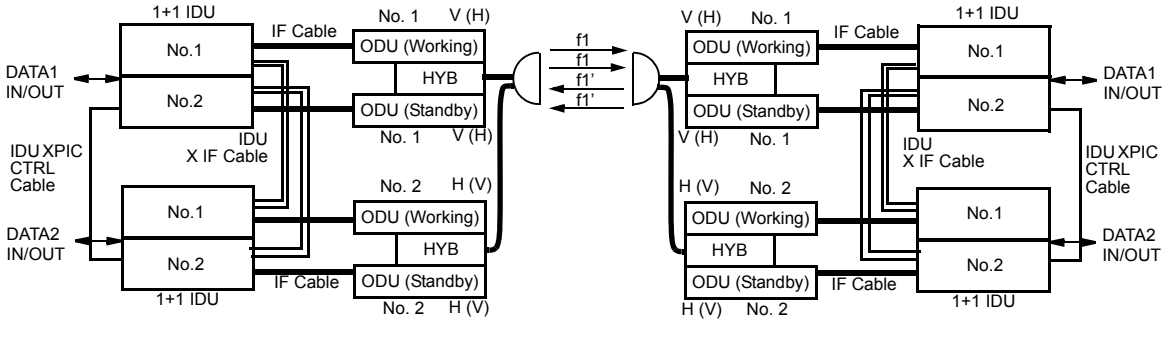
2(1+0) XPIC with Antenna Direct Connection



2(1+0) XPIC with Waveguide/Coaxial Cable Connection

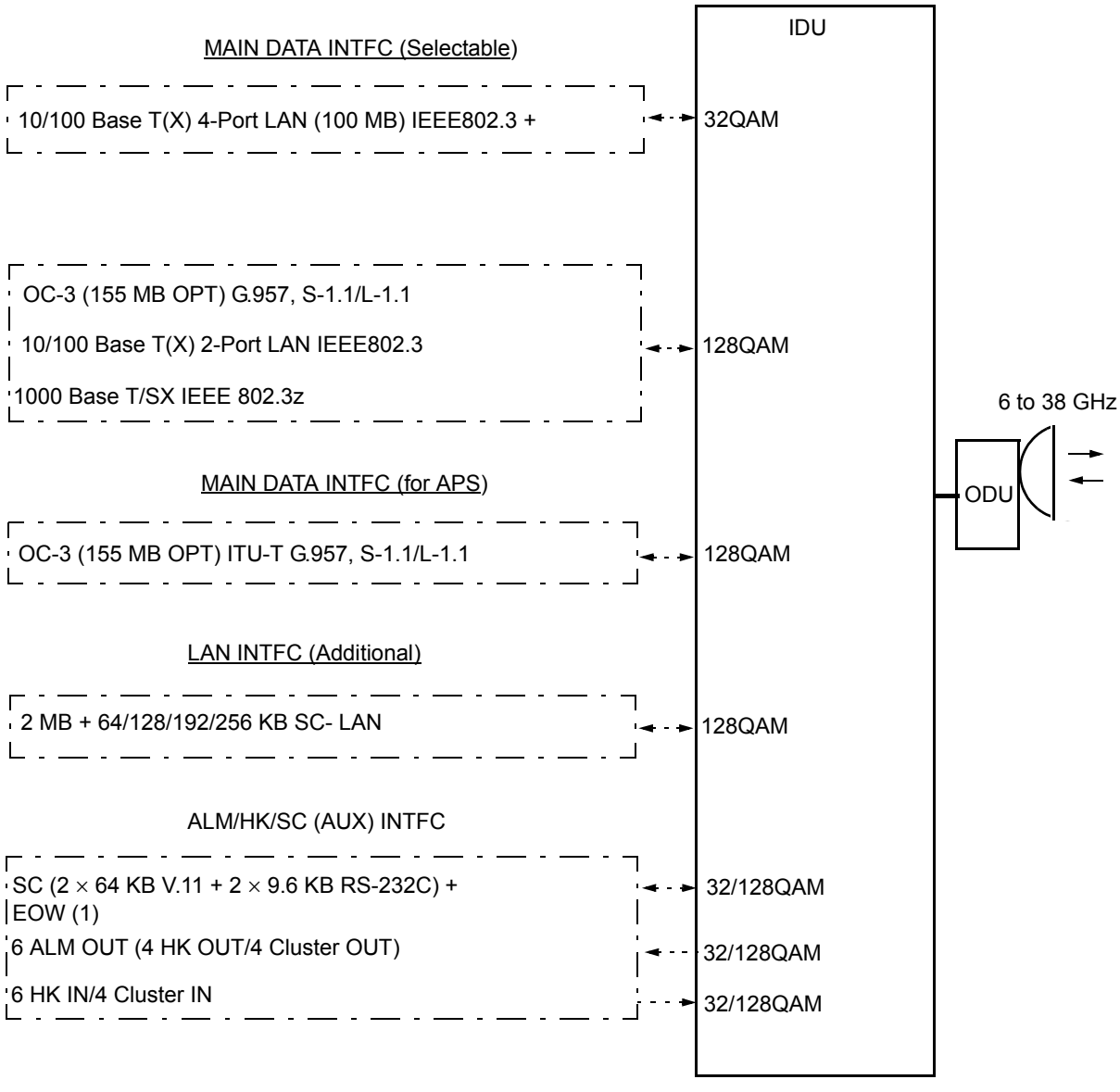


2(1+0) XPIC with Waveguide/Coaxial Cable Connection



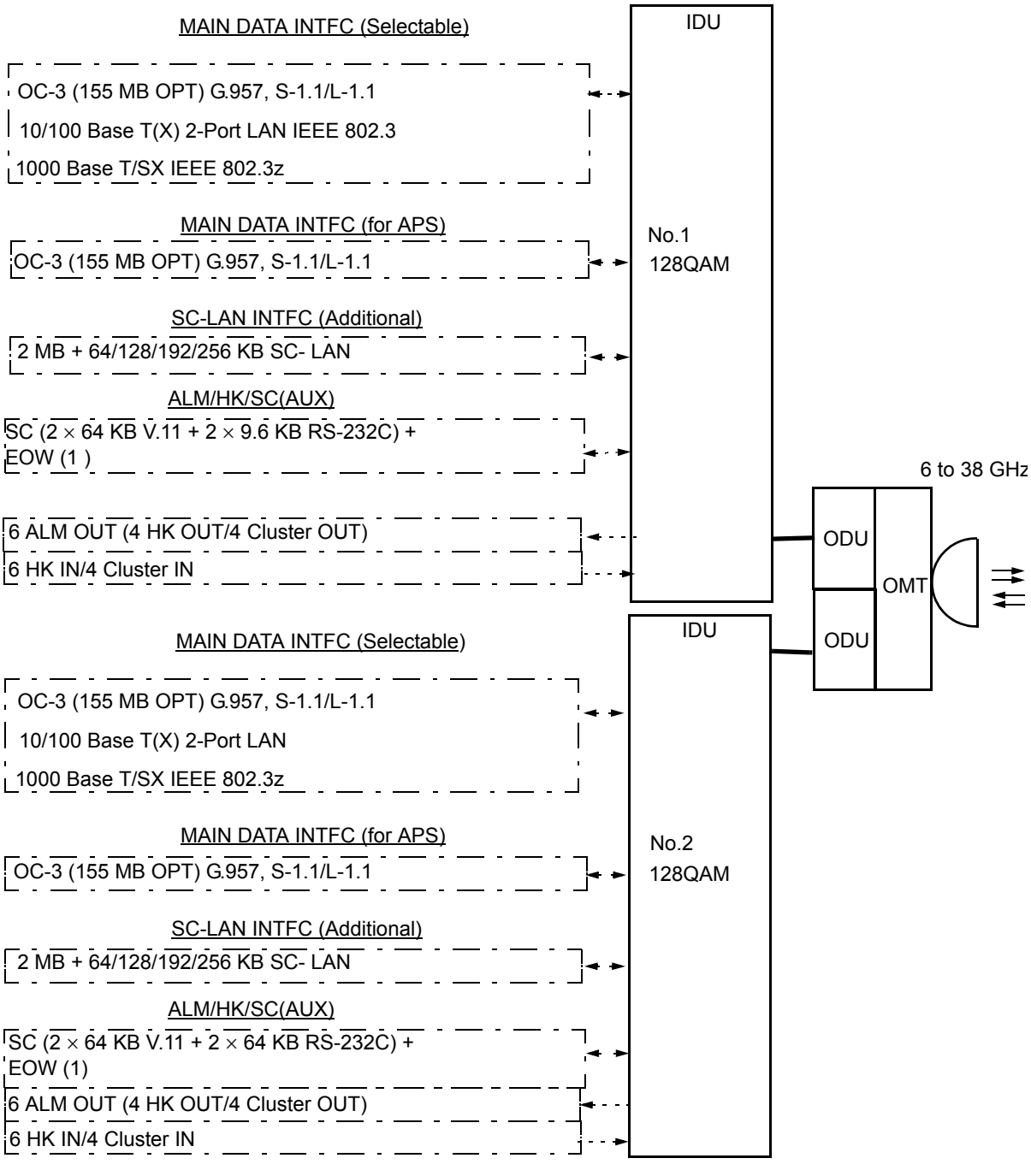
2(1+1) XPIC with Waveguide/Coaxial Cable Connection

Fig. 2-1 Protected/Unprotected System Configuration (2/2)



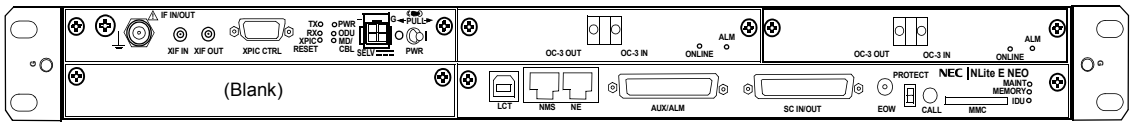
1+0/1+1 Configuration

Fig. 2-2 Signal Interface/Capacity (1/2)

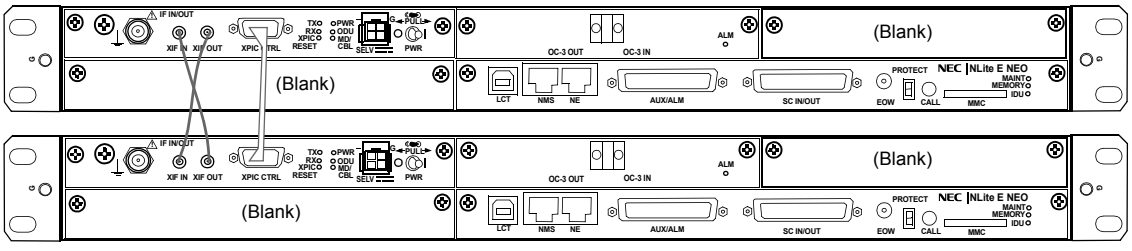


XPIC Configuration

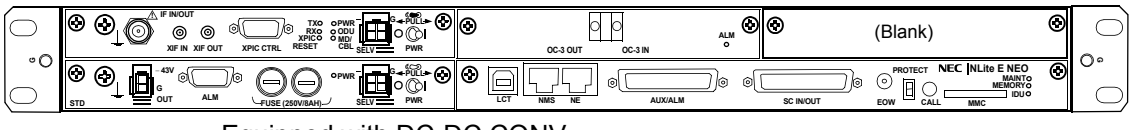
Fig. 2-2 Signal Interface/Capacity (2/2)



Equipped with OC-3 Optical Interface for APS

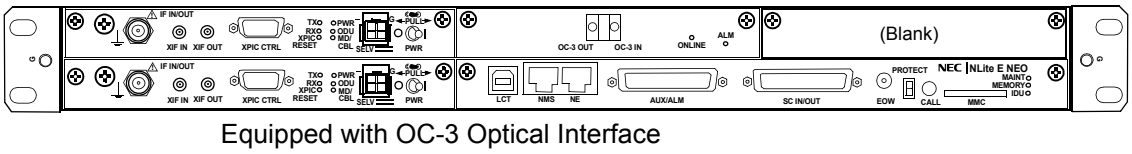


Equipped with OC-3 Optical Interface in XPIC

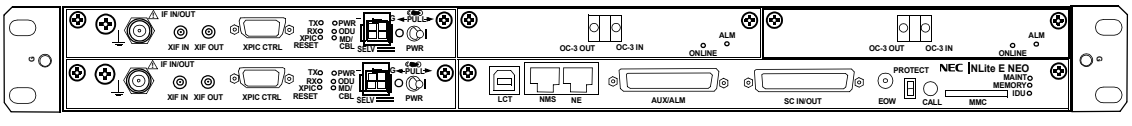


Equipped with DC-DC CONV

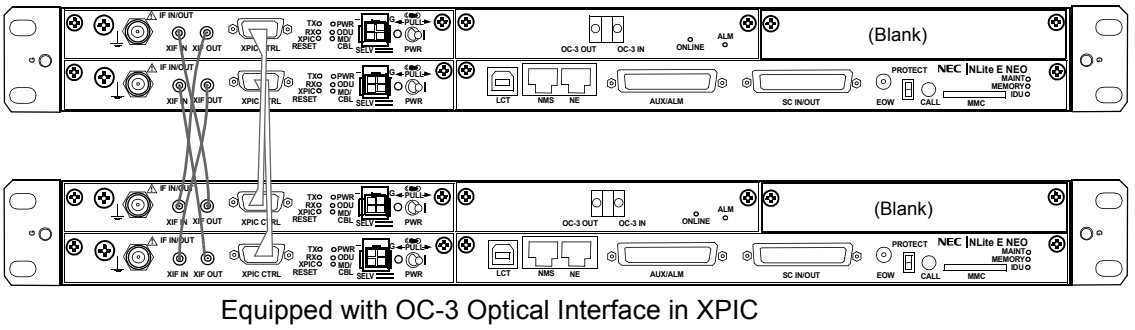
Unprotected Systems (IDU)



Equipped with OC-3 Optical Interface



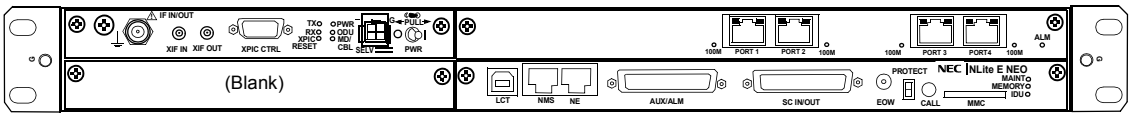
Equipped with OC-3 Optical Interface in APS



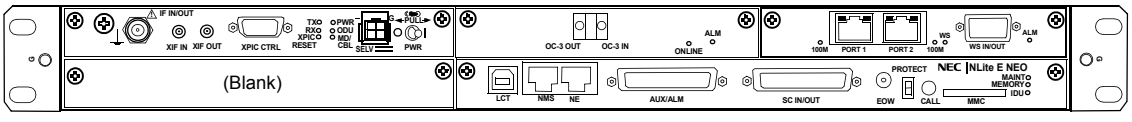
Equipped with OC-3 Optical Interface in XPIC

Protected Systems (IDU)

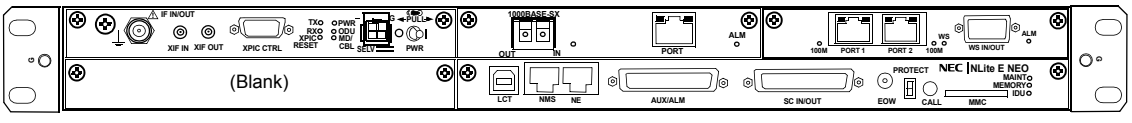
Fig. 2-3 IDU e/w Standard and Optional Interface (1/2)



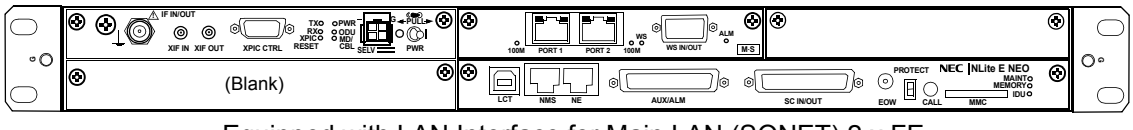
Equipped with 4P LAN Interface 32 QAM 100MB



Equipped with OC-3 Optical Interface with SC LAN Interface (SONET) 155MB



Equipped with GbE Interface with SC LAN Interface (SONET) 153 MB



Equipped with LAN Interface for Main LAN (SONET) 2 x FE

Fig. 2-3 IDU e/w Standard and Optional Interface (2/2)

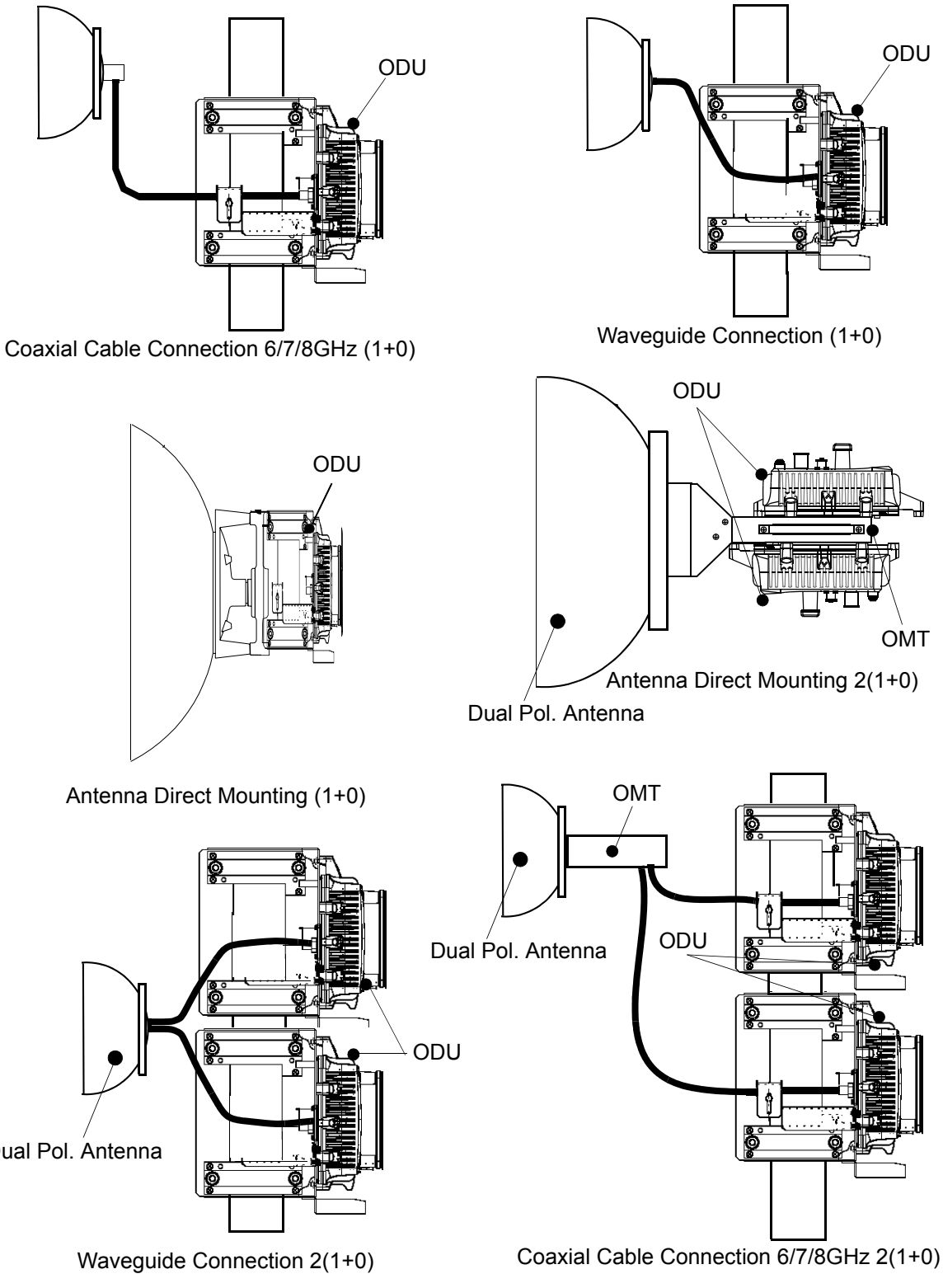
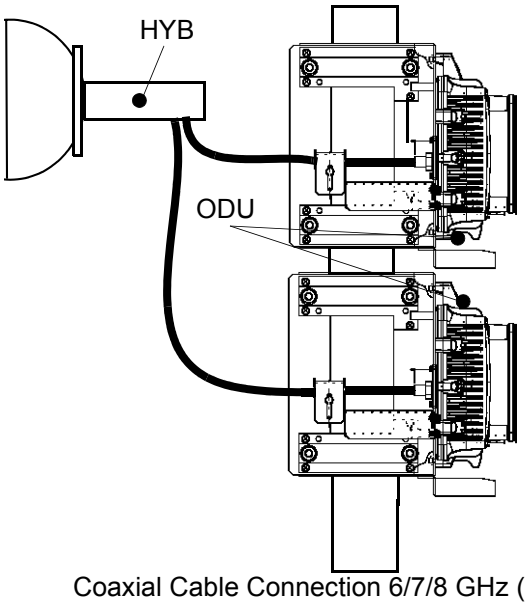
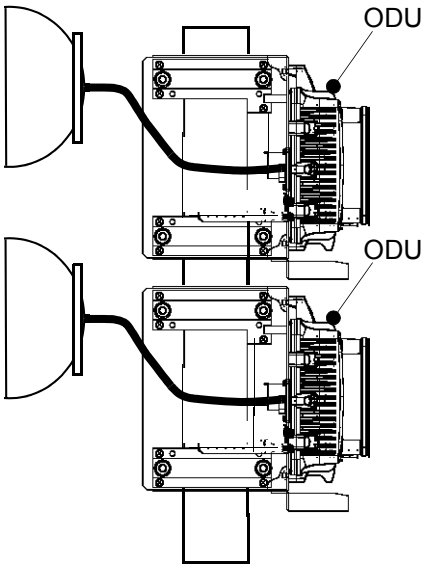


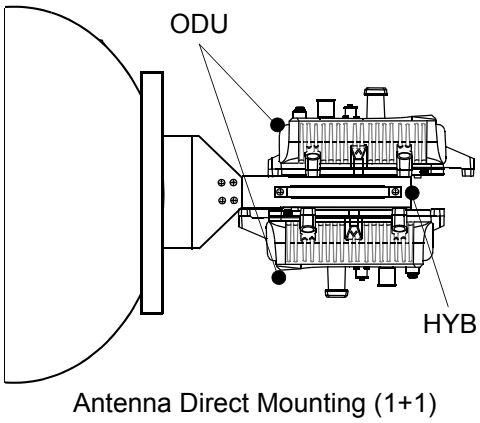
Fig. 2-4 Configuration of the ODU (1/3)



Coaxial Cable Connection 6/7/8 GHz (1+1)



Waveguide Connection (1+1 SD)



Antenna Direct Mounting (1+1)

Fig. 2-4 Configuration of the ODU (2/3)

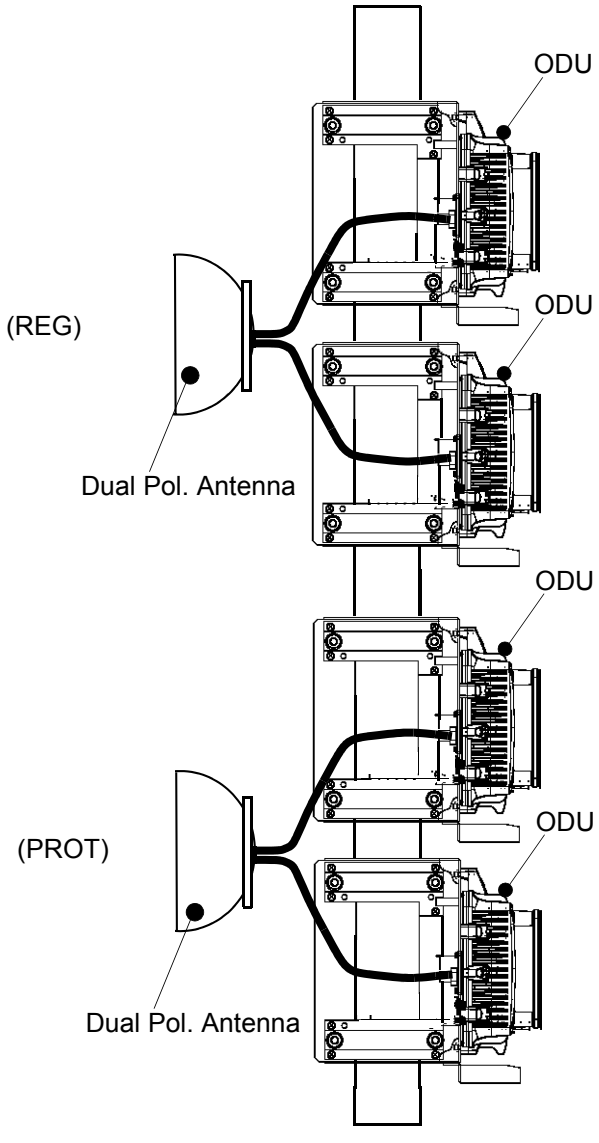
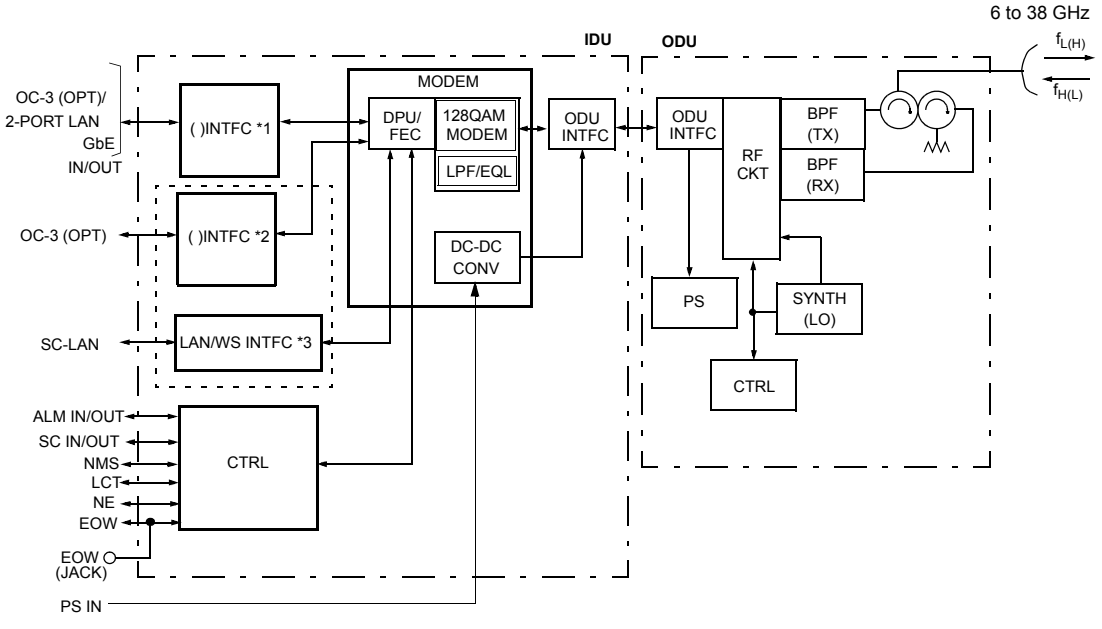


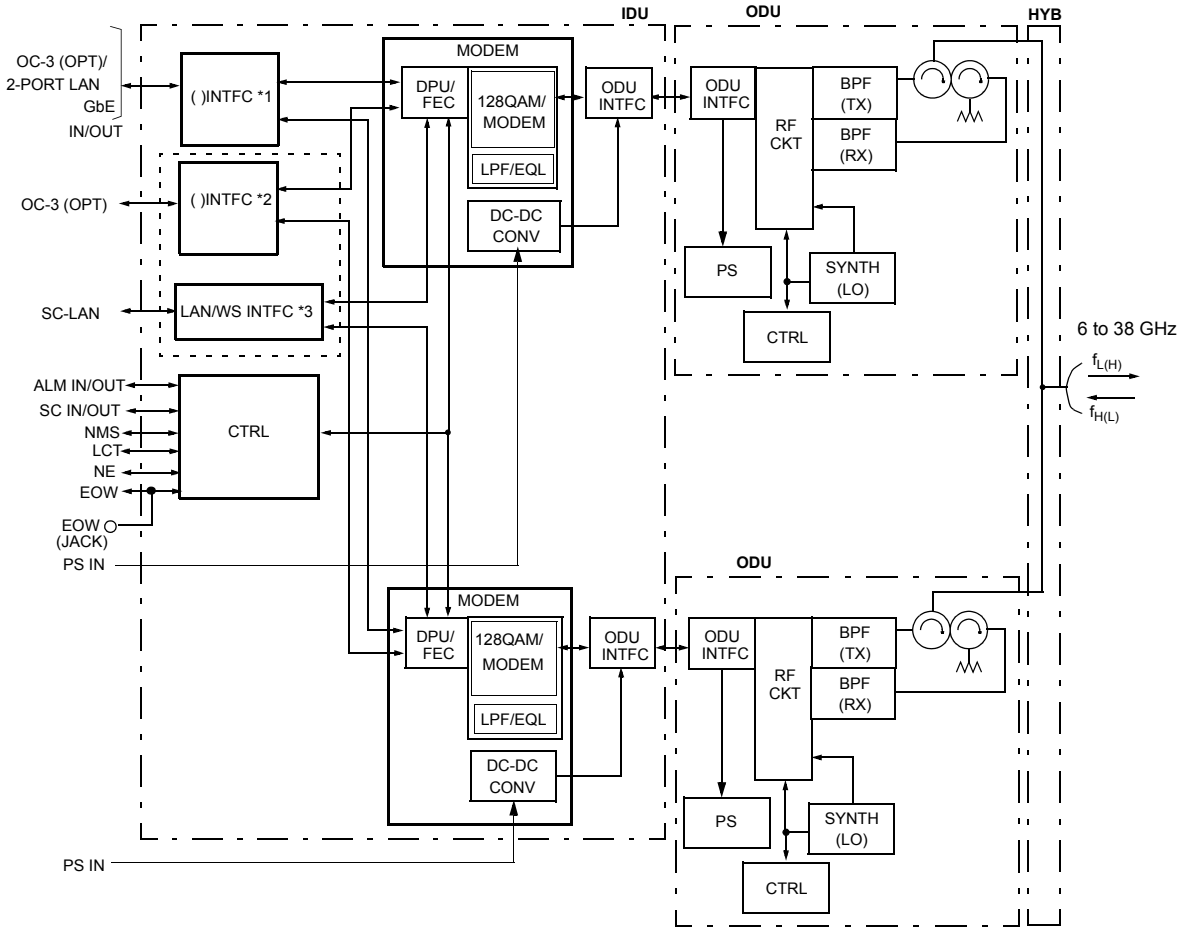
Fig. 2-4 Configuration of the ODU (3/3)



*Notes: *1 :Optional*
**2:Provides for APS*
**3:Provides for auxiliary signals*

1+0 CONFIGURATION FOR SONET

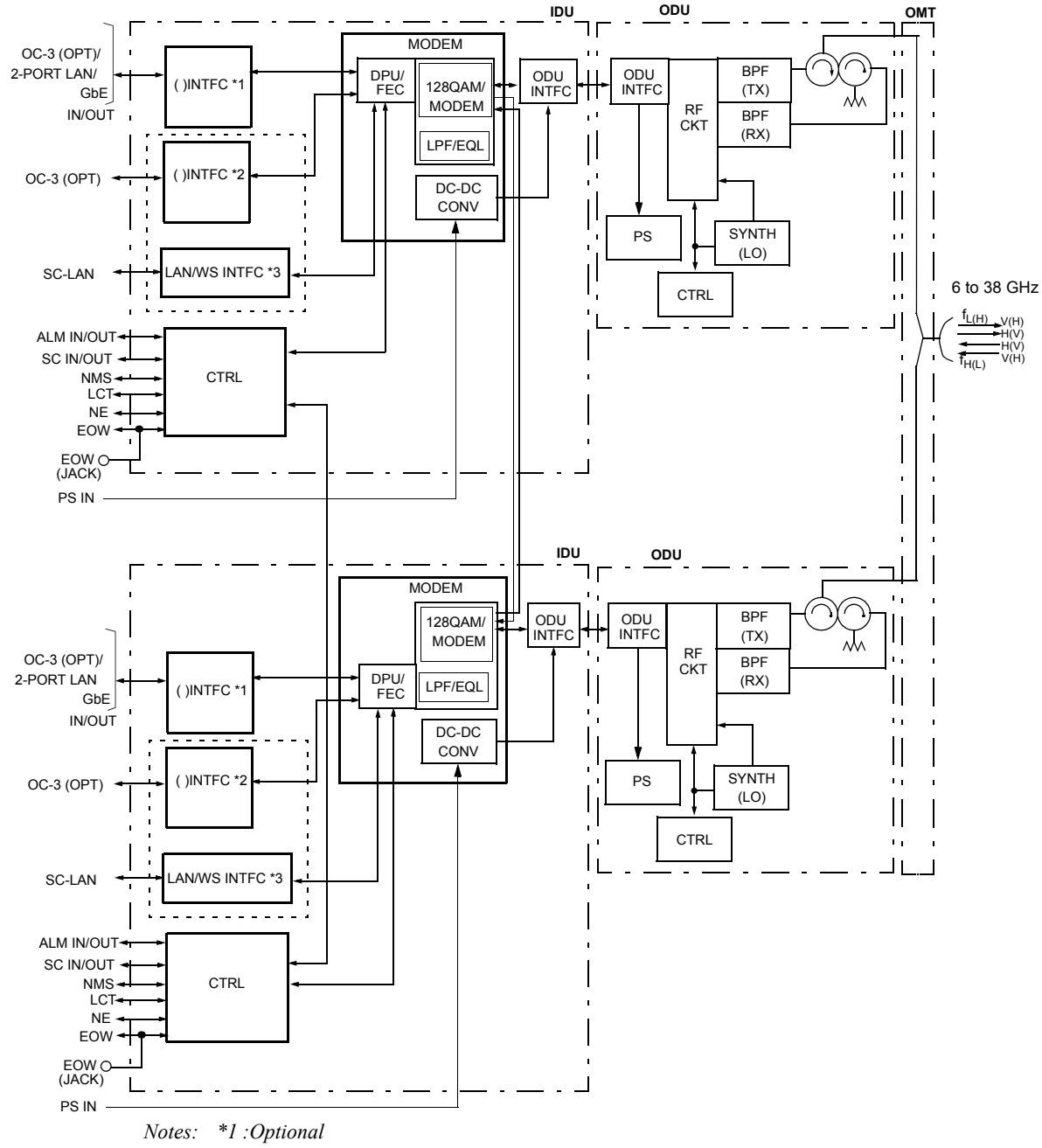
Fig. 2-5 System Block Diagram (1/3)



*Notes: *1 :Optional*
**2:Provides for APS*
**3:Provides for auxiliary signals*

1+1 CONFIGURATION FOR SONET

Fig. 2-5 System Block Diagram (2/3)



*Notes: *1 :Optional*
**2:Provides for APS*
**3:Provides for auxiliary signals*

1+0 CONFIGURATION FOR XPIC SONET

Fig. 2-5 System Block Diagram (3/3)

2.2 Performance Charactersitics

2.2.1 General System

Table 2-0 System Performance Characteristics

		STANDARD (STD)	
ITEM		**SONET**	**LAN**
Capacity		155 Mbps *2	Up to 150 Mbps
Interface		Optical: LC Up to 2 × OC-3 *3	RJ-45 (2 Ports): 10/100 BASE-T(X) RJ-45: 1000 BASE-T LC: 1000 BASE-SX
Interconnecting Connector, Cable impedance and Cable length (IDU-ODU)		ODU side: N type female, 50 ohms (Coaxial) IDU side: TNC type female, 50 ohms (Coaxial) 300m (in case 8D-FB cable or equivalent cable)	
Channel Spacing *	32QAM LAN	Not Applicable	
	128QAM	28 (27.5) MHz	28 (27.5) MHz
Environmental Requirement	Guaranteed Operation	ODU: –33 to +50°C IDU: –5 to +50°C	
	Workable Operation	ODU: –40 to +55°C IDU: –10 to +55°C	
	Transportation/ Storage	ODU, IDU: –40 to +70°C	
	Relative humidity	ODU: 100% applicable IDU: Less than 90% at +50°C (Non-condensing)	
EMC		Conforms to EN301 489-4	
Safety		Conforms to EN60950	
Power Requirement		–48 VDC (–40.5 to –57 VDC), Conforms to EN300 132-2	
Power Consumption (Typical)			
ODU/Unit		30 W (6 to 11GHz), 23 W (13 to 52 GHz)	
IDU Card/Unit			
	MODEM	10 W	
	OC-3 INTFC	5 W	-
	LAN INTFC	-	5 W
	CTRL	7 W	
Mechanical Dimension	ODU	237(W) × 237(H) × 101(D): Approx. 3.5 kg/Unit	
	IDU	482(W) × 44(H) × 240(D): Approx.4 kg	

*Notes *1: 27.5 MHz is applied for 18 GHz.*
**2: 2 × 155Mbps using 2 sets for XPIC*
**3: 2 for APS configuration*

(3) 4 Port LAN

Table 2-1 4 Port LAN 100 Mbps (32QAM)

LAN Setting				Capacity *
Port 1	**Port 2**	**Port 3**	**Port 4**	**LAN [Mbps]**
P1 - P4 = 100 M shared				100
P1 & P2=50M separated		P3 & P4=50M separated		100
P1 = 25M separated	P2 = 25M separated	P3 = 25M separated	P4 = 25M separated	100
Disabled	Disabled	Disabled	Disabled	0

*Note: * Total capacity: 108 Mbps.*

2.2.2 LAN Interface (1000 Base-SX/1000 Base-T) (GbE)

Table 2-2 GbE LAN

Type	1000 Base-SX (IEEE 802.3z)	1000 Base-T (IEEE 802.3ab)
Throughput	150 Mbps	150 Mbps
Connector type	LC	RJ-45
Port Number	1 port	1 port

2.2.3 Service Channel (SC)

- SC1 to SC4 : RS-232C, 9.6 kbps async., V.11, 64 kbps (Contra/Co-directional: Selectable)
- SC5 : EOW 1 channel
- Connector : High Density D-sub 44 ways
- LAN Interface : SC LAN Interface (throughput: 64/128/256 kbps)

2.2.4 LCT (PNMT) Interface

- Serial Interface : Connector type USB-B

2.2.5 PNMS Interface

- 10 Base T : Connector RJ-45

2.2.6 RF I/O Port

- Interface Port Type:

  Antenna direct mount interface:exclusive NEC flange (11-38 GHz) *is attached to the RF IN/OUT port in standard*

  Coaxial cable interface : 6/7/8 GHz: N (Female)

  Waveguide feeder interface* (Remote mount):

  6 GHz: PDR70
  7/8 GHz: PDR84
  10/11 GHz: PDR100
  13 GHz: PBR120 or PBR140
  15 GHz: PBR140
  18/23 GHz: PBR220
  26 GHz: PBR260
  28/32/38 GHz: PBR320

  Polarization : Field changeable (Vertical or Horizontal)

  Note: For the ODU of waveguide connection type, waveguide flange adapter is attached to the RF IN/OUT port of remote mount ODU in standard.

2.2.7 ODU (Outdoor Unit) and System Performance

Table 2-3 System Performance for 32QAM/ODU

Frequency Band (GHz)		6	7-8	10-11	13	15	18	23	26	28	32	38	Guaranteed
Range [GHz]		5.925-7.11	7.12-8.5	10.15-11.7	12.75-13.25	14.25-15.35	17.7-19.7	21.3-23.6	24.25-27.5	27.5-29.5	31.8-33.4	37.0-40.0	–
Interface type	Direct Mount	N/A	N/A	NEC Original									–
	Remote mount *2	N type or PDR 70	N type or PDR 84	PDR 100	PBR 120	PBR 140	PBR 220	PBR 220	PBR 260	PBR 320	PBR 320	PBR 320	–
Output Power, nominal (dBm) (Measured at ODU output port)		+25		+21	+21	+21	+19	+19	+18	+18	+17	+14.5	6-28G:±1.5 dB 32-38G:+1.5/–2.5 dB
Power Control (1 dB step, variable)		0 to 23 dB *3								0 to 23 dB *4			±1.0 dB
ATPC (1 dB step)		0 to 23 dB *4											–
Frequency Stability		± 6 ppm											±10 ppm
Threshold Level		(dBm), (Measured at ODU input port) at BER = 10^{-6}											+3.0 dB
Channel Separation (CS)= 28 (27.5) *1 MHz		–75.5		–74.5	–74.5	–75	–75	–74.5	–74.5	–73	–73	73	
BER = 10^{-3}		Above value –1.5 dB											
System Gain		(dB), (Measured at ODU input port) at BER = 10^{-6}											–3.0 dB
Channel Separation (CS)= 28 (27.5) *1 MHz		100.5	95.5	95.5	96	94	94	92.5	92.5	92.5	90	87.5	
BER = 10^{-3}		Above value +1.5 dB											
Maximum Input Level		–20 dBm for the BER less than 10^{-3}											–
Residual BER		Less than 10^{-12} at RSL=–30 dBm											–

**1 27.5 MHz is applied for 18 GHz.*

**2 For the ODU of waveguide connection type, flange adapter is attached to the RF IN/OUT port of remote mount ODU in standard.*

**3 Additional attenuation (5 dB maximum) is available.*

**4 Additional attenuation is unavailable.*

Table 2-4 System Performance for 128QAM**/ODU**

Frequency Band (GHz)		**6**	**7-8**	**10-11**	**13**	**15**	**18**	**23**	**26**	**28**	**32**	**38**	**Guaranteed**
Range [GHz]		5.925-7.11	7.12-8.5	10.15-11.7	12.75-13.25	14.25-15.35	17.7-19.7	21.3-23.6	24.25-27.5	27.5-29.5	31.8-33.4	37.0-40.0	–
Interface type	Direct Mount	N/A	N/A	NEC Original									–
	Remote mount *2	N type or PDR 70	N type or PDR 84	PDR 100	PBR 120	PBR 140	PBR 220	PBR 220	PBR 260	PBR 320	PBR 320	PBR 320	–
Output Power, nominal (dBm) (Measured at ODU output port)		+25		+21	+21	+21	+19	+19	+18	+18	+17	+14.5	6-26G:±1.5 dB 28-38G:+1.5/–2.5 dB
Power Control (1 dB step, variable)		0 to 20 dB *3								0 to 20 dB *4			±1.0 dB
ATPC range)		0 to 20 dB *4								0 to 20 dB *4			–
Frequency Stability		± 6 ppm											±10 ppm
Threshold Level		(dBm), (Measured at ODU input port) at BER = 10^{-6}											+3.0 dB
Channel Separation (CS)= 28 (27.5) *1 MHz		–69.5		–68.5	–68.5	–69	–69	–69	–68.5	–68.5	–67	–67	
BER = 10^{-3}		Above value –1.5 dB											
System Gain		(dB), (Measured at ODU input port) at BER = 10^{-6}											–3.0 dB
Channel Separation = 28 (27.5) *1 MHz		94.5		89.5	89.5	90	88	88	86.5	86.5	84	81.5	
BER = 10^{-3}		Above value +1.5 dB											
Maximum Input Level		–20 dBm for the BER less than 10^{-3}											–
Residual BER		Less than 10^{-12} at RSL=–30 dBm											–

**1 27.5 MHz is applied for 18 GHz.*

**2 For the ODU of waveguide connection type, flange adapter is attached to the RF IN/OUT port in standard.*

**3 Additional attenuation (5 dB maximum) is available.*

**4 Additional attenuation is unavailable.*

Note: XPIC system has the same condition as above.

2.2.8 IDU (Indoor Unit) and System performance

Table 2-5 System Performance for IDU

No.	Item	Specification		
			SONET	LAN
1	IDU type	1+0 Expandable/1+1		
2	Modulation Type		128QAM	32/128QAM
3	Baseband Interface		155.52 Mbps ±20 ppm	10/100 Base-T(X) 1000 Base-SX 1000 Base-T
			75 ohm/S-1.1/L-1.1	
			IEC 169-29 (1.0/2.3)	RJ-45 (10/100/1000 Base-T(X)) LC (1000 Base-SX)
	Channel Number		1/2*	1/2
	Total Capacity		155 Mbps	100+50, 75+75 Mbps
4	Service Channels	V.11 (Contra/Co-directional) × 2 channels, RS-232C × 2 channels		
5	EOW	IDU-IDU		
6	External alarm & House keeping	See table below		
7	Security level by LCT	2 levels		
8	Control &Setting by LCT/PNMT	Serial Interface (USB connector)		
	Loop Back	a) Far End Baseband Loop Back b) Near End Baseband Loop Back c) IF Loop back		
	BER Alarm	Adjustable 10^{-3}/ 10^{-4}/ 10^{-5} (High BER) 10^{-6}/ 10^{-7}/ 10^{-8}/ 10^{-9} (Low BER)		
	Frequency setting	Direct entry or Table Download entry: Available when using PNMx (optional)		
	TX output Control	Manual control, Automatic control, Mute control		
9	Performance monitoring (PMON) /Metering	PMON Items; a) OFS, b) BBE, c) ES, d) SES, e) UAS		
		Metering Items a) Output power level (TX PWR), b) Received signal level (AGC V) c) Bit error rate (BER MON)		
		LAN monitoring Items; a) RX Unicast, b) RX Broadcast, c) RX Multicast, d) RX Pause, e) RX CRC error		
10	LED Display	CTRL	IDU Alarm (Red) Maintenance (Amber) Memory Access (Amber)	
		MODEM	Operating PWR (Green) ODU Alarm (Red) MD/CBL Alarm (Red) TX status (Green) RX status (Green) XPIC Reset (Amber)*	
		SONET INTFC	Module alarm (Red) Online (Green)**	
		LAN INTFC	Module alarm (Red)	

** This value is available with 2 IDUs per 1 RF CH with XPIC system.*

*** This indicates the online status which is selected from Working/Standby in APS system or Working in w/o APS system.*

Table 2-6 Alarm & House Keeping Output Items

#	Alarm Item displayed on LCT/PNMT	Condition	ALM LED Indication (IDU's front)	Summarized Alarm Output (Form-C) <Note 1,2,3,7>					
				RL1	RL2	RL3	RL4	RL5	RL6
1	MAINT	System under maintenance	MAINT	●	—	MASK	MASK	MASK	MASK
2	IDU CPU ALM	IDU CPU failure	-	—	●	—	—	—	—
3	PS ALM1	PS1 failure (only1+1)	PWR	—	●	—	—	—	—
4	PS ALM2	PS2 failure (only1+1)	-	—	●	—	—	—	—
5	ODU ALM1	ODU1 total alarm	ODU	—	—	√	○	○	○
6	ODU ALM2	ODU2 total alarm		—	—	√	○	○	○
7	ODU CPU/CBL OPN ALM1	ODU1 CPU failure or IF cable is open	ODU Blinking	—	—	○	√	○	○
8	ODU CPU/CBL OPN ALM2	ODU2 CPU failure or IF cable is open		—	—	○	√	○	○
9	TX PWR ALM1	ODU1 output power decrease	ODU	—	—	○	○	○	○
10	TX PWR ALM2	ODU2 output power decrease		—	—	○	○	○	○
11	TX INPUT ALM1	ODU1 TX IF input level decrease	ODU	—	—	○	○	○	○
12	TX INPUT ALM2	ODU2 TX IF input level decrease		—	—	○	○	○	○
13	APC ALM1	ODU1 LO OSC APC loop out of lock	ODU	—	—	○	○	○	○
14	APC ALM2	ODU2 LO OSC APC loop out of lock		—	—	○	○	○	○
15	RX LEV ALM1	ODU1 Receiving level decrease	ODU	—	—	○	○	○	○
16	RX LEV ALM2	ODU2 Receiving level decrease		—	—	○	○	○	○
17	IF CABLE SHORT ALM1	IF Cable connected to ODU1 short	IDU MD/CBL Blinking	—	—	○	○	○	○
18	IF CABLE SHORT ALM2	IF Cable connected to ODU2 short		—	—	○	○	○	○
19	IDU ALM	IDU total alarm	IDU	—	—	○	○	√	○
20	MOD ALM1	MOD PLL APC loop out of lock, MOD output level down or TX DPU CLK loss in MODEM1	IDU MD/CBL	—	—	○	○	○	○
21	MOD ALM2	MOD PLL APC loop out of lock, MOD output level down or TX DPU CLK loss in MODEM2		—	—	○	○	○	○
22	DEM ALM1	Carrier Asynchronous, Frame Asynchronous at DPU in MODEM1	IDU MD/CBL	—	—	○	○	○	○
23	DEM ALM2	Carrier Asynchronous, Frame Asynchronous at DPU in MODEM2		—	—	○	○	○	○
24	HIGH BER ALM1	BER > 10E-3 to -5 (selectable) in MODEM1	IDU MD/CBL	—	—	○	○	○	√
25	HIGH BER ALM2	BER > 10E-3 to -5 (selectable) in MODEM2		—	—	○	○	○	√
26	LOW BER ALM1	BER > 10E-6 to -9 (selectable) in MODEM1	IDU MD/CBL	—	—	○	○	○	○
27	LOW BER ALM2	BER > 10E-6 to -9 (selectable) in MODEM2		—	—	○	○	○	○
28	LOF1	Loss of Radio frame synchronization in MODEM1	IDU MD/CBL	—	—	○	○	○	○
29	LOF2	Loss of Radio frame synchronization in MODEM2		—	—	○	○	○	○
30	OC-3(1/2) LOS (MUX)	Loss of input data stream from MUX <Note 1>	IDU INTFC <Note5>	—	—	○	○	○	○
31	OC-3(1/2) LOS (DMR)	Loss of input data stream from DMR <Note 1>	IDU INTFC <Note5>	—	—	○	○	○	○
32	OC-3(1/2) TF ALM	Loss of OC-3 signal output to MUX <Note 1>	IDU INTFC <Note5>	—	—	○	○	○	○

Table 2-6 Alarm & House Keeping Output Items (Cont'd)

#	Alarm Item displayed on LCT/PNMT	Condition	ALM LED Indication (IDU's front)	Summarized Alarm Output (Form-C) <Note 1,2,3,7>					
				RL1	RL2	RL3	RL4	RL5	RL6
33	INTFC (1/2) LAN LINK PORT	Loss of SC LAN Link	IDU INTFC <Note5>	—	—	○	○	○	○
34	XCTRL ALM1	Control failure or REF Signal failure	IDU INTFC <Note6>	—	—	○	○	○	○
35	XCTRL ALM2	Control failure or REF Signal failure	IDU INTFC <Note6>	—	—	○	○	○	○
36	XREF ALM1	Control failure or REF Signal failure	IDU INTFC <Note6>	—	—	○	○	○	○
37	XREF ALM2	Control failure or REF Signal failure	IDU INTFC <Note6>	—	—	○	○	○	○
38	HK-OUT1	House keeping Control out1	Only show PNMT	—	—	—	—	—	○
39	HK-OUT2	House keeping Control out2	Only show PNMT	—	—	—	—	○	—
40	HK-OUT3	House keeping Control out3	Only show PNMT	—	—	—	○	—	—
41	HK-OUT4	House keeping Control out4	Only show PNMT	—	—	○	—	—	—
42	Cluster ALM out1	This item received from opposite site. Item 1	Only show PNMT	—	—	—	—	—	○
43	Cluster ALM out2	This item received from opposite site. Item 2	Only show PNMT	—	—	—	—	○	—
44	Cluster ALM out3	This item received from opposite site. Item 3	Only show PNMT	—	—	—	○	—	—
45	Cluster ALM out4	This item received from opposite site. Item 4	Only show PNMT	—	—	○	—	—	—

Note 1: It is not possible to change capacity between OC-3 and Ethernet under working condition.
Note 2: In MAINT status, excepting HK-OUT and Cluster ALM, alarm outputs are masked to normal condition.
Note 3: The summarization of alarm outputs is fully user programmable; The sign ● in above table shows fixed item and can not be changed. The sign √ only shows the factory settings. The sign ○ output can be assigned for plural items. The sign — input/output can not be assigned. Either HK output or Cluster ALM output in each channel can be assigned.
Note 4: Above Table shows Alarm output matrix for 1+1 configuration
Note 5: Only apply to SONET system.
Note 6: Only apply to XPIC system.
Note 7: Assign to relays 3 to 6 only one category, either NLite E Alarm, House Keeping Control out or Cluster Alarm out.

Output Port condition

Interface circuit: Relay Form C
Maximum Current: 0.2 A
Maximum Voltage: 100 V (AC+DC)

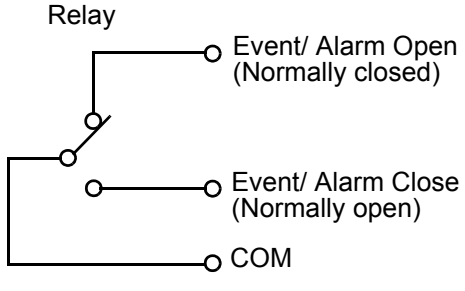


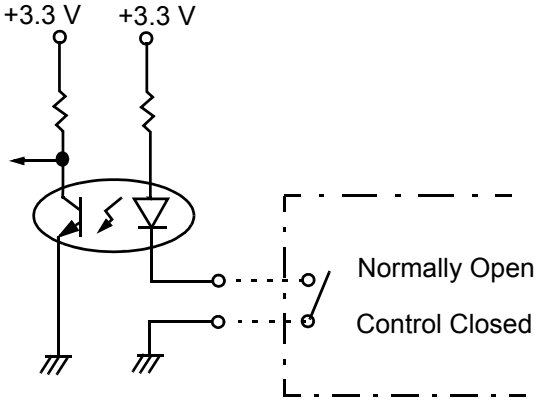
Table 2-7 House keeping input Items

#	House keeping Item displayed on LCT/PNMT	Condition	Event Indication	Summarized Alarm Input (Photo coupler)					
				IN1	IN2	IN3	IN4	IN5	IN6
1	HK-IN1	House keeping Event inport1	Only show PNMT	●	—	—	—	—	—
2	HK-IN2	House keeping Event inport2	Only show PNMT	—	●	—	—	—	—
3	HK-IN3	House keeping Event inport3	Only show PNMT	—	—	●	—	—	—
4	HK-IN4	House keeping Event inport4	Only show PNMT	—	—	—	●	—	—
5	HK-IN5	House keeping Event inport5	Only show PNMT	—	—	—	—	●	—
6	HK-IN6	House keeping Event inport6	Only show PNMT	—	—	—	—	—	●
7	Cluster ALM input1	This item transmits to opposite site. Item 1	Only show PNMT	—	—	—	—	—	○
8	Cluster ALM input2	This item transmits to opposite site. Item 2	Only show PNMT	—	—	—	—	○	—
9	Cluster ALM input3	This item transmits to opposite site. Item 3	Only show PNMT	—	—	—	○	—	—
10	Cluster ALM input4	This item transmits to opposite site. Item 4	Only show PNMT	—	—	○	—	—	—

Note 1: Unused channel/interface is masked according to the bit rate.
Note 2: In the 2-WAY mode, Cluster ALM is transmitted in parallel for DIR-A and DIR-B.

Input Port condition

Normal OPEN (> 200 k ohms)
Control CLOSE (< 50 ohms)
Interface circuit: photo coupler with bias circuit



2.3 Interconnection between ODU and IDU

Table 2-8 IF Cable

No.	Item	Specification
1	Interconnection	Single coaxial cable /50 ohms
2	Standard Type of Cable	5D-FB, 8D-FB (standard), 10D-FB
3	Signals	IF signal, alarms, control, monitoring and power source
4	Maximum Cable Length	150 m (5D-FB) 300 m (8D-FB) 350 m (10D-FB)
5	Cable Equalization	Automatic level equalization
6	Guaranteed temperature range	–33°C to +50°C (workable : –40°C to +55°C)

Note 1 : In case of employing hitless protection, set each length of two IF cables same or the difference of their cable length shall be less than 100 meters.

Note 2 : Salt damage (custom order)
In case of operating in the sea or around the coast area (within 3 km from coastline), measure must be taken for the ODU against salt damage. Please contact NEC for the countermeasure.

Note 3 : Water Proof N type connector
The waterproof N type connectors must be used for IF cable of ODU side, because DC voltage power is supplied in it.

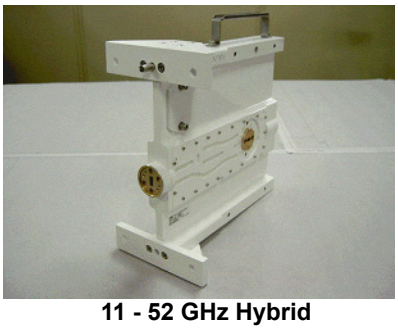
Note 4 : IDU IF connector = TNC (Female),
ODU IF connector = N (Female)

Note 5 : TNC (Male) L-angle connector for the 8D-FB IF cable is used to connect it to the IDU. When the N (Male) straight connector is attached to the 5D-FB or 10D-FB IF cable, the TNC (Male) - N (Female) L-angle adapter is used.

2.4 Hybrid Combiner/Divider

There are two types of hybrid combiner/divider used in 1+1 protected systems, one is coaxial cable connection type for 6/7/8 GHz Bands and the other is ODU Direct Mount type for 11 - 38 GHz Bands. The following NEC Hybrid Combiner/Divider is suited for Andrew or RFS Antenna, and all NEC ODUs.

6/7/8 GHz Hybrid



11 - 52 GHz Hybrid

Fig. 2-6 Hybrid

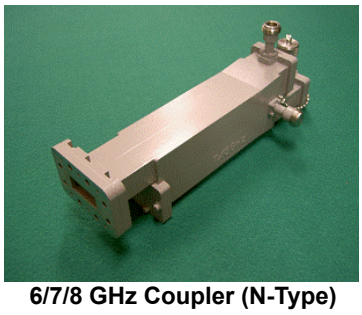
Table 2-9 Characteristics

Frequency Band [GHz]	Frequency Range [GHz]	1-2 PORT Variation Max.(dB)	Loss Max. (dB)	Isolation Min.(dB)	VSWR Max.	Interface	
						(ANT Side)	(ODU Side)
L6	5.925 - 6.425	0.5	3.7	20	1.3	UDR70	N Connector
U6	6.43 - 7.11	0.5	3.7	20	1.3	UDR70	N Connector
7	7.125 - 7.9	0.5	3.7	20	1.3	UDR84	N Connector
8	7.7 - 8.5	0.5	3.7	20	1.3	UDR84	N Connector
11	10.5 - 11.7	0.5	3.5	20	1.2	NEC original	NEC original
13	12.75 - 13.25	0.5	3.5	20	1.2		
15	14.5 - 15.35	0.5	3.5	20	1.2		
18	17.7 - 19.7	0.5	3.5	20	1.2		
23	21.2 - 23.6	0.5	3.5	20	1.2		
26	24.5 - 26.5	0.5	3.8	20	1.2		
32	31.8 - 33.4	0.5	3.8	20	1.2		
38	37 - 39.5	0.5	3.8	20	1.2		

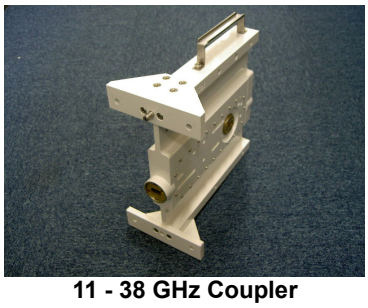
** Custom ordered for 28 GHz.*

2.4.1 10 dB Coupler

There are two types of NEC 10 dB Coupler; one is coaxial cable connection type for 6/7/8 GHz bands and the other is ODU Direct Mount type for 11 - 38 GHz Bands. The following 10 dB Coupler is suited for Andrew or RFS Antenna, and all NEC ODUs.



6/7/8 GHz Coupler (N-Type)



11 - 38 GHz Coupler

Fig. 2-7 10 dB Coupler

Table 2-10 Characteristics

Frequency Band [GHz]	Frequency Range [GHz]	1-2 PORT Variation Max.(dB)	Loss Max. (dB)	Isolation Min.(dB)	VSWR Max.	Interface	
						(ANT Side)	(ODU Side)
L6/U6	5.925 - 7.125	0.5	1.2	20	1.3	UDR70	N Connector
7/8	7.125 - 8.5	0.5	1.2	20	1.3	UDR84	N Connector
11	10.5 - 11.7	0.5	1.2	20	1.2	NEC original	NEC original
13	12.75 - 13.25	0.5	1.2	20	1.2		
15	14.5 - 15.35	0.5	1.2	20	1.2		
18	17.7 - 19.7	0.5	1.2	20	1.2		
23	21.2 - 23.6	0.5	1.2	20	1.2		
26	24.5 - 26.5	0.5	1.2	20	1.2		
32	31.8 - 33.4	0.5	1.2	20	1.2		
38	37 - 39.5	0.5	1.2	20	1.2		

* *ODU for 6/7/8 GHz: Separate Type*
* *ODU for 11 - 38 GHz: Direct Mount Type*
* *Custom ordered for 28 GHz.*

2.4.2 OMT (Ortho-Mode Transducer)

The OMT enables dual polarization feature to double the transmission capacity for the NLite E system using the same frequency. The following NEC OMT has ODU Direct Mount type for 11-38 GHz Bands, which is suited for RFS Antenna and all NEC ODUs.

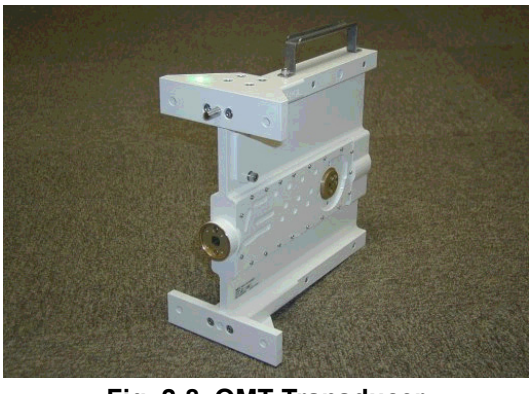


Fig. 2-8 OMT Transducer

Table 2-11 Characteristics

Frequency Band [GHz]	Frequency Range [GHz]	XPD Min. [dB]	LOSS Max. [dB]	P-P ISOLATION Min.[dB]	VSWR Max.	INTERFACE WG INNER DIA. (mm) (ANT Side)	INTERFACE (ODU Side)
11	10.5 - 11.7	35	0.6	38	1.3	18.0	NEC original
13	12.75 - 13.25	35	0.6	38	1.3	15.0	
15	14.5 - 15.35	35	0.6	38	1.3	13.5	
18	17.7 - 19.7	35	0.6	38	1.3	10.5	
23	21.2 - 23.6	35	0.6	38	1.3	9.0	
26	24.5 - 26.5	35	0.8	38	1.3	8.0	
32	31.8 - 33.4	35	1.0	38	1.3	6.5	
38	37 - 39.5	35	1.0	38	1.3	5.5	

2.5 RF Channel Plan

Radio frequencies in 6 to 38 GHz applicable to NLite E are shown in the following Table: For details of frequency range in each Sub Band RF frequency band listed below, refer to the Appendix attached in this Section 1.

Table 2-12 RF Frequencies

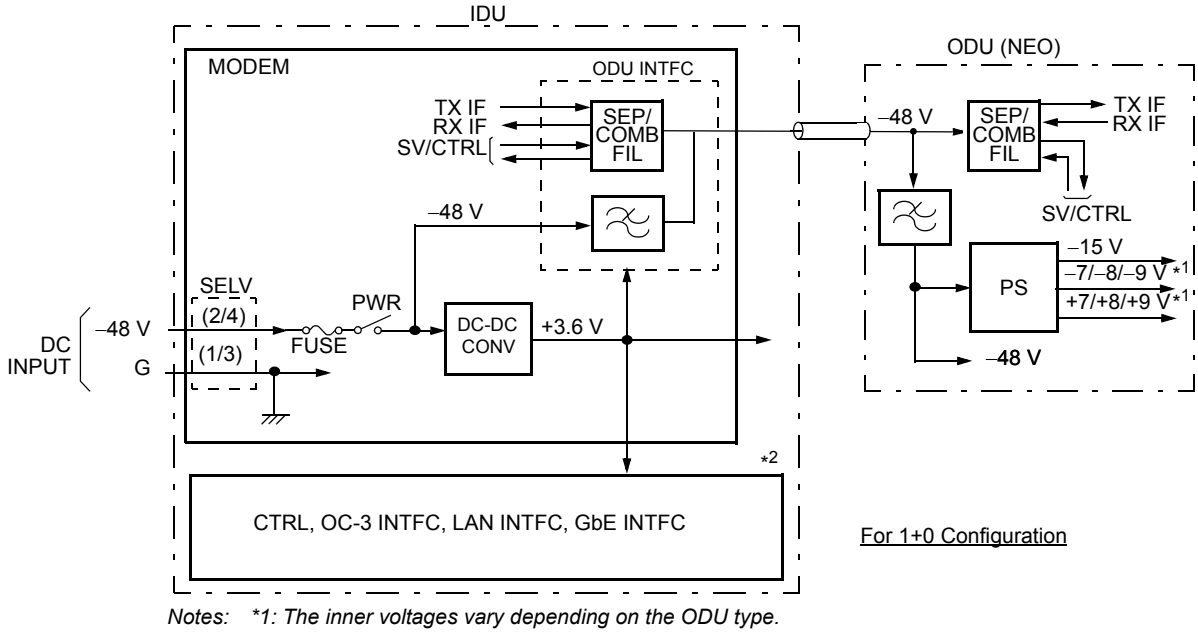
RF BAND [GHz]	Tx-Rx Shift Frequency [MHz]
L6 GHz : 5.925 - 6.425	252.04/ 266
U6 GHz : 6.43 - 7.11	340
7 GHz : 7.125 - 7.9	154/ 161/ 196/ 245
8 GHz : 7.7 - 8.5	119/ 126/ 151.614/ 154/ 266/ 294.44/ 305.56/ 310 311.32
11 GHz : 10.15 - 11.7	490
13 GHz : 12.75 - 13.25	266
15 GHz : 14.5 - 15.35	315/ 420/ 470/ 490/ 644/ 728
18 GHz : 17.7 - 19.7	340/ 1560
23 GHz : 21.2 - 23.6	1200
26 GHz : 24.5 - 26.5	855/ 1008/ 1123.5
28 GHz : 27.5 - 29.5	1008
32 GHz : 31.8 - 33.4	812
38 GHz : 37 - 39.5	700/ 1000/ 1260/

2.6 Power Supply

The power supply systems are shown in Fig. 2-9 (1/3) to (3/3). The DC-DC CONV module in the MODEM module produces regulated +3.6 V DC from –48 V *1 DC input for the component modules on the IDU. Also, this module supplies a –48 V DC to the ODU.

The DC V to the ODU is supplied through the coaxial cable which is also used for the IF and other signals. The PS circuit on the ODU produces +7/+8/+9/–7/–8/–9 * and –15 V DC for the component modules from the –48 V DC supplied from the IDU.

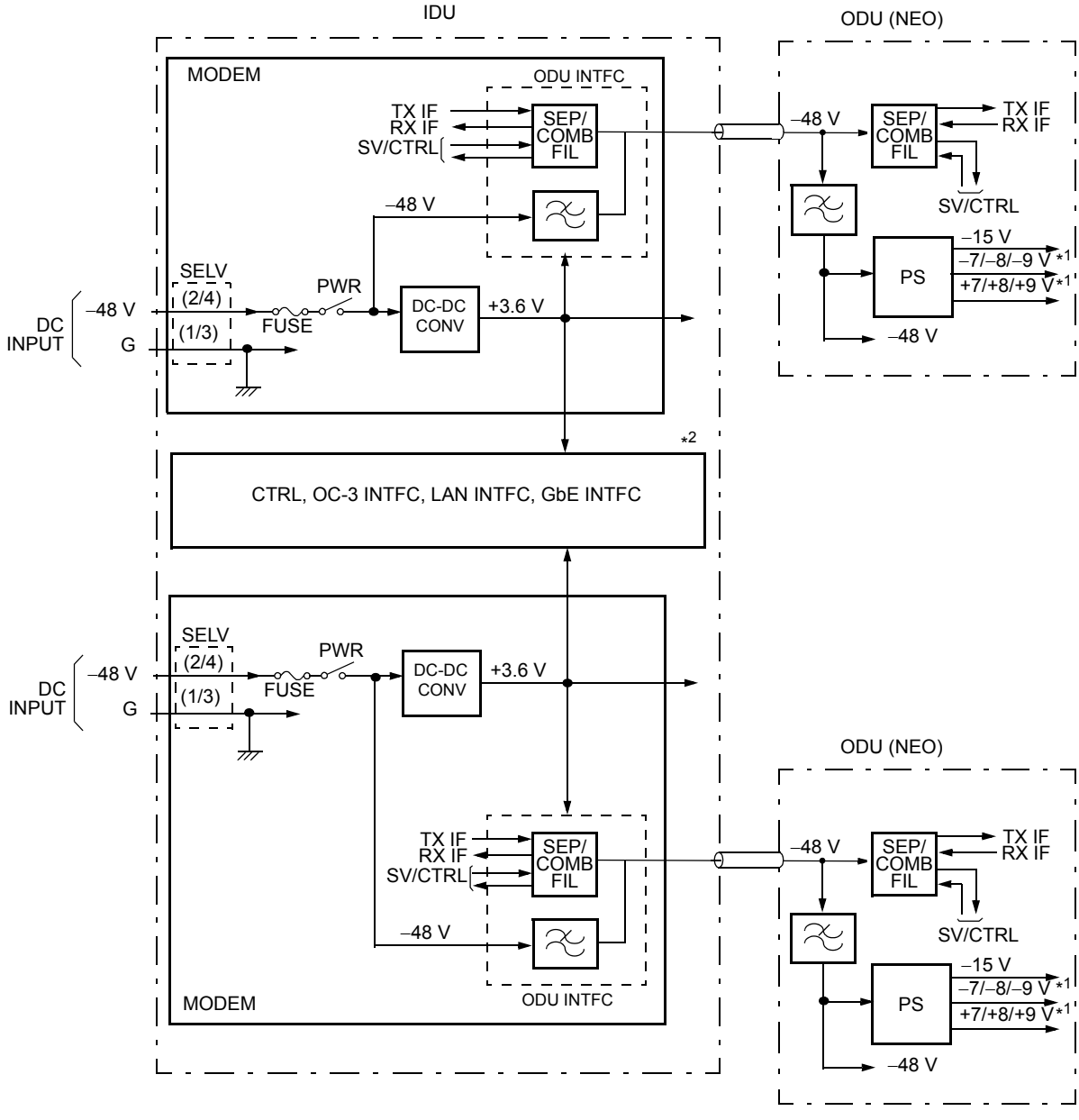
*Note: *: Necessary voltages in the ODU vary depending on the ODU type.*



*Notes: *1: The inner voltages vary depending on the ODU type.*
**2: Optional*

For 1+0 Configuration

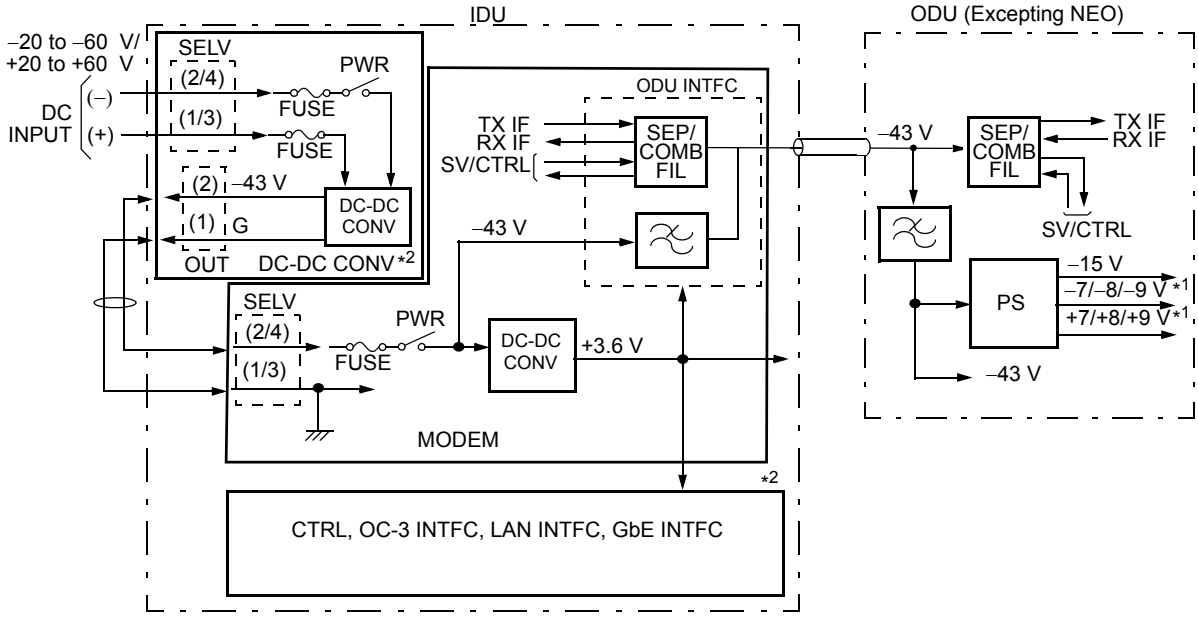
Fig. 2-9 Power Supply System Block Diagram (1/3)



*Notes: *1: The inner voltages vary depending on the ODU type.*
**2: Optional*

For 1+1 Configuration

Fig. 2-9 Power Supply System Block Diagram (2/3)



*Notes: *1: The inner voltages vary depending on the ODU type.*
**2: Optional*

For 1+0 Configuration

Connecting Other Type NLite E ODU

Fig. 2-9 Power Supply System Block Diagram (3/3)

NLite E
6-38 GHz SONET DIGITAL RADIO SYSTEM

APPENDIX
RADIO FREQUENCY PLAN FOR NLite E

CONTENTS

APPENDIX
RADIO FREQUENCY PLAN FOR NLite E

This provides frequency range used in each RF frequency band (6 to 38 GHz). Refer to Note 1, Note 2 and Note 3 for corresponding frequency band of the system.

Note 1: When 13 to 38 GHz band is applied, each data transmission system have to take following channel separation or more.

Usually, RF channel frequency must be assigned that is shifted a half of channel separation from Start and Stop frequency values within frequency range of Sub Band.

SELECTABLE MODEM SYSTEM	CHANNEL SEPARATION FOR TRAFFIC CAPACITY			
	3.5 MHz	7 MHz	14 (13.75)* MHz	28 (27.5)* MHz
128QAM	–			155 MB

**: 13.75 and 27.5 MHz apply for 18 GHz.*

Note 2: When 6/7/8 GHz Band is applied , the TX/RX BPFs are adjusted to the point frequency which is indicated in the ODU name plate. Therefore, to change the point frequency over the variable range the TX/RX BPFs replacement and LCT resetup are required (excepting Sub Band K/L/M/N/P).*
** When Sub Band K/L/M/N/P in 6/7/8 GHz Band is applied, RF channel frequency is assignable depending on the transmission capacity within frequency range of Sub Band as above Note 1 for 13 to 38 GHz band. Refer to start and stop frequency in the frequency table corresponded channel separation.*

Note3: When 10/11 GHz Band is applied, refer to start and stop frequency in the frequency table corresponded channel separation.

The change of the BPF varies depending on the Frequency Band and Sub Band to be used, so contact NEC before changing the ODU Sub Band whether the change of the BPF is necessary or not.

Caution: ODUs that have been used outside should NOT be opened. Silica Gel Packs should be replaced with new ones every time the customer opens the ODU and also the air leakage test operation should be performed by using the air leakage tester (NEC made, sold separately).

1. L6 GHz Band

Table A-1 L6 GHz, Sub-band E versus Frequency Range (TX-RX frequency spacing: 252.04 MHz): STANDARD

ODU Type	Sub-Band	TX Radio Point Frequency Range		RX Radio Point Frequency Range		TX HIGH/LOW	
		5930.375 to 6152.750 MHz		6182.415 to 6404.790 MHz		Lower Band	
		6182.415 to 6404.790 MHz		5930.375 to 6152.750 MHz		Higher Band	
		TX Low			TX High		
		RF CH	TX Point Freq.	RX Point Freq.	RF CH	TX Point Freq.	RX Point Freq.
NWA-009024( )	E	1	5930.375	6182.415	1'	6182.415	5930.375
		2	5945.200	6197.240	2'	6197.240	5945.200
		3	5960.025	6212.065	3'	6212.065	5960.025
		4	5974.850	6226.890	4'	6226.890	5974.850
		5	5989.675	6241.715	5'	6241.715	5989.675
		6	6004.500	6256.540	6'	6256.540	6004.500
		7	6019.325	6271.365	7'	6271.365	6019.325
		8	6034.150	6286.190	8'	6286.190	6034.150
		9	6048.975	6301.015	9'	6301.015	6048.975
		10	6063.800	6315.840	10'	6315.840	6063.800
		11	6078.625	6330.665	11'	6330.665	6078.625
		12	6093.450	6345.490	12'	6345.490	6093.450
		13	6108.275	6360.315	13'	6360.315	6108.275
		14	6123.100	6375.140	14'	6375.140	6123.100
		15	6137.925	6389.965	15'	6389.965	6137.925
		16	6152.750	6404.790	16'	6404.790	6152.750

Note: It is required to define point frequency which is to be used. The BPF for 6/7/8 GHz is set to each frequency though it is within the same Sub Band. To change the point frequency, not only LCT setup, but also the change of BPF is needed.

Table A-2 L6 GHz, Sub-band E versus Frequency Range (TX-RX frequency spacing: 252.04 MHz): MEXICO

ODU Type	Sub-Band	TX Radio Point Frequency Range		RX Radio Point Frequency Range		TX HIGH/LOW	
		5935.317 to 6162.633 MHz		6187.357 to 6414.673 MHz		Lower Band	
		6187.357 to 6414.673 MHz		5935.317 to 6162.633 MHz		Higher Band	
		TX Low			TX High		
		RF CH	TX Point Freq.	RX Point Freq.	RF CH	TX Point Freq.	RX Point Freq.
NWA-009024( )	E	1	5935.317	6187.357	1'	6187.357	5935.317
		2	5945.200	6197.240	2'	6197.240	5945.200
		3	5955.083	6207.123	3'	6207.123	5955.083
		4	5964.966	6217.006	4'	6217.006	5964.966
		5	5974.850	6226.890	5'	6226.890	5974.850
		6	5984.733	6236.773	6'	6236.773	5984.733
		7	5994.616	6246.656	7'	6246.656	5994.616
		8	6004.500	6256.540	8'	6256.540	6004.500
		9	6014.383	6266.423	9'	6266.423	6014.383
		10	6024.266	6276.306	10'	6276.306	6024.266
		11	6034.150	6286.190	11'	6286.190	6034.150
		12	6044.033	6296.073	12'	6296.073	6044.033
		13	6053.916	6305.956	13'	6305.956	6053.916
		14	6063.800	6315.840	14'	6315.840	6063.800
		15	6073.683	6325.723	15'	6325.723	6073.683
		16	6083.566	6335.606	16'	6335.606	6083.566
		17	6093.450	6345.490	17'	6345.490	6093.450
		18	6103.333	6355.373	18'	6355.373	6103.333
		19	6113.216	6365.256	19'	6365.256	6113.216
		20	6123.100	6375.140	20'	6375.140	6123.100
		21	6132.983	6385.023	21'	6385.023	6132.983
		22	6142.866	6394.906	22'	6394.906	6142.866
		23	6152.750	6404.790	23'	6404.790	6152.750
		24	6162.633	6414.673	24'	6414.673	6162.633

Note: It is required to define point frequency which is to be used. The BPF for 6/7/8 GHz is set to each frequency though it is within the same Sub Band. To change the point frequency, not only LCT setup, but also the change of BPF is needed.

Note: Refer to Note.2 on the first page for 6/7/8 GHz Band.

Note: It is required to define point frequency which is to be used. The BPF for 6/7/8 GHz is set to each frequency though it is within the same Sub Band. To change the point frequency, not only LCT setup, but also the change of BPF is needed.

2. 11 GHz Band

Table A-3 11 GHz, Sub-band A/B/C/D versus Frequency (TX-RX frequency spacing: 490 MHz): STANDARD

ODU Type	Sub-Band	TX Radio Point Frequency Range	RX Radio Point Frequency Range	TX HIGH/LOW
NWA-009032( )	A	10715 to 10825 MHz	11205 to 11315 MHz	Lower Band
	B	10835 to 10945 MHz	11325 to 11435 MHz	
	C	10955 to 11065 MHz	11445 to 11555 MHz	
	D	11075 to 11195 MHz	11565 to 11685 MHz	
	A	11205 to 11315 MHz	10715 to 10825 MHz	Higher Band
	B	11325 to 11435 MHz	10835 to 10945 MHz	
	C	11445 to 11555 MHz	10955 to 11065 MHz	
	D	11565 to 11685 MHz	11075 to 11195 MHz	

Note: When the channel separation of 28 MHz applies in the Sub-Band A, the channel frequency must be assigned within from (Start frequency + 6 MHz) to (Stop frequency – 6 MHz).

When the channel separation of 28 MHz applies in the Sub-Band B/C/D, the channel frequency must be assigned within from (Start frequency) to (Stop frequency – 6 MHz).

Table A-4 18 GHz, Sub-band A versus Frequency Range (TX-RX frequency spacing: 1560 MHz): USA/BRAZIL

ODU Type	Sub-Band	TX Radio Point Frequency Range	RX Radio Point Frequency Range	TX HIGH/LOW
NWA-009038( )	A	17700 to 18140 MHz	19260 to 19700 MHz	Lower Band
	A	19260 to 19700 MHz	17700 to 18140 MHz	Higher Band

3. 23 GHz Band

Table A-5 23 GHz, Sub-band A/B/C versus Frequency Range (TX-RX frequency spacing: 1200 MHz): USA

ODU Type	Sub-Band	TX Radio Point Frequency Range	RX Radio Point Frequency Range	TX HIGH/LOW
NWA-009040( )	A	21200.00 to 21802.00 MHz	22400.00 to 23002.00 MHz	Lower Band
	B	21498.00 to 22100.00 MHz	22698.00 to 23300.00 MHz	
	C	21798.00 to 22400.00 MHz	22998.00 to 23600.00 MHz	
	A	22400.00 to 23002.00 MHz	21200.00 to 21802.00 MHz	Higher Band
	B	22698.00 to 23300.00 MHz	21498.00 to 22100.00 MHz	
	C	22998.00 to 23600.00 MHz	21798.00 to 22400.00 MHz	

Sub-Band A and C cover full band.

4. 38 GHz Band

Table A-6 38 GHz, Sub-band A/B/C/D/E/F versus Frequency Range (TX-RX frequency spacing: 1260 MHz): STANDARD

ODU Type	Sub-Band	TX Radio Point Frequency Range	RX Radio Point Frequency Range	TX HIGH/LOW
NWA-009048( )	A/D	37016.00 to 37620.00 MHz	38276.00 to 38880.00 MHz	Lower Band
	B/E	37316.00 to 37920.00 MHz	38576.00 to 39180.00 MHz	
	C/F	37616.00 to 38220.00 MHz	38876.00 to 39480.00 MHz	
	A/D	38276.00 to 38880.00 MHz	37016.00 to 37620.00 MHz	Higher Band
	B/E	38576.00 to 39180.00 MHz	37316.00 to 37920.00 MHz	
	C/F	38876.00 to 39480.00 MHz	37616.00 to 38220.00 MHz	

NLite E
6-38 GHz SONET DIGITAL RADIO SYSTEM

Section III INSTALLATION AND INITIAL LINE UP

CONTENTS

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1.NLite E GENERAL

This section provides installation and initial line up information on the NLite E used for the 6-38 GHz SONET microwave radio systems.

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2. INSTALLATION

The standard installation is summarized in this section. Included herein is information on typical installation work flow and guides for IDU installation, ODU installation, Antenna (ANT) installation, waveguide connection and coaxial cable connections. The installation flow diagram is shown below.

This product is a part of radio link system, and is intended to be connected with a external antenna.

This product will be installed and operated by professional.

After installation, the professional person shall make sure that the system shall comply with the relevant limits for general public exposure specified as basic restrictions or reference levels in the council Recommendation 1999/519/EC.

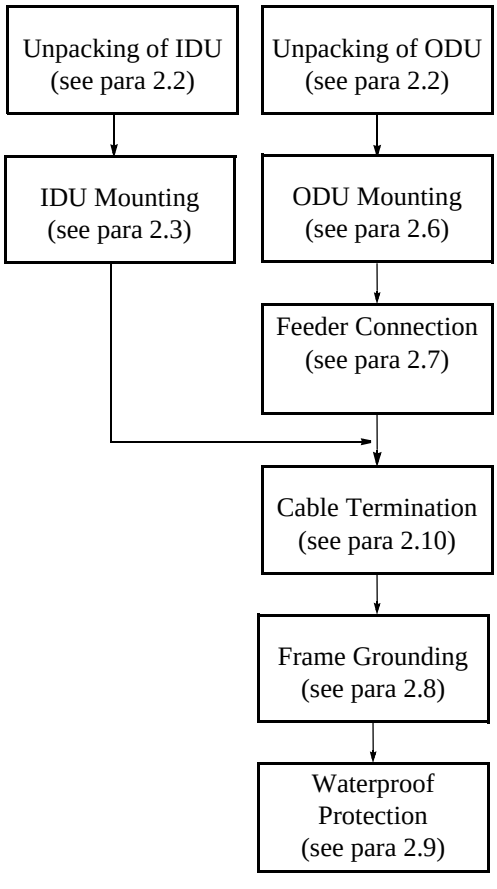

Fig. 2-1 Typical Installation Flow Diagram