Modular Block Converter Systems

Key Features

Hot-swappable, plug-in upconverter and downconverter modules

Dual, redundant, hot-swappable power supplies

Excellent frequency stability over temperature

Built-in monitoring of individual modules and overall system performance

Internal/external auto-switch 5 or 10 MHz reference.

Front hot-swappable plug-in modules (RF, PS, touch screen, and logic card).

Available in stand-alone, 1:1 redundancy, and 1:2 redundancy configurations

Color touch-screen user interface

TCP/IP embedded page to monitor and control system functions, and send email alerts

Ethernet or Serial I/O M&C interface

Standard 19” rack panel, 3.5” high (2 RU), with 22” chassis slides; chassis is 24” deep.

The Modular Block Converter System eliminates system downtime and maximizes ease of repair by providing fully modular systems for up conversion or down conversion. Critical components in the system are hot-swappable without removal of power. All active components are removable from the front of the chassis, except the fan assembly, which is accessible from the rear panel.

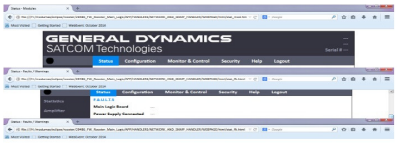
Hot-Swappable Architecture

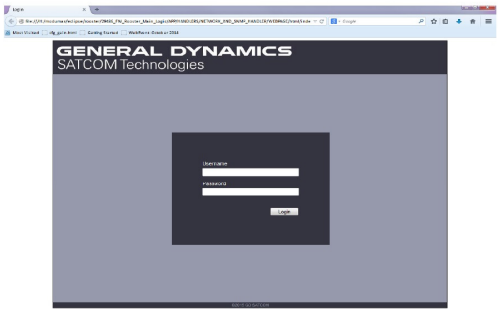
The converters can be configured for single-thread operation or for 1:1 or 1:2 redundancy. In a redundant system, a backup converter can be switched in automatically or manually to replace a faulted unit; the faulted module may be removed and replaced while the other is running.

The system design leverages a blindmate backplane for front panel removal for converters, power supplies, logic card, and color touchscreen. The design enables fast and easy repair with continuous operation, achieving MTTR of less than 3 minutes.

User Interface—Leading Edge Software

The MBC is equipped with a color touch-screen for local control along with a leading-edge TCP/IP embedded Web Page software package. The software can be configured for remote monitoring, while allowing virtual factory access to monitor the converter modules’ key performance parameters such as temperature, current, and voltage. The user interface features secure login with user privilege level controls.





GENERAL DYNAMICS
SATCOM Technologies

Operating Functions

- Monitors and controls two or three redundant RF modules of a single type in either a 1:1 (two module) or 1:2 (three module) configuration.
- Monitors and controls one or two independent, single-thread modules.
- Monitors the internal power supply modules for faults.
- Front panel controls and status indicators
- Ethernet Interface:

  SNMPv1/2/3

  HTTP (Web page)

  Firmware Updates via secure protocol
- RS-232/485/422 Serial Interface
- Redundant Control Modes:
  - *Auto Mode*: A faulted RF module is automatically switched off line and replaced with the backup unit.
  - *Manual Mode*: Allows manual control over which unit is online, via the front panel, serial port, or network.
- Converter modules feature an autoselection reference that automatically phase locks to an external 5 or 10 MHz reference when present, or uses its internal high stability reference when the external reference is not detected.
- Built-in RF module monitoring & control capabilities:
  - Gain Adjust or attenuation control
  - External Reference Level
  - External Reference Frequency
  - Reference Phase Lock
  - LO Phase Lock
  - Module Current
  - Module Power-On Self-Test
  - Module Temperature

RF Module Bands

Downconverters

Input	*LO Frequency*	*Output*	*Model*
10.70-11.75 GHz	9.75 GHz	950-2000 MHz	DKFX
11.70-12.75 GHz	10.75 GHz	950-2000 MHz	DKJX

Upconverters

Input	*LO Frequency*	*Output*	*Model*
950-1700 MHz	12.80 GHz	13.75-14.50 GHz	UKBX

Auto-recovery and Sparing

The MBC senses loss-of-lock conditions and component failures to initiate switching to a redundant converter. Users have the capability of setting up alert emails, along with remote monitoring capability via embedded TCP/IP web status pages. Replacement of any component can be accomplished within minutes.

Sparing of the MBC is dependent upon the user. Active components are:

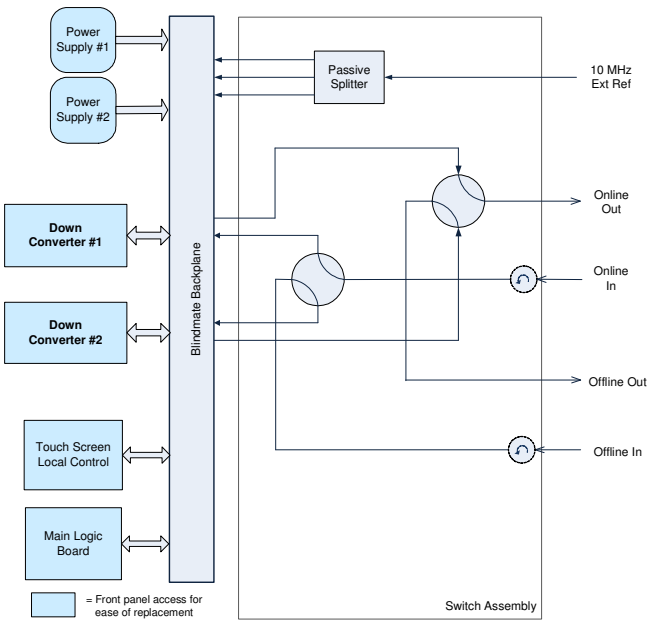
- Converter
- Logic Board
- Power Supply
- Touchscreen
- Fan Assembly

Cooling Fans

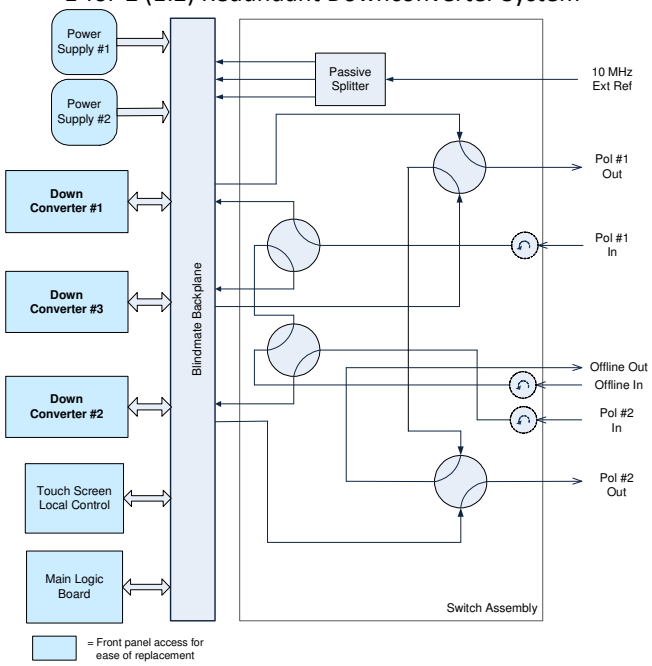
The MBC has two cooling fans mounted on an easy-to-replace fan assembly.

MBC System Block Diagrams

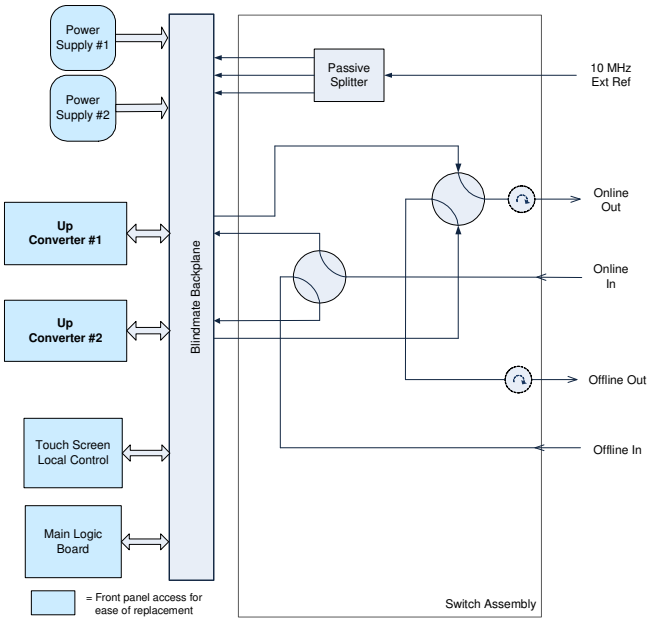
1-for-1 (1:1) Redundant Downconverter System



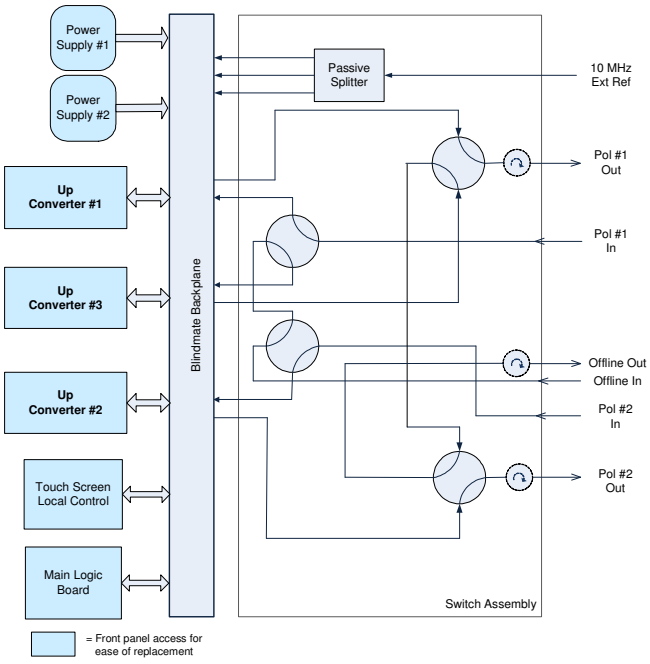
1-for-2 (1:2) Redundant Downconverter System



1-for-1 (1:1) Redundant Upconverter System



1-for-2 (1:2) Redundant Upconverter System



Downconverter Module Performance

Parameter	Notes	Min.	Nom./Typ.†	Max.	Units
RF Input Power	At maximum gain			-10	dBm
RF Input VSWR	Ratio			1.25	:1
	Return Loss	19.1			dB
IF Output VSWR	Ratio			1.5	:1
	Return Loss	14			dB
LO Leakage				-50	dBm
Reference Input Frequency	Auto Detect		5 or 10 MHz		
Reference Input Power	At module	-7.5	0	+7.5	dBm
Power Output at 1 dB Compression ($P_{1\ dB}$)	IF Output, at max. gain	+15	+17		dBm
3rd Order Intercept Point	IF output, at max. gain	+26	+28		dBm
Gain	At max. gain setting	24	26	30	dB
Gain Step Resolution		0.5			dB
Adjustable Gain Range		25			dB
Gain Flatness	Full band, at max. gain			± 1	dB
	Per 40 MHz, at max. gain			± 0.25	dB
Gain Stability	Over temperature		± 1.0		dB
	Per week, constant temp.		± 0.5		dB
	Per week and over temp.		± 1.5		dB
In-Band Spurious	Signal-related			-60	dBc
	Non-signal-related			-70	dBc
Harmonics	At IF		-55	-45	dBc
Noise Figure	At maximum gain		15	16	dB
Power	Voltage		12		Vdc
	Power		20		W
Temperature Range	Operating	0		+50	°C
	Storage	-40		+85	°C

Reference Performance

Parameter	Notes	Min.	Nom./Typ.†	Max.	Units
Internal Reference Standard	0 to +50 °C		±30		ppb
Aging per day			±1		ppb
Aging after 10 years			±500		ppb
External Reference Requirements	All subbands				
Frequency			5 or 10		MHz
Frequency Tolerance			±0.5		ppm
Power Level	At module	-10		0	dBm
Impedance			50		ohms
Ref PLL Bandwidth				10	Hz
Ext. Ref. Phase Noise Req.	10 Hz Offset			-105	dBm/Hz
	100 Hz Offset			-135	dBm/Hz
	1 kHz Offset			-145	dBm/Hz
	10 kHz Offset			-150	dBm/Hz

† When there is only one value on a line, the Nom./Typ. column is a nominal value; otherwise it is a typical value. Typical values are intended to illustrate typical performance, but are not guaranteed.

Upconverter Module Performance

Parameter	Notes	Min.	Nom./Typ.†	Max.	Units
IF Input Power				-7	dBm
IF Input VSWR	Ratio			1.5	:1
	Return Loss	14			dB
RF Output VSWR	Ratio			1.25	:1
	Return Loss	19.1			dB
LO Leakage				-50	dBm
Reference Input Frequency	Auto Detect		5 or 10 MHz		
Reference Input Power	At module	-7.5	0	+7.5	dBm
Power Output at 1 dB Compression ($P_{1\ dB}$)	RF Output, at max. gain	+15	+17		dBm
3rd Order Intercept Point	RF output, at max. gain	+26	+27		dBm
Gain	At max. gain setting	24	26	30	dB
Gain Step Resolution		0.5			dB
Adjustable Gain Range		25			dB
Gain Flatness	Full band, at max. gain			± 1	dB
	Per 40 MHz, at max. gain			± 0.25	dB
Gain Stability	Over temperature		± 1.0		dB
	Per week, constant temp.		± 0.5		dB
	Per week and over temp.		± 1.5		dB
In-Band Spurious	Signal-related			-60	dBc
	Non-signal-related			-70	dBm
Noise Figure	At maximum gain		15	16	dB
Power	Voltage		12		Vdc
	Power		20		W
Temperature Range	Operating	0		+50	°C
	Storage	-40		+85	°C

Reference Performance

Parameter	Notes	Min.	Nom./Typ.†	Max.	Units
Internal Reference Standard	0 to +50 °C		±30		ppb
Aging per day			±1		ppb
Aging after 10 years			±500		ppb
External Reference Requirements	All subbands				
Frequency			5 or 10		MHz
Frequency Tolerance			±0.5		ppm
Power Level	At module	-10		0	dBm
Impedance			50		ohms
Ref PLL Bandwidth				10	Hz
Ext. Ref. Phase Noise Req.	10 Hz Offset			-105	dBm/Hz
	100 Hz Offset			-135	dBm/Hz
	1 kHz Offset			-145	dBm/Hz
	10 kHz Offset			-150	dBm/Hz

† When there is only one value on a line, the Nom./Typ. column is a nominal value; otherwise it is a typical value. Typical values are intended to illustrate typical performance, but are not guaranteed.

Phase Noise Performance

Maximum dBc/Hz at	*Downconverter*	*Upconverter*
10 Hz Offset	-36	-36
100 Hz Offset	-66	-66
1 kHz Offset	-76	-76
10 kHz Offset	-86	-86
100 kHz Offset	-96	-96
1 MHz Offset	-106	-106

System Performance

The redundant modular block downconverter or upconverter system generally has the same performance as the individual converter modules with the following exceptions:

Parameter	Specification
RF port VSWR	1.3:1 max. (17.7 dB RL)
IF port VSWR	1.9:1 max. (10.1 dB RL)
System RF Gain Losses (typ.)	2 dB
System IF Gain Losses (typ.)	1 dB
Gain Flatness (typ.)	Add ±0.3 dB to module specification
Noise Figure	Add +2 dB to module specification
Reference Input Power	-5 to +5 dBm; 0 dBm typical

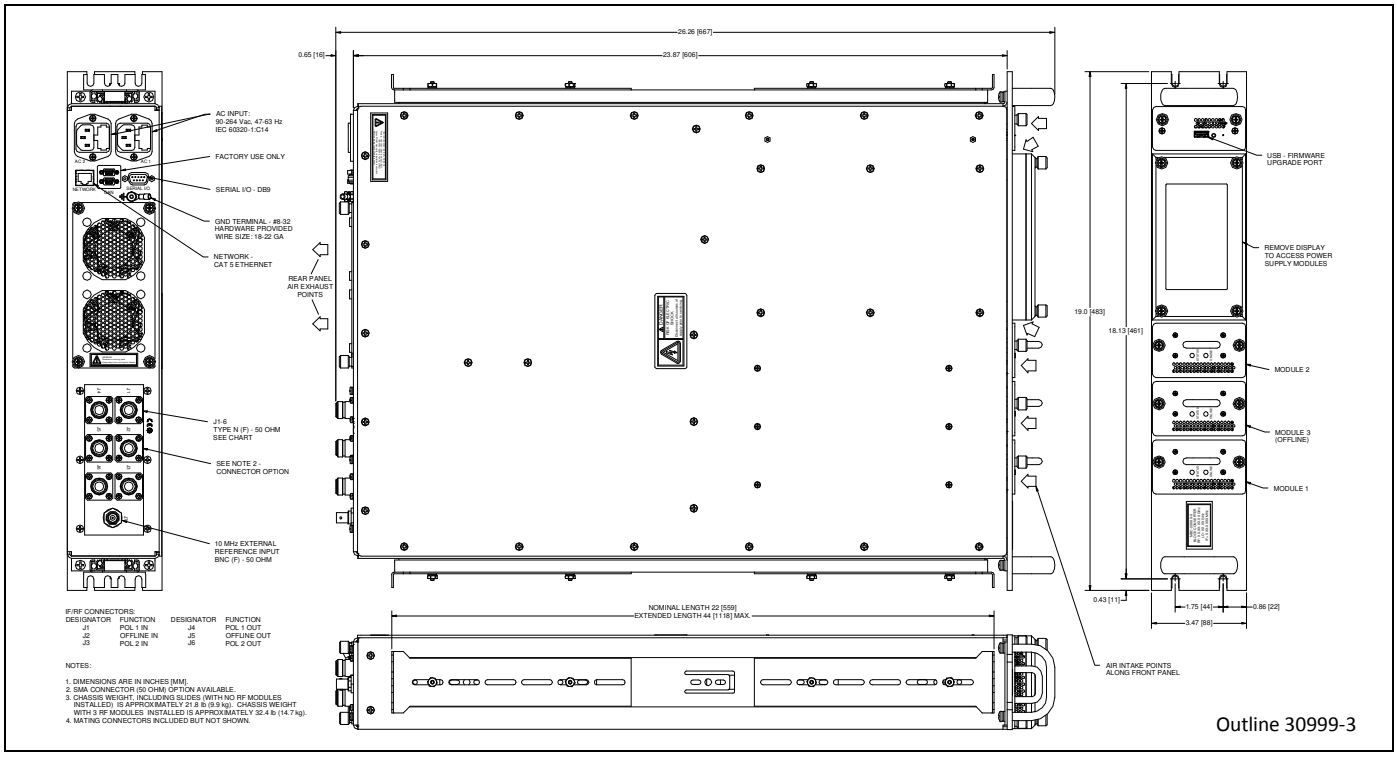
Power Supply

Parameter	Specification
AC Input (dual line input)	90–264 Vac, 47–63 Hz; 60 W typical
DC Output	12 V, 250 W over 0 to +50 °C

Connector Interfaces

Parameter	Specification
RF/IF Input	Type N, 50 ohms (standard); SMA, 50 ohms (option)
IF/RF Output	Type N, 50 ohms (standard); SMA, 50 ohms (option)
10 MHz External Reference Input	BNC Female
Network	RJ-45/CAT 5 Ethernet
Serial I/O	DB-9 (RS-232, RS-422, RS-485:2, RS-485:4)

Outline Drawing



Outline 30999-3

Part Number/Ordering Information

Top-Level Configuration Includes rack chassis with 2 power supply modules and choice of 1 (single-thread), 2 (1:1 redundant), or 3 (1:2 redundant) RF modules:

MBC-□□□□□-□

Configuration
- Single-thread, no redundancy (1 RF module) X
- 1:1 Redundant (2 identical RF modules) 1
- 1:2 Redundant (3 identical RF modules) 2

Module Identifier (see below) XXXX

Rear Panel RF connectors
- Type N, 50 ohms (Standard) X
- SMA, 50 ohms (Option) 1

Note: Standard configuration includes only one type of RF module per chassis.

RF Modules ..... To order single modules separately:

BCM-□□□□

Downconverters

Ku-Band
- 10.70-11.75 GHz in, 9.75 GHz LO, 950-2000 MHz out ..... DKFX
- 11.70-12.75 GHz in, 10.75 GHz LO, 950-2000 MHz out ..... DKJX

Upconverters

Ku-Band
- 950-1700 MHz in, 12.80 GHz LO, 13.75-14.50 GHz out ..... UKBX

Note: To order a blank module cover plate, use part number MPAN-30281.

PS modules can also be ordered separately, part number AMAX-30271-1.

Spares Kit

Includes 1 Fan Assembly, 1 Power Supply Module, 1 Logic Board, and 1 Display Board. Converter modules sold separately.

For more information about the Modular Block Converter system, or to arrange for a demonstration unit, please send an email to satcom@gd-ms.com.

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Other Products

- Solid-State Power Amplifiers and SSPA Systems
- Solid-State Power BUCs and SSPB Systems
- Low Noise Amplifiers and LNA Systems
- Low Noise Block Converters and LNB Systems
- Block Up and Block Down Converters
- Synthesized Converters
- Line Drive Amplifiers
- Power Supply Monitors
- Redundant Control Panels for SSPAs, SSPBs, and LNAs

GENERAL DYNAMICS
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