Inmarsat B

Das Inmarsat B benötigt eine grosse Satellitenantenne und kommt deshalb auf Segelbooten nicht zum Einsatz.

In der LRC (Long Range Certificate) Prüfung werden einige systemvergleiche Fragen zu Inmarsat B und Inmarsat M gestellt.

Beide stellen wie im Telefonnetz eine Verbindung zwischen den Teilnehmern her, das Inmarsat C arbeitet dagegen nach dem Store and Foreward Prinzip – ähnlich wie der email Transport im Internet.

SatBm_Technical_Manual_S2.pdf

http://funk-an-bord.de/downloads.html

Saturn Bm Marine Mk2
Technical Manual

NERA TELECOMMUNICATIONS

Changing the way you communicate

Introduction

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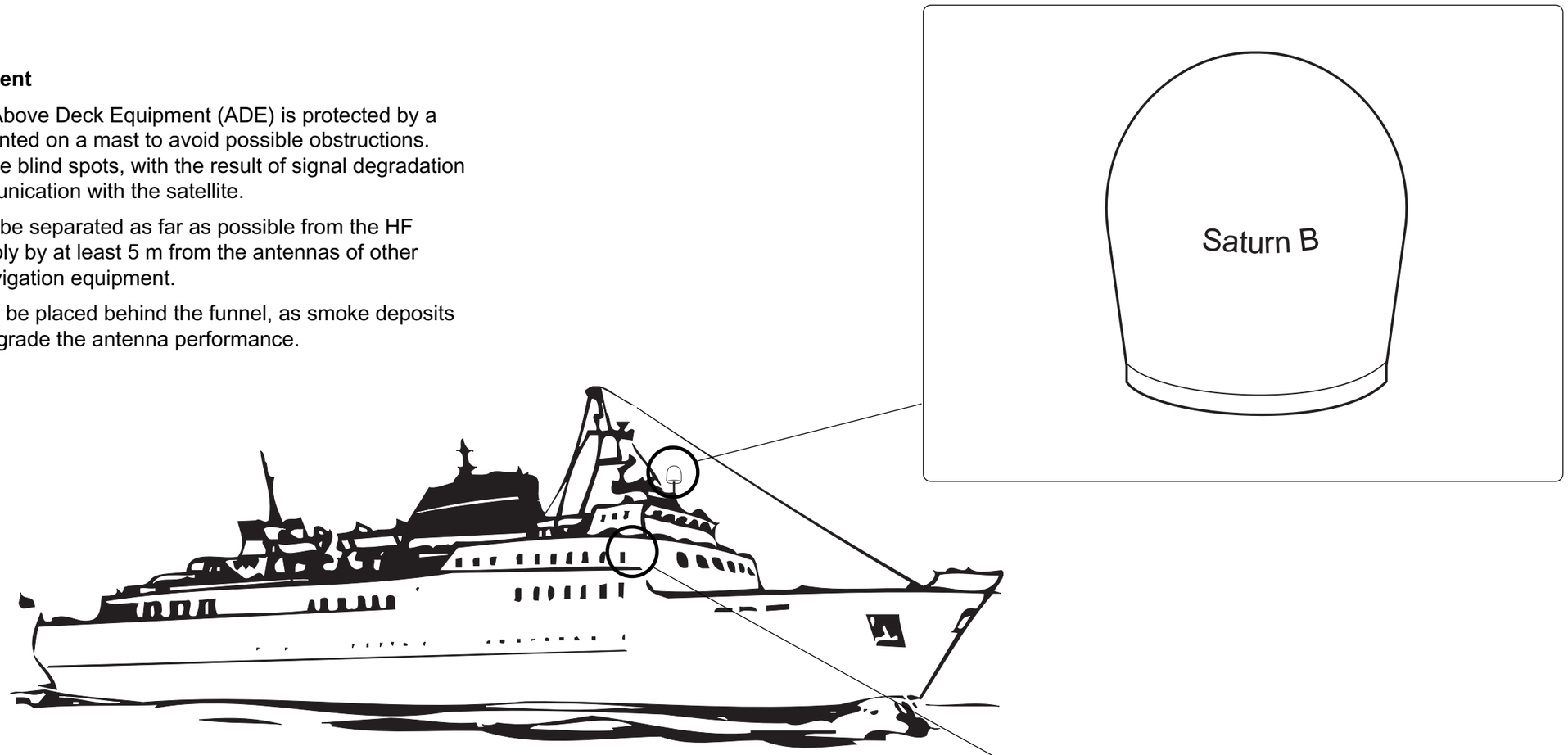
ADE

Above Deck Equipment

The Saturn Bm Mk2 Above Deck Equipment (ADE) is protected by a radome, and it is mounted on a mast to avoid possible obstructions. Obstructions will cause blind spots, with the result of signal degradation or even loss of communication with the satellite.

The ADE should also be separated as far as possible from the HF antenna, and preferably by at least 5 m from the antennas of other communication or navigation equipment.

Neither must the ADE be placed behind the funnel, as smoke deposits then evenually will degrade the antenna performance.



BDE

Below Deck Equipment

The **Saturn Bm Main Control Unit (MCU)** can be placed in any suitable location, but is usually installed in the radio room.

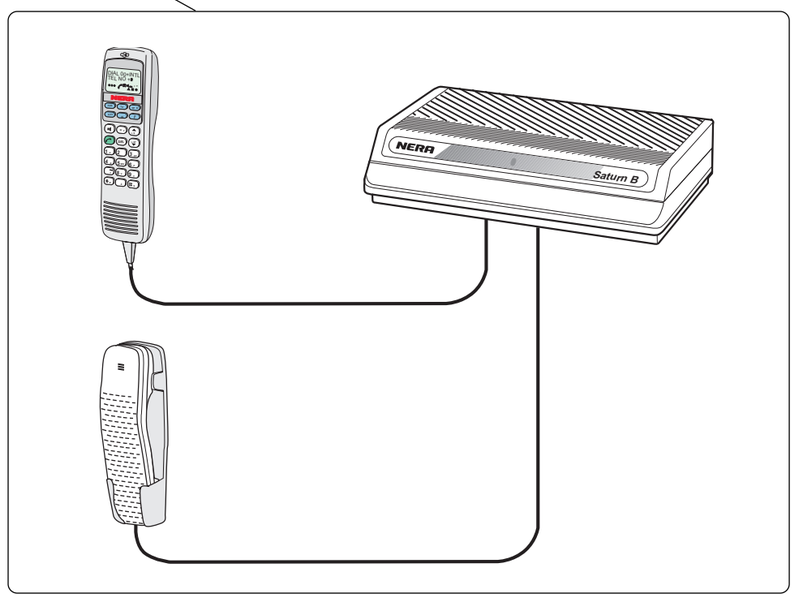
The MCU is designed for wall or desk top installation.

As all commands of the Saturn Bm terminal may be carried out from the **Display Handset**, the MCU can be located out of the way so as not to occupy valuable working space.

The **telephone(s)** can be placed anywhere onboard the vessel.

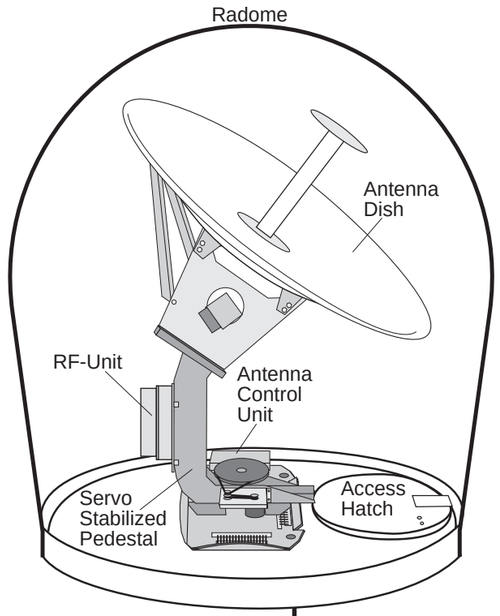
The following optional peripherals may be connected to Saturn Bm:

- DTMF telephones (max 5)
- Telefax (for connection to a telephone port)
- Message Indicator
- PC (telex)
- PC (data)
- Serial printer
- GPS navigator
- Plug for NMEA-0183 connection
- Course gyro
- Power 11 - 34 VDC
- Power 110/220 VAC and 24 VDC (automatic switchover)



Main Parts List, ADE

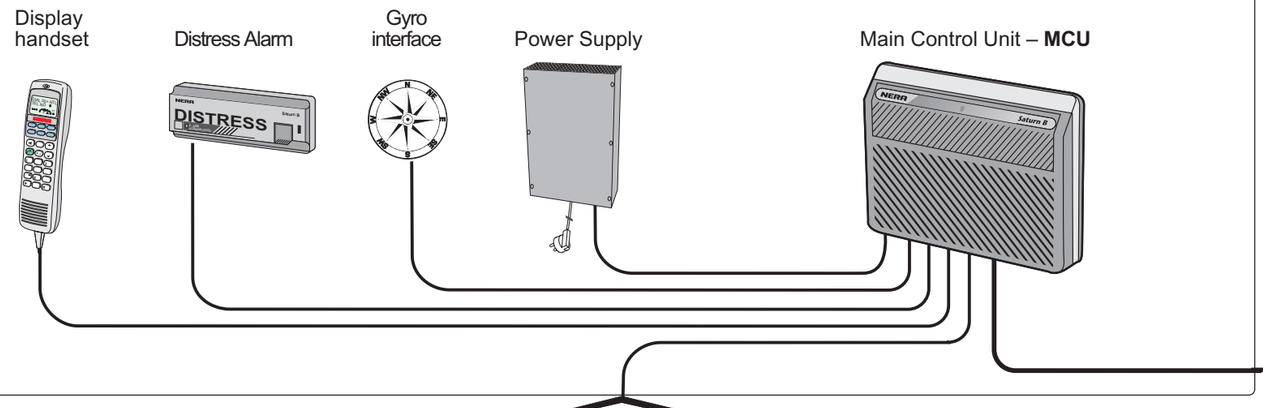
Above Deck Equipment		NERA Part No.
Stabilized Platform, AU		QSXK 911 951
Radome	(R 906 565)	QSXK 911 903
RF Unit		QUFC 911 931
Antenna Control Unit, ACU:		
• Antenna Control Board, ACB		QROF 2199041
• Pedestal Control Unit, PCU		MM 113 101
Reflector Antenna	(10AY652A)	SXAR 920 210
Antenna Feed		QSXK 911 906



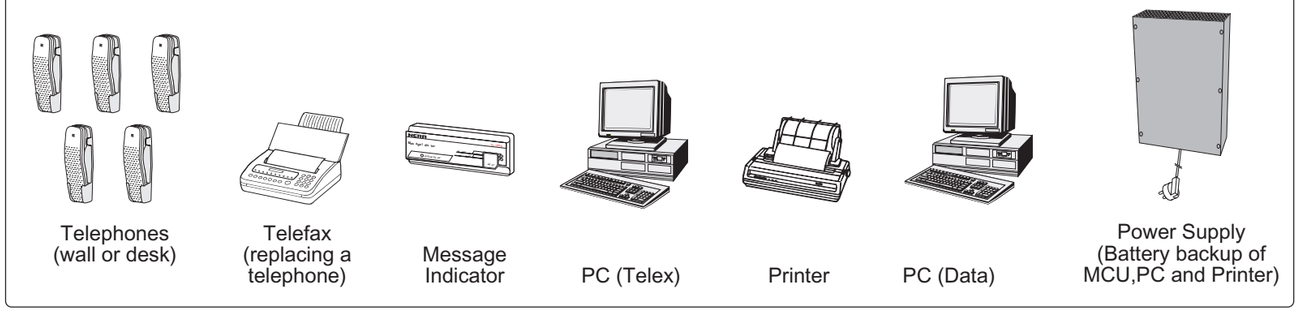
ADE

BDE

Basic Equipment



Optional Equipment



Main Parts List, BDE

Below Deck Equipment	NERA Part No.
Main Control Unit, MCU	QUFC 911 901-2
Display Handset	QDGS 911 903
Distress Alarm	QUFC 911 910-2
Interface box	QUFC 911 918

Main Control Unit, MCU	NERA Part No.
Main Control Board	QROF 219 9001-2
Power Board	QROF 219 9002
Connection Board	QROF 219 9005
Gyro Board	QROF 219 9003
Power Supply 220/110V	QDFC 911 903-2

Options	NERA Part No.
Telephone (wall)	DBAR 104 001/888
Telephone (desk)	DBAR 104 001/888
Message Indicator	QUFC 911 910-3
Power Supply for battery backup	QUFC 911 920
Screened cable w/ferrite core	QRPM 911 077/1000
Telefax Adapter	QRPM 911032

For further information, see the Saturn Bm Installation Manual.

Services

Voice:	16 kbps
Telefax:	9.6 kbps
Telex:	50 Baud (Class 1 only)
Asynchronous Data:	9.6 kbps
High Speed Data: (option)	56/64 kbps full duplex

System Specifications

Radio frequency performance

Transmit Frequencies:	1626.5 - 1646.5 MHz
EIRP:	33/25 dBW
Receive Frequencies:	1530.0 -1559.0 MHz
Channel spacing:	20 kHz
G/T:	-4 dB/K

Antenna Unit

1 m stabilized parabolic dish

Gain:	21.8 dB Tx, 21.1 dB Rx
	Axial ratio less than 2 dB on axis
Polarisation:	right-hand circular (CCIR 573)
Steerability:	hemispheric coverage, 0°- 90°
Tracking:	Automatic search.
Cable rewind:	30 seconds

Ship Motion

Max turning rate:	12°/sec
Roll:	±30°
Pitch:	±10°
Yaw:	±8°

Physical Characteristics

Above Deck Equipment (ADE)

Size:	H = 1445 mm, D = 1420 mm, *see drawing*
Weight:	90 kg
Mounting:	Flange

Main Control Unit (MCU)

Size:	310 x 236 x 70 mm, *see drawing*
Weight:	4 kg
Mounting:	Special mounting bracket, *see Installation Manual*

Environmental Conditions

Vibration, Precipitation and Icing: As specified by Inmarsat

Above Deck Equipment

Temperature:	-25°C to 55°C
Rain:	100 mm/hour

Below Deck Equipment

Temperature:	-25°C to 55°C
Humidity:	95 % at 40°C

Electromagnetic Compatibility

Radiated:	EN55022 class B
Conducted:	EC 801

Cabling

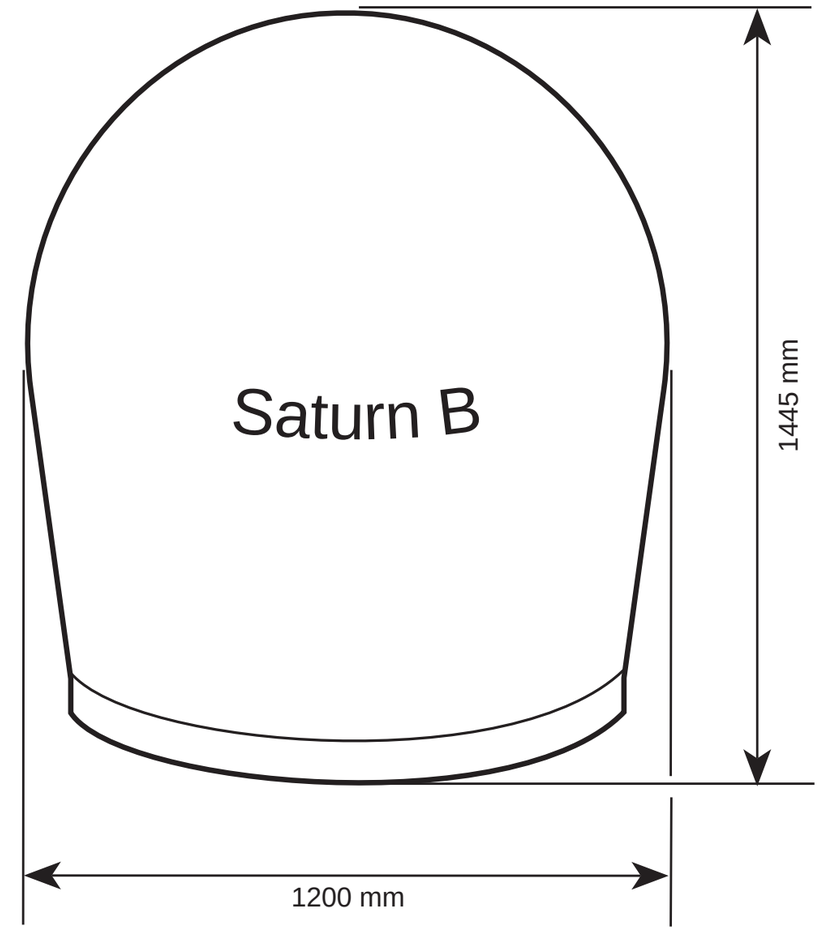
ADE - BDEU:	Length up to 44 m: single, flexible, 20 mm diameter
	Length to 44-77 m: One coaxial 06230 10.3 diameter (Ethernet) and one screened mains cable.
Telephone/telefax:	screened twisted pair
Auxiliary :	8-core cable
Display Handset :	8-core cable
PC :	RS-232 cable
Printer :	RS-232 cable
Distress Alarm :	4-core screened cable

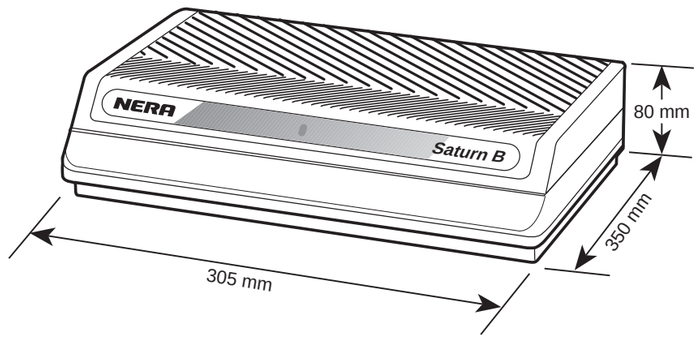
Power requirements

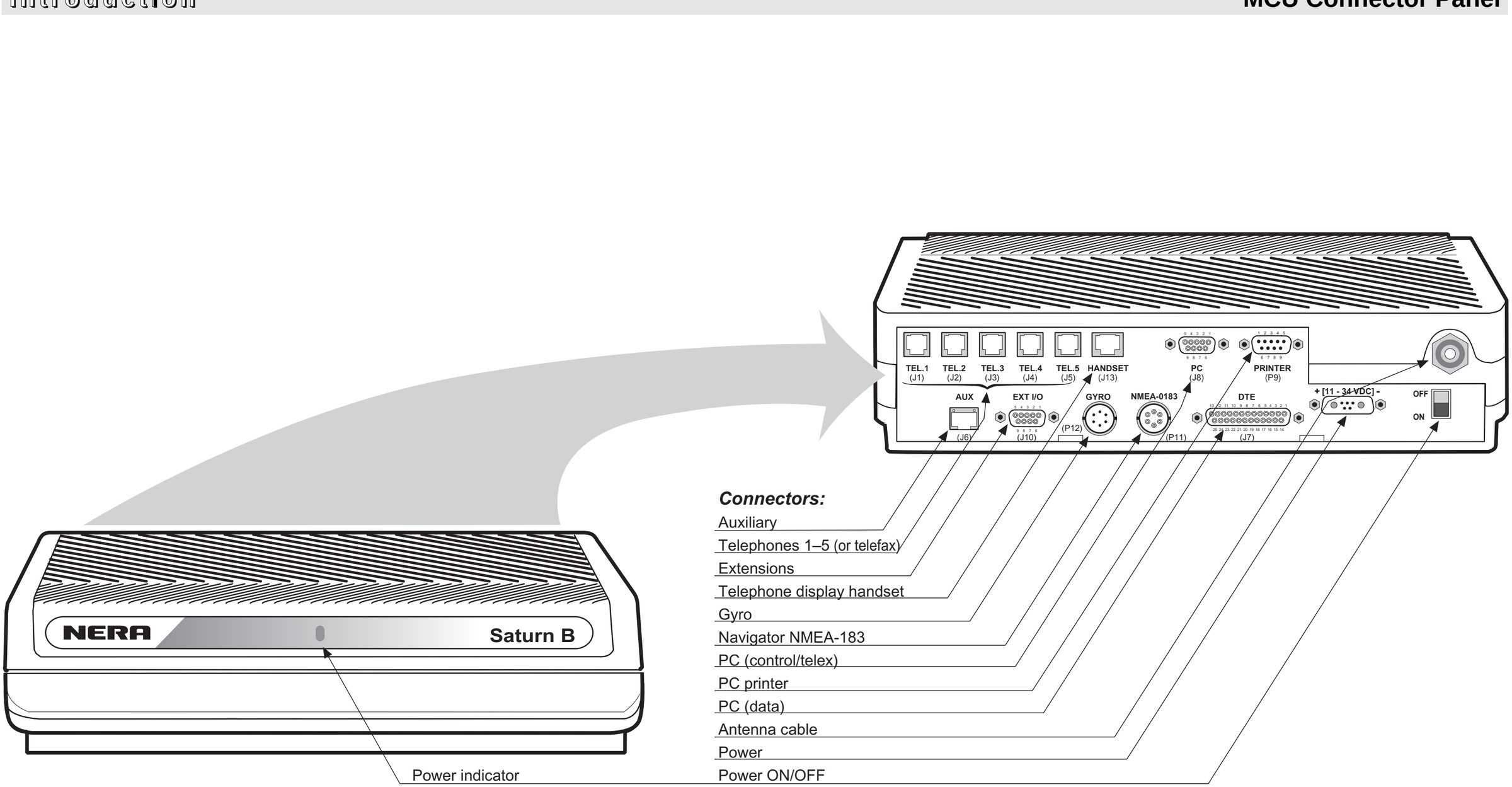
Voltage:	11 - 34 VDC
Power Consumption:	150 W
Power Supply:	220 VAC to 28 VDC
Optional Power Supply:	220 VAC to 28 VDC with 24 VDC battery backup input

Interfaces

Telephone/telefax:	5 x RJ11, 2-wire with echo cancelling and touch-tone dialing
Fax:	CCITT G3 at 2400 bps
Data:	D-sub, 25-pin female, 9600 bps,
	RS-232, Hayes AT compatible
PC:	D-sub, 9-pin female, RS-232
Printer:	D-sub, 9-pin male, RS-232
Gyro:	Synchro, step-by-step, 1:360, 1:180, 1 :90
Navigator:	NMEA-0183






TEL.1 (J1)
TEL.2 (J2)
TEL.3 (J3)
TEL.4 (J4)
TEL.5 (J5)
HANDSET (J13)
PC (J8)
PRINTER (P9)
AUX
(J6)
EXT I/O
(J10)
GYRO
(P12)
NMEA-0183
(P11)
DTE
(J7)
+ [11 - 34 VDC] -
OFF
ON
NERA
Saturn B
Connectors:
Auxiliary
Telephones 1–5 (or telefax)
Extensions
Telephone display handset
Gyro
Navigator NMEA-183
PC (control/telex)
PC printer
PC (data)
Antenna cable
Power
Power ON/OFF
Power indicator

The INMARSAT-B System

Inmarsat

The INMARSAT-B system offers high quality 16 kbps voice communication, and 9.6 kbps telefax and data transmission.

The benefit of the INMARSAT system is its high capacity, and the rapid and reliable connection between the land based (fixed) users and the **Mobile Earth Stations (MESs)**.

The large number of **Land Earth Stations (LESs)** in operation allows the operator to select the one giving the lowest cost to a particular land based subscriber.

Each satellite region is under the control of a **Network Coordinating Station** (**NCS**), which controls and monitors the traffic between the MESs and the LESs.

See figure 1.

Services

- Duplex telephone calls – basic telephony services
- Simplex telephone calls – LES-to-mobile only
- Duplex telefax – CCITT Group 3 facsimile services, 9.6 kbps
- Simplex telefax calls – LES-to-mobile only
- Simplex group ID addressing – to a selected group of mobiles
- Simplex area addressing – to all mobiles within a specific geographic area
- Duplex data communication – Hayes compatible 9.6 kbps data service

System Satellites

The satellites are positioned in a geostationary orbit above the equator at approximately 35700 km altitude.

In geostationary orbit, each satellite moves at the same rate as the earth, and so remains in the same relative position to the earth, above equator, allowing the antenna to have line-of-sight communication with the satellite.

The Saturn Bm Marine can communicate via the four satellites covering one Ocean Region each.

The positions of the system satellites are shown in figure 2.

Transmission frequencies

The INMARSAT-B MESs operate in the following frequency bands:

Calls from Saturn B terminals	1626.5	MHz	— 1646.5	MHz
Calls to Saturn B terminals	1530.0	MHz	— 1559.0	MHz

A large number of channels are available (20 kHz channel separation), offering either 16 kbps voice communication, or 9.6 kbps duplex data communication.

Duplex communication uses two channel frequencies, one in each direction.

The LESs provide interface to the international networks for telephony and data: PSTN (Public Switched Telephone Networks) and PSDN (Packet Switched Data Networks).

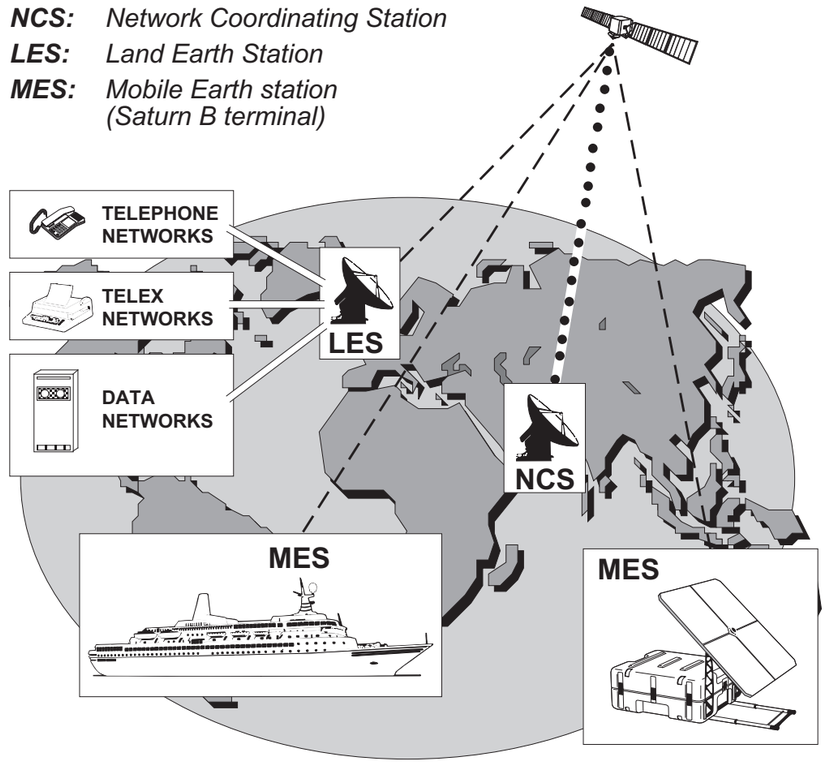


Figure 1.
Overview of the Inmarsat-B system.

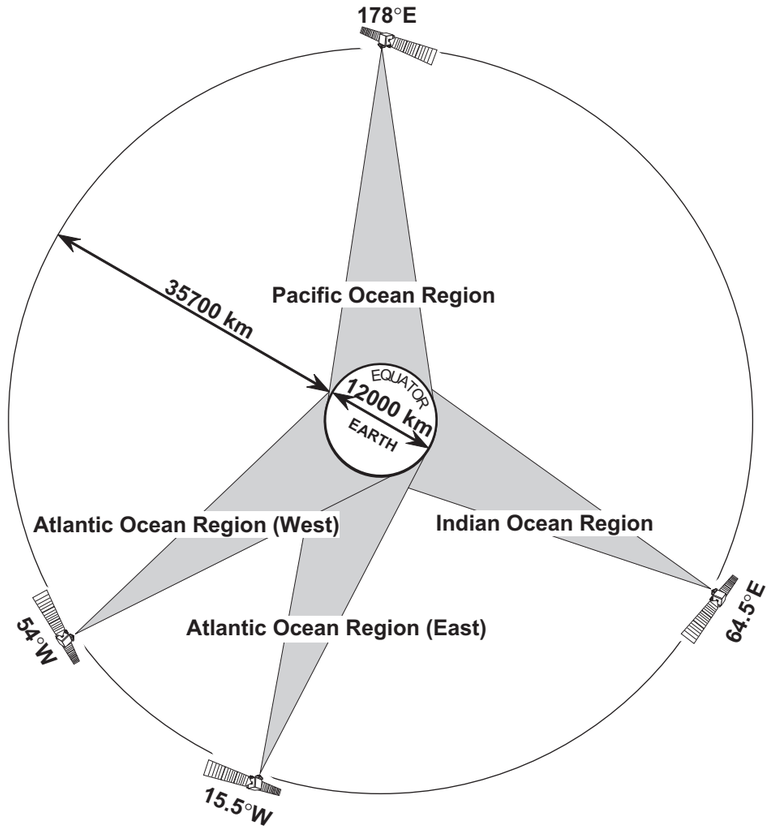


Figure 2.
Four satellites in a geostationary orbit above the equator at approx. 35700 km altitude.

The INMARSAT-B System Cont'd

Channel numbers

All radio frequency channels used by the MES are assigned a particular hexadecimal number which is translated into frequencies on L-band between MES and satellite, and to C-band between LES and satellite.

Channel no. ***32C8*** *for an MES always designates:*

1660.5000 MHz transmitting frequency

1542.5000 receiving frequency

Channel Types

The Inmarsat-B System differs between physical and functional channels. A physical channel refers to one frequency, one carrier. Every frequency can have several functional channels muliplexed on it. Each functional channel is named after the originating unit. The NCS TDM will in the initial system multiplex the NCSC for Bulletin Boards and Call Announcement, the NCSA for Channel Assignments and NCSI for Interstation information to the LES on the same physical channel. When the system expands, spot beams and Ocean Region Registration will be introduced using the functional channels NCSS and NCRA multiplexed on the NCS TDM. The traffic on one TDM may then be to heavy and some of the functional channels may be moved to another NCS TDM frequency.
The physical SCPC channels are always divided into three functional channels. During call set up and release the whole bandwith is used for signalling and the functional channel is called MES-SIG/LES-SIG. During speech or data phase, the signalling part of the channel is called VSUB or DSUB and the service carrying part is called MESV/LESV or MESD/LESD.

Requests and assignments

The Network Coordinating Station in each Ocean Region continually transmits to the MESs within its region on the NCS Common Signalling Channel (NCSC).

When selecting a particular Ocean Region, the MES automatically tunes its receiver to the NCSC frequency, and awaits System Information from the NCS.

The System Information (Bulletin Board) includes available NCS/LES channel frequencies, location of satellites, operational status, etc.

When the NCS sends a Call Announcement, detailing the channel to which the MES should tune to receive the call.

When the MES user dials a subscriber's international telephone number, the MES transmits an Access Request to the NCS via the LES, and awaits a Channel Assignment from the NCS.

Telephone communication

For telephone communication a Frequency Division Multiple Access (FDMA) is used, in a Single Channel Per Carrier (SCPC) system. The voice communication occupies two (unpaired) channel frequencies.

The telephone channels are controlled by NCS which assigns a free channel upon request. When a channel has been assigned it is controlled by LES until end of call.

Facsimile communication

The Saturn Bm telephone ports may be configured for telefax communication. The transmission is telefax only, and is performed at a rate of 9.6 kbps. Telefaxes without keypad may be connected via an adapter.

Data communication

The data service allows the Saturn Bm user to communicate at up to 56/64 kbps, via the public switched network, to fixed modems and data terminals.

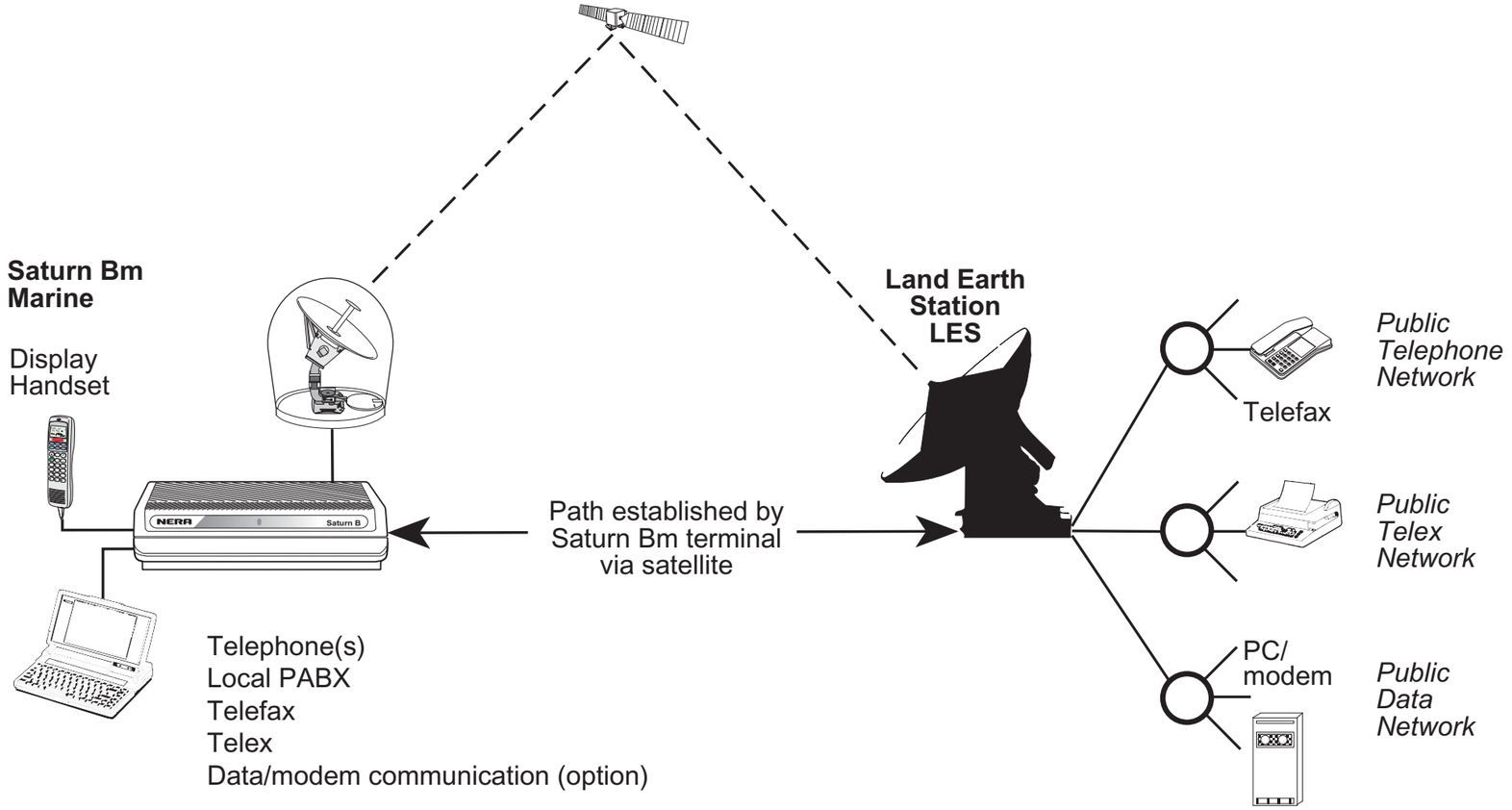


Figure 3.
Communication path.

Calls from Mobiles

To initiate a call, the user dials the international call prefix 00 prior to the telephone number for the required destination. The LES code is also included, either automatically when using the default LES, or manually selected from the Display Handset.

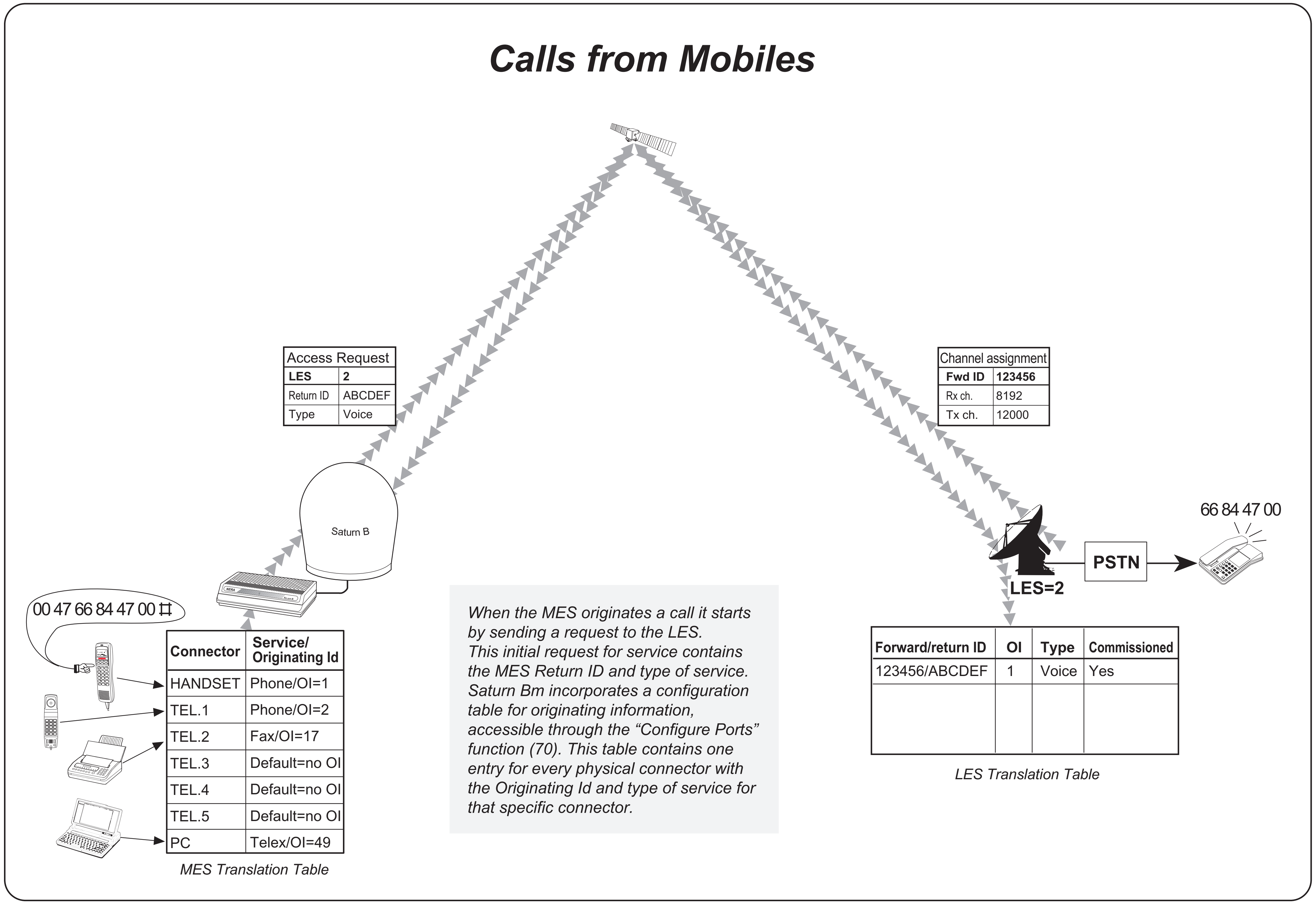
The mobile automatically includes information to identify the MES and the particular end terminal that originates the call. Saturn Bm has six connections: the Display Handset and five connectors that are normally configured for telephone and a telefax.

The LES uses the end terminal identifying information (OI) for billing purposes.

The mobile transmits the dialing information on a channel specially assigned by the NCS, to the LES, which also has been instructed to tune to the same channel.

On receiving the call, LES routes it over the public telecommunications networks to the intended destination. When the destination responds, for example by the dialed subscriber lifting the handset, the call proceeds.

The illustration of the call initiation is simplified.



Calls to Mobiles

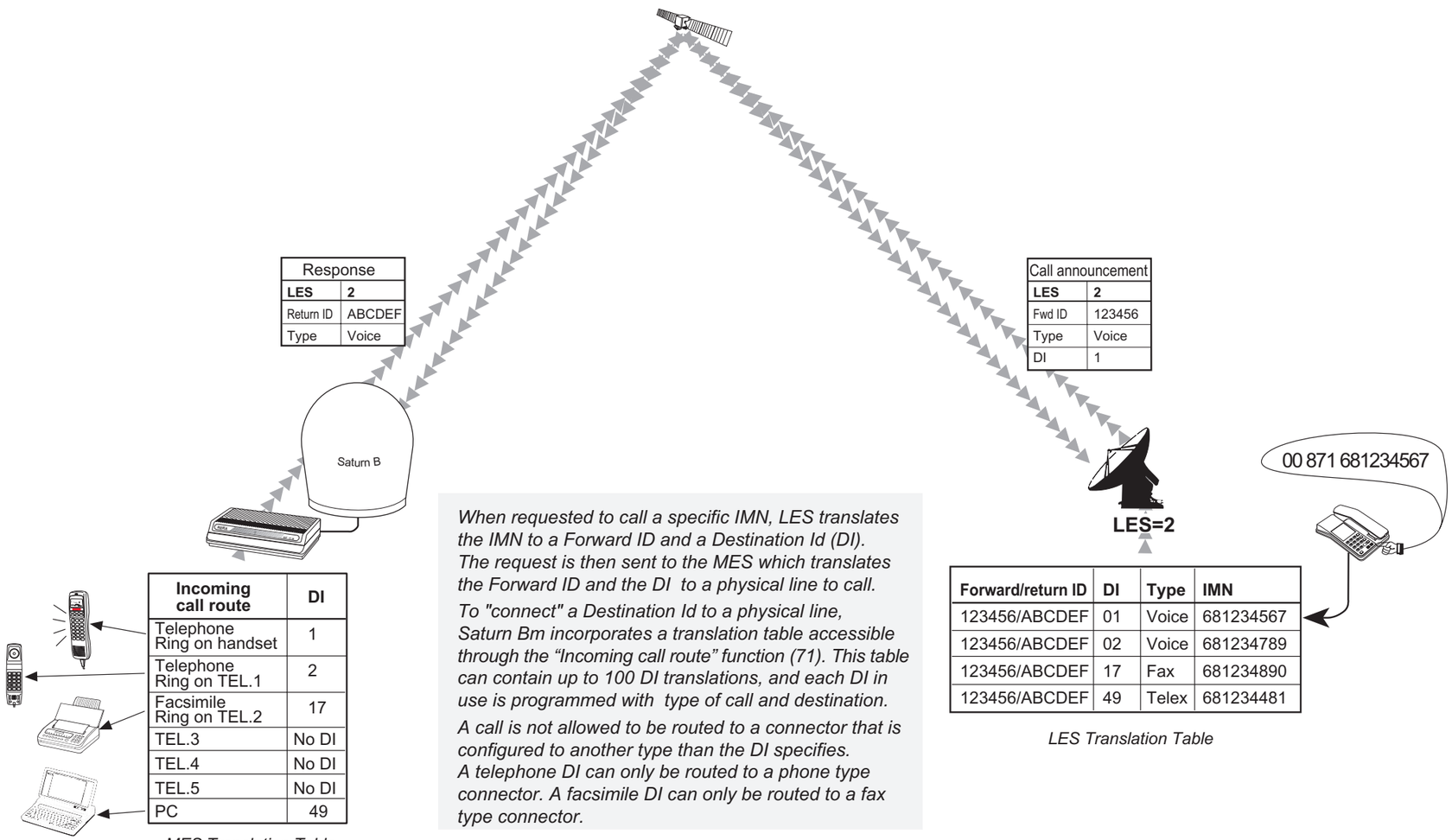
Calls are made as ordinary international (Satellite) calls where each Ocean Region has an international country code. If an area is covered by more than one satellite, it is necessary that the caller knows which satellite (Ocean Region) the mobile is tuned to.

The international codes to the four Ocean Regions are as follows:

Atlantic Ocean East Region:	*871*
Pacific Ocean Region:	*872*
Indian Ocean Region:	*873*
Atlantic Ocean West Region:	*874*

The illustration of the call initiation is simplified.

Calls to Mobiles



Incoming call route	DI
Telephone Ring on handset	1
Telephone Ring on TEL.1	2
Facsimile Ring on TEL.2	17
TEL.3	No DI
TEL.4	No DI
TEL.5	No DI
PC	49

MES Translation Table

When requested to call a specific IMN, LES translates the IMN to a Forward ID and a Destination Id (DI). The request is then sent to the MES which translates the Forward ID and the DI to a physical line to call.

To "connect" a Destination Id to a physical line, Saturn Bm incorporates a translation table accessible through the "Incoming call route" function (71). This table can contain up to 100 DI translations, and each DI in use is programmed with type of call and destination.

A call is not allowed to be routed to a connector that is configured to another type than the DI specifies. A telephone DI can only be routed to a phone type connector. A facsimile DI can only be routed to a fax type connector.

Forward/return ID	DI	Type	IMN
123456/ABCDEF	01	Voice	681234567
123456/ABCDEF	02	Voice	681234789
123456/ABCDEF	17	Fax	681234890
123456/ABCDEF	49	Telex	681234481

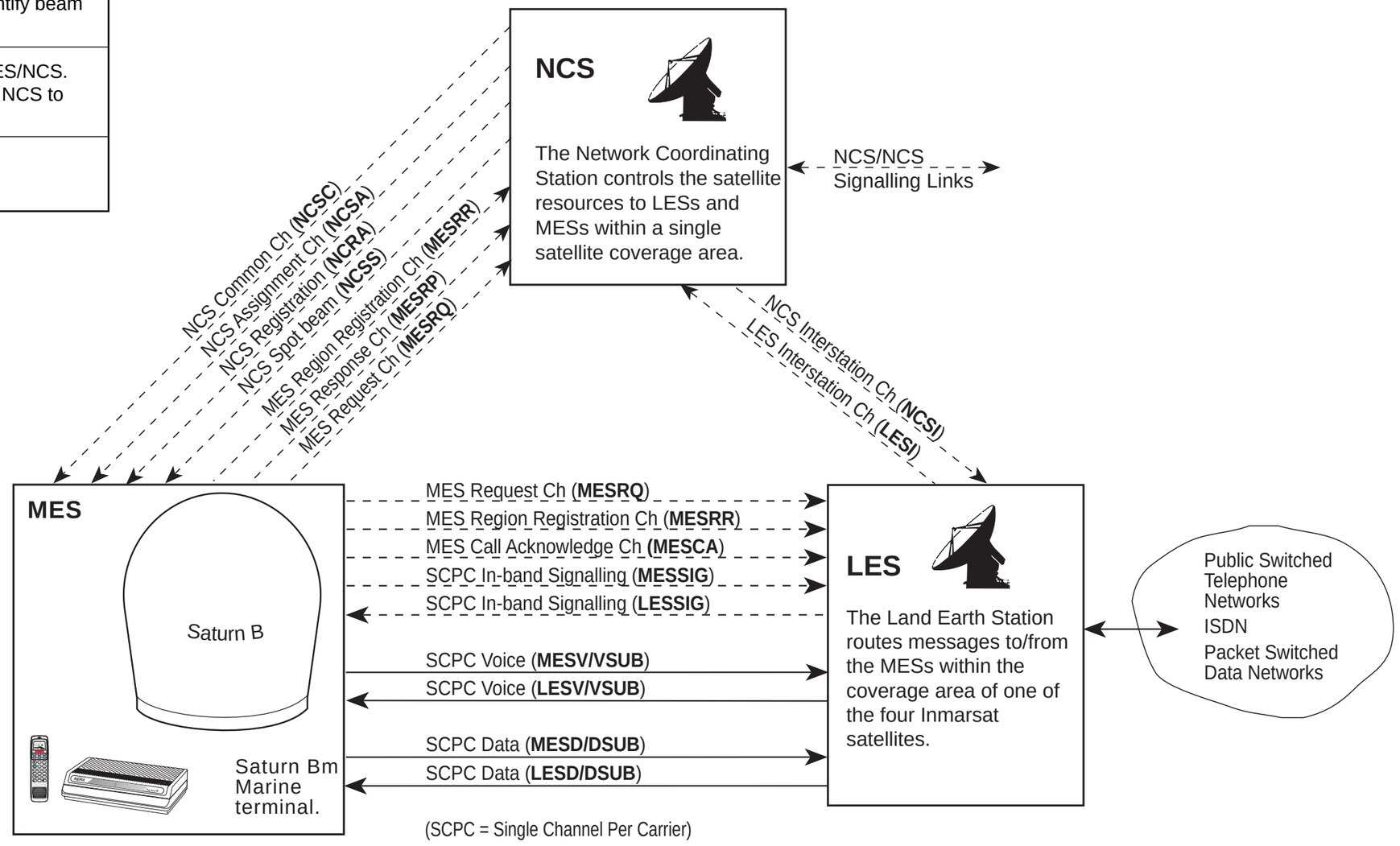
LES Translation Table

Signalling Channels

Designation	*Transmission*	*Type of information*
NCSI **LESI**	Continuous TDM	Bi-directional signalling information between LES and NCS
NCSC **MESRP**	TDM TDMA	Bulletin Board announcements. MES responses
NCSA	Continuous TDM	Assigns SPCS channels
MESRQ	Slotted Aloha	Request from MES to LES
MESCA	Slotted Aloha	Acknowledges shore-originated simplex calls.
NCSS	Continuous TDM	One frequency per spot beam; enables an MES to identify beam serving location.
MESRR **NCRA**	Slotted Aloha Continuous TDM	Registration signal to LES/NCS. Acknowledgement from NCS to MES
MESSIG **LESSIG**	SCPC	In-band signalling

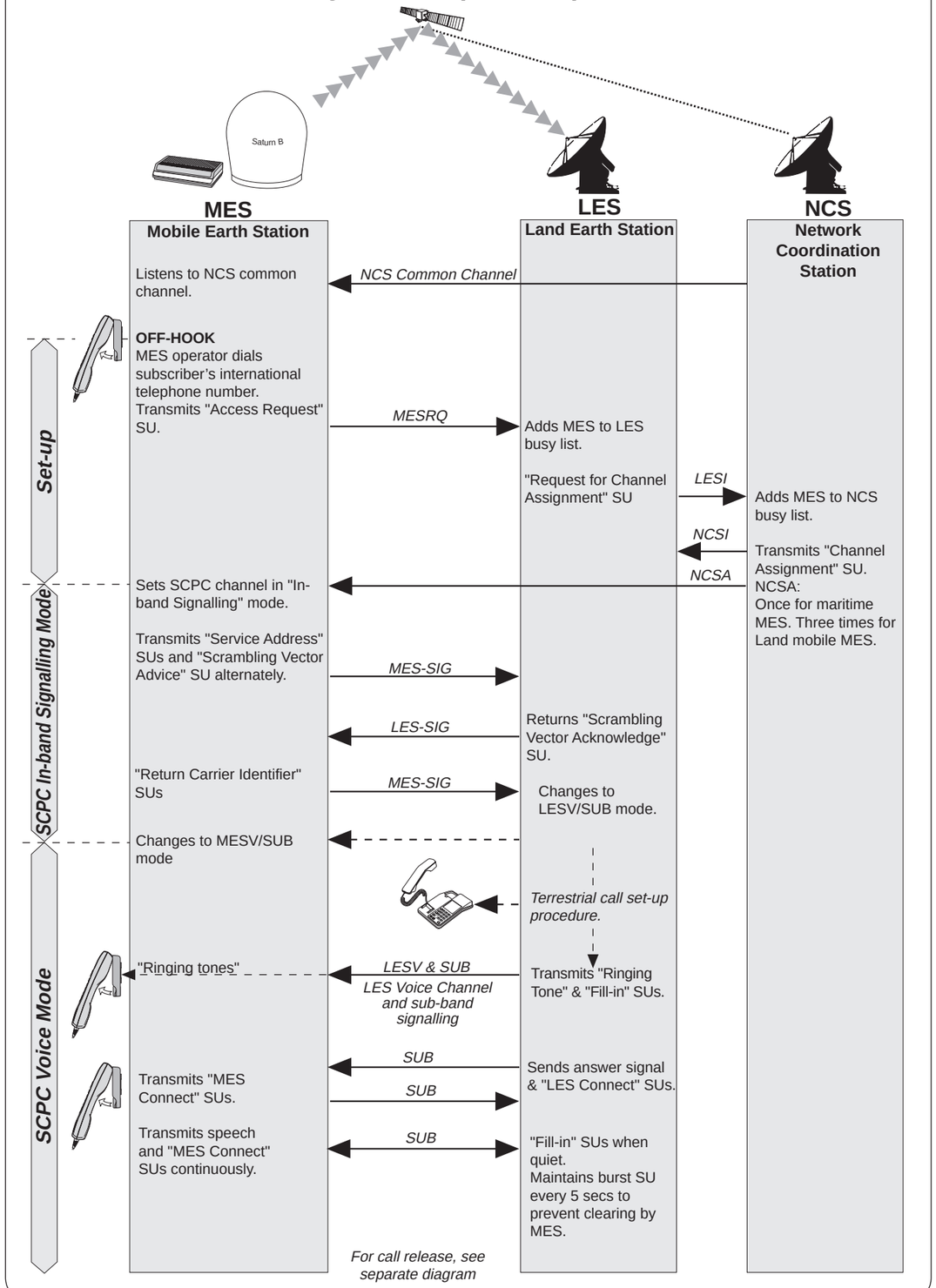
Communication Channels

Designation	*Transmission*	*Type of information*
LESV **MESV**	SCPC with VSUB sub-band signalling	Duplex 16 kbps voice communication
LESD **MESD**	SCPC with VSUB sub-band signalling	Duplex 9.6 kbps data communication

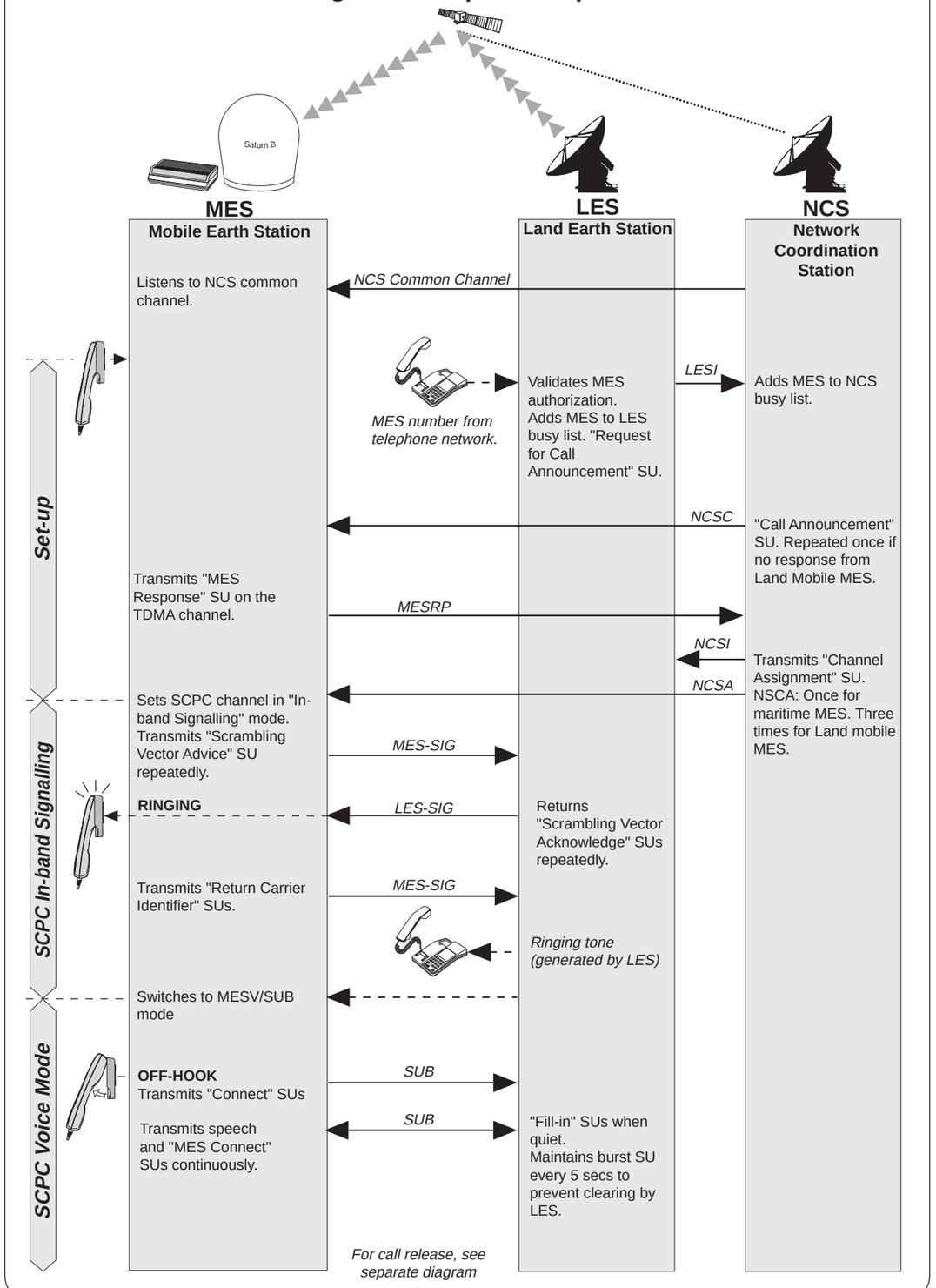


Communication Sequences

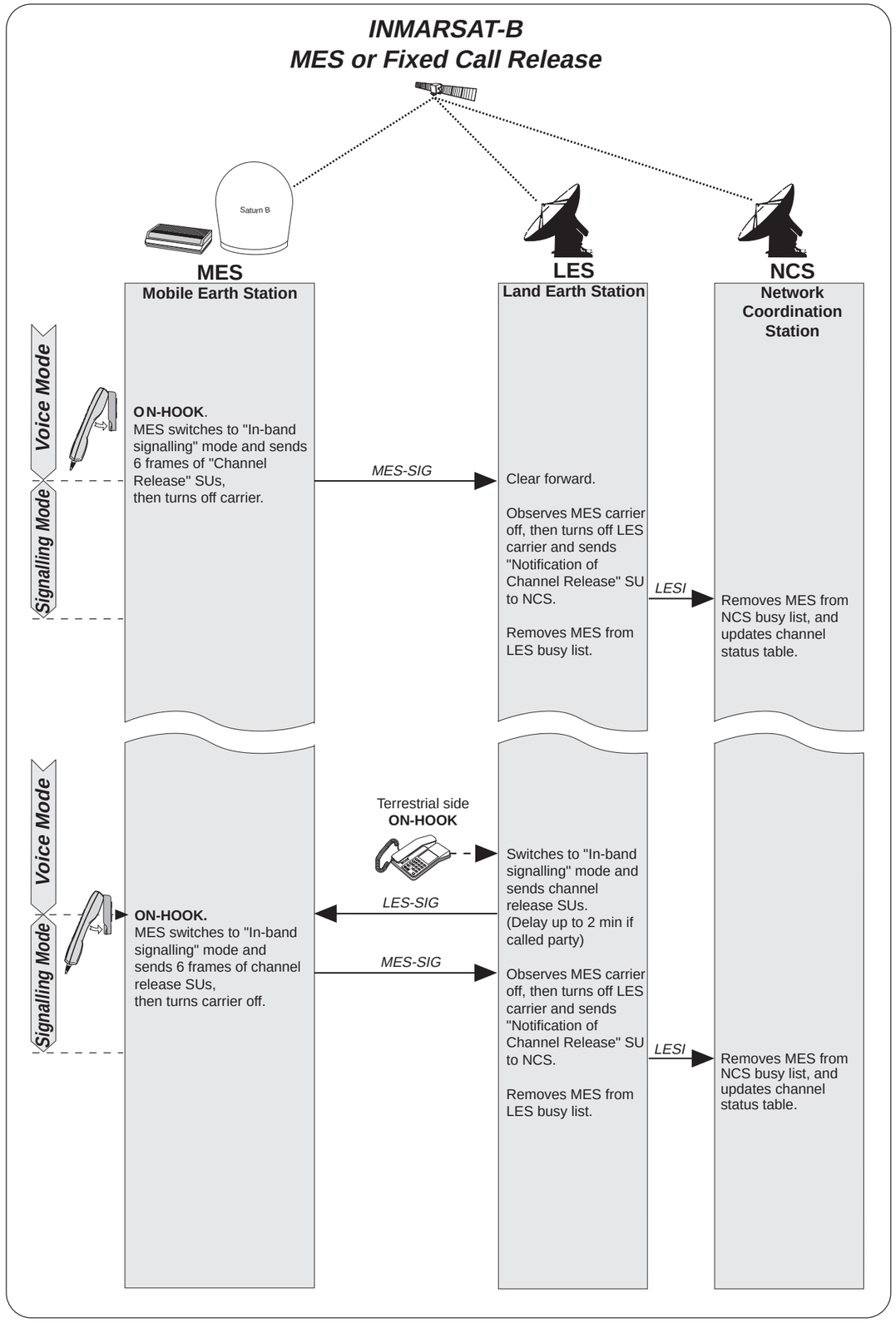
INMARSAT-B
MES-originated Duplex Telephone Call

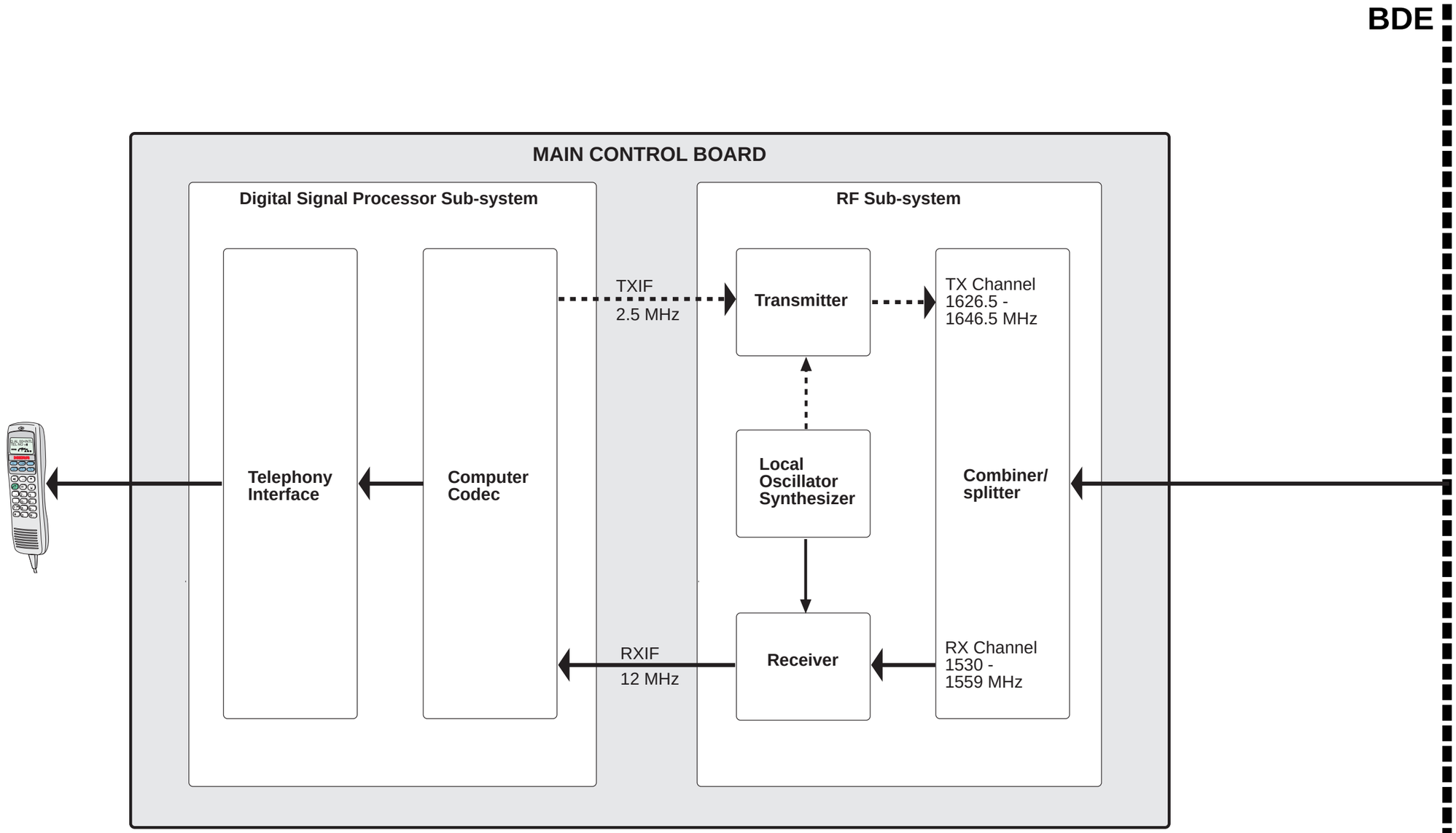


INMARSAT-B
Fixed-originated Duplex Telephone Call



Communication Sequences Cont'd




BDE
MAIN CONTROL BOARD
Digital Signal Processor Sub-system
RF Sub-system
Telephony Interface
Computer Codec
TXIF
2.5 MHz
Transmitter
TX Channel
1626.5 -
1646.5 MHz
Local Oscillator Synthesizer
Combiner/ splitter
RXIF
12 MHz
Receiver
RX Channel
1530 -
1559 MHz

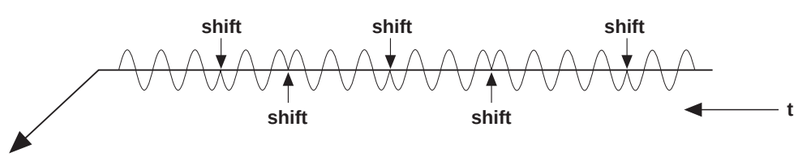
ADE

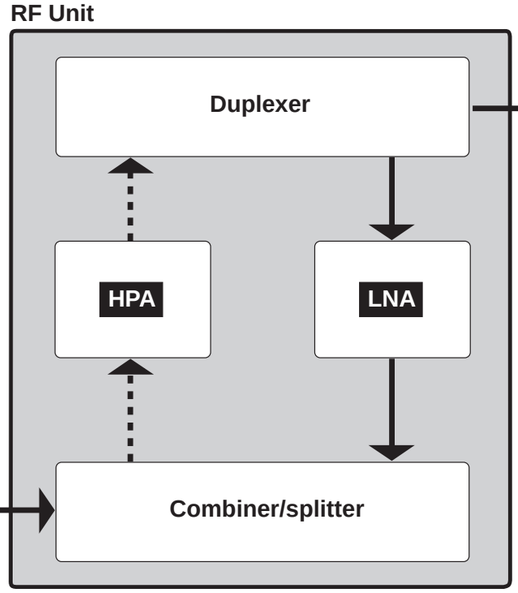
Forward Direction

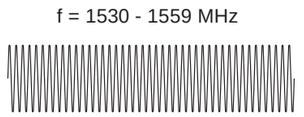
MES ⟸ NCS

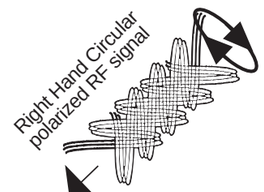
NCS Common Channel (NCSC)

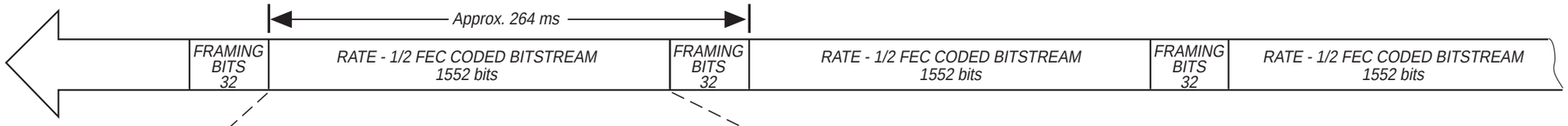
BPSK Encoded Signal
(BPSK = Binary Phase Shift Keying)

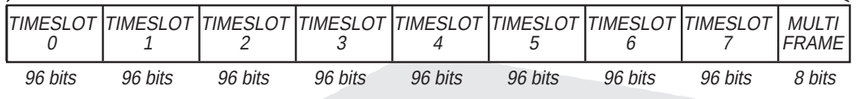








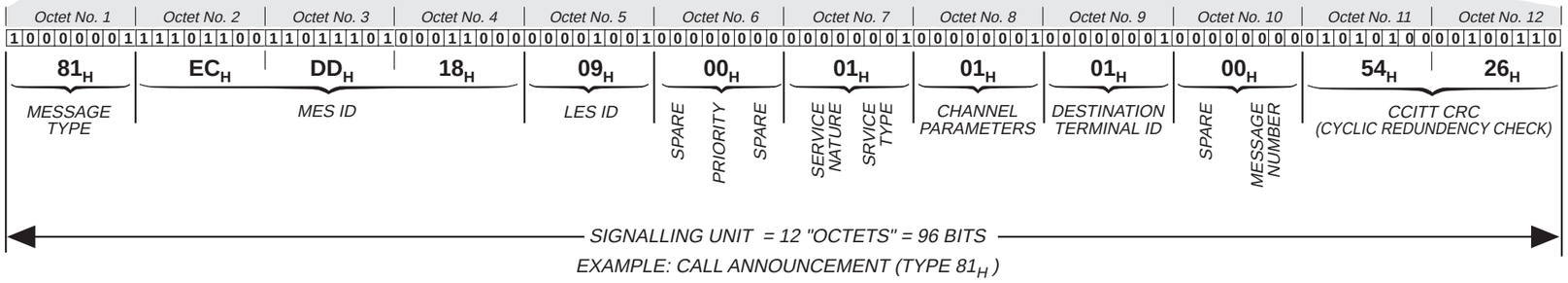


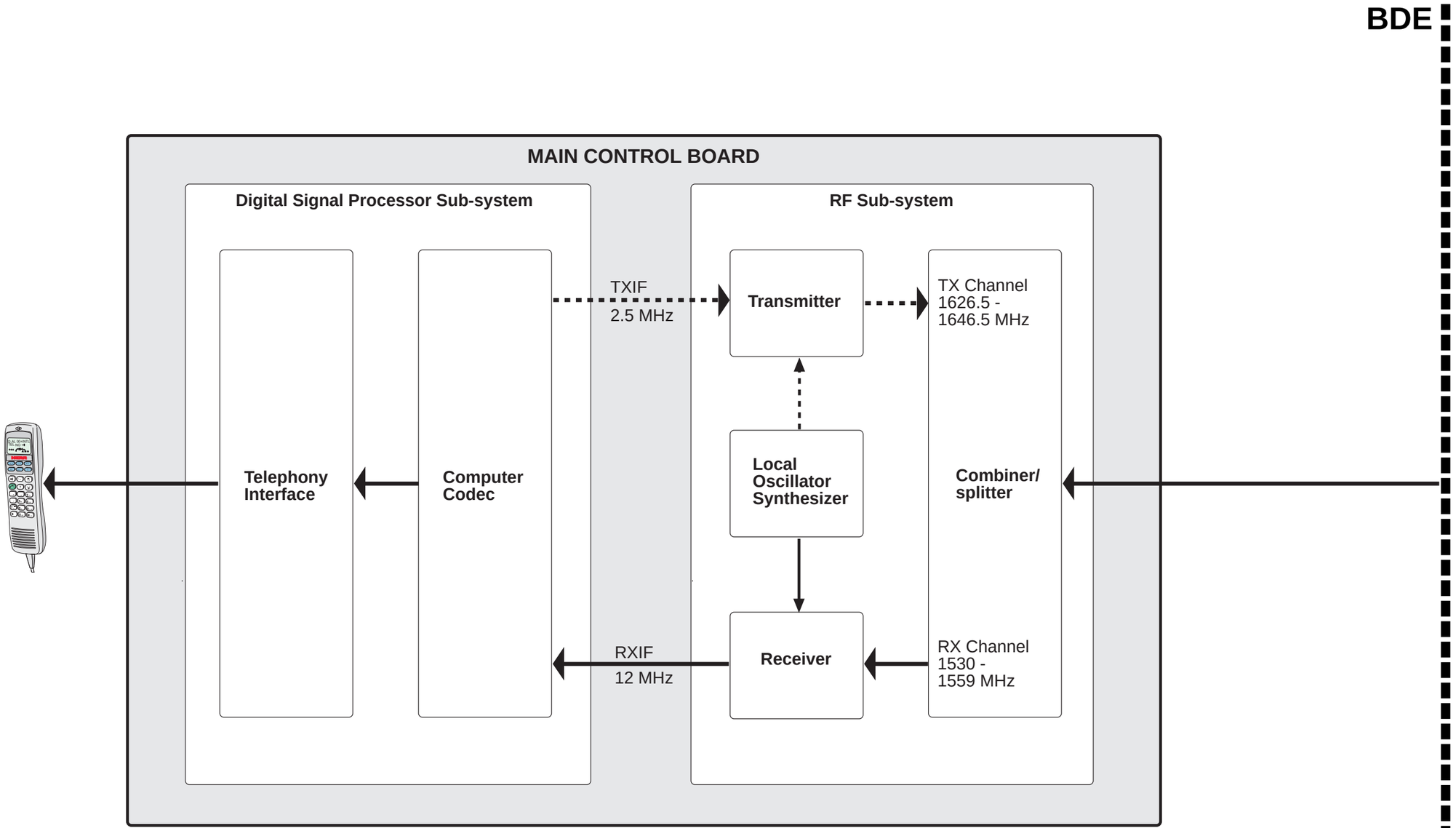


SIGNALLING UNIT – SU

BIT No. 8	7	6	5	4	3	2	1	OCTET No.
Message type							81	1
MES ID								2
								3
								4
LES ID								5
spare				priority		spare		6
service nature			service type					7
channel parameters								8
destination terminal ID								9
spare				message number				10
CCITT CRC								11
								12

M1
CALL ANNOUNCEMENT




BDE
MAIN CONTROL BOARD
Digital Signal Processor Sub-system
RF Sub-system
Telephony Interface
Computer Codec
TXIF
2.5 MHz
Transmitter
TX Channel
1626.5 -
1646.5 MHz
Local Oscillator Synthesizer
Combiner/ splitter
RXIF
12 MHz
Receiver
RX Channel
1530 -
1559 MHz

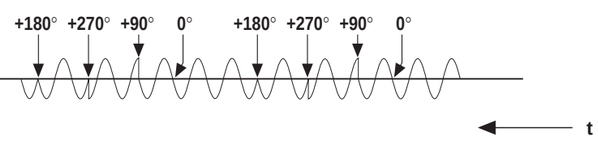
ADE

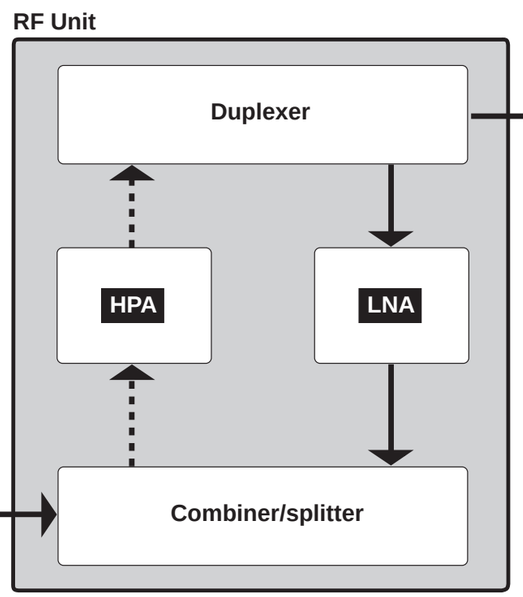
Forward Direction

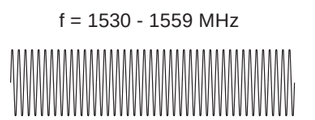
MES ⇐ LES

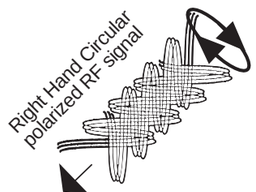
SCPC Channel (Single Carrier Per Channel)
In-band Signalling Mode

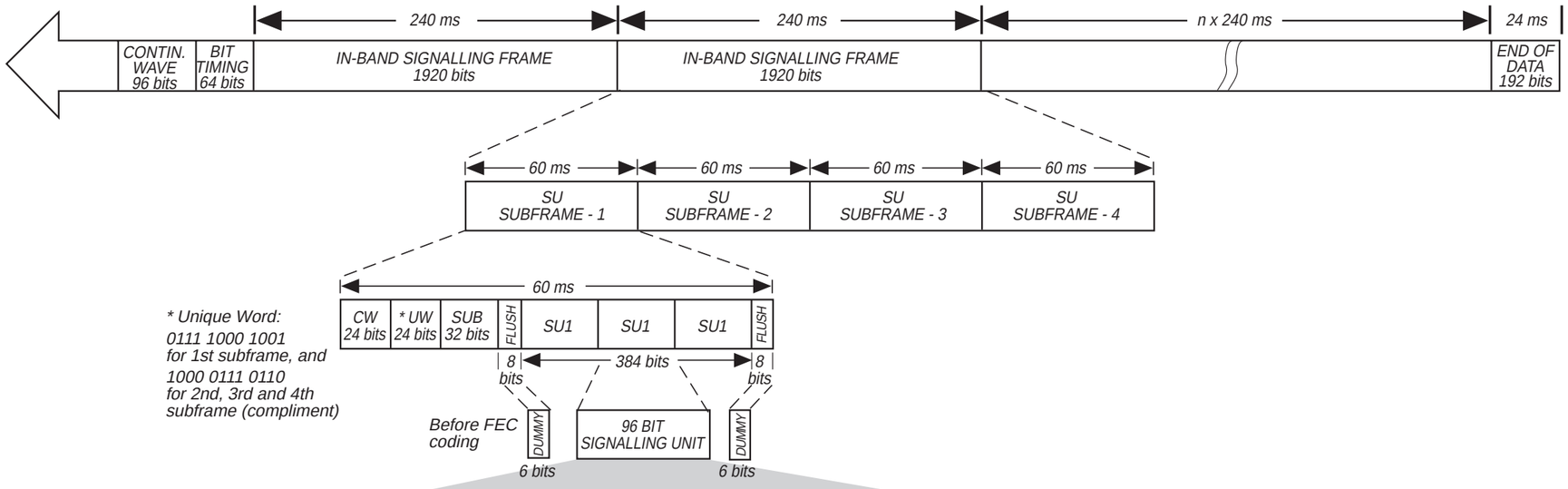
O-QPSK Encoded Signal
(O-QPSK = Offset Quadrature Phase Shift Keying)









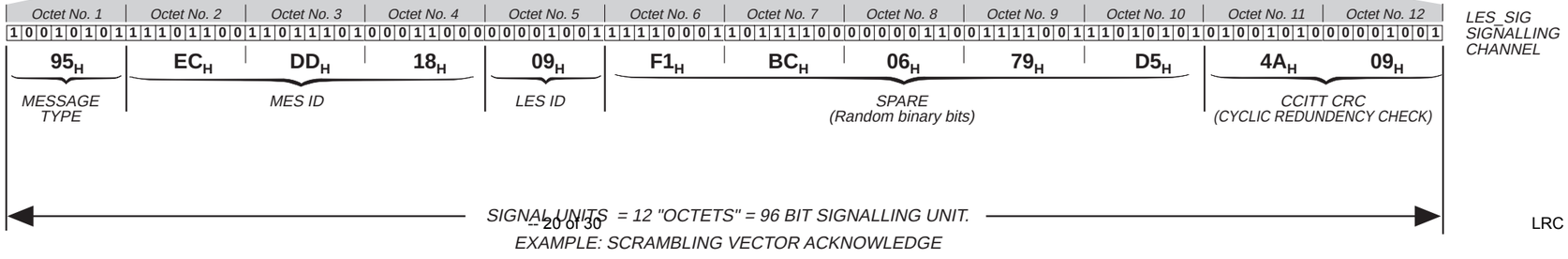


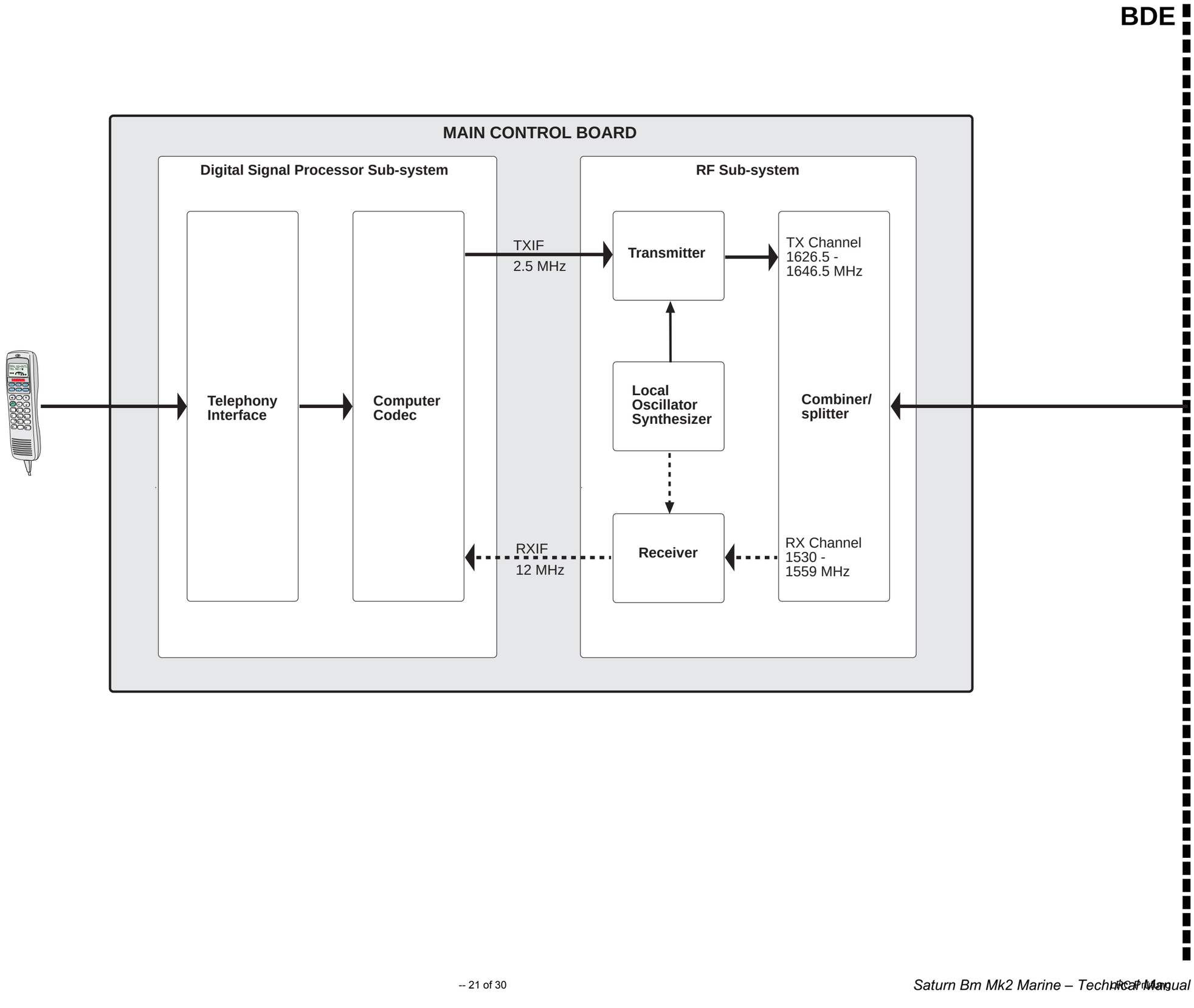
SIGNALLING UNIT – SU

BIT No.

8	7	6	5	4	3	2	1		OCTET No.
Message type							95	1	
MES ID								2	
								3	
								4	
LES ID								5	
spare								6	
								7	
								8	
								9	
								10	
CCITT CRC								11	
								12	

M21
SCRAMBLING VECTOR ACKNOWLEDGE

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1646.5 MHz
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Combiner/ splitter
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12 MHz
Receiver
RX Channel
1530 -
1559 MHz

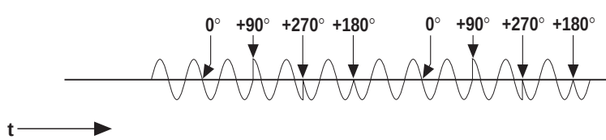
ADE

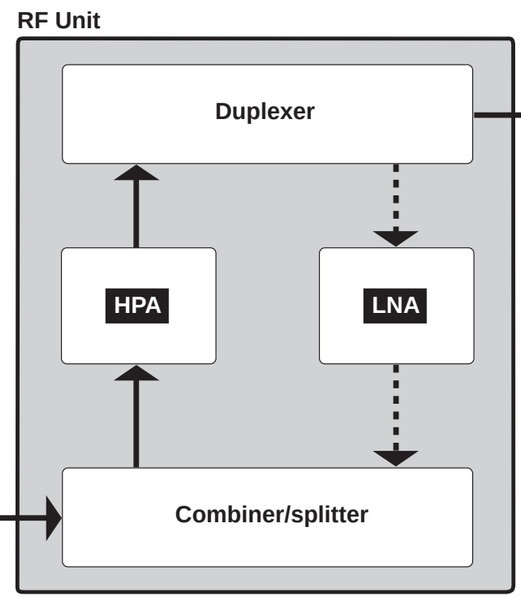
Return Direction

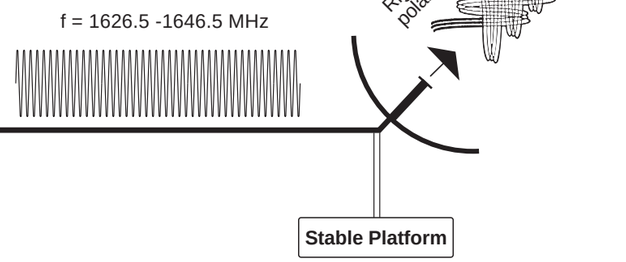
MES ⇨ LES

SCPC channel (Single Carrier Per Channel)
In-band

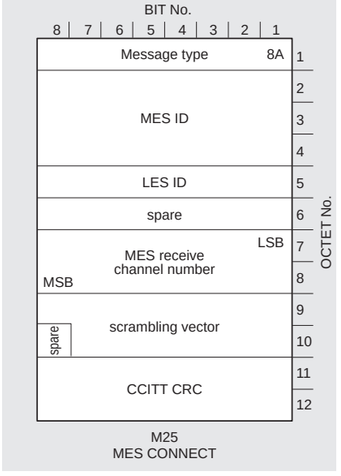
OQPSK Encoded Signal
(OQPSK = Offset Quadrature Phase Shift Keying)

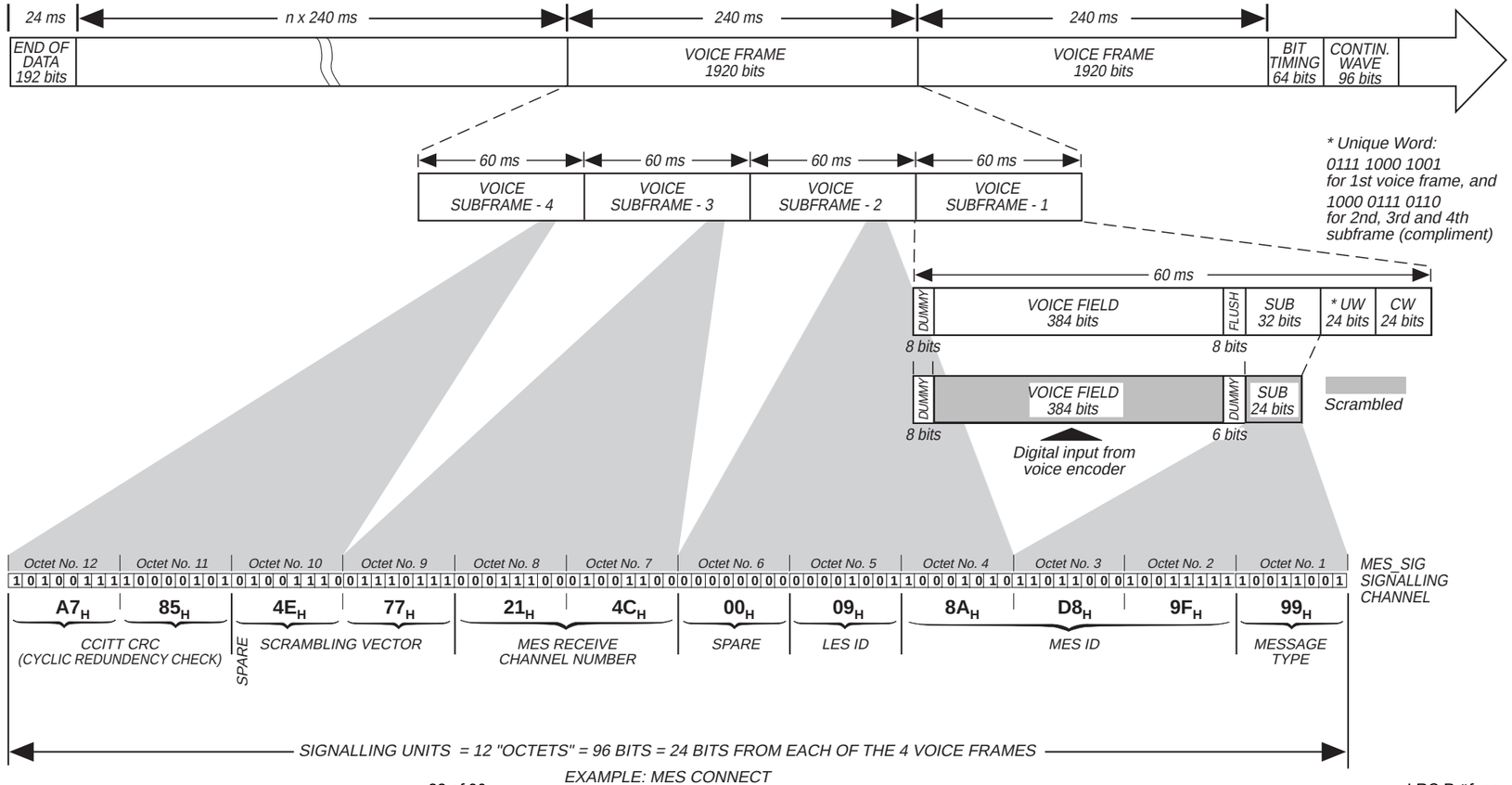


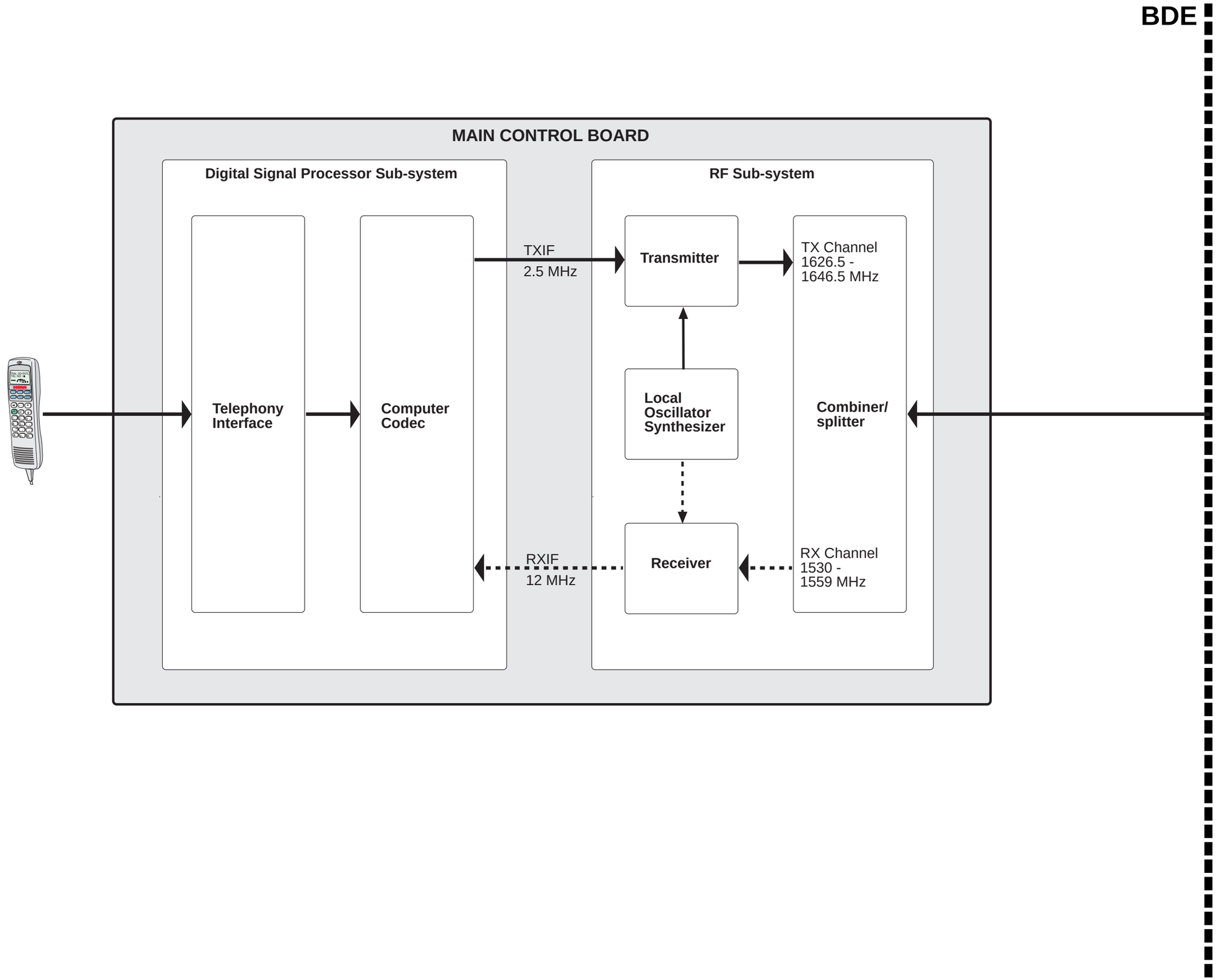




SIGNALLING UNIT – SU



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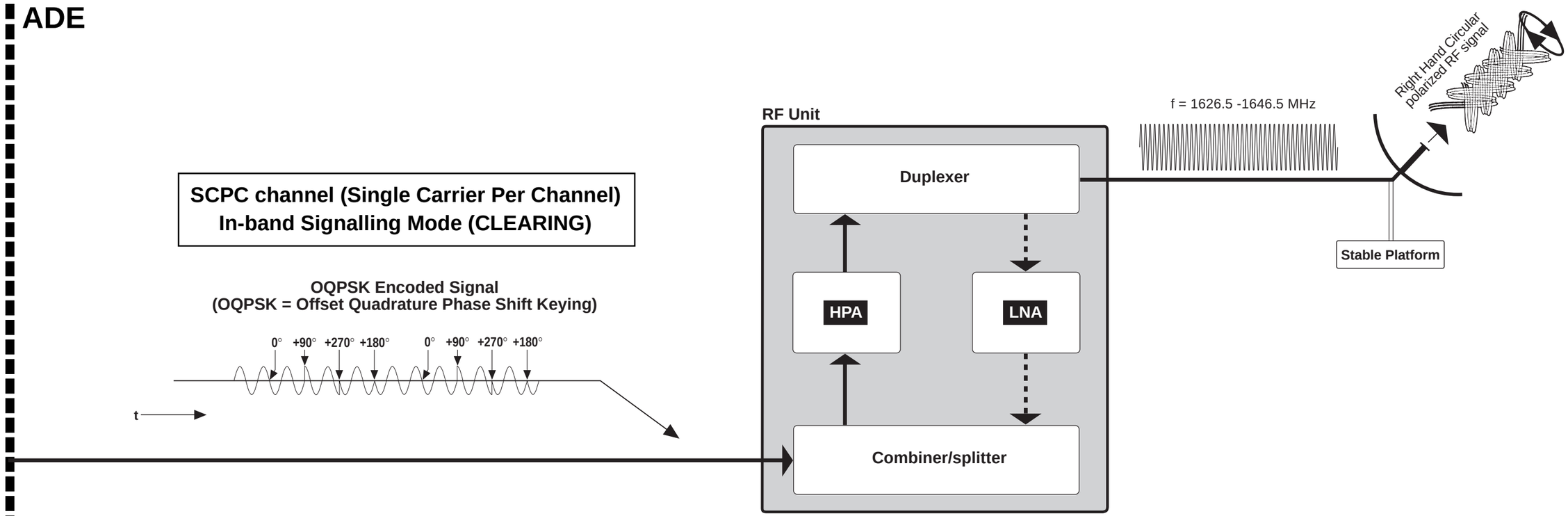
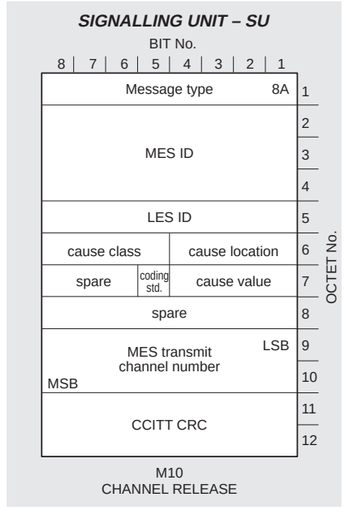
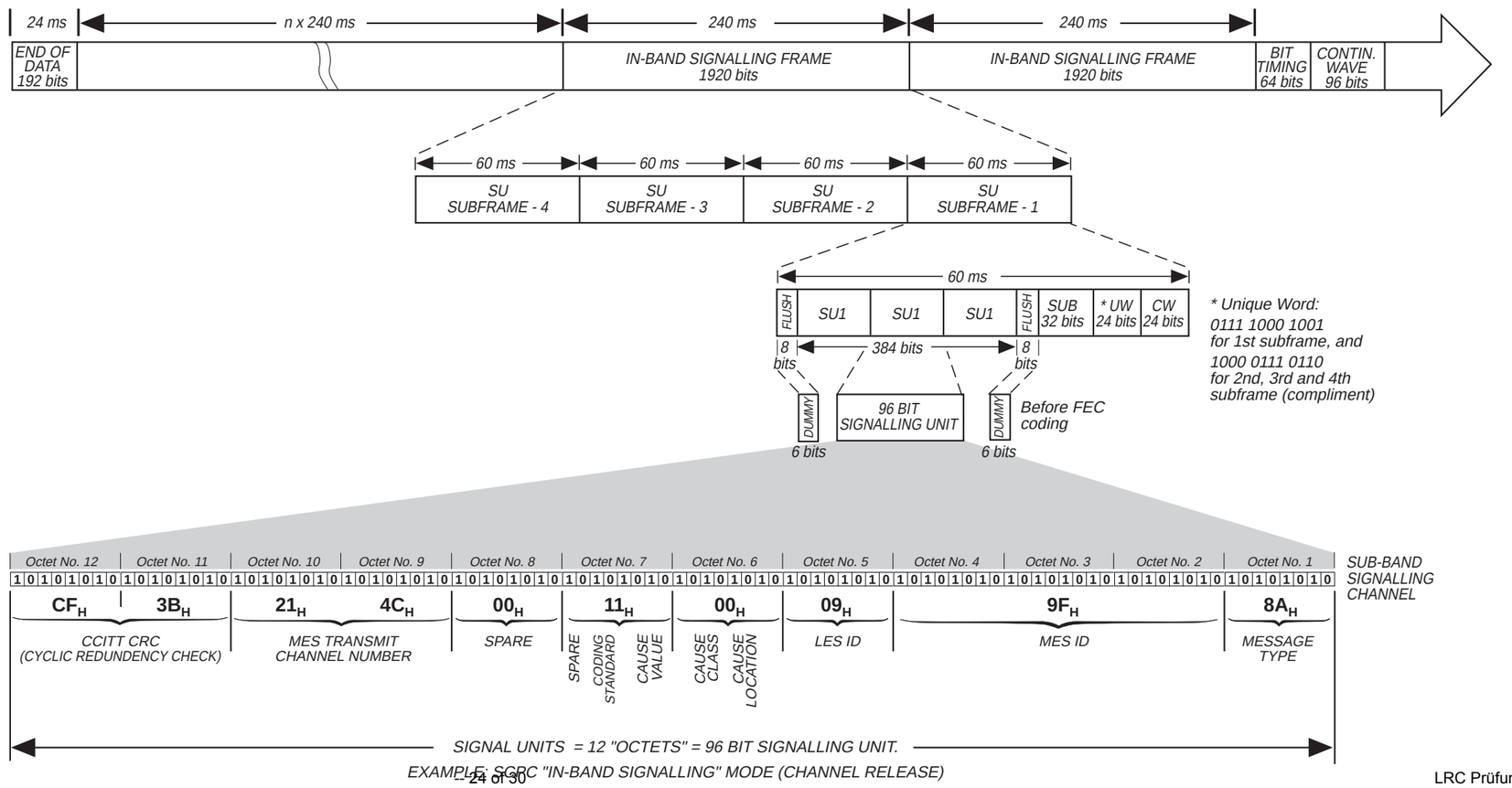
RXIF
12 MHz
Receiver
RX Channel
1530 -
1559 MHz

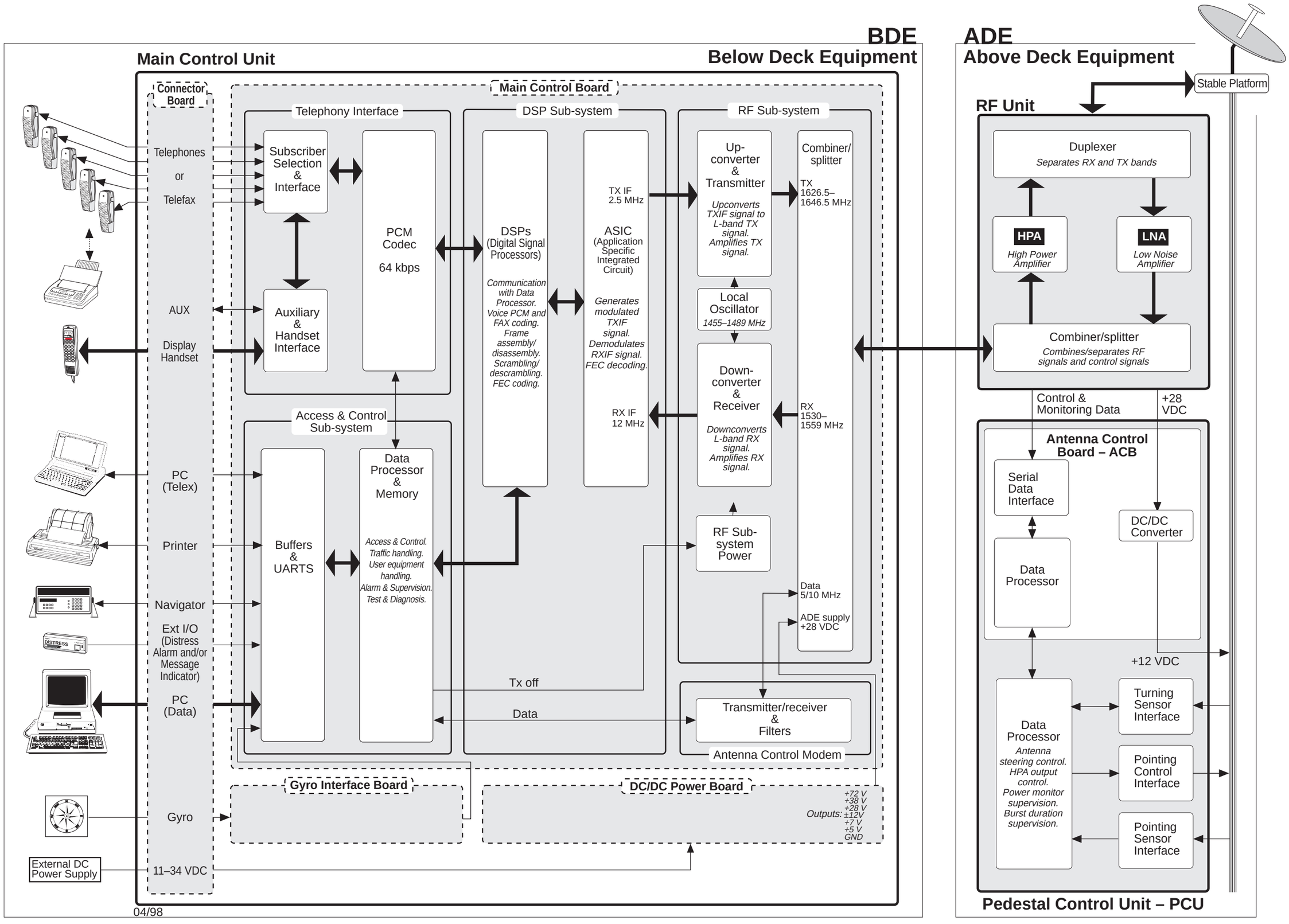
ADE


SCPC channel (Single Carrier Per Channel)
In-band Signalling Mode (CLEARING)
OQPSK Encoded Signal
(OQPSK = Offset Quadrature Phase Shift Keying)
0° +90° +270° +180° 0° +90° +270° +180°
t
RF Unit
Duplexer
HPA
LNA
Combiner/splitter
f = 1626.5 -1646.5 MHz
Right Hand Circular
polarized RF signal
Stable Platform


SIGNALLING UNIT – SU
BIT No.
8 7 6 5 4 3 2 1
Message type 8A 1
MES ID 2 3 4
LES ID 5
cause class cause location 6
spare coding std. cause value 7
spare 8
MES transmit channel number LSB 9 10
MSB
CCITT CRC 11 12
OCTET No.
M10
CHANNEL RELEASE


24 ms
n x 240 ms
240 ms
240 ms
END OF DATA 192 bits
IN-BAND SIGNALLING FRAME 1920 bits
IN-BAND SIGNALLING FRAME 1920 bits
BIT TIMING 64 bits
CONTIN. WAVE 96 bits
60 ms
SU SUBFRAME - 4
SU SUBFRAME - 3
SU SUBFRAME - 2
SU SUBFRAME - 1
FLUSH SU1 SU1 SU1 FLUSH SUB 32 bits * UW 24 bits CW 24 bits
8 bits
384 bits
DUMMY
96 BIT SIGNALLING UNIT
Before FEC coding
6 bits
* Unique Word:
0111 1000 1001
for 1st subframe, and
1000 0111 0110
for 2nd, 3rd and 4th
subframe (compliment)
Octet No. 12 Octet No. 11 Octet No. 10 Octet No. 9 Octet No. 8 Octet No. 7 Octet No. 6 Octet No. 5 Octet No. 4 Octet No. 3 Octet No. 2 Octet No. 1
SUB-BAND SIGNALLING CHANNEL
CF H 3B H
CCITT CRC (CYCLIC REDUNDENCY CHECK)
21 H 4C H
MES TRANSMIT CHANNEL NUMBER
00 H
SPARE
11 H
SPARE CODING STANDARD CAUSE VALUE
00 H
CAUSE CLASS CAUSE LOCATION
09 H
LES ID
9F H
MES ID
8A H
MESSAGE TYPE
SIGNAL UNITS = 12 "OCTETS" = 96 BIT SIGNALLING UNIT.
EXAMPLE: SCPC "IN-BAND SIGNALLING" MODE (CHANNEL RELEASE)

Block Diagram



MAIN CONTROL UNIT – INTERCONNECTION DIAGRAM PAGE 1

Connector Board

Main Control Unit Board

Telephony Interface

Digital Signal Processing Sub-system

Telephone Interface & Relay Circuits

TEL J1 2 3 4 — TEL-1A, TEL-1B — J15/P2 A33, A32 — Telephone 1 (or Telefax)

J2 2 3 4 — TEL-2A, TEL-2B — A31, A30 — Telephone 2 (or Telefax)

J3 2 3 4 — TEL-3A, TEL-3B — A29, A28 — Telephone 3 (or Telefax)

J4 2 3 4 — TEL-4A, TEL-4B — A27, A26 — Telephone 4 (or Telefax)

J5 2 3 4 — TEL-5A, TEL-5B — A25, A24 — Telephone 5 (or Telefax)

AUX J6

3	EXOA	A22
6	EXOB	A21
5	EXIA	A20
4	EXIB	A19
1	EWA	A18
2	EWB	A17
7	MWA	A16
8	MWB	A15

HANDSET J13

6	HSA-RX	A12
8	HSA-TX	A10
7	HS-GNDA	A11

Display Handset

3	TXD (103)	A06
4	RXD (104)	A07
2	MS-ON	A08
5	12V	
1	DIG GND	A05

DTE J7 — J14/P1

1	SCREEN (101)	
2	TXD (103)	B27
3	RXD (104)	B26
4	RTS (105)	B25
5	CTS (106)	A20
6	DSR (107)	B24
7	GND (102)	A27
20	DTR (108)	A24
8	DCD (109)	B23
22	RI (125)	A23
15	TXCLK (DCE)	A26
17	RXCLK (DCE)	
24	TXCLK (DTE)	A21
23	DRS (111)	A19
25	DRS (112)	B19

PC (Data)

SWITCH (1:7)

IL (0:5)

TXS

RXS

Codec Selection Circuits

VFRO

VFRI

PCM Codec

DRI

DTI

SCLK_OUT

F_SYNCI

-CDC_SEL

CDC_CLK

RESET

RXE

TXE

CDC_RX

CDC_TX

Master Digital Signal Processor

TX-SAMBA & D/A Converter

TXMUTE

TXIF

~ 2.5 MHz

RX-SAMBA & A/D Converter

RXIF

~ 12 MHz

Digital Signal Processor

Access & Control Sub-system (see also diagram page 2)

Telephony Control Latch

UART CH. A

RS-232 Serial Interface

RS-232

CPU

SCC1

Data (0:15)

Address (1:2)

-RES_DSP

R-W

-HIP_2111

-TX_REQ

-RX_RDY

11/97

To/from RF Sub-system (see diagram page 2)

MCU Interconnection Diagram Cont'd

MAIN CONTROL UNIT – INTERCONNECTION DIAGRAM PAGE 2

To/from DSP (see diagram page 1)

Connector Board Cont'd

Main Control Unit Board Cont'd

Access & Control Sub-system (see also diagram page 1)

RF Sub-system

PC J8 — J14/P1

2	RXD (104)	B21
3	TXD (103)	B22
4	DTR (108)	A19
5	GND (102)	A22
6	DSR (107)	B19
7	RTS (105)	B20
8	CTS (106)	A20

PC

PRINTER P9

2	RXD (104)	B17
3	TXD (103)	B18
4	DTR (108)	A15
5	GND (102)	A18
6	DSR (107)	B15
7	RTS (105)	B16
8	CTS (106)	A16

Printer

EXT I/O J10

2	EXT-A	A04
6	EXT-B	A03
9	12V FUSED	A01 (+12V)
5		A02

Distress Alarm and/or Message Indicator

NAVIGATOR J11

1	LIST1-A	A30
2	LIST1-B	B30
3	TALK1-A	A29
4	TALK1-B	B29
5	LIST2-A	A28
6	LIST2-B	B28

NMEA-0183 Heading Sensor

NMEA-0183 Position

Optocoupler

Optocoupler

RS-232 Serial Interface

RS-232 Serial Interface

RS-485 Serial Interface

UART CH. D

UART CH. C

UART CH. B

SCC2

CPU

SCC3

Latch & Buffer

* TX1 LOCK
BWCTRL1
BWCTRL2
BWCTRL3
SYNTDAT
SYNTCLK
TXSLCT
* TX2 LOCK
* LO LOCK
LOSLCT
Clock
Data

* OSC_LOCK

(STATUS function message)*

* RX SIGNAL
-TXOFF

Memory

ANT_TX

ANT_RX

RXIF ~12 MHz

TXIF ~2.5 MHz

TXMUTE

~18.3 MHz — Tracking filter (PLL) — ~18.3 MHz — Up-converter (PLL)

15.84 MHz

1626.5 - 1646.5 MHz

Saturn B

Combiner/ splitter

System clock

LOREF

Local oscillator (PLL)

1450 - 1484 MHz

X-ta osc — x1 — 15.84 MHz; x4 — 63.36 MHz

BW=3 MHz — ~12 MHz — AGC Amp. — ~75 MHz

1530 - 1559

Power detector

Tx supply

Antenna Control Modem

Transmitter — Lowpass Filter

Receiver — Highpass Filter

DATA

+28V

+28V RET

GYRO 3 G-CNTRL 3 GYRO 2 G-CNTRL 2 GYRO 1 G-CNTRL 1

-POWER-OFF KEY-ON DC-LEVEL

+72 V RET +72V -38V RET -38V TEMP_RET TEMP DC_LEVEL RET DC_LEVEL KEY_ON RET KEY_ON POWER_OFF RET -POWER_OFF -12V -12V RET +5V +5V RET +12V +12V RET +7V RET +7V +28V +28V RET

J14/P1 B31 A34 B32 B33 A32 A33

J14/P1 A12 B12 A13 B13 A14 B13

J17/P2 A04 B04 A05 B05 A06 B06 A07 B07 A08 B08 A09 B09 A10 B10 A11 B11 A12 B13 A13 B14 A14 B15 A15 B16 A16 A17-A18 B17-B18 A19-A20 B19-B20

GYRO P12 — J18

1	PHASE 1	B20
2	PHASE 2	B19
3	PHASE 3	B18
4	SYNC REF-	B17
5	COM REF	A16
6	SYNC REF +	A17

Gyro

Automatic STEP GYRO/SYNCHRO GYRO Input Sensing/conversion

Gyro Board

DC-DC Voltage Generator/regulator

Power Board

11 – 34 V DC

A1

A2

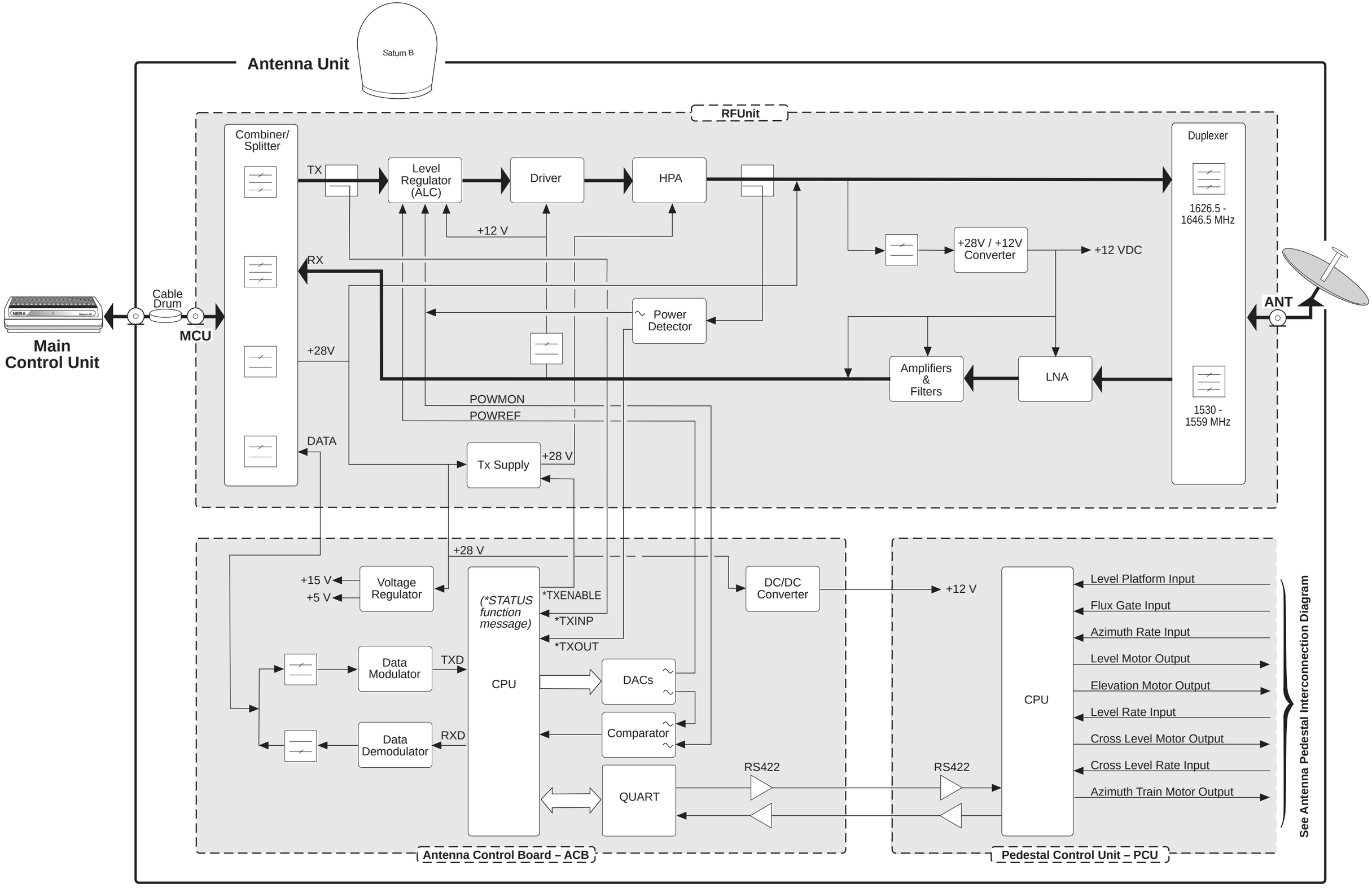
Fuse

OFF

ON

3/98

Antenna Unit Interconnection Diagram



Antenna Pedestal Interconnection Diagram