4 Boards and Modules of the BTS3012

About This Chapter

The BTS3012 boards include DTMU, DEMU, DATU, DCSU, DCCU, DCMB, DELC, DMLC, DSAC, DCTB, and DTRB. The modules include DTRU, DCOM, DDPU, DFCU, DFCB, and FAN Box.

4.8 DDPU

The Dual-Duplexer Unit for DTRU BTS (DDPU) is configured in the DAFU subrack with the DCOM. The DDPU is an optional module. You can choose to configure DDPU or DFCU. Generally, three DDPUs are configured. If the DCOM is not configured, a maximum of six DDPUs can be configured.

4.9 DEMU

the Environment Monitoring Unit for DTRU BTS (DEMU) is placed in the common subrack of the BTS. The DEMU shares slots 2, 3, 4, or 7 with the DATU in the common subrack. The DEMU is an optional board. Only one DEMU can be configured.

4.10 DELC

The E1 Signal Lightning-Protection Card for DTRU BTS (DELC) is configured in slot 0, 1, or 2 of the cabinet top subrack. These three slots are shared by the DELC and the DMLC. The DELC is a mandatory board. At least one DELC should be configured.

4.11 DFCB

The DFCB refers to the Filter Combiner Unit for DTRU BTS (type B). It is located in the DAFU subrack of the RF front-end subsystem. The DFCB is optional. The BTS3012/BTS3012AE can be configured with the DDPU or the DFCU/DFCB.

4.12 DFCU

The DFCU refers to the Filter Combiner Unit for DTRU BTS. It is located in the DAFU subrack of the RF front-end subsystem. The DFCU is optional. The BTS3012/BTS3012AE can be configured with the DDPU or the DFCU.

4.13 DMLC

The Monitor Signal Lightning-Protection Card for DTRU BTS (DMLC) is configured in slot 0, 1, or 2 of the cabinet top subrack. The DMLC is an optional board. Only one DCSU can be configured.

4.14 DSAC

The Signal Access Card for DTRU BTS (DSAC) is placed in slot 3 of the cabinet top subrack. The DATU is a mandatory board. Only one DSAC can be configured.

4.15 DTMU

The Transmission/Timing/Management Unit for DTRU BTS (DTMU) is an entity for basic transmission and control in the BTS3012. It works as a main controller. The DTMU is a mandatory module installed in slots 1 and 2 of the common subrack.

4.16 DTRB

The Double-Transceiver Unit Backplane (DTRB) is placed in the DTRU subrack. The DTRB provides six slots to house the DTRUs.

4.17 DTRU

The Double-Transceiver Unit (DTRU) is placed in the double-transceiver subsystem of the BTS. One DTRU consists of two TRXs.

4.18 FAN Box

The FAN Box forms a loop with the air inlet box to provide forced ventilation and dissipation for the common subrack, DTRU subrack, and DAFU subrack.

4.1 List of the BTS3012 Boards and Modules

The BTS3012 boards include DTMU, DEMU, DATU, DCSU, DCCU, DCMB, DELC, DMLC, DSAC, DCTB, and DTRB. The BTS3012 modules include DTRU, DCOM, DDPU, DFCU, DFCB, and FAN Box.

Table 4-1 lists the boards and modules of the BTS3012.

Table 4-1 Boards and modules of the BTS3012

Subrack	Board/Module	Full Spelling	Quantity	
			Full Configuration	Minimum Configuration
Common subrack	**DTMU**	Transmission/Timing/ Management Unit for DTRU BTS	2	1
	DEMU	Environment Monitoring Unit for DTRU BTS	1	0
	DATU	Antenna and TMA Control Unit for DTRU BTS	2	0
	DCSU	Combined cabinet Signal connection Unit for DTRU BTS	1	1
	DCCU	Cable Connection Unit for DTRU BTS	1	1
	Performs RF signals dividing, diversity receiving, RF hopping, and demodulation of the two carriers.	Common Module Backplane for DTRU BTS	1	1
Cabinet top subrack	**DELC**	E1 Signal Lightning-Protection Card for DTRU BTS	3	1
	DMLC	Monitor Signal Lightning-Protection Card for DTRU BTS	1	0
	DSAC	Signal Access Card for DTRU BTS	1	1

Subrack	Board/Module	Full Spelling	Quantity	
			Full Configuration	Minimum Configuration
	DCTB	Cabinet Top Backplane for DTRU BTS	1	1
DTRU Subrack	**DTRU**	Double-Transceiver Unit	6	1
	DTRB	Double-Transceiver Unit Backplane	1	1
DAFU	**DCOM**	Combining Unit for DTRU BTS	3	0
	DDPU	Dual-Duplexer Unit for DTRU BTS	6	0
	DFCU	Filter Combiner Unit for DTRU BTS	3	0
	DFCB	Filter Combiner Unit for DTRU BTS	1	0
FAN subrack	**FAN Box**	Fan Module	1	1

4.2 DATU

The Antenna and TMA Control Unit for DTRU BTS (DTAU) is placed in the common subrack. It shares slots 2, 3, 4, and 7 with the DEMU. The DATU is an optional board. A maximum of two DATUs can be configured.

4.2.1 Functions of the DATU

The DATU controls the remote electrical tilt (RET) antenna and feeds the TMA.

4.2.2 Working Environment of the DATU

Upon reception of the signals from the DTMU, the DATU processes the signals and generates the RET control signals. In addition, the DATU feeds the TMA through the Bias-Tee. The DATU communicates with the DTMU through the CBUS3.

4.2.3 Indicators and Ports on the DATU

The three indicators on the DATU indicates the working status of the DATU. Of the six ports on the DATU, three ports feeds the TMA, the other three ports feeds the TMA and transmits control signals for the RET antenna.

4.2.4 DIP Switches on the DATU

There are three DIP switches on the DATU. SW1 enables the loading of single-chip microcomputers in case of debugging. SW2 to SW3 enable the feed output.

4.2.5 Specifications of the DATU

The specifications of the DATU include dimensions, working voltage, power consumption, and weight.

4.2.1 Functions of the DATU

The DATU controls the remote electrical tilt (RET) antenna and feeds the TMA.

The DATU performs the following functions:

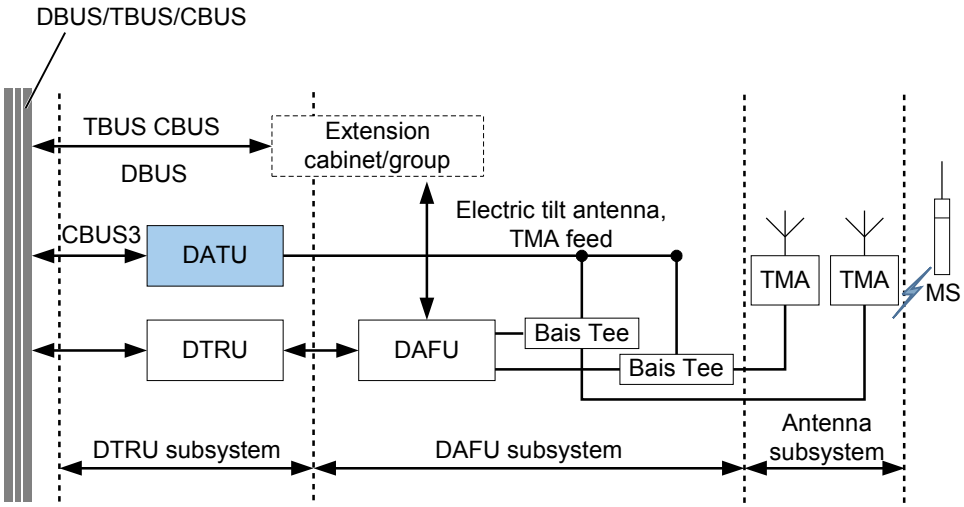
- Controlling the RET antenna
- Feeding the TMA
- Reporting alarms related to the control of the RET antenna
- Monitoring the feed current

4.2.2 Working Environment of the DATU

Upon reception of the signals from the DTMU, the DATU processes the signals and generates the RET control signals. In addition, the DATU feeds the TMA through the Bias-Tee. The DATU communicates with the DTMU through the CBUS3.

Figure 4-1 shows the working environment of the DATU.

Figure 4-1 Working environment of the DATU



Upon reception of the signals from the DTMU, the DATU processes the signals and generates the RET control signals. In addition, the DATU feeds the TMA through the Bias-Tee. The DATU communicates with the DTMU through the CBUS3.

4.2.3 Indicators and Ports on the DATU

The three indicators on the DATU indicates the working status of the DATU. Of the six ports on the DATU, three ports feeds the TMA, the other three ports feeds the TMA and transmits control signals for the RET antenna.

Figure 4-2 shows the DATU panel.

Figure 4-2 DATU panel

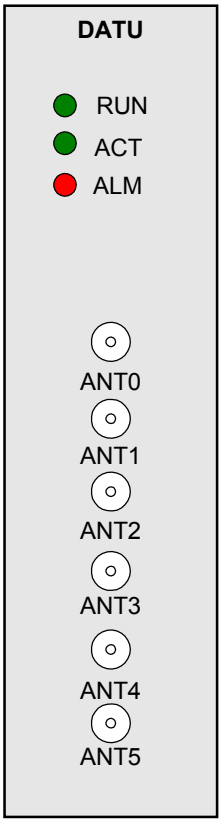


Table 4-2 describes the indicators on the DATU.

Table 4-2 Indicators on the DATU

Indicator	Color	Description	Status	Meaning
RUN	Green	Indicating the running status of the board	Slow flash (on for 2s and off for 2s)	There is power supply but the communication with the DTMU is abnormal.
			Slow flash (on for 1s and off for 1s)	The board is running normally and the communication with the DTMU is normal.
			Off	There is no power supply or the board is faulty.
ACT	Green	Indicating the running status of the services	On	The AISG link is normal.
			Off	The AISG link is abnormal.
			Fast flash at irregular intervals	AISG link transmission is under progress.

Indicator	Color	Description	Status	Meaning
ALM	Red	Alarm indicator	On	An alarm is generated, such as an overcurrent alarm.
			Off	The board is running normally.

Table 4-3 describes the ports on the DATU.

Table 4-3 Ports on the DATU

Port	Type	Function
ANT0	SMA female connector	Feeding and transmitting control signals for the RET antenna
ANT1	SMA female connector	Feeding
ANT2	SMA female connector	Feeding and transmitting control signals for the RET antenna
ANT3	SMA female connector	Feeding
ANT4	SMA female connector	Feeding and transmitting control signals for the RET antenna
ANT5	SMA female connector	Feeding

4.2.4 DIP Switches on the DATU

There are three DIP switches on the DATU. SW1 enables the loading of single-chip microcomputers in case of debugging. SW2 to SW3 enable the feed output.

Figure 4-3 shows the layout of the DIP switches on the DATU and their initial settings.

Figure 4-3 Layout of the DIP switches on the DATU

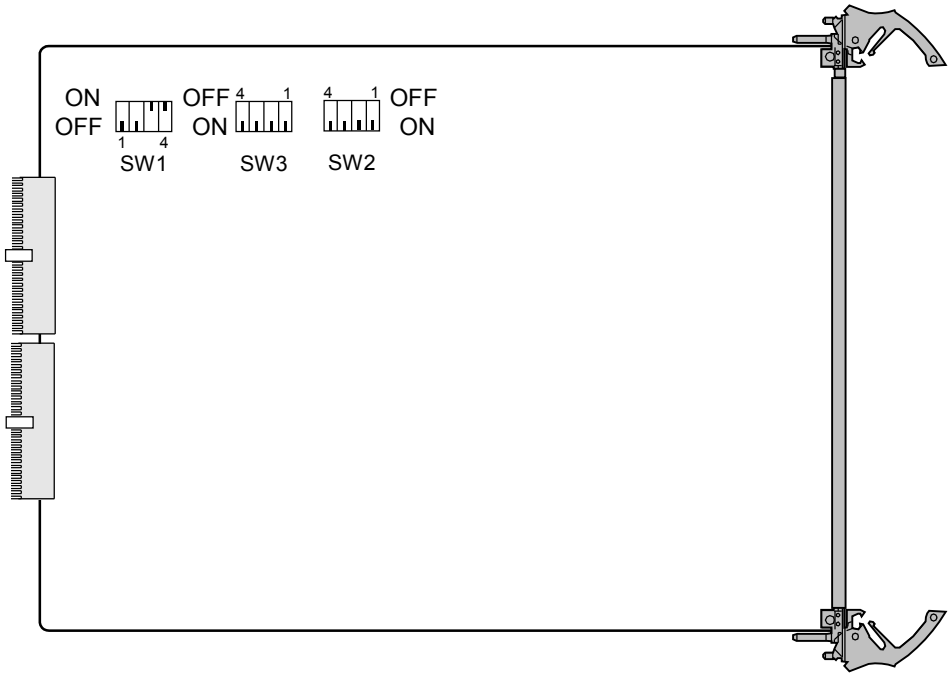


Table 4-4 describes the DIP switches.

Table 4-4 DIP switches on the DATU

DIP Switch	DIP Bit	ON/OFF	Function
SW1	1	ON	Enabling the single-chip microcomputer loading in case of debugging
		OFF	Normal working mode
	2	ON	Enabling the single-chip microcomputer loading in case of debugging
		OFF	Normal working mode
	3	ON	Normal working mode
		OFF	Enabling the single-chip microcomputer loading in case of debugging
	4	ON	Normal working mode
		OFF	Enabling the single-chip microcomputer loading in case of debugging
SW2	1	ON	No.1 feed output: ON
		OFF	No.1 feed output: OFF
	2	ON	No.2 feed output: ON
		OFF	No.2 feed output: OFF

DIP Switch	DIP Bit	ON/OFF	Function
	3	ON	No.3 feed output: ON
		OFF	No.3 feed output: OFF
	4	ON	No.4 feed output: ON
		OFF	No.4 feed output: OFF
SW3	1	ON	No.5 feed output: ON
		OFF	No.5 feed output: OFF
	2	ON	No.6 feed output: ON
		OFF	No.6 feed output: OFF
	3	-	Reserved
	4	-	Reserved

NOTE

The DIP switches on the DATU are set before delivery. There is no need to set them on site.

4.2.5 Specifications of the DATU

The specifications of the DATU include dimensions, working voltage, power consumption, and weight.

Table 4-5 describes the specifications of the DATU.

Table 4-5 Specifications of the DATU

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 280.0 mm x 233.4 mm x 2.0 mm
	Dimension of the front panel (length x width): 261.0 mm x 30.5 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption: 72 W
Weight	0.6 kg

4.3 DCCU

The Cable Connection Unit for DTRU BTS (DCCU) is placed in slot 6 of the common subrack. The DCCU is mandatory. A maximum of one DCCU can be configured.

4.3.1 Functions of the DCCU

The DCCU implements signal transfer and EMI filtering.

4.3.1 Functions of the DCCU

The DCCU implements signal transfer and EMI filtering.

The DCCU performs the following functions:

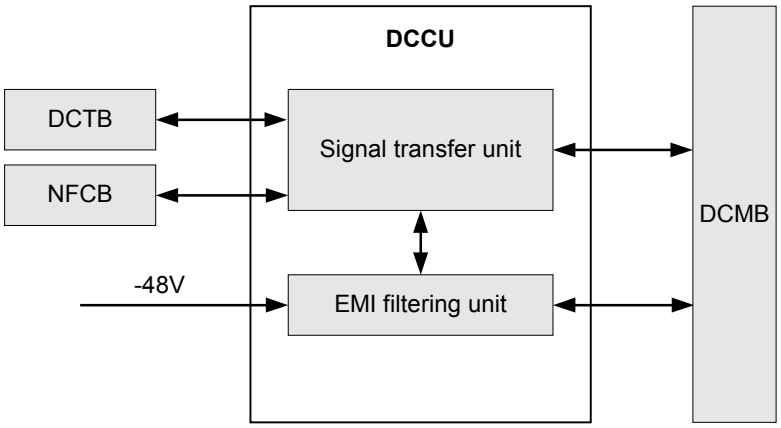
- Transferring E1 signals
- Transferring the control signals for the fans
- Transferring the clock signals from the DAFU subrack
- Inputting the power for the common subrack and providing EMI filtering

4.3.2 Working Principles of the DCCU

The DCCU consists of the signal transfer unit and the EMI filtering unit.

Figure 4-4 shows the working principles of the DCCU.

Figure 4-4 Working principles of the DCCU



NOTE

The configuration of the DCTB in **Figure 4-4** shows that this is a BTS3012 cabinet. The BTS3012AE uses the DSCB instead of the DCTB.

Signal Transfer Unit

The signals from the DCMB are transmitted to the DCCU through three 2 mm connectors. Then, these signals are transmitted to the following parts through the connectors on the front panel of the DCCU:

- Fan subrack and the DCTB on the cabinet top subrack of the BTS3012

- Fan subrack and the DSCB of the BTS3012AE

EMI Filtering Unit

The –48 V power goes through the EMI filter and then out to the DCMB for the use of other boards in the common subrack.

4.3.3 Ports on the DCCU

There are four ports on the DCCU. TRAN is used to input E1 signals. To_FAN is used to connect with the FAN Box. TO_TOP1 is used to connect with the backplane. POWER is used to input power supply.

Figure 4-5 shows the DCCU panel.

Figure 4-5 DCCU panel

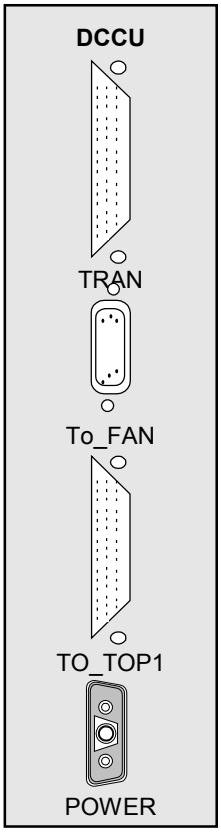


Table 4-6 describes the ports on the DCCU.

Table 4-6 Ports on the DCCU

Ports	Type	Function
TRAN	MD64 female connector	Inputting E1 signals
To_FAN	DB26 female connector	Connecting to the FAN Box through cables

Ports	Type	Function
TO_TOP1	MD64 female connector	Connecting to the DCTB of the BTS3012 through cables
		Connecting to the DSCB of the BTS3012AE through cables
POWER	3V3 power connector	Inputting power supply for the common subrack

4.3.4 Specifications of the DCCU

The specifications of the DCCU include dimensions and weight.

Table 4-7 describes the specifications of the DCCU.

Table 4-7 Specifications of the DCCU

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 280.0 mm x 233.4 mm x 2.0 mm
	Dimension of the front panel (length x width): 261.0 mm x 25.4 mm
Weight	0.7 kg

4.4 DCMB

The Common Module Backplane for DTRU BTS (DCMB) is configured in the common subrack of the BTS3012/BTS3012AE cabinet. The DCMB is mandatory. There are nine slots on the board.

4.4.1 Functions of the DCMB

The DCMB provides power circuit and signal cables for the boards in the common subrack. The DCMB transmits signals from the boards in the common subrack to the DCCU, through whose ports the signals are transmitted to the boards in other subracks.

The DCMB performs the following functions:

- Connecting with the boards in the common subrack
- Providing –48 V power circuits for the boards in the common subrack

4.4.2 Specifications of the DCMB

This part describes the physical dimensions of the DCMB.

Table 4-8 describes the specifications of the DCMB.

Table 4-8 Specifications of the DCMB

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 259.3 mm x 246.0 mm x 3.0 mm
	Dimension of the front panel (length x width): The DCMB is a backplane and has no front panel.

4.5 DCOM

The Combining Unit for DTRU BTS (DCOM) is placed in the DAFU subrack. It can be inserted in the DAFU subrack with the DDPU. The DCOM is optional and a maximum of three DCOMs can be configured. The precondition for configuring the DCOM is that the 2-in-1 combination function in the DTRU is used while there is additional requirements for combination of signals.

4.5.1 Functions of the DCOM

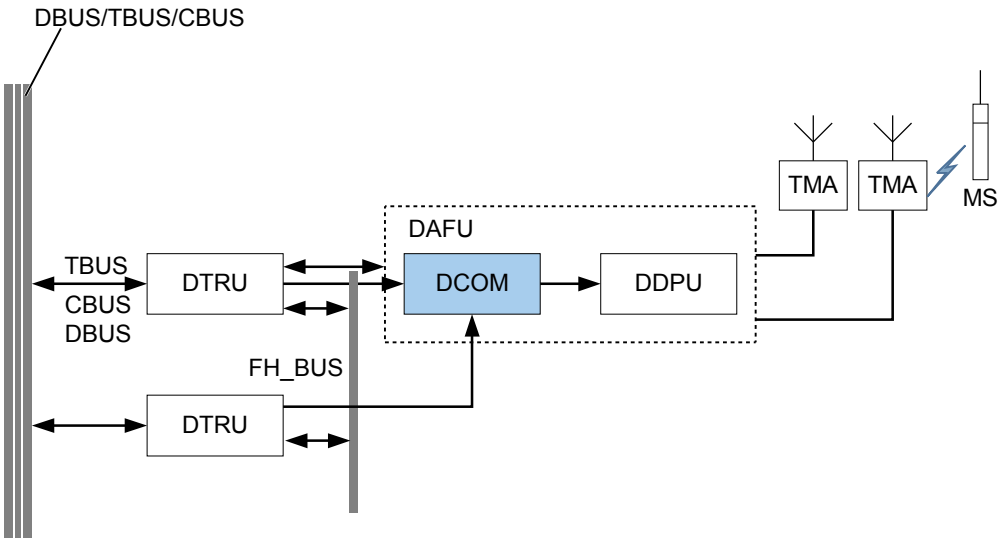
The DCOM combines two routes of TX signals from the DTRU and sends them to the DDPU.

4.5.2 Working Environment of the DCOM

The DCOM receives two routes of DL signals from the DTRU and combines them into one channel. Then, the DCOM sends the combined signals to the DDPU, from which the antenna receives the signals for transmission.

Figure 4-6 shows the working environment of the DCOM.

Figure 4-6 Working environment of the DCOM

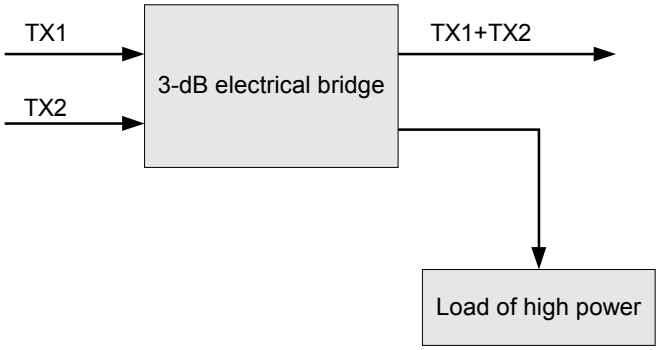


4.5.3 Working Principles of the DCOM

The DCOM consists of a 3 dB electrical bridge and a load of high power.

Figure 4-7 shows the working principles of the DCOM.

Figure 4-7 Working principles of the DCOM



3 dB Electrical Bridge

It combines two routes of RF TX signals into one route.

Load of High Power

It matches the 3 dB electrical bridge.

4.5.4 Ports on the DCOM

There are four ports on the DCOM. ONSHELL output the in-position signals of the DCOM to the backplane of the cabinet. TX-COM outputs the combined RF signals. TX1 and TX2 inputs the RF signals from the DTRU.

Figure 4-8 shows the DCOM panel.

Figure 4-8 DCOM panel

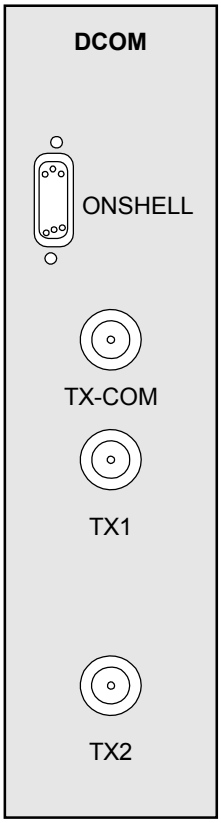


Table 4-9 describes the ports on the DCOM.

Table 4-9 Ports on the DCOM

Port	Type	Function
ONSHELL	DB26 female connector	Outputting the in-position signals of the DCOM to the DCTB of the BTS3012
		Outputting the in-position signals of the DCOM to the DSCB of the BTS3012AE
TX-COM	N female connector	Outputting the combined signals from the DCOM to the DDPU
TX1	N female connector	Inputting TX signals from the DTRU to the DCOM
TX2	N female connector	Inputting TX signals from the DTRU to the DCOM

4.5.5 Specifications of the DCOM

The specifications of the DCOM include dimensions and weight.

Table 4-10 describes the specifications of the DCOM.

Table 4-10 Specifications of the DCOM

Item	Specification
Dimension	Dimension of the front panel (length x width): 383.6 mm x 70.6 mm
Weight	3.2 kg

4.6 DCSU

The Combined cabinet Signal connection Unit for DTRU BTS (DCSU) is placed in slot 5 of the common subrack. The DATU is an optional board. Only one DCSU can be configured.

4.6.1 Functions of the DCSU

The DCSU transmits the following signals: signals for the combined cabinets and cabinet groups, in-position signals of the modules in the DAFU subrack, and baseband signals between the DTMU and the DTRU.

The DCSU performs the following functions:

- Transmitting clock signals, data signals, and control signals between the main cabinet and the extension cabinet
- Transmitting clock signals, data signals, and control signals from the DTMU to the DTRU
- Transmitting the in-position signals of the DCOM, DDPU, or DFCU in the DAFU subrack to the DCMB

4.6.2 Ports on the DCSU

There are four ports on the DCSU. CC_OUT outputs signals on the cable for the combined cabinets. CC_IN inputs signals on the cable for the combined cabinets. TO_DTRB outputs baseband signals. TOP2 inputs the in-position signals of the boards and the Boolean value alarm signals.

Figure 4-9 shows the DCSU panel.

Figure 4-9 DCSU panel

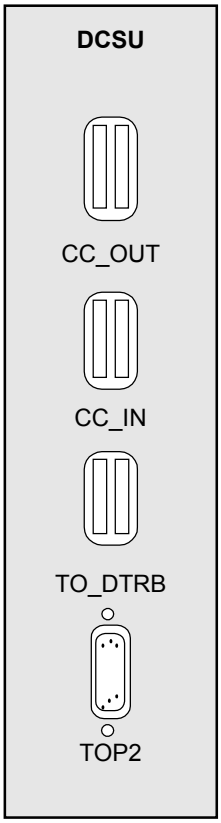


Table 4-11 describes the ports on the DCSU panel.

Table 4-11 Ports on the DCSU panel

Silk-Screen	Type	Description
CC_OUT	MD64 female connector	Outputting signals over the cable for the combined cabinets
CC_IN	MD64 female connector	Inputting signals on the cable for the combined cabinets
TO_DTRB	MD64 female connector	Connecting to the DTRB through cables
TOP2	DB26 female connector	Connecting to the DCTB of the BTS3012 through cables
		Connecting to the DSCB of the BTS3012AE through cables

4.6.3 DIP Switches on the DCSU

There are 14 DIP switches on the DCSU. SW1 is used to set the main cabinet in the main cabinet group. SW2 to SW5 are used to set the main cabinet and extension cabinet in a cabinet group. SW6 and SW7 are used to set E1 impedance. SW8 is used to set the cabinet number. SW9 and SW10 are used to set the cabinet type. SW11 is used to select the terminal match. SW12, SW13, and SW14 are reserved.

Figure 4-10 shows the layout of the DIP switches on the DCSU and their initial settings.

Figure 4-10 Layout of the DIP switches on the DCSU

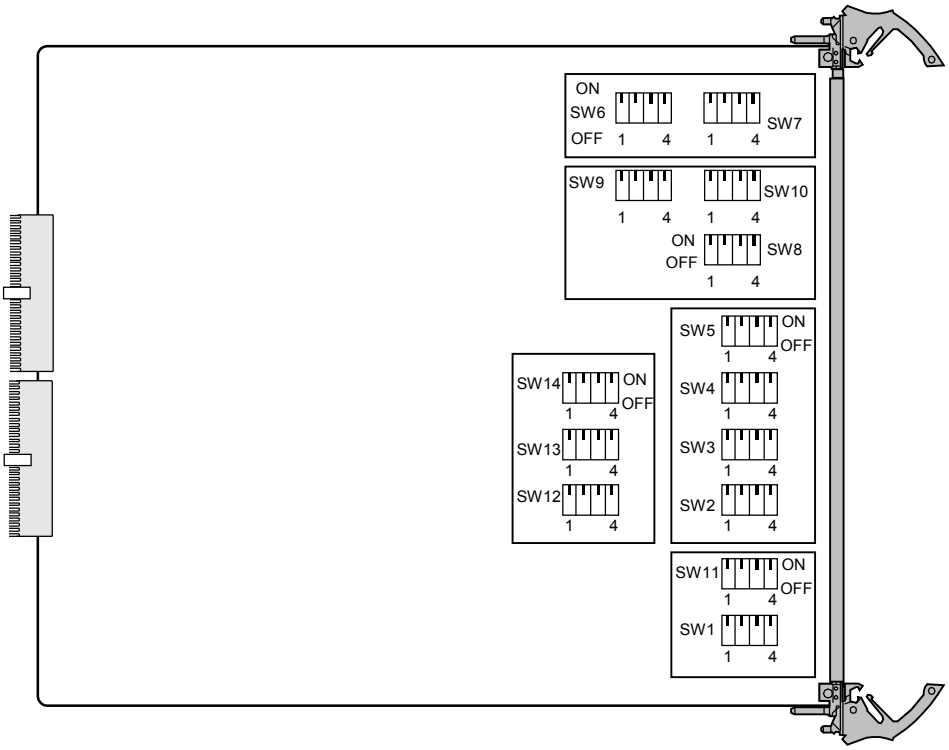


Table 4-12 describes the settings of the main cabinet in the main cabinet group and **Table 4-13** is used to select the terminal match.

The settings of SW11 are as follows:

- In the case of a single cabinet, all the DIP bits of SW11 should be set to ON.
- In the case of combined cabinets, all the DIP bits of SW11 for the cabinets should be set to ON.
- In the case of two cabinet groups, all the DIP bits of the SW11 for the cabinets should be set to ON.
- In the case of three cabinet groups, the DIP bits of SW11 for the main cabinet in the main group should be set to OFF and the DIP bits of SW11 for other cabinets should be set to ON.

SW2 to SW5 are used to set the main cabinet and extension cabinet in a cabinet group. They are also used to select the terminal match. Irrespective of the main cabinet group or extension cabinet group, the DIP bits of SW2 to SW5 for the main cabinet are set to ON and the DIP bits for the extension cabinet are set to OFF. **Table 4-14** describes the settings of the DIP switches.

SW6 and SW7 are used to set E1 impedance. **Table 4-15** describes the settings of the DIP switches.

SW8 is used to set the cabinet number. In a cabinet group, you need to set SW8 for the main cabinet. You can use the default settings for the extension cabinets, that is, all the extension cabinets are set to ON. **Table 4-16** describes the settings of the DIP switches.

SW9 and SW10 are used to set the cabinet type. **Table 4-17** describes the setting of the DIP switches.

Table 4-12 Settings of SW1

SW1	Function
All ON	Main cabinet of the main cabinet group
All OFF	Other cases

Table 4-13 Settings of SW11

SW11	Function
All ON	CBUS1 terminal match
All OFF	CBUS1 no terminal match

Table 4-14 Settings of SW2–SW5

SW2–SW5	Function
All ON	Main cabinet
All OFF	Extension cabinet

Table 4-15 Settings of SW6 and SW7

DIP Switch	DIP Bit	ON/OFF	Function
SW6	1	ON	First E1 cable: 75 ohms
		OFF	First E1 cable: 120 ohms
	2	ON	Second E1 cable: 75 ohms
		OFF	Second E1 cable: 120 ohms
	3	ON	Third E1 cable: 75 ohms
		OFF	Third E1 cable: 120 ohms
	4	ON	Fourth E1 cable: 75 ohms
		OFF	Fourth E1 cable: 120 ohms
SW7	1	ON	Fifth E1 cable: 75 ohms

DIP Switch	DIP Bit	ON/OFF	Function
		OFF	Fifth E1 cable: 120 ohms
	2	ON	Sixth E1 cable: 75 ohms
		OFF	Sixth E1 cable: 120 ohms
	3	ON	Seventh E1 cable: 75 ohms
		OFF	Seventh E1 cable: 120 ohms
	4	ON	Eighth E1 cable: 75 ohms
		OFF	Eighth E1 cable: 120 ohms

Table 4-16 Settings of SW8

DIP Bits of SW8				Function
1	2	3	4	
ON	ON	ON	ON	Main cabinet of the main cabinet group
OFF	OFF	ON	ON	Main cabinet in extension cabinet group 1
ON	OFF	OFF	ON	Main cabinet in extension cabinet group 2

Table 4-17 Settings of SW9 and SW10

DIP Bits of SW9		DIP Bits of SW10	Function
1	2-4	1-4	
ON	ON	ON	The cabinet type is BTS3012.
OFF	ON	ON	The cabinet type is BTS3012AE.
Others			Undefined

4.6.4 Specifications of the DCSU

The specifications of the DCSU include dimensions and weight.

Table 4-18 describes the specifications of the DCSU.

Table 4-18 Specifications of the DCSU

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 280.0 mm x 233.4 mm x 2.0 mm
	Dimension of the front panel (length x width): 261.0 mm x 25.4 mm
Weight	0.7 kg

4.7 DCTB

The Cabinet Top Backplane for DTRU BTS (DCTB) is placed in the cabinet top subrack of the BTS3012. The DCTB is a mandatory board providing four slots.

4.7.1 Functions of the DCTB

The DCTB provides signal connection for the boards in the cabinet top subrack.

The DCTB performs the following functions:

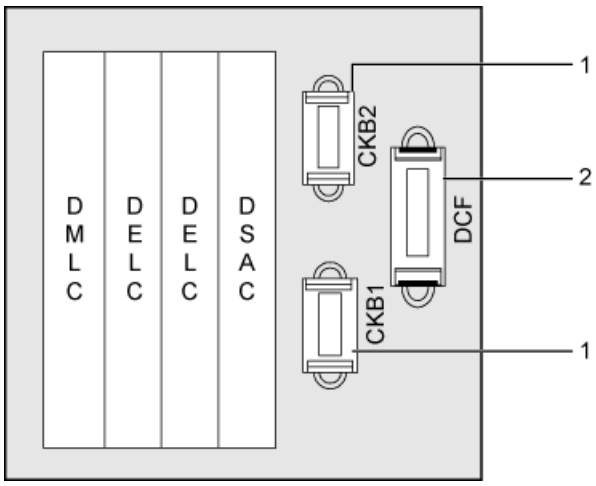
- Providing signal connection for the boards in the cabinet top subrack
- Providing the ports for connecting combined cabinets (two cabinets at most) and cabinet groups (three cabinet groups at most)

4.7.2 Ports on the DCTB

There are three ports on the DCTB. One port is used for combined cabinets. The other two ports are used for cabinet groups.

Figure 4-11 shows the DCTB panel.

Figure 4-11 DCTB panel



(1) Connector for cables connecting the cabinet groups (MD36 female)
(2) Connector for cables connecting the combined cabinets (MD68 female)

Table 4-19 describes the ports on the DCTB.

Table 4-19 Ports on the DCTB

Port	Connector	Function
CKB1	Connector for cables connecting the cabinet groups (MD36 female)	Connecting cables for the cabinet groups
CKB2	Connector for cables connecting the cabinet groups (MD36 female)	Connecting cables for the cabinet groups
DCF	Connector for cables connecting the combined cabinets (MD68 female)	Connecting cables for the combined cabinets

4.7.3 Specifications of the DCTB

This part describes the physical dimensions of the DCTB.

Table 4-20 describes the specifications of the DCTB.

Table 4-20 Specifications of the DCTB

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 214.0 mm x 158.0 mm x 3.0 mm
	Dimension of the front panel (length x width): The DCTB is a backplane and has no front panel.

4.8 DDPU

The Dual-Duplexer Unit for DTRU BTS (DDPU) is configured in the DAFU subrack with the DCOM. The DDPU is an optional module. You can choose to configure DDPU or DFCU. Generally, three DDPUs are configured. If the DCOM is not configured, a maximum of six DDPUs can be configured.

4.8.1 Functions of the DDPU

The DDPU receives multiple routes of RF signals from the transmitter of the DTRU and then sends them to the antenna. Meanwhile, it receives the signals from the antenna, amplifies them, divides them into four routes, and then sends them to the receiver of the DRTU.

The DDPU performs the following functions:

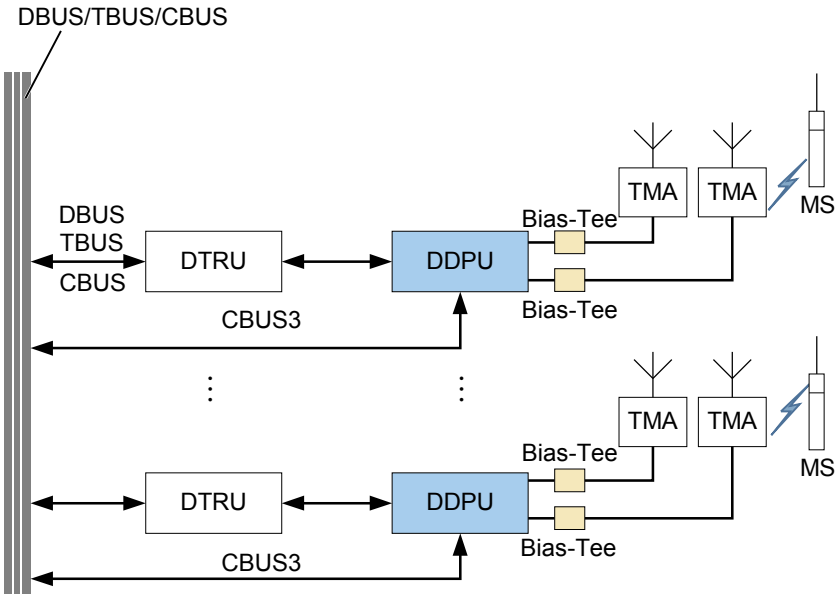
- Providing lightning protection
- Detecting VSWR alarms in the antenna system
- Receiving the gain control of the low noise amplifier
- Sending multiple routes of RF signals from the transmitter to the antenna
- Receiving signals from the antenna, amplifying and quartering these signals, and then sending them to the receiver of the DTRU

4.8.2 Working Environment of the DDPU

The DDPU receives the UL signals from the antenna, filters and amplifies them, and then sends them to the DTRU for demodulation. The DDPU also receives the DL signals from the DTRU, filters them, and then sends them to the antenna for transmission.

Figure 4-12 shows the working environment of the DDPU.

Figure 4-12 Working environment of the DDPU



The working environment of the DDPU is as follows:

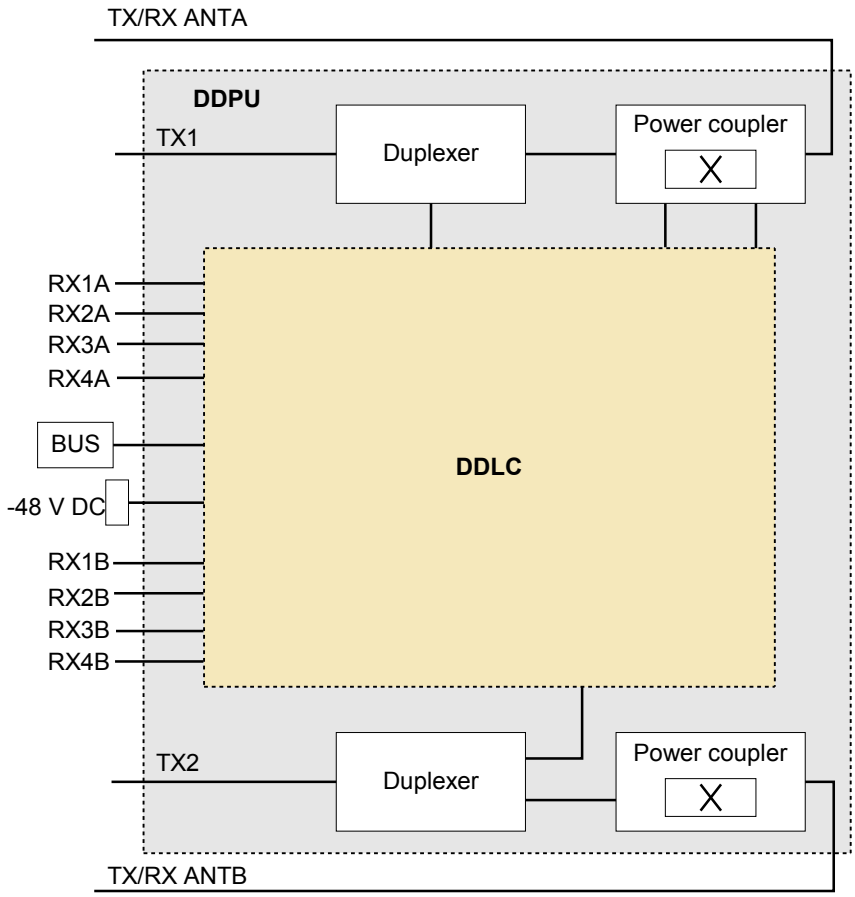
- The DDPU receives the UL signals from the antenna, filters and amplifies them, and then sends them to the DTRU for demodulation.
- The DDPU also receives the DL signals from the DTRU, filters them, and then sends them to the antenna for transmission.

4.8.3 Working Principles of the DDPU

The DDPU consists of the DDLC, duplexer, and power coupler.

Figure 4-13 shows the working principles of the DDPU.

Figure 4-13 Working principles of the DDPU



DDLC

It receives signals from the antenna, amplifies and quarters these signals, and then sends them to the DTRU. It also features fault self-detection.

Duplexer

The duplexer consists of the receive filer and the transmit receiver. The duplexer filters the received signals and the signals that are to be transmitted.

Power Coupler

It extracts signals for the DDLC to perform VSWR detecting.

4.8.4 Indicators and Ports on the DDPU

The two indicators on the DDPU indicate the working status of the DDPU. There are 14 ports on the DDPU. These ports include antenna ports, TX ports, RX ports, communication port, and power port.

Figure 4-14 shows the DDPU panel.

Figure 4-14 DDPU panel

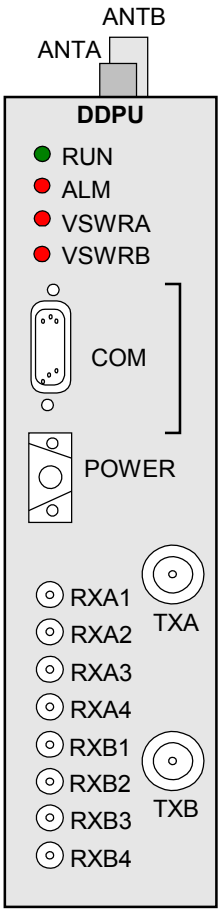


Table 4-21 describes the indicators on the DDPU.

Table 4-21 Indicators on the DDPU

Indicator	Color	Description	Status	Meaning
RUN	Green	Running status and power-on indicator of the DDPU	On	There is power supply. However, the module is faulty.
			Off	There is no power supply or the module is faulty.
			Slow flash (on for 1s and off for 1s)	The module works normally.
			Fast flash (on for 0.2s and off for 0.2s)	The DTMU is sending configuration parameters to the DDPU or the DDPU is loading software programs.
ALM	Red	Alarm indicator	On (flash at high frequency)	Alarms (including VSWR alarm), indicating that there are faults

Indicator	Color	Description	Status	Meaning
			Off	No alarm
			Slow flash (on for 1s and off for 1s)	The DDPM is starting or loading the latest application.
VSWRA	Red	Channel A VSWR alarm indicator	Slow flash (on for 1s and off for 1s)	Channel A VWSR alarm
			On	Critical channel A VSWR alarm
			Off	No channel A VSWR alarm
VSWRB	Red	Channel B VSWR alarm indicator	Slow flash (on for 1s and off for 1s)	Channel B VWSR alarm
			On	Critical channel B VSWR alarm
			Off	No channel B VSWR alarm

Table 4-22 describes the ports on the DDPU.

Table 4-22 Ports on the DDPU

Port	Type	Function
COM	DB26 female connector	Receiving control signals, communication signals, clock signals, and rack number signals from the DCTB of the BTS3012
		Receiving control signals, communication signals, and clock signals from the DSCB of the BTS3012AE
POWER	3V3 power connector	Power input
TXA	N female connector	• Inputting TX signals from the DTRU • Inputting combination signals from the DCOM
TXB	N female connector	• Inputting TX signals from the DTRU • Inputting combination signals from the DCOM
RXA1	SMA female connector	Main output port for route 1
RXA2	SMA female connector	Main output port for route 2
RXA3	SMA female connector	Main output port for route 3
RXA4	SMA female connector	Main output port for route 4
RXB1	SMA female connector	Diversity output port for route 1

Port	Type	Function
RXB2	SMA female connector	Diversity output port for route 2
RXB3	SMA female connector	Diversity output port for route 3
RXB4	SMA female connector	Diversity output port for route 4
ANTA	DIN female connector	Connecting to the indoor 1/2-inch jumper of the BTS3012 or the BiasTee
		Connecting to the indoor 1/4-inch jumper of the BTS3012AE or the BiasTee
ANTB	DIN female connector	Connecting to the indoor 1/2-inch jumper of the BTS3012 or the BiasTee
		Connecting to the indoor 1/4-inch jumper of the BTS3012AE or the BiasTee

4.8.5 Specifications of the DDPU

The specifications of the DDPU include dimensions, working voltage, power consumption, and weight.

Table 4-23 describes the specifications of the DDPU.

Table 4-23 Specifications of the DDPU

Item	Specification
Dimension	Dimension of the front panel (length x width): 383.6 mm x 70.6 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption: 8 W
Weight	8.0 kg

4.9 DEMU

the Environment Monitoring Unit for DTRU BTS (DEMU) is placed in the common subrack of the BTS. The DEMU shares slots 2, 3, 4, or 7 with the DATU in the common subrack. The DEMU is an optional board. Only one DEMU can be configured.

4.9.1 Functions of the DEMU

The DEMU guarantees the normal operation of the BTS by monitoring the environment surrounded.

4.9.2 Working Environment of the DEMU

The DEMU receives alarm information from the DMLC and sends the information collected to the DTMU through the buses.

4.9.3 Working Principles of the DEMU

The DEMU consists of the power circuit, MCU control circuit, analog signal detecting circuit, Boolean value input and output circuit, board serial port circuit, and power and voltage detecting circuit.

4.9.4 Indicators and Ports on the DEMU
The three indicators on the DEMU indicates the working status of the DEMU. One port is used to access and output Boolean value and analog value.

4.9.5 DIP Switches on the DEMU
There are eight DIP switches on the DEMU. SW_AV is set manually while the other seven DIP switches are set through the LMT.

4.9.6 Specifications of the DEMU
The specifications of the DEMU include dimensions, working voltage, power consumption, and weight.

4.9.1 Functions of the DEMU

The DEMU guarantees the normal operation of the BTS by monitoring the environment surrounded.

The DEMU performs the following functions:

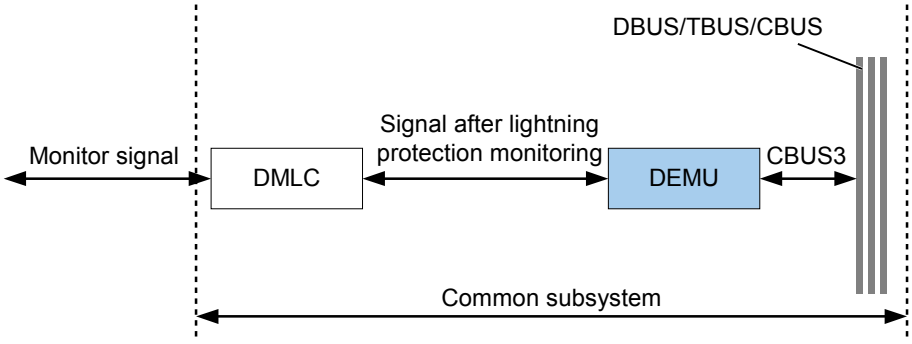
- Monitoring environment variables from the smoke, water, temperature, humidity, infrared, and door sensors in the equipment room
- Collecting alarm information and reporting it to the DTMU
- Providing 6 Boolean value outputs and 32 Boolean value inputs

4.9.2 Working Environment of the DEMU

The DEMU receives alarm information from the DMLC and sends the information collected to the DTMU through the buses.

Figure 4-15 shows the working environment of the DEMU.

Figure 4-15 Working environment of the DEMU



The working environment of the DEMU is as follows:

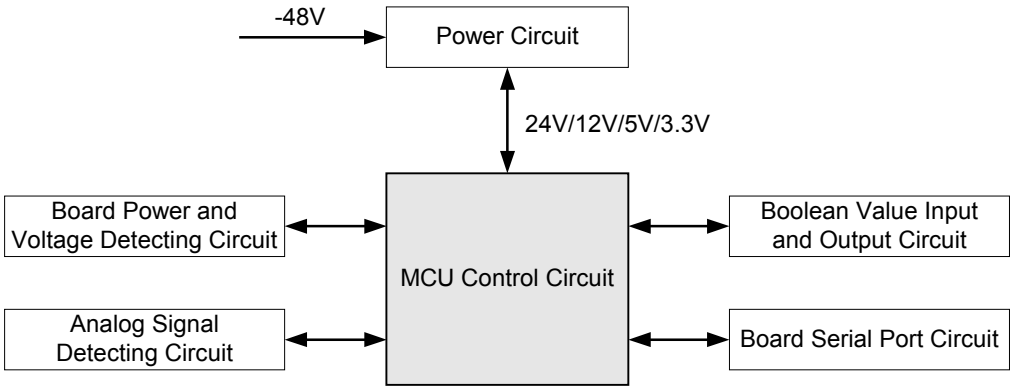
- The DEMU receives the alarm information collected by the DMLC.
- After processing the alarm information, the DEMU sends the information to the DTMU through the buses.

4.9.3 Working Principles of the DEMU

The DEMU consists of the power circuit, MCU control circuit, analog signal detecting circuit, Boolean value input and output circuit, board serial port circuit, and power and voltage detecting circuit.

Figure 4-16 shows the working principles of the DEMU

Figure 4-16 Working principles of the DEMU



Power Circuit

- Providing 3.3 V, 5 V, 12 V, and –24 V power input
- Converting power supply

MCU Control Circuit

- Receiving the monitoring configuration parameters data from the main control board
- Reporting the board monitoring status and internal alarm information to the main control board during the polling period of the main control board
- Providing working clock reference for the MCU through the 24 MHz oscillator
- Providing manual and automatic reset functions

Analog Signal Detecting Circuit

Detecting analog signal inputs and outputting temperature and humidity value through the 24 V DC (current type) detection ports provided by the DEMU

Board Power and Voltage Detecting Circuit

Checking the input –48 V voltage and triggering the alarm to the MCU control unit upon detection of an overvoltage or undervoltage situation

Boolean Value Input and Output Circuit

Detecting the Boolean value inputs and reporting the relevant alarm information

Board Serial Port Circuit

Providing one route of RS485 full duplex alarm input and reporting the external alarm information to the MCU control unit

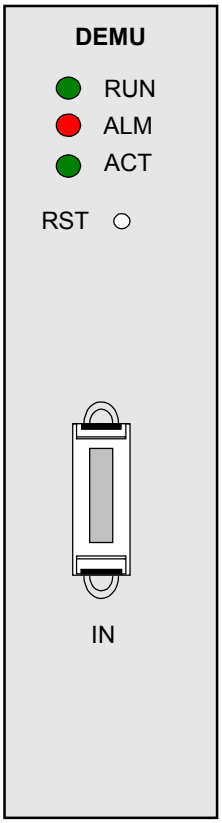
4.9.4 Indicators and Ports on the DEMU

The three indicators on the DEMU indicates the working status of the DEMU. One port is used to access and output Boolean value and analog value.

Panel

Figure 4-17 shows the DEMU panel.

Figure 4-17 DEMU panel



Indicators

Table 4-24 describes the indicators on the DEMU panel.

Table 4-24 Indicators on the DEMU

Indicators	Color	Description	Status	Meaning
RUN	Green	Indicating the running status of the board	On	There is power supply. However, the board or software is faulty.

Indicators	Color	Description	Status	Meaning
			Off	There is no power supply or the board is faulty.
			Slow flash (on for 1s and off for 1s)	The board is operational under current configuration.
			Fast flash (on for 0.125s and off for 0.125s)	The board communicates with the DTMU normally.
ALM	Red	Alarm indicator	Slow flash (on for 1s and off for 1s)	An alarm is generated.
			Off	No board alarm
ACT	Green	Indicating the running status of the services	On	There is power supply and the board is in working mode.
			Off	There is no power supply for the board.

Ports

Table 4-25 describes the ports on the DEMU.

Table 4-25 Ports on the DEMU

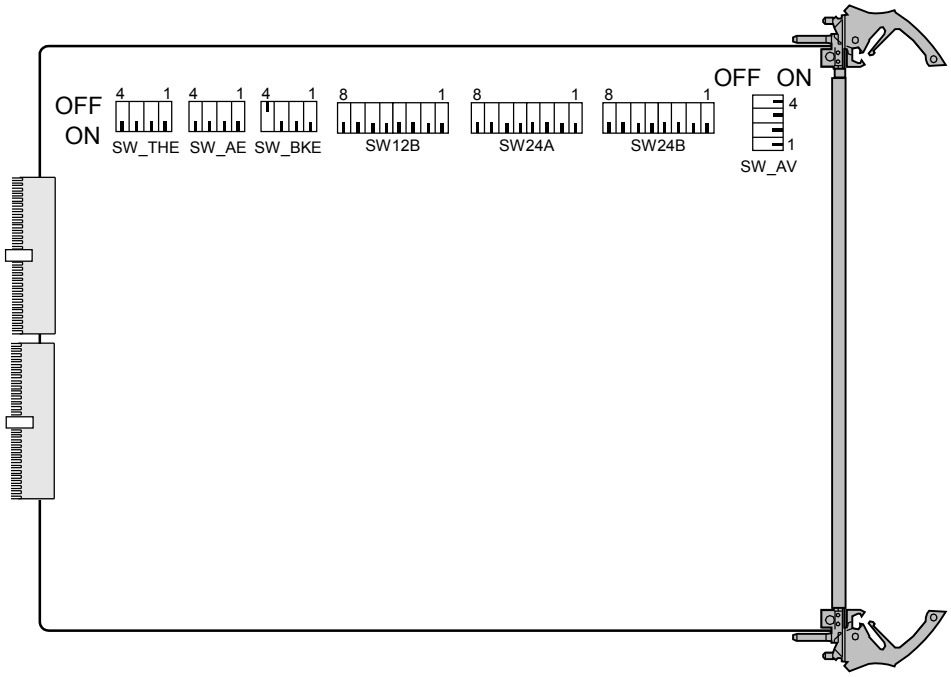
Port	Type	Function
IN	MD68 female connector	• Accessing and outputting Boolean value • Accessing analog value

4.9.5 DIP Switches on the DEMU

There are eight DIP switches on the DEMU. SW_AV is set manually while the other seven DIP switches are set through the LMT.

Figure 4-18 shows the layout of the eight DIP switches on the DEMU and their initial settings.

Figure 4-18 Layout of the DIP switches on the DEMU



The DIP switches on the DEMU are described as follows:

- For settings of the SW_THE DIP switches, refer to **Table 4-26**.
- For settings of the SW_AE DIP switches, refer to **Table 4-27**.
- For settings of the SW_BKE DIP switches, refer to **Table 4-28**.
- For settings of the SW12A/SW12B/SW24A/SW24B DIP switches, refer to **Table 4-29**.
- For settings of the SW_AV DIP switches, refer to **Table 4-30**.

Table 4-26 SW_THE DIP switches

DIP Bit	Definition	ON/OFF	Function
SW_THE.1	Enabling the temperature sensor	ON	Enabled
		OFF	Disabled
SW_THE.2	Enabling the humidity sensor	ON	Enabled
		OFF	Disabled
SW_THE.3	Reserved	—	—
SW_THE.4	Reserved	—	—

Table 4-27 SW_AE DIP switches

DIP Bit	Definition	ON/OFF	Function
SW_AE.1	Enabling analog channel 1	ON	Enabled

DIP Bit	Definition	ON/OFF	Function
		OFF	Disabled
SW_AE.2	Enabling analog channel 2	ON	Enabled
		OFF	Disabled
SW_AE.3	Enabling analog channel 3	ON	Enabled
		OFF	Disabled
SW_AE.4	Enabling analog channel 4	ON	Enabled
		OFF	Disabled

Table 4-28 SW_BKE DIP switches

DIP Bit	Definition	ON/OFF	Function
SW_BKE.1	Controlling the water sensor	ON	Enabled
		OFF	Disabled
SW_BKE.2	Controlling the smoke sensor	ON	Enabled (All the sensors used at preset should be set to ON.)
		OFF	Disabled
SW_BKE.3	Controlling the infrared sensor	ON	Enabled
		OFF	Disabled
SW_BKE.4	Controlling the door sensor	ON	Enabled
		OFF	Disabled

Table 4-29 SW12A/SW12B/SW24A/SW24B DIP switches

DIP Switch	Definition	ON/OFF	Function
SW12A	DIP bits 1 through 8 are used to set the alarm voltage of the Boolean value input sensors 1 through 8.	ON	High voltage alarm
		OFF	Low voltage alarm
SW12B	DIP bits 1 through 8 are used to set the alarm voltage of the Boolean value input sensors 9 through 16.	ON	High voltage alarm
		OFF	Low voltage alarm
SW24A	DIP bits 1 through 8 are used to set the alarm voltage of the	ON	High voltage alarm

DIP Switch	Definition	ON/OFF	Function
	Boolean value input sensors 17 through 24.	OFF	Low voltage alarm
SW24B	DIP bits 1 through 8 are used to set the alarm voltage of the Boolean value input sensors 25 through 32.	ON	High voltage alarm
		OFF	Low voltage alarm

Table 4-30 SW_AV DIP switches

DIP Bit	Definition	ON/OFF	Function
SW_AV-1	Analog input signal #1	ON	Current type
		OFF	Voltage type
SW_AV-2	Analog input signal #2	ON	Current type
		OFF	Voltage type
SW_AV-3	Analog input signal #3	ON	Current type
		OFF	Voltage type
SW_AV-4	Analog input signal #4	ON	Current type
		OFF	Voltage type

4.9.6 Specifications of the DEMU

The specifications of the DEMU include dimensions, working voltage, power consumption, and weight.

Table 4-31 describes the specifications of the DEMU.

Table 4-31 Specifications of the DEMU

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 280.0 mm x 233.3 mm x 2.0 mm
	Dimension of the front panel (length × width): 261.00 mm x 30.5 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption: 12 W

Item	Specification
Weight	0.6 kg

4.10 DELC

The E1 Signal Lightning-Protection Card for DTRU BTS (DELC) is configured in slot 0, 1, or 2 of the cabinet top subrack. These three slots are shared by the DELC and the DMLC. The DELC is a mandatory board. At least one DELC should be configured.

4.10.1 Functions of the DELC

One DELC provides lightning protection for four routes of E1 signals. Three DELCs (full configuration) provide lightning protection for twelve routes of E1 signals.

The DELC performs the following functions:

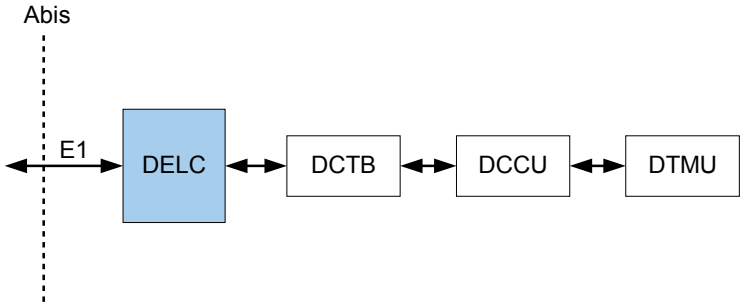
- Providing lighting protection for E1 signals
- Transmitting E1 signals to the DCCU, through which the signals are sent to the DTMU for processing

4.10.2 Working Environment of the DELC

The DELC sends E1 signals to the DCCU, through which the signals are sent to the DTMU for processing.

Figure 4-19 shows the working environment of the DELC.

Figure 4-19 Working environment of the DELC



The working environment of the DELC is as follows:

- The DELC transmits E1 signals to the DCCU through the DCTB.
- The DCCU transmits the signals to the DTMU for processing.

4.10.3 Ports on the DELC

There is one port on the DELC. It is used to transmit E1 signals.

Figure 4-20 shows the DELC panel.

Figure 4-20 DELC panel

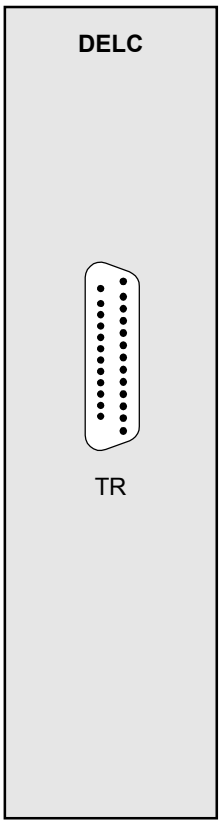


Table 4-32 describes the ports on the DELC.

Table 4-32 Ports on the DELC

Port	Type	Function
TR	DB25 female connector	Transmitting E1 signals

4.10.4 Specifications of the DELC

The specifications of the DELC include dimensions and weight.

Table 4-33 describes the specifications of the DELC.

Table 4-33 Specifications of the DELC

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 70.0 mm x 62.0 mm x 2.0 mm
	Dimension of the front panel (length × width): 216.6 mm x 25.4 mm
Weight	0.5 kg

4.11 DFCB

The DFCB refers to the Filter Combiner Unit for DTRU BTS (type B). It is located in the DAFU subrack of the RF front-end subsystem. The DFCB is optional. The BTS3012/BTS3012AE can be configured with the DDPU or the DFCU/DFCB.

4.11.1 Functions of the DFCB

The DFCB receives the UL signals from the antenna, divides the signals, and then sends the signals to the DTRU. The DFCB also receives DL signals from the DTRU, filters and amplifies the signals, and then sends the signals to the antenna. The DFCB must be cascaded with the DFCU.

The DFCB performs the following functions:

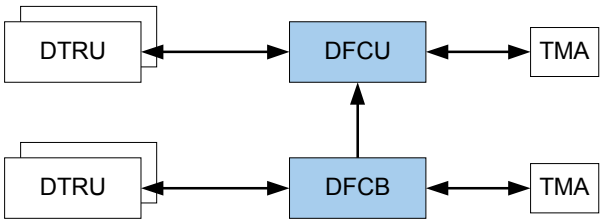
- Combining one route or two routes of RF TX signals from the DTRU transmitter and sending them to the antenna through the duplexer
- Sending the received signals from the antenna to the duplexer and to the low noise amplifier (The DFCU also controls the gain of the amplifier), dividing the signals into several routes, and sending them to the receivers of the DTRUs
- Detecting the VSWR alarms of the antenna system and providing the function of the VSWR alarms whose thresholds are adjustable

4.11.2 Working Environment of the DFCB

The DFCB receives multiple routes of RF TX signals from the transmitter of the DTRU, combines them, and then sends them to the antenna. The DFCB also receives the signals from the antenna, divides them, and then sends them to the receiver of the DRTU. One route of RF signals from the dual two-in-one combiner of the DFCB connects to the DFCU so that the DFCU can combine six routes of RF signals for transmission.

Figure 4-21 shows the working environment of the DFCB.

Figure 4-21 Working environment of the DFCB



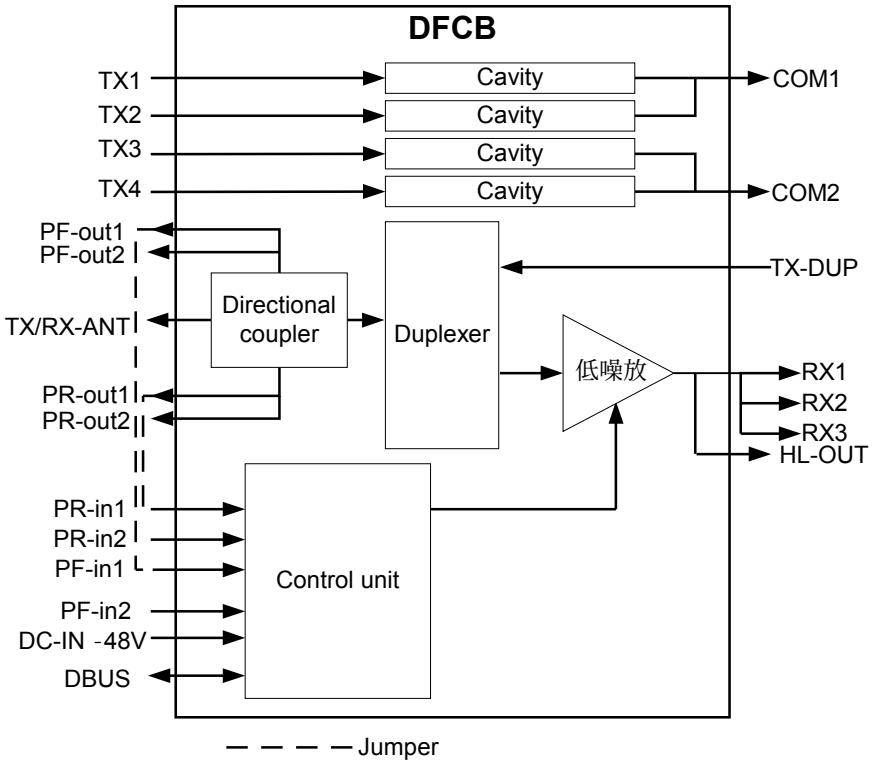
- The DFCB receives the UL signals from the antenna, filters and amplifies them, and then sends them to the DTRU for demodulation.
- The DFCB receives the DL signals from the DTRU, filters them, and then sends them to the antenna for transmission.
- The DFCB combines two routes of RF signals and sends them to the TX-COM port on the DFCU so that the DFCU can combine six routes of RF signals for transmission.

4.11.3 Working Principles of the DFCB

The DFCB has the following components: four cavity combiners, duplexer, LNA, control unit, directional coupler, and so on.

Figure 4-22 shows the functional structure of the DFCB.

Figure 4-22 Functional structure of the DFCB



Duplexer

The duplexer consists of a RX filter and a TX filter. The duplexer provides a reliable channel for both RX signals and TX signals sharing one antenna, ensuring that the strong TX signals will not affect weak RX signals.

Cavity Combiner

It provides dual two-in-one mechanism to be cascaded with the DFCU.

LNA

The LNA amplifies RX signals sent from the antenna. You can run the commands on the BTS to control the gain of the LNA. The LNA features self-detection through which an alarm is reported when a fault occurs.

Control Unit

The control unit controls the combiner, detects the VSWR alarm, sets the LNA gain, detects the LNA alarm, and sets up the communication between the DFCU and the BTS.

Directional Coupler

The directional coupler features VSWR detection. The VSWR testing circuit checks the forward/reverse DL power through the standing-wave detector. The output voltage from the standing-wave detector are processed and calculated. If the VSWR exceeds a specified threshold, the VSWR alarm is reported.

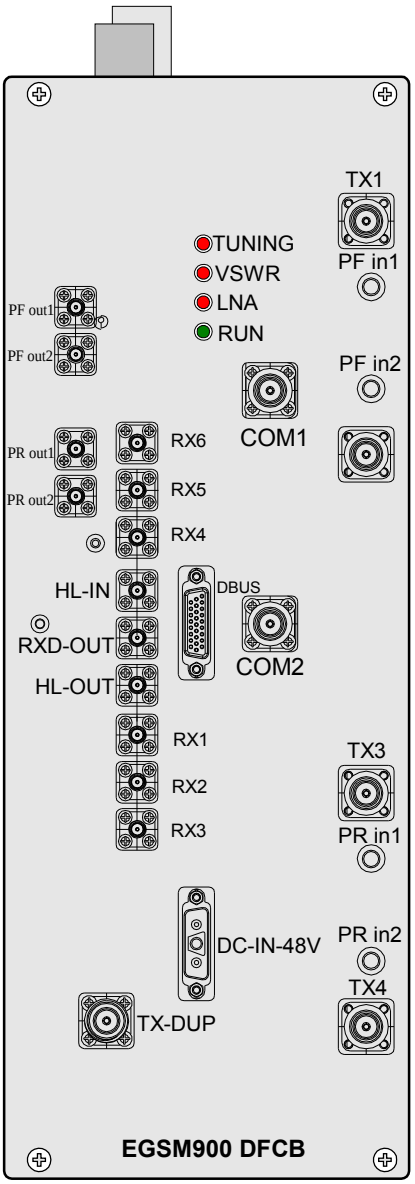
4.11.4 Indicators and Ports on the DFCB

The four indicators on the DFCU indicate the working status of the DFCB. The DFCB also provides 29 ports that include 4 DTRU signal input ports, 3 main output ports, 3 diversity output ports, 2 reverse power sampling output ports, 2 reverse power sampling input ports, 2 forward power sampling input ports, 2 forward power sampling output ports, 2 high level input/out ports, 2 extended combining ports, 2 antenna ports, and so on.

Panel

Figure 4-23 shows the DFCB panel.

Figure 4-23 DFCB panel



Indicators

Table 4-34 describes the indicators on the DFCB panel.

Table 4-34 Indicators on the DFCB panel

Indicator	Color	Description	Status	Meaning
RUN	Green	Power indicator	On	With power input
			Off	Without power input
VSWR	Red	VSWR alarm indicator of TX/RX_ANT	On	Level 2 VSWR alarm
			Slow flash (on for 1s and off for 1s)	Level 1 VSWR alarm
			Off	No VSWR alarm
LNA	Red	LNA alarm indicator	On	LNA_ alarm
			Off	No alarm
TUNING	Red	Tuning fail alarm indicator	On	Tuning fail alarm
			Slow flash (on for 1s and off for 1s)	Tuning
			Off	No alarm

Ports

Table 4-35 describes the ports on the DFCB panel.

Table 4-35 Ports on the DFCB panel

Port	Type	Function
TX/RX-ANT	7/16 DIN female connector	Antenna port for reception and transmission
RXD-ANT	7/16 DIN female connector	Diversity receive antenna port
DBUS	DB26 female connector	DBUS signal input and output port
DC-IN –48 V	3V3 power connector	DC power input port
COM1	N female connector	Combining output port 1
TX-DUP	N female connector	Duplexer input port
COM2	N female connector	Combining output port 2
TX1	N female connector	DTRU signal input port 1
TX2	N female connector	DTRU signal input port 2
TX3	N female connector	DTRU signal input port 3

Port	Type	Function
TX4	N female connector	DTRU signal input port 4
RX1	SMA female connector	Main DTRU signal output port 1
RX2	SMA female connector	Main DTRU signal output port 2
RX3	SMA female connector	Main DTRU signal output port 3
RX4	SMA female connector	Diversity DTRU signal output port 1
RX5	SMA female connector	Diversity DTRU signal output port 2
RX6	SMA female connector	Diversity DTRU signal output port 3
HL-OUT	SMA female connector	High level output port
HL-IN	SMA female connector	High level input port
RXD-ANT	SMA female connector	Diversity receive output port
PR out1	SMA female connector	Reverse power sampling output port 1
PR out2	SMA female connector	Reverse power sampling output port 2
PF out1	SMA female connector	Forward power sampling output port 1
PF out2	SMA female connector	Forward power sampling output port 2
PR in1	SMA female connector	Reverse power sampling input port 1
PR in2	SMA female connector	Reverse power sampling input port 2
PF in1	SMA female connector	Forward power sampling input port 1
PF in2	SMA female connector	Forward power sampling input port 2

4.11.5 Specifications of the DFCB

The specifications of the DFCB include dimensions, working voltage, power consumption, and weight.

Table 4-36 describes the specifications of the DFCB.

Table 4-36 Specifications of the DFCB

Item	Specification
Dimension	Dimension of the front panel (length x width): 396 mm x 142 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption: 50 W
Weight	20 kg

4.12 DFCU

The DFCU refers to the Filter Combiner Unit for DTRU BTS. It is located in the DAFU subrack of the RF front-end subsystem. The DFCU is optional. The BTS3012/BTS3012AE can be configured with the DDPU or the DFCU.

4.12.1 Functions of the DFCU

The DFCU receives the UL signals from the antenna, divides the signals, and then sends the signals to the DTRU. The DFCU also receives DL signals from the DTRU, filters and amplifies the signals, and then sends the signals to the antenna. The DFCU features four-in-one signal combination. The DFCU also supports six-in-one signal combination once connected with the DFCB.

The DFCU performs the following functions:

- Sending multiple routes of RF TX signals from the DTRU transmitter to the antenna through the duplexer after combination
- Sending the received signals from the antenna to the duplexer and to the low noise amplifier (The DFCU also controls the gain of the amplifier), dividing the signals into several routes, and sending them to the receivers of the DTRUs
- Providing four-in-one signal combination or six-in-one signal combination once connected with the DFCB
- Detecting the frequencies of the input signals and performing automatic tuning

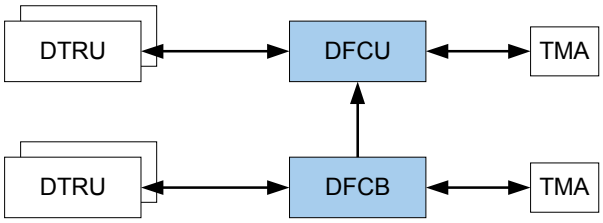
- Detecting the VSWR alarms of the antenna system and providing the function of the VSWR alarms whose thresholds are adjustable

4.12.2 Working Environment of the DFCU

The DFCU receives multiple routes of RF signals from the transmitter of the DTRU and then sends them to the antenna. The DFCU also receives the signals from the antenna, amplifies them, divides them into four routes, and then sends them to the receiver of the DRTU.

Figure 4-24 shows the working environment of the DFCU.

Figure 4-24 Working environment of the DFCU



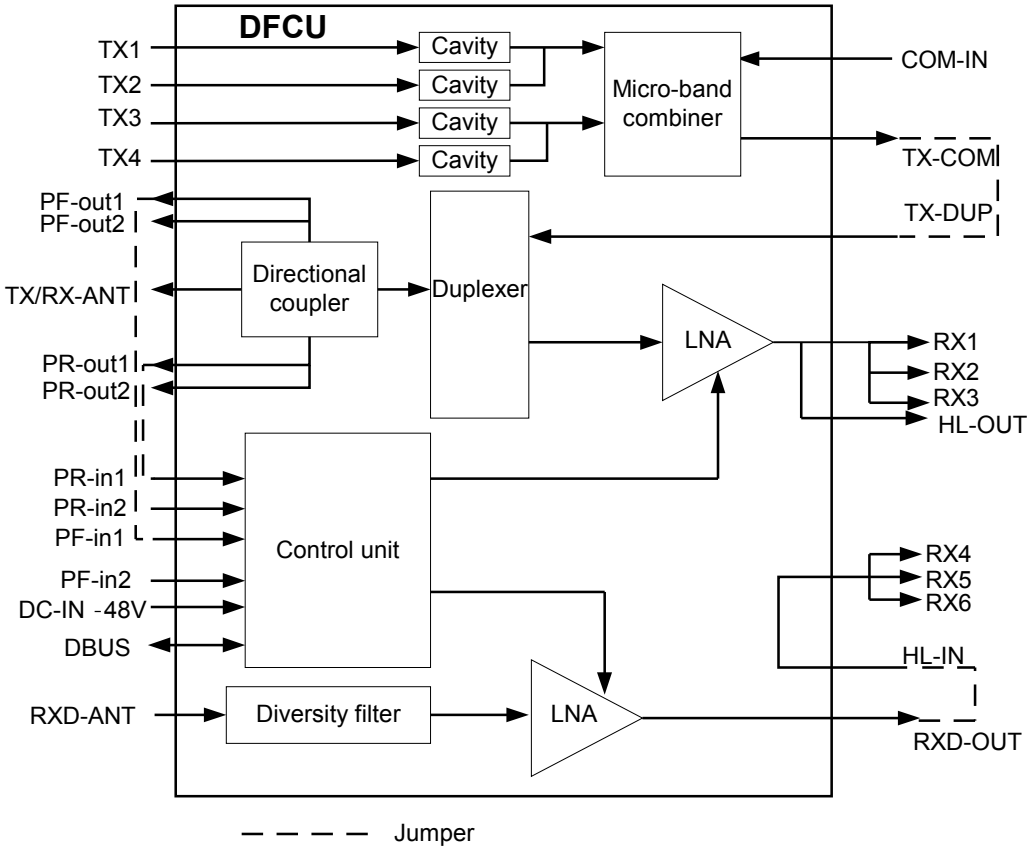
- The DFCU receives the UL signals from the antenna, filters and amplifies them, and then sends them to the DTRU for demodulation.
- The DFCU receives the DL signals from the DTRU, filters them, and then sends them to the antenna for transmission.
- The DFCU receives the combined signals from the DFCB, filters them, and then sends them to the antenna for transmission.

4.12.3 Working Principles of the DFCB

The DFCU has the following components: cavity combiner, micro-band combiner, duplexer, diversity filter, lower noise amplifier (LNA), control unit, and directional coupler.

Figure 4-25 shows the functional structure of the DFCU.

Figure 4-25 Functional structure of the DFCU



Duplexer

The duplexer consists of a RX filter and a TX filter. The duplexer provides a reliable channel for both RX signals and TX signals sharing one antenna, ensuring that the strong TX signals will not affect weak RX signals.

Cavity Combiner

Combining four routes of signals into two routes

Micro-Band Combiner

Combining two routes of signals from the cavity combiner into one route

LNA

The LNA amplifies RX signals sent from the antenna. You can run the commands on the BTS to control the gain of the LNA. The LNA features self-detection through which an alarm is reported when a fault occurs.

Diversity Filter

The diversity filter filters the signals from the diversity ports.

Control Unit

The control unit controls the combiner, detects the VSWR alarm, sets the LNA gain, detects the LNA alarm, and sets up the communication between the DFCU and the BTS.

Directional Coupler

The directional coupler features VSWR detection. The VSWR testing circuit checks the forward/reverse DL power through the standing-wave detector. The output voltage from the standing-wave detector are processed and calculated. If the VSWR exceeds a specified threshold, the VSWR alarm is reported.

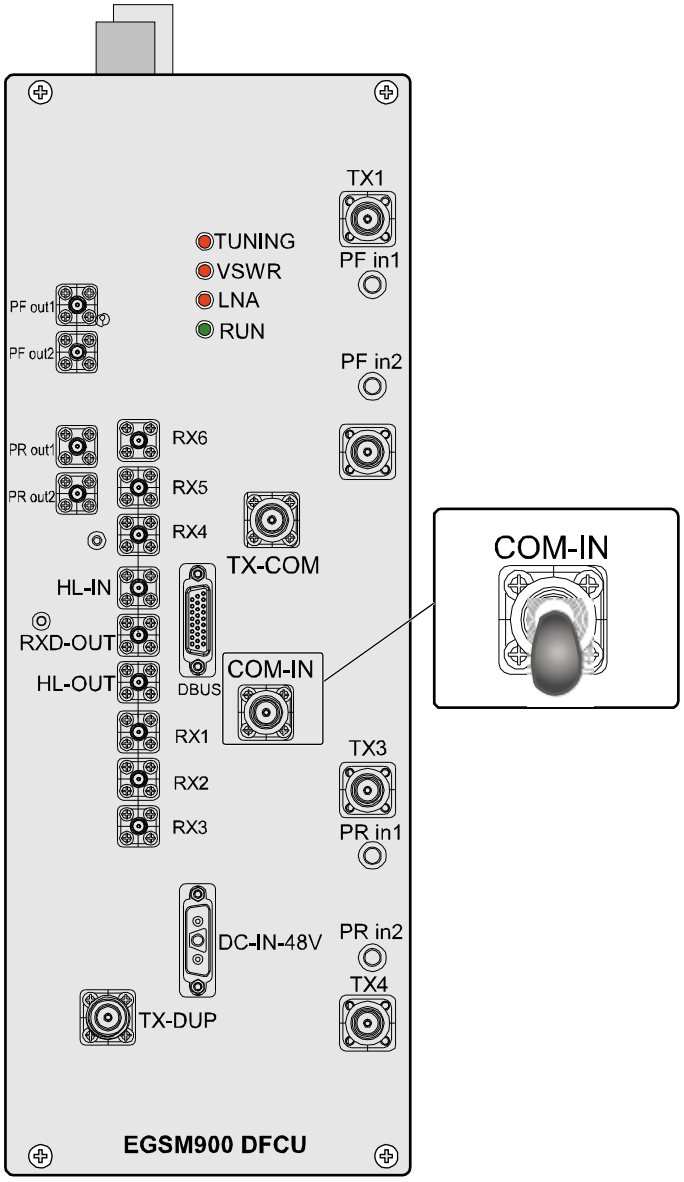
4.12.4 Indicators and Ports on the DFCU

The four indicators on the DFCU indicate the working status of the DFCU. The DFCU also provides 29 ports that include 4 DTRU signal input ports, 3 main output ports, 3 diversity output ports, 2 reverse power sampling output ports, 2 reverse power sampling input ports, 2 forward power sampling input ports, 2 forward power sampling output ports, 2 high level input/out ports, 2 extended combining ports, 2 antenna ports, and so on.

Panel

Figure 4-26 shows the DFCU panel.

Figure 4-26 DFCU panel



Indicators

Table 4-37 describes the indicators on the DFCU panel.

Table 4-37 Indicators on the DFCU panel

Indicator	Color	Description	Status	Meaning
RUN	Green	Power indicator	On	With power input
			Off	Without power input
VSWR	Red	VSWR alarm indicator of TX/RX_ANT	On	Level 2 VSWR alarm

Indicator	Color	Description	Status	Meaning
			Slow flash (on for 1s and off for 1s)	Level 1 VSWR alarm
			Off	No VSWR alarm
LNA	Red	LNA alarm indicator	On	LNA_ alarm
			Off	No alarm
TUNING	Red	Tuning fail alarm indicator	On	Tuning fail alarm
			Slow flash (on for 1s and off for 1s)	Tuning
			Off	No alarm

Ports

Table 4-38 describes the ports on the DFCU panel.

Table 4-38 Ports on the DFCU panel

Port	Type	Function
TX/RX-ANT	7/16 DIN female connector	Antenna port for reception and transmission
RXD-ANT	7/16 DIN female connector	Diversity receive antenna port
DBUS	DB26 female connector	DBUS signal input and output port
DC-IN –48 V	3V3 power connector	DC power input port
TX-COM	N female connector	Combining output port
TX-DUP	N female connector	Duplexer input port
COM-IN	N female connector	Extended combining port 2
TX1	N female connector	DTRU signal input port 1
TX2	N female connector	DTRU signal input port 2
TX3	N female connector	DTRU signal input port 3
TX4	N female connector	DTRU signal input port 4
RX1	SMA female connector	Main DTRU signal output port 1
RX2	SMA female connector	Main DTRU signal output port 2
RX3	SMA female connector	Main DTRU signal output port 3
RX4	SMA female connector	Diversity DTRU signal output port 1

Port	Type	Function
RX5	SMA female connector	Diversity DTRU signal output port 2
RX6	SMA female connector	Diversity DTRU signal output port 3
HL-OUT	SMA female connector	High level output port
HL-IN	SMA female connector	High level input port
RXD-ANT	SMA female connector	Diversity receive output port
PR out1	SMA female connector	Reverse power sampling output port 1
PR out2	SMA female connector	Reverse power sampling output port 2
PF out1	SMA female connector	Forward power sampling output port 1
PF out2	SMA female connector	Forward power sampling output port 2
PR in1	SMA female connector	Reverse power sampling input port 1
PR in2	SMA female connector	Reverse power sampling input port 2
PF in1	SMA female connector	Forward power sampling input port 1
PF in2	SMA female connector	Forward power sampling input port 2

NOTE

The circuit connected to the COM-IN port is an open circuit. When the DFCU is used independently, the open circuit connects with the RF signal cable between PR in1 and PR out1 ports. These two ports are connected by default before delivery.

4.12.5 Specifications of the DFCU

The specifications of the DFCU include dimensions, working voltage, power consumption, and weight.

Table 4-39 describes the specifications of the DFCU.

Table 4-39 Specifications of the DFCU

Item	Specification
Dimension	Dimension of the front panel (length x width): 396 mm x 142 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption: 50 W
Weight	20 kg

4.13 DMLC

The Monitor Signal Lightning-Protection Card for DTRU BTS (DMLC) is configured in slot 0, 1, or 2 of the cabinet top subrack. The DMLC is an optional board. Only one DCSU can be configured.

4.13.1 Functions of the DMLC

The DMLC is the external interface for the DEMU. The DMLC provides lightning protection for the monitor signals associated with Boolean value and analog value.

The DMLC performs the following functions:

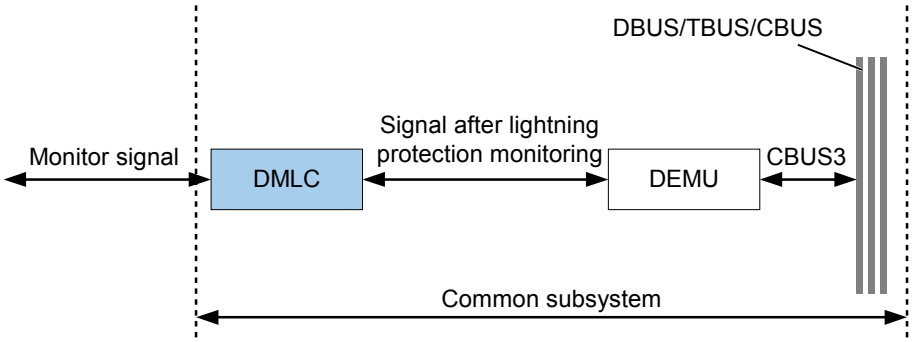
- Providing lightning protection for monitor signals of Boolean value inputs or outputs
- Providing lightning protection for monitor signals of analog value inputs from the smoke, water, door, infrared, humidity, and temperature sensors

4.13.2 Working Environment of the DMLC

The DMLC receives the monitor signals for the Boolean value and analog value. After the DMLC applies lightning protection treatment to the monitor signals, these signals are sent to the DEMU. The DMLC also receives the monitor signals for the Boolean value from the DEMU. After the DMLC applies lightning protection treatment to the monitor signals, these signals are sent to the external equipment.

Figure 4-27 shows the working environment of the DMLC.

Figure 4-27 Working environment of the DMLC



The DMLC receives from the external equipment one route of the monitor signals for the Boolean value and analog value. After the DMLC applies lightning protection treatment to the monitor signals, these signals are sent to the DEMU.

The DMLC receives from the DEMU another route of the monitor signals for the Boolean value from the DEMU. After the DMLC applies lightning protection treatment to the monitor signals, these signals are sent to the external equipment.

4.13.3 Ports on the DMLC

There are three ports on the DMLC. SWIN is used for 32 Boolean value inputs. SWOUT is used for 6 Boolean value outputs. AIN is used for 4 analog value inputs and the lightning protection inputs from the smoke, water, door, infrared, temperature, and humidity sensors.

Figure 4-28 shows the DMLC panel.

Figure 4-28 DMLC panel

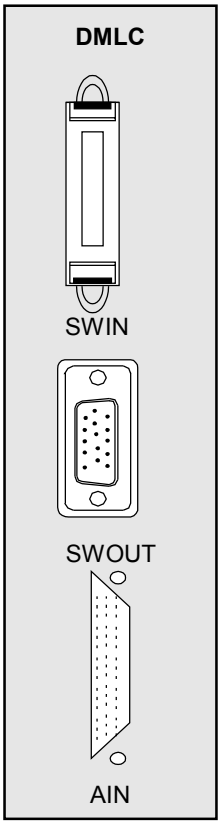


Table 4-40 describes the ports on the DMLC panel.

Table 4-40 Ports on the DMLC panel

Silk-Screen	Type	Function
SWIN	MD68 female connector	Providing 32 Boolean value inputs
SWOUT	DB15 female connector	Providing six Boolean value outputs
AIN	DB44 female connector	Providing four analog value inputs and the lightning protection inputs from the smoke, water, door, infrared, temperature, and humidity sensors

4.13.4 Specifications of the DMLC

The specifications of the DMLC include dimensions and weight.

Table 4-41 describes the specifications of the DMLC.

Table 4-41 Specifications of the DMLC

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 70.0 mm x 62.0 mm x 2.0 mm
	Dimension of the front panel (length x width): 216.6 mm x 25.4 mm
Weight	0.5 kg

4.14 DSAC

The Signal Access Card for DTRU BTS (DSAC) is placed in slot 3 of the cabinet top subrack. The DATU is a mandatory board. Only one DSAC can be configured.

4.14.1 Functions of the DSAC

The DSAC provides ports for Boolean value alarms, failure alarm for the lightning protection arrester of power supply, BITS clock signal inputs, and CBUS3 signal outputs.

The DSAC performs the following functions:

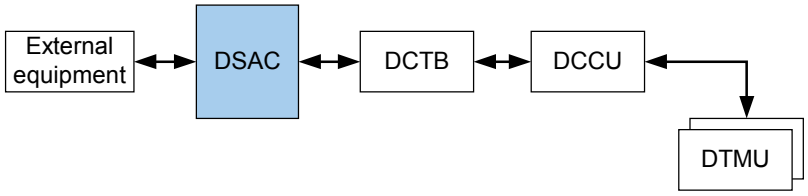
- Providing six Boolean value alarm inputs
- Providing two CBUS3 signal outputs
- Providing two lightning protection arrester failure alarm inputs of the power supply
- Providing lightning protection for BITS clock signals

4.14.2 Working Environment of the DSAC

The DSAC sends the Boolean value inputs, lightning protection arrester failure alarm inputs of the power supply, and BITS clock signal inputs to the DCTB. It also sends the CBUS3 signals to the external equipment.

Figure 4-29 shows the working environment of the DSAC.

Figure 4-29 Working environment of the DSAC



The DSAC receives one route of Boolean value monitor signals from the external equipment, lightning protection arrester failure alarm inputs of the power supply, and BITS clock signals and then sends them to the DTMU after lightning protection treatment.

The DSAC sends another route of CBUS3 signals to the external equipment.

4.14.3 Ports on the DSAC

There are six ports on the DSAC. COM1 and COM2 are extension ports for the CBUS3. S1+S1 and S2+S2 are used for the lightning protection arrester failure alarm inputs of the power supply. EAC is used for six Boolean value inputs. SYNC is used for the lightning protection inputs of BITS clock signals.

Figure 4-30 shows the DSAC panel.

Figure 4-30 DSAC panel

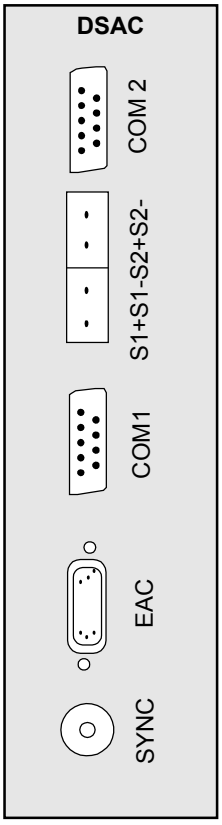


Table 4-42 describes the ports on the DSAC.

Table 4-42 Ports on the DSAC panel

Port	Type	Function
COM2	DB9 female connector	Extension port 2 for CBUS3
S2+S2-	Phoenix socket	Input 2 for lightning protection arrester failure alarm
S1+S1-	Phoenix socket	Input 1 for lightning protection arrester failure alarm
COM1	DB9 female connector	Extension port 1 for CBUS3
EAC	DB26 female connector	Providing six Boolean value inputs
SYNC	SMA female connector	Providing lightning protection for BITS clock inputs

4.14.4 Specifications of the DSAC

The specifications of the DSAC include dimensions and weight.

Table 4-43 describes the specifications of the DSAC.

Table 4-43 Specifications of the DSAC

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 70.0 mm x 125.0 mm x 2.0 mm
	Dimension of the front panel (length x width): 216.6 mm x 25.4 mm
Weight	0.5 kg

4.15 DTMU

The Transmission/Timing/Management Unit for DTRU BTS (DTMU) is an entity for basic transmission and control in the BTS3012. It works as a main controller. The DTMU is a mandatory module installed in slots 1 and 2 of the common subrack.

4.15.1 Functions of the DTMU

The DTMU controls and manages the entire BTS. It not only provides the ports for accessing reference clock, power supply, and maintenance utility but also provides the ports for collecting external alarms.

4.15.2 Working Environment of the DTMU

The DTMU works in the common subsystem of the BTS. It processes the data signals from the DELC or the optical transmission equipment and sends the data signals, clock signals, and control signals to the entire BTS through the system buses.

4.15.3 Working Principles of the DTMU

The DTMU consists of the BIU, MCU, and MCK.

4.15.4 Indictors and Ports on the DTMU

The nine indicators on the DTMU panel indicate the working status of other functional subsystems. The four ports provide clock access and terminal maintenance access.

4.15.5 DIP Switches on the DTMU
There are five DIP switches on the DTMU. Four switches, namely, S4, S5, S6, and S7, specify the grounding for eight E1 routes. The other switch, S3, is reserved.

4.15.6 Specifications of the DTMU
The specifications of the DTMU include dimensions, working voltage, power consumption, and weight.

4.15.1 Functions of the DTMU

The DTMU controls and manages the entire BTS. It not only provides the ports for accessing reference clock, power supply, and maintenance utility but also provides the ports for collecting external alarms.

The DTMU performs the following functions:

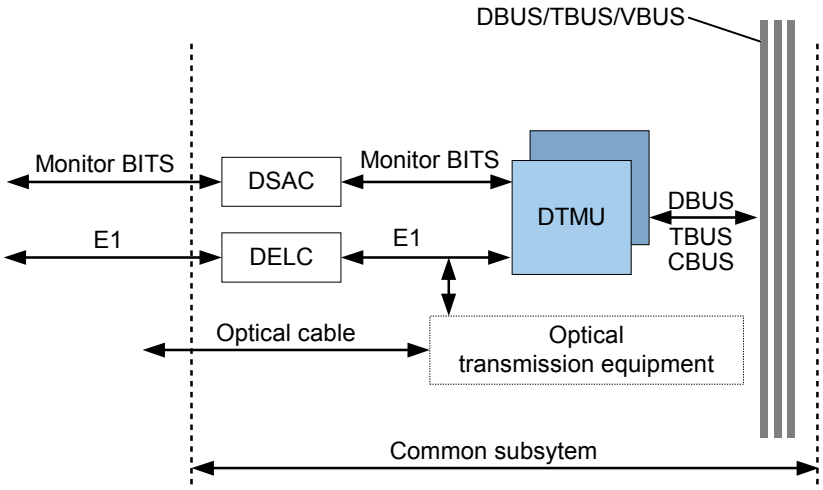
- Providing external GPS inputs
- Providing BITS synchronized clock inputs
- Providing backup between the active and standby boards
- Providing a 10 Mbit/s network port for terminal maintenance
- Supporting four routes of E1 inputs or eight routes of E1 inputs if required
- Controlling, maintaining, and operating the BTS
- Downloading the BTS software
- Providing fault management, configuration management, performance management, and security management
- Managing the clock access and providing hot backup for the clock units
- Providing backup for the E1 ports and the main control unit
- Supporting eight routes of digital alarm inputs, two of them being lightning arrester failure alarm inputs
- Supporting four routes of extended digital control signal outputs
- Monitoring the external fan control board and the power modules

4.15.2 Working Environment of the DTMU

The DTMU works in the common subsystem of the BTS. It processes the data signals from the DELC or the optical transmission equipment and sends the data signals, clock signals, and control signals to the entire BTS through the system buses.

Figure 4-31 shows the working environment of the DTMU.

Figure 4-31 Working environment of the DTMU



NOTE

The configuration of the DELC in **Figure 4-31** shows that this is a BTS3012 cabinet. The BTS3012AE uses the DELU instead of the DELC.

The working environment of the DTMU is as follows:

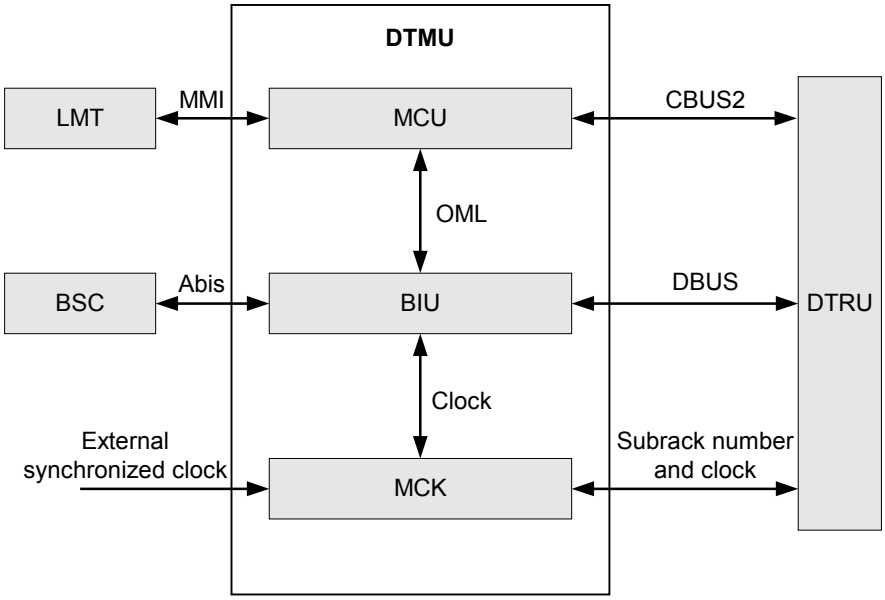
- The DTMU processes the data signals from the DELC or the optical transmission equipment and sends the signals to the DCSU through the data bus.
- The DTMU provides the entire with clock signals and control signals through the system buses.
- The DTMU processes the lightning protection failure signals reported by the DSAC. These signals are associated with power supply and BITS clock access.

4.15.3 Working Principles of the DTMU

The DTMU consists of the BIU, MCU, and MCK.

Figure 4-32 shows the working principles of the DTMU.

Figure 4-32 Working principles of the DTMU



BIU

- Connecting the BTS with the BSC
- Providing four or eight routes of E1 backup between the active and the standby DTMUs
- Exchanging timeslot data between the E1 links and the DBUS
- Synchronzing the lower-level clock with the upper-level clock

MCU

- Supporting multiple communication protocols such as UART and HDLC
- Controlling the BIU to enable the communications between the BSC and the BTS
- Providing a platform for the MCK software

MCK

- Providing high-precision clock reference and system clock for the BTS
- Judging the status of the phase-lock, providing software phase-lock and DA adjustment, and generating the frame numbers
- Transmitting clock signals and synchronization signals between the active and the standby DTMUs

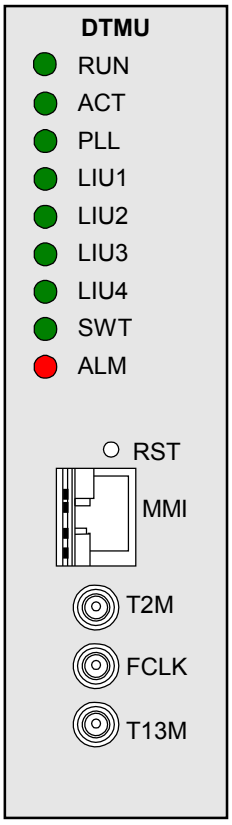
4.15.4 Indictors and Ports on the DTMU

The nine indicators on the DTMU panel indicate the working status of other functional subsystems. The four ports provide clock access and terminal maintenance access.

Panel

Figure 4-33 shows the DTMU panel.

Figure 4-33 DTMU panel



Indicators

Table 4-44 describes the indicators on the DTMU.

Table 4-44 Indictors on the DTMU

Indicator	Color	Description	Status	Meaning
RUN	Green	Indicating the running status of the board	Slow flash (on for 2s and off for 2s)	The OML is blocked.
			Slow flash (on for 1s and off for 1s)	Normal
			Fast flash at irregular intervals	BSC data loading
			Off	Power failure of the board
ACT	Green	Indicating whether the board is active or standby	Off	Standby board
			On	Active board
PLL	Green	Indicating the clock status	Off	Abnormal clock
			On	Free-run

Indicator	Color	Description	Status	Meaning
			Fast flash (0n for 0.125s and off for 0.125s)	Pull-in
			Fast flash (on for 0.5s and off for 0.5s)	Locked
LIU1	Green	Indicating the transmission status of E1 port 1 and port 5	Off	E1 port 1 is normal when SWT is off.
				E1 port 5 is normal when SWT is on.
			On	E1 port 1 near end alarm occurs when SWT is off.
				E1 port 5 near end alarm occurs when SWT is on.
			Fast flash (on for 0.125s and off for 0.125s)	E1 port 1 remote end alarm occurs when SWT is off.
				E1 port 5 remote end alarm occurs when SWT is on.
LIU2	Green	Indicates the transmission status of E1 port 2 and port 6	Off	E1 port 2 is normal when SWT is off.
				E1 port 6 is normal when SWT is on.
			On	E1 port 2 near end alarm occurs when SWT is off.
				E1 port 6 near end alarm occurs when SWT is on.
			Fast flash (On for 0.125s and off for 0.125s)	E1 port 2 remote end alarm occurs when SWT is off.
				E1 port 6 remote end alarm occurs when SWT is on.
LIU3	Green	Indicating the transmission status	Off	E1 port 3 is normal when SWT is off.

Indicator	Color	Description	Status	Meaning
		of E1 port 3 and port 7		E1 port 7 is normal when SWT is on.
			On	E1 port 3 near end alarm occurs when SWT is off.
				E1 port 7 near end alarm occurs when SWT is on.
			Fast flash (on for 0.125s and off for 0.125s)	E1 port 3 remote end alarm occurs when SWT is off.
				E1 port 7 remote end alarm occurs when SWT is on.
LIU4	Green	Indicating the transmission status of E1 port 4 and port 8	Off	E1 port 4 is normal when SWT is off.
				E1 port 8 is normal when SWT is on.
			On	E1 port 4 near end alarm occurs when SWT is off.
				E1 port 8 near end alarm occurs when SWT is on.
			Fast flash (on for 0.125s and off for 0.125s)	E1 port 4 remote end alarm occurs when SWT is off.
				E1 port 8 remote end alarm occurs when SWT is on.
SWT	Green	Indicating the transmission status of E1 links	When the DTMU supports eight E1 routes, the SWT status is slow flash (on for 10s and off for 10s).	When the SWT is off, LIU1 to LIU4 indicate the transmission status of E1 port 1 to 4.
				When the SWT is on, LIU1 to LIU4 indicate the transmission status of E1 port 5 to 8.

Indicator	Color	Description	Status	Meaning
			When the DTMU supports four E1 routes, the SWT indicator is always off.	LIU1 to LIU4 indicate the transmission status of E1 port 1 to 4.
ALM	Red	Alarm indicator	Off	No board alarm
			On	An alarm is generated.

NOTE

When eight E1 routes are available in the DTMU and only the first E1 route is used and functions, the description of the indicators is as follows: When SWT is off, LIU1 is off and LIU2 to LIU4 are on; when SWT is on, LIU1 to LIU4 are on. If you only view LIU1, you will find that LIU1 is on for 10s then off for 10s.

Ports

Table 4-45 describes the ports on the DTMU.

Table 4-45 Ports on the DTMU

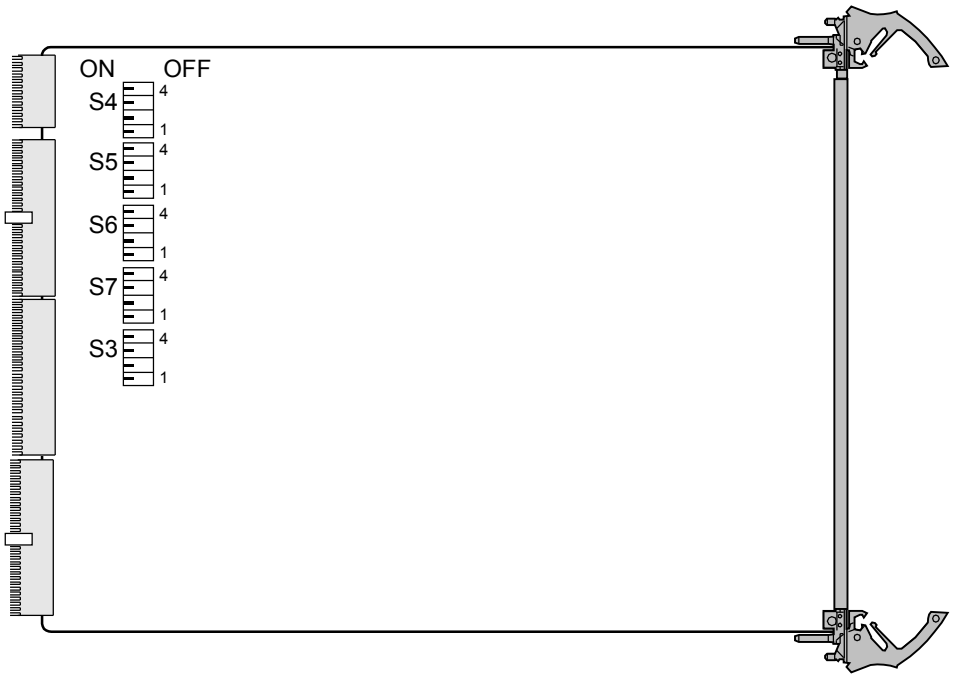
Ports	Type	Function
T2M	SMB female connector	Outputting reference testing clock
FCLK	SMB female connector	216.7 Hz frame clock
T13M	SMB female connector	13 MHz primary reference clock
MMI	RJ45	Terminal maintenance port

4.15.5 DIP Switches on the DTMU

There are five DIP switches on the DTMU. Four switches, namely, S4, S5, S6, and S7, specify the grounding for eight E1 routes. The other switch, S3, is reserved.

Figure 4-34 shows the layout of the DIP switches on the DTMU and their initial settings.

Figure 4-34 Layout of the DIP switches on the DTMU



The DIP switches on the DTMU specify the grounding of eight E1 routes. **Table 4-46** describes the settings in detail.

Table 4-46 Settings of DIP switches on the DTMU

DIP Switch	DIP Bit	ON/OFF	Function
S5	1	ON	Ring of the first TX E1 route is grounded.
		OFF	Ring of the first TX E1 route is not grounded.
	2	ON	Ring of the first RX E1 route is grounded.
		OFF	Ring of the first RX E1 route is not grounded.
	3	ON	Ring of the second TX E1 route is grounded.
		OFF	Ring of the second TX E1 route is not grounded.
	4	ON	Ring of the second RX E1 route is grounded.
		OFF	Ring of the second RX E1 route is not grounded.
S4	1	ON	Ring of the third TX E1 route is grounded.
		OFF	Ring of the third TX E1 route is not grounded.
	2	ON	Ring of the third RX E1 route is grounded.

DIP Switch	DIP Bit	ON/OFF	Function
		OFF	Ring of the third RX E1 route is not grounded.
	3	ON	Ring of the fourth TX E1 route is grounded.
		OFF	Ring of the fourth TX E1 route is not grounded.
	4	ON	Ring of the fourth RX E1 route is grounded.
		OFF	Ring of the fourth RX E1 route is not grounded.
S7	1	ON	Ring of the fifth TX E1 route is grounded.
		OFF	Ring of the fifth TX E1 route is not grounded.
	2	ON	Ring of the fifth RX E1 route is grounded.
		OFF	Ring of the fifth RX E1 route is not grounded.
	3	ON	Ring of the sixth TX E1 route is grounded.
		OFF	Ring of the sixth TX E1 route is not grounded.
	4	ON	Ring of the sixth RX E1 route is grounded.
		OFF	Ring of the sixth RX E1 route is not grounded.
S6	1	ON	Ring of the seventh TX E1 route is grounded.
		OFF	Ring of the seventh TX E1 route is not grounded.
	2	ON	Ring of the seventh RX E1 route is grounded.
		OFF	Ring of the seventh RX E1 route is not grounded.
	3	ON	Ring of the eighth TX E1 route is grounded.
		OFF	Ring of the eighth TX E1 route is not grounded.
	4	ON	Ring of the eighth RX E1 route is grounded.
		OFF	Ring of the eighth RX E1 route is not grounded.

NOTE

Adhere to the following principles to set the DIP switches on the DTMU:

- Set all the DIP switches to ON when the 75-ohm E1 transmission is used for the BTS.
- Set all the DIP switches to OFF when the 120-ohm E1 transmission is used for the BTS.

4.15.6 Specifications of the DTMU

The specifications of the DTMU include dimensions, working voltage, power consumption, and weight.

Table 4-47 describes the specifications of the DTMU.

Table 4-47 Specifications of the DTRB

Item	Specification
Dimension	Dimension of the PCB (length × width × height): 280.0 mm × 233.4 mm × 2.0 mm
	Dimension of the front panel (length × width): 261.0 mm × 30.5 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption: 27 W
Weight	1.2 kg

4.16 DTRB

The Double-Transceiver Unit Backplane (DTRB) is placed in the DTRU subrack. The DTRB provides six slots to house the DTRUs.

4.16.1 Functions of the DTRB

The DTRB connects the DCSU with the DTRU. All the in-position signals of the DTRUs are sent to the DCSU through the DTRB.

The DTRB performs the following functions:

- Providing bus connection between the common subsystem and the double-transceiver subsystem in the BTS

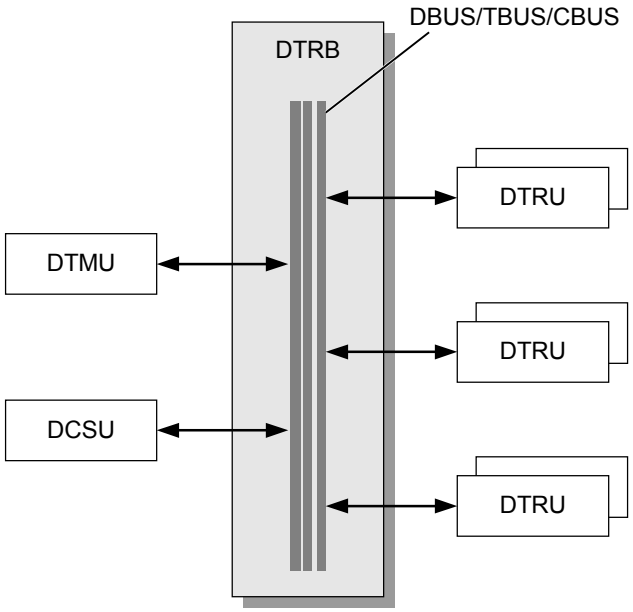
- Specifying the slot number and rack number of the DTRU
- Transmitting the in-position signals of the DTRUs to the DCSU

4.16.2 Working Principles of the DTRB

The DTRB uses the bus structure to implement the signal exchange between the DTRU and the common subsystem of the BTS. The DTRB provides clock bus, control bus, and data bus.

Figure 4-35 shows the working principles of the DTRB.

Figure 4-35 Working principles of the DTRB



The signal transfer principles of the DTRB are as follows:

- The DTRU connects to the DTMU through the DCSU by using the PCB cabling on the DTRB.
- The slot number and the rack number of the DTRU are determined by the DTRB. All the in-position signals are transmitted to the DCSU through the DTRB.
- The clock signals of the BTS system are sent from the DTMU and then go through the DCSU, DTRB, and the DTRUs.
- The uplink and downlink control bus and data bus of the DTRU connect to the DCSU through the DTRB.

4.16.3 Specifications of the DTRB

The specifications of the DTRB include its dimension.

Table 4-48 describes the specifications of the DTRB.

Table 4-48 Specifications of the DTRB

Item	Specification
Dimension	Dimension of the PCB (length x width x height): 426.0 mm x 178.0 mm x 3.0 mm
	Dimension of the front panel: The DTRB is a backplane and has no front panel.

4.17 DTRU

The Double-Transceiver Unit (DTRU) is placed in the double-transceiver subsystem of the BTS. One DTRU consists of two TRXs.

4.17.1 Functions of the DTRU

The DTRU performs the following functions: processing baseband signals, transmitting RF signals, and receiving RF signals.

Baseband Processing Part

The baseband processing part performs the following operations:

- Processing the signaling, such as coding, decoding, interleaving, de-interleaving, modulation, and demodulation
- Supporting RF loop test and switchover of the faulty phase-lock loop
- Amplifying the output power

RF Transmit Part

The RF transmit part performs the following functions:

- Modulating baseband signals into RF signals and providing RF frequency hopping
- Dividing received RF signals and performing receive diversity

The RF transmit modes are as follows:

- Transmit independency
- PBT
- Wideband combination
- Transmit diversity

RF Receive Part

The RF receive part performs the following operations:

- Demodulating RF signals and performing frequency hopping of the RF signals
- Dividing received RF signals and performing receive diversity

The RF receive modes are as follows:

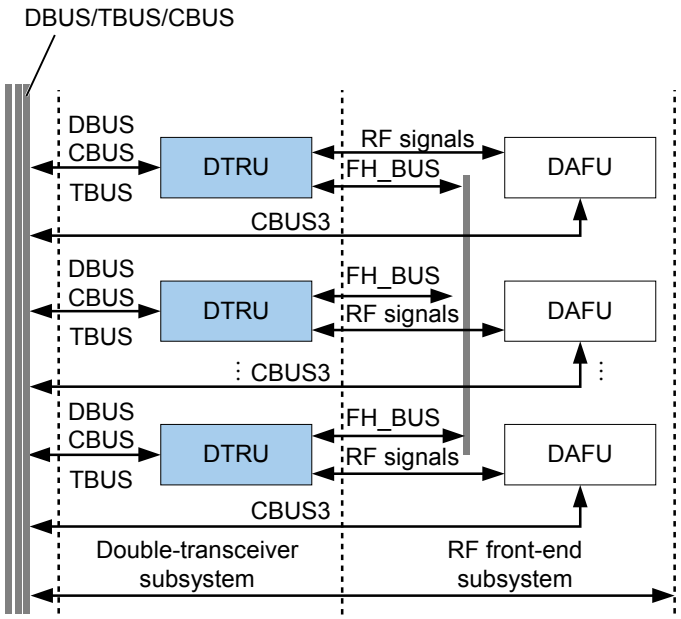
- Receive independency
- Receive diversity
- Four-way receive diversity

4.17.2 Working Environment of the DTRU

The DTRU is inserted into the slots of the backplane in the DTRU subrack.

Figure 4-36 shows the working environment of the DTRU.

Figure 4-36 Working environment of the DTRU



The working environment of the DTRU is as follows:

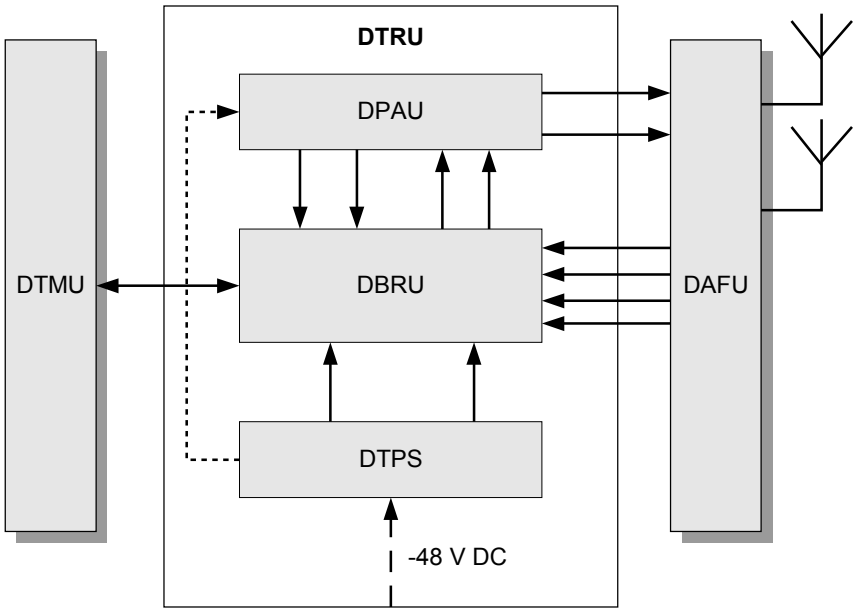
- Receiving clock signals, control signals, and data signals from the DTRB
- Modulating the baseband signals into RF signals and sending the RF signals to the DAFU subrack through the RF cables

4.17.3 Working Principles of the DTRU

The DTRU consists of the following parts: DTRU Baseband and RF Unit (DBRU), DTRU Power Amplifier Unit (DPAU), and DTRU Power Supply Unit (DTPS).

Figure 4-37 shows the working principles of the DTRU.

Figure 4-37 Working principles of the DTRU



DBRU

The DBRU is the main functional module of the DTRU. The DBRU performs modulation/demodulation, data processing, and combining/dividing between the baseband signals and the RF signals.

DPAU

The DPAU performs the following functions:

- Amplifying the TX signals transmitted from the DBRU to the required level
- Coupling the output power for loopback test and power detection
- Detecting the temperature of the power amplifier
- Supporting wideband combination and PBT functions

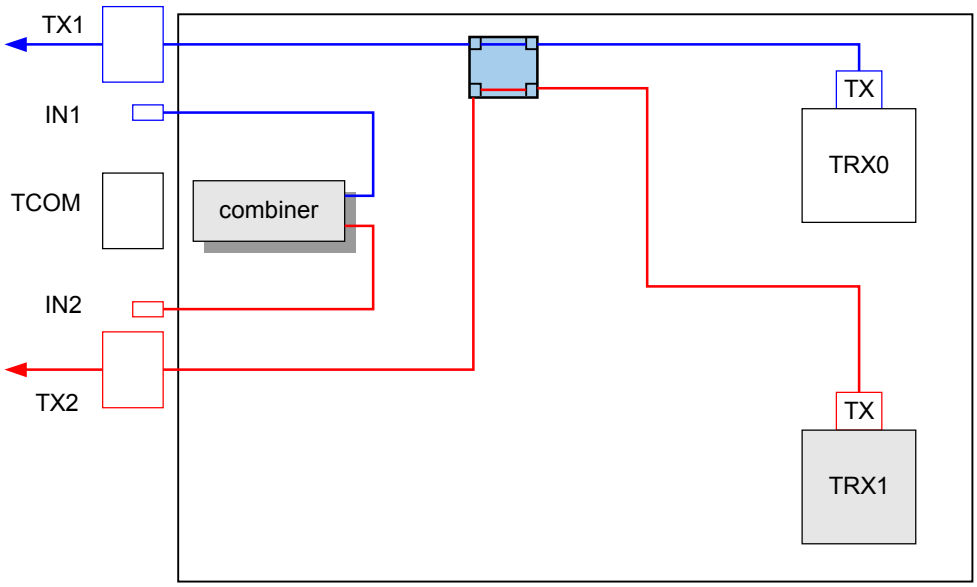
DTPS

The DTPS is the power supply board of the DTRU. The DTPS converts the –48 V DC power supply into +28 V DC for the DPAU. The DTPS also supplies three routes of power required by the TRX: 8 V, 4 V, and 3.3 V.

RF Transmit Mode

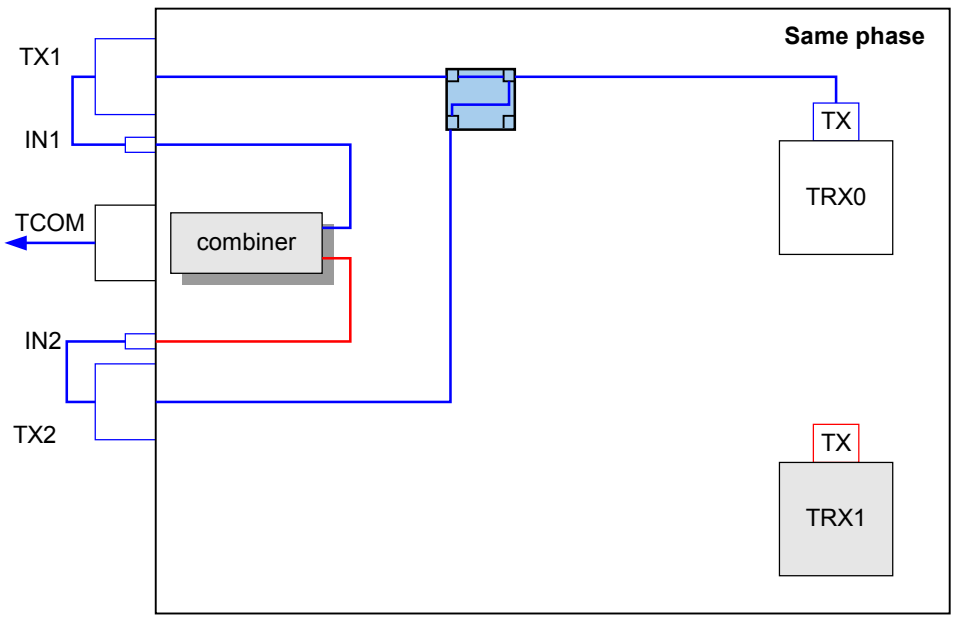
- In transmit independency mode, the two TRXs are used independently without using the combination unit. **Figure 4-38** shows the transmit independency mode.

Figure 4-38 Transmit independency mode



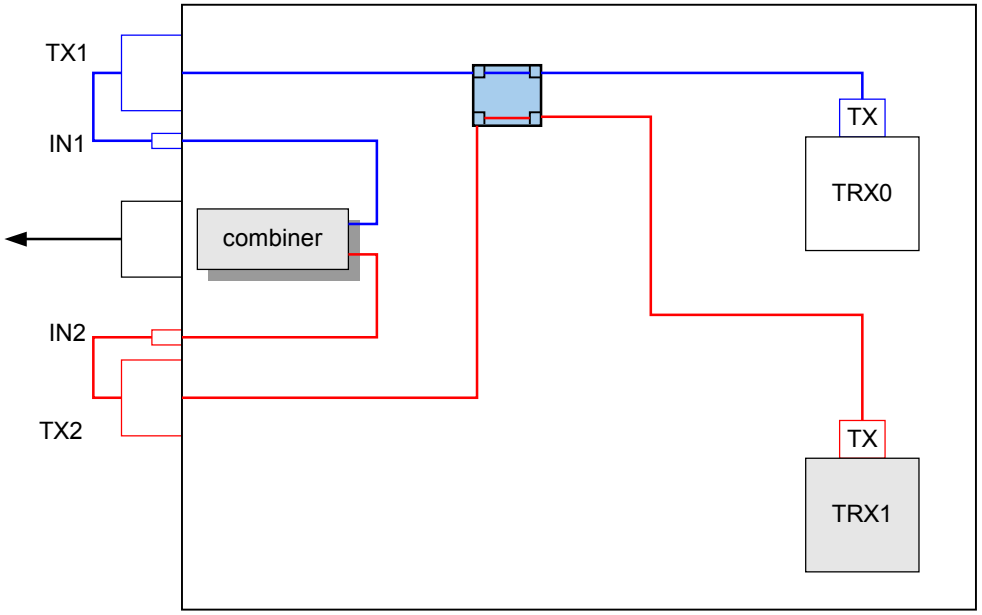
- In PBT mode, only one TRX in the DTRU is used. One route of signals goes through modulation and DA conversion. Then, the converted RF signals are divided into two routes and sent to the power amplified for amplification. At last, the amplified signals are combined. Because these two routes of signals are aligned in phase, combination results in their power amplification. **Figure 4-39** shows the working principles in the PBT mode.

Figure 4-39 PBT mode



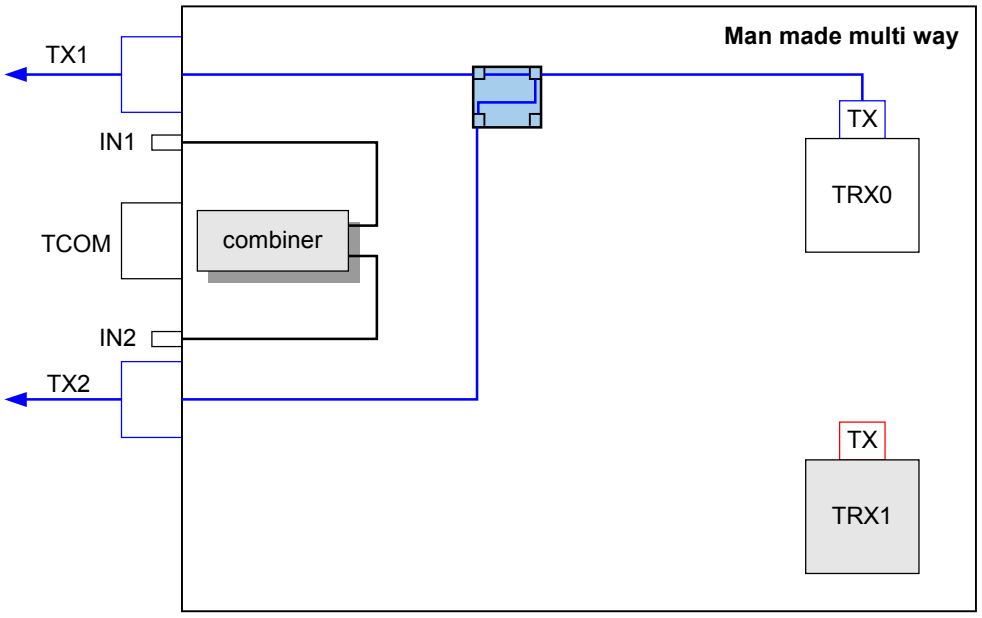
- In wideband combination mode, the two carriers are combined through a combiner before transmission. **Figure 4-40** shows the working principles in wideband combination mode.

Figure 4-40 Wideband combination mode



- In transmit diversity mode, one route of baseband signals are divided into two routes. Thus, the downlink receive level of the MS is improved. **Figure 4-41** shows the working principles in the transmit diversity mode.

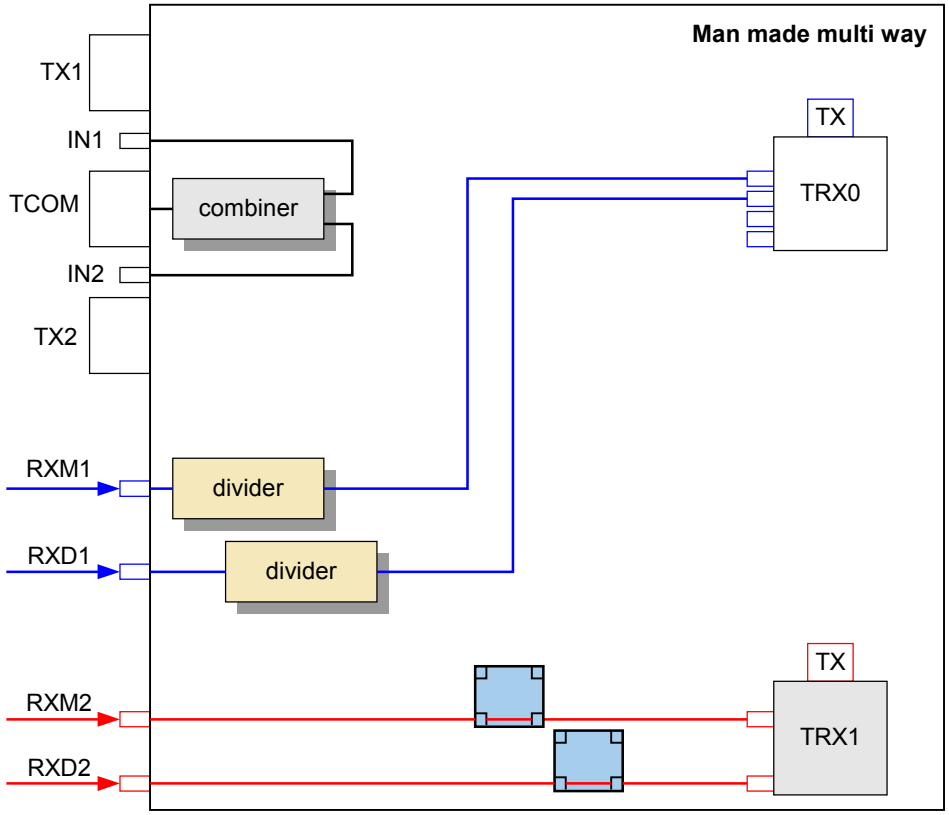
Figure 4-41 Transmit diversity mode



RF receive mode

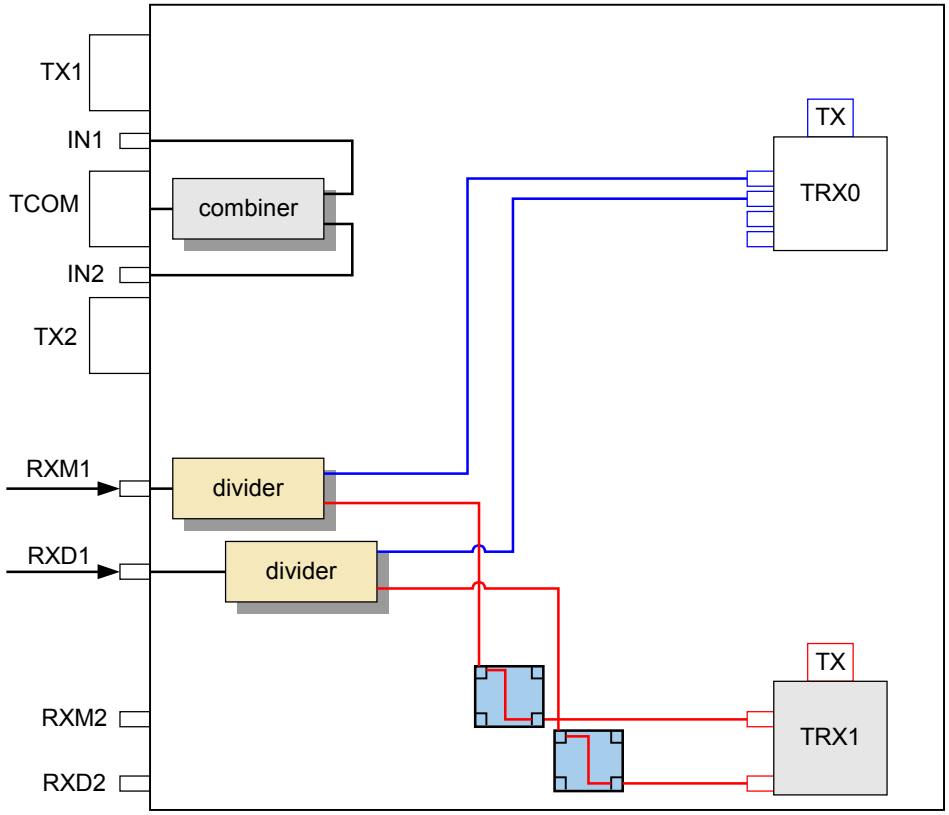
- In receive independency mode, each TRX in the DTRU uses the main port and diversity port of itself. **Figure 4-42** shows the working principle in the receive independency mode.

Figure 4-42 Receive independency mode



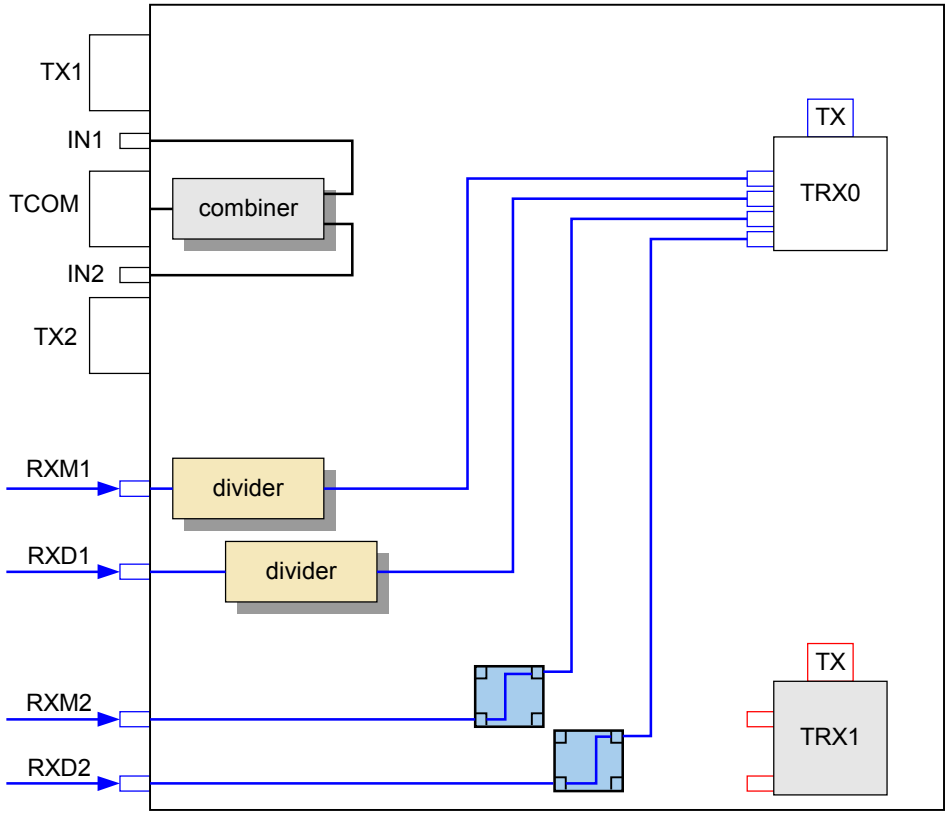
- In receive diversity mode, one route of RF signals are divided into two routes through a divider. Of the two routes, one route is sent to the main port of one TRX while the other route is sent to the diversity port of another TRX. Note only two channels of RF signals are routed into the DTRU through the RF cables. **Figure 4-43** shows the working principle in the receive diversity mode.

Figure 4-43 Receive diversity mode



- In the four-way receive diversity mode, four routes of signals are sent to one TRX. The four-way receive diversity helps achieve more uplink gain than the main receive diversity does. Note in the four-way receive diversity mode, only one TRX can be used in the DTRU. **Figure 4-44** shows the working principles in the four-way receive diversity mode.

Figure 4-44 Four-way receive diversity mode



4.17.4 Indicators and Ports on the DTRU

There are two types of DTRU available: type A and type B. The four indicators on the DTRU panel indicate the working status of the DTRU and other functional subsystems. DTRU (type A) has 10 ports while DTRU (type B) has 8 ports. These ports are used for the exchange of signals inn the RF front-end subsystem.

Panel

Figure 4-45 shows the DTRU panel (type A).

Figure 4-45 DTRU panel (type A)

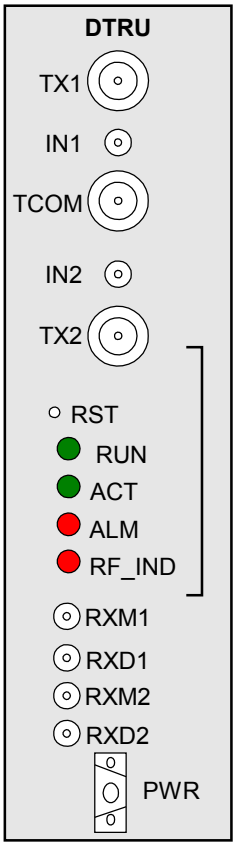
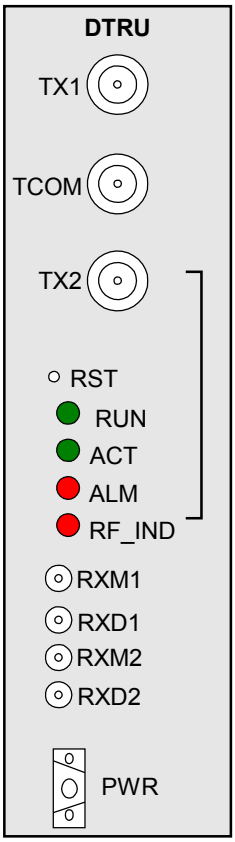


Figure 4-46 shows the DTRU panel (type B).

Figure 4-46 DTRU panel (type B)



Indicators

Table 4-49 describes the indicators on the DTRU (type A) and DTRU (type B).

Table 4-49 Indicators on the DTRU

Indicator	Color	Description	Status	Meaning
RUN	Green	Running status and power-on indicator of the DTRU	On	There is power supply. However, the module is faulty.
			Off	There is no power supply or the module is faulty.
			Slow flash (on for 2s and off for 2s)	The module is starting.
			Slow flash (on for 1s and off for 1s)	The module works normally.

Indicator	Color	Description	Status	Meaning
			Fast flash (on for 0.2s and off for 0.2s)	The DTMU is sending configuration parameters to the DTRU.
ACT	Green	Indicating the running status of the TRX	On	The DTRU is working. (The DTMU sends configuration parameters normally and the cells starts) All the channels on the two TRXs work normally.
			Off	The communication between the DTRU and the DTMU is not set up.
			Slow flash (on for 1s and off for 1s)	A part of logical channels work normally (before and after TRX mutual aid).
ALM	Red	Alarm indicator	On (flash at high frequency)	Critical alarm, indicating that the module is faulty
			Off	The module is normal.
RF_IND	Red	RF port indicator	On	Voltage standing wave radio (VSWR) alarm
			Off	Normal
			Slow flash (on for 1s and off for 1s)	No link alarm

Ports

Table 4-50 describes the ports on DTRU (type A).

Table 4-50 Ports on DTRU (type A)

Port	Type	Function
TX1	N female connector	Outputting TX1 signals
IN1	SMA female connector	When the signals are combined, IN1 connects to TX1.
TCOM	N female connector	Combining and outputting signals from IN1 and IN2 or outputting PBT combined signals
IN2	SMA female connector	When the signals are combined, IN2 connects to TX2.
TX2	N female connector	Outputting TX2 signals
RXM1	SMA female connector	Main receive port of TRX 1 or diversity receive port 1 of TRX 1
RXD1	SMA female connector	Diversity receive port of TRX 1 or diversity receive port 2 of TRX 1
RXM2	SMA female connector	Main receive port of TRX 2 or diversity receive port 3 of TRX 1
RXD2	SMA female connector	Diversity receive port of TRX 2 or diversity receive port 4 of TRX 1
PWR	3V3 power connector	Power input

Table 4-51 describes the ports on DTRU (type B).

Table 4-51 Ports on DTRU (type B)

Port	Type	Function
TX1	N female connector	Outputting TX1 signals
TCOM	N female connector	Combining and outputting signals from TRX1 and TRX2 or outputting PBT combined signals
TX2	N female connector	Outputting TX2 signals
RXM1	SMA female connector	Main receive port of TRX 1 or diversity receive port 1 of TRX 1
RXD1	SMA female connector	Diversity receive port of TRX 1 or diversity receive port 2 of TRX 1
RXM2	SMA female connector	Main receive port of TRX 2 or diversity receive port 3 of TRX 1

Port	Type	Function
RXD2	SMA female connector	Diversity receive port of TRX 2 or diversity receive port 4 of TRX 1
PWR	3V3 power connector	Power input

4.17.5 Specifications of the DTRU

The specifications of the DTRU include dimensions, working voltage, power consumption, and weight.

Table 4-52 describes the specifications of the DTRU (type A).

Table 4-52 Specifications of the DTRU (type A)

Item	Specification
Dimension	Dimension of the front panel (length x width): 389.2 mm x 68.1 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption in –48 V power supply: 450 W
	Maximum power consumption in +27 V power supply: 390 W
Weight	9.2 kg

Table 4-53 describes the specifications of the DTRU (type B).

Table 4-53 Specifications of the DTRU (type B)

Item	Specification
Dimension	Dimension of the front panel (length x width): 389.2 mm x 68.1 mm
Working voltage	–48 V DC or +24 V DC
Power consumption (heat consumption)	Maximum power consumption in –48 V power supply: 320 W
	Maximum power consumption in +27 V power supply: 310 W
Weight	6.8 kg

4.18 FAN Box

The FAN Box forms a loop with the air inlet box to provide forced ventilation and dissipation for the common subrack, DTRU subrack, and DAFU subrack.

4.18.1 Functions of the FAN Box

The FAN Box monitors the temperature at the air inlet of the cabinet and the temperature in the FAN subrack and then adjust the speed of the fans accordingly.

4.18.1 Functions of the FAN Box

The FAN Box monitors the temperature at the air inlet of the cabinet and the temperature in the FAN subrack and then adjust the speed of the fans accordingly.

The FAN Box performs the following functions:

- Monitoring the temperature at the air inlet of the cabinet and the temperature in the FAN subrack and adjusting the speed of the fans
- Communicating with the DTMU to adjust the speed of the fans and report alarms

4.18.2 Working Principles of the FAN Box

The FAN subrack is configured with one FAN Box, which comprises one NFCB and four independent axial flow fans.

NFCB

- The NFCB is placed in the FAN subrack. It is a mandatory module. Only one DFCB can be configured.
- Upon detection of the temperature at the air inlets at the bottom of the cabinet, the NFCB either reports the temperature information to the DTMU or automatically adjusts the speed of the fans.
- The NFCB monitors the status of the fans and adjusts the speed of the fans through an intelligent speed adjustment mechanism.
-

Fans

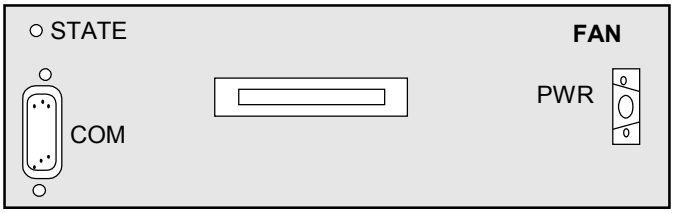
- The rear part of the cabinet top and the air inlets at the bottom of the cabinet form a ventilation circuit, cooling the entire cabinet.
- The fans take the N+1 redundancy backup strategy. When one fan fails, the other fans run at full speed. In normal temperature, the fans can meet the heat dissipation requirements.

4.18.3 Indicators and Ports on the FAN Box

The STATE indicator on the FAN Box panel indicates the running status of the fans. Of the two ports on the FAN Box panel, one port exchanges the signals with the DTMU, the other port inputs power supply.

Figure 4-47 shows the panel of the FAN Box.

Figure 4-47 Panel of the FAN Box



The STATE indicator on the FAN Box indicates the running status of the fans, as shown in **Table 4-54**.

Table 4-54 Indicators on the FAN Box

Indicator	Color	Status	Meaning
STATE	Green	Fast flash (on for 0.125s and off for 0.125s)	The communication between the NFCB and the DTMU is abnormal. There is no alarm.
	Red	Fast flash (on for 0.125s and off for 0.125s)	An alarm is generated.
	Green	Slow flash (on for 1s and off for 1s)	The board is running normally.
	Orange (red and green)	On	The board software is being upgraded.
	Green or red or orange	Off	There is no power supply or the board is faulty.

Table 4-55 describes the two ports on the panel of the FAN Box.

Table 4-55 Ports on the FAN Box

Port	Type	Function
COM	DB26 female connector	• Communicating with the DTMU • Checking the in-position information of the 12 TRXs • Connecting with the temperature sensor at the air inlet
PWR	3V3 power connector	This is the power input port that leads the power supply from the Busbar to the fan subrack.

4.18.4 Specifications of the FAN Box

The specifications of the FAN Box include dimensions, working voltage, and power consumption (heat consumption).

Table 4-56 describes the specifications of the FAN Box.

Table 4-56 Specifications of the FAN Box

Item	Specification
Dimension	Dimension of the front panel (length x width): 435.0 mm x 88.1 mm
Working voltage	–48 V power input
Power consumption (heat consumption)	Maximum power consumption: 153 W