The Communications & Power Industries LLC Modular Block Converter (MBC) System eliminates downtime and maximizes performance and ease of repair by providing fully modular systems for up conversion or down conversion.

Modular converter units upconvert an IF uplink frequency block to a corresponding Ku-Band RF transmit frequency block, or downconvert a Ku-Band RF receive frequency block to a corresponding IF downlink frequency block.

Leveraging patented technology and field proven architecture, all of the critical system components are hot-swappable without the removal of power and can be removed from the front of the chassis with the exception of 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 redundancies. 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 or replaced while the others remain operational.

The system design leverages a blind mate backplane for front panel removal of 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.

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-switching 5 or 10 MHz reference

FEATURES:

- 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
- 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

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

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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.
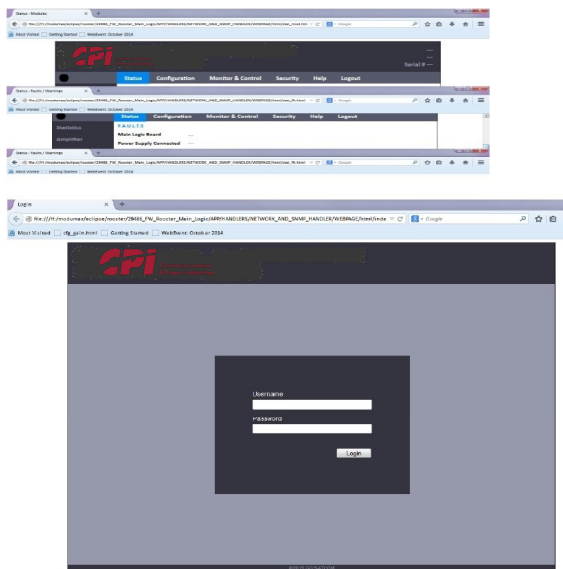
Operating Functions

- 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, two or three independent, single-thread modules.
- Monitors cooling fan speed for faults
- Monitors the internal power supply modules for faults.
- Front panel controls and status indicators
- Ethernet Interface:
  SNMPv1/2/3
  HTTPS (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 auto selection 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

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 remote monitoring 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 that are hot-swappable
  RF Converter Module
  Logic Module
  Power Supply Module
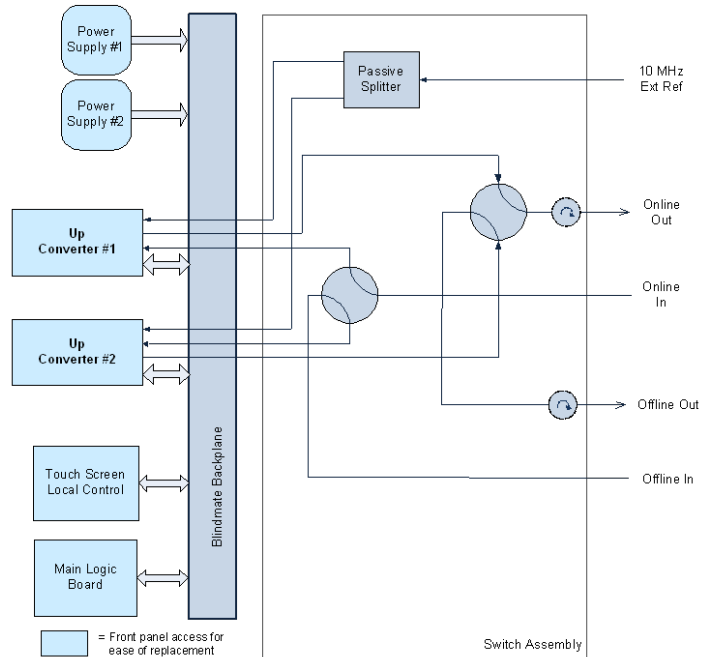 Touchscreen Display Module
  Fan Assembly

Cooling Fans

- The MBC has two cooling fans mounted on an easy-to-replace fan assembly.
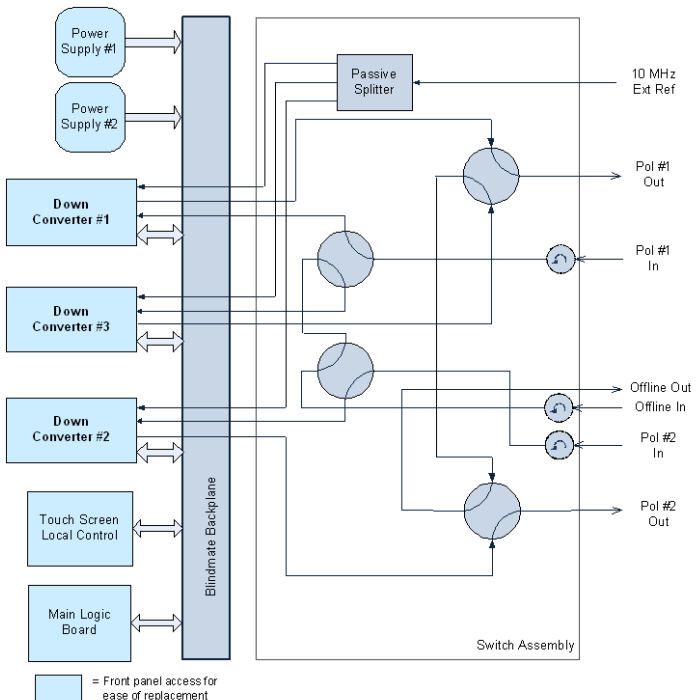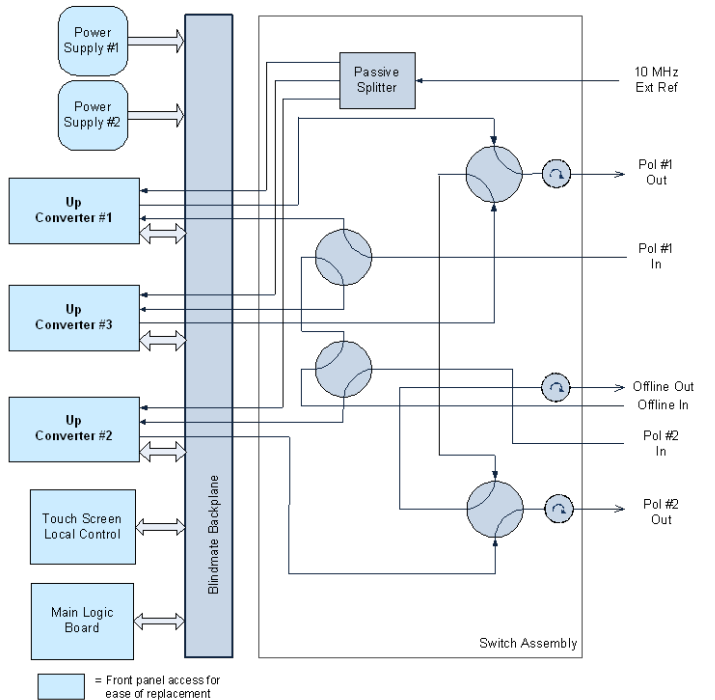
1 for 1 (1:1) Redundant Downconverter System
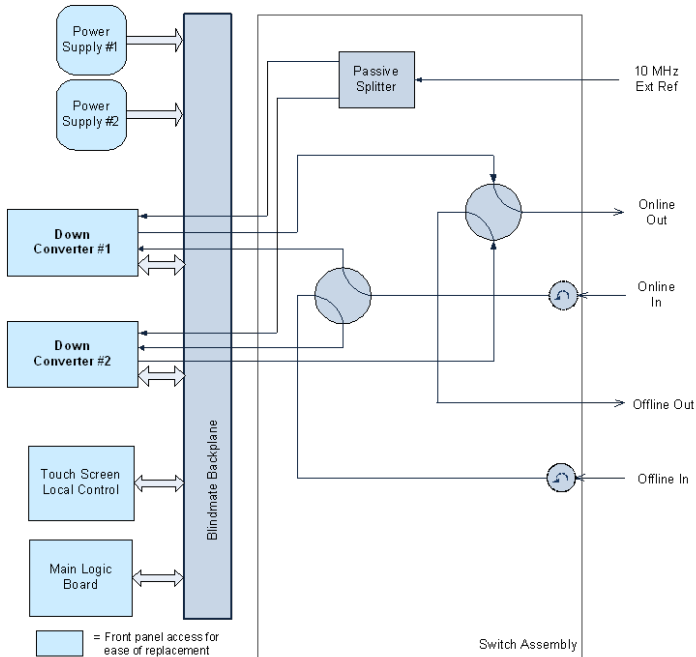
1 for 1 (1:1) Redundant Upconverter System

1 for 2 (1:2) Redundant Downconverter System

1 for 2 (1:2) Redundant Upconverter System

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Downconverter Module Performance

Parameter	Notes	Specification
RF Input Power		-10 dBm at maximum gain
RF Input VSWR		1.25:1 max. ratio 19.1 dB Return Loss min.
RF Output VSWR		1.5:1 max. ratio 14 dB Return Loss min.
LO Leakage		150 dBm max. at IF Output
Reference input Frequency		5 or 10 MHz typical, Auto Detect
Reference input Power		-7.5 dBm min., 0 dBm typical, +7.5 dBm max., At module
Power Output at 1dB compression ($P_{1\,dB}$)	IF Output, at max. gain	+15 dBm min., +17 dBm typical
3rd Order Output Intercept Point	IF Output, at max. gain	+26 dBm min., +28 dBm typical
Gain		24 dB min., 26 dB typical, 30 dB max., at max. gain setting
Gain Step Resolution	Standard LNA	0.1 dB typical
Adjustable Gain Range		25 dB typical
Gain Flatness		±1 dB over the full band ±0.25 dB per 40 MHz
Gain Stability	Per day, Over temperature Per week, Constant temperature Per week and over temperature	±1 dB typical ±0.5 dB typical ±1.5 dB typical
In-Band Spurious		-60 dBc max., Signal-related -70 dBc max., Non-Signal-related
Harmonics		-55 dBc typical, -45 dBc max., at IF linear operation
Noise Figure	At maximum gain	15 dB typical, 16 dB max.
Power	Voltage Power	12 VDC 12 W
Temperature Range	Operating Storage	0°C to +50°C -40°C to +85°C

Reference Performance

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

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Upconverter Module Performance

Parameter	Notes	Specification
RF Input Power		-10 dBm at maximum gain
RF Input VSWR		1.5:1 max. ratio 14 dB Return Loss min.
RF Output VSWR		1.25:1 max. ratio 19.1 dB Return Loss min.
LO Leakage		-50 dBm max. at RF Output
Reference input Frequency		5 or 10 MHz typical, Auto Detect
Reference input Power		-7.5 dBm min., 0 dBm typical, +7.5 dBm max., At module
Power Output at 1dB compression ($P_{1 dB}$)	RF Output, at max. gain	+15 dBm min., +17 dBm typical
3rd Order Output Intercept Point	RF Output, at max. gain	+26 dBm min., +27 dBm typical
Gain		24 dB min., 26 dB typical, 30 dB max., at max. gain setting
Gain Step Resolution		0.1 dB typical
Adjustable Gain Range		25 dB typical
Gain Flatness		±1 dB over the full band ±0.25 dB per 40 MHz
Gain Stability	Over temperature Per week, Constant temperature Per week and over temperature	±1 dB typical ±0.5 dB typical ±1.5 dB typical
In-Band Spurious		-60 dBc max., Signal-related -70 dBm max., Non-Signal-related
Noise Figure	At maximum gain	15 dB typical, 16 dB max.
Power	Voltage Power	12 VDC 12 W
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Reference Performance

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Internal Reference Standard	0°C to +50°C	±30 ppb typical
Aging per day		±1 ppb typical
Aging after 10 years		±500 ppb typical
External Reference Requirements	All RF bands	
Frequency		5 or 10 MHz
Frequency Tolerance		±0.5 ppm
Power Level		-5 dBm min., +5 dBm max., At module
Impedance		50 ohms typical
Ext. Ref. Phase Noise Req.	10 Hz Offset 100 Hz Offset 1 kHz Offset 10 kHz Offset	-105 dBm/Hz -135 dBm/Hz -145 dBm/Hz -150 dBm/Hz

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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	1.6:1 max. (12.7 dB RL)
System RF Losses (typ.)	2 dB
System IF 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	0 to +10 dBm

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)

* Use an adapter or transformer (not supplied) if interfacing to 75 ohm equipment is required.

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Outline Drawing

26.26 [667]
23.87 [606]
0.65 [16]

AC INPUT:
90-264 Vac, 47-63 Hz
IEC 60320-1:C14

FACTORY USE ONLY

SERIAL I/O - DB9

GND TERMINAL - #8-32
HARDWARE PROVIDED
WIRE SIZE: 18-22 GA

NETWORK -
CAT 5 ETHERNET

REAR PANEL
AIR EXHAUST
POINTS

J1-6
TYPE N (F) - 50 OHM
SEE CHART

SEE NOTE 2 -
CONNECTOR OPTION

10 MHz EXTERNAL
REFERENCE INPUT
BNC (F) - 50 OHM

USB - FIRMWARE
UPGRADE PORT

REMOVE DISPLAY
TO ACCESS POWER
SUPPLY MODULES

19.0 [483]
18.13 [461]

MODULE 2

MODULE 3
(OFFLINE)

MODULE 1

0.43 [11]
1.75 [44]
0.86 [22]
3.47 [88]

AIR INTAKE POINTS
ALONG FRONT PANEL

NOMINAL LENGTH 22 [559]
EXTENDED LENGTH 44 [1118] MAX

IF/RF CONNECTORS:

DESIGNATOR	FUNCTION	DESIGNATOR	FUNCTION
J1	POL 1 IN	J4	POL 1 OUT
J2	OFFLINE IN	J5	OFFLINE OUT
J3	POL 2 IN	J6	POL 2 OUT

NOTES:
1. DIMENSIONS ARE IN INCHES [MM].
2. SMA CONNECTOR (50 OHM) OPTION AVAILABLE.
3. CHASSIS WEIGHT, INCLUDING SLIDES (WITH NO RF MODULES INSTALLED) IS APPROXIMATELY 21.8 lb (9.9 kg). CHASSIS WEIGHT WITH 3 RF MODULES INSTALLED IS APPROXIMATELY 32.4 lb (14.7 kg).
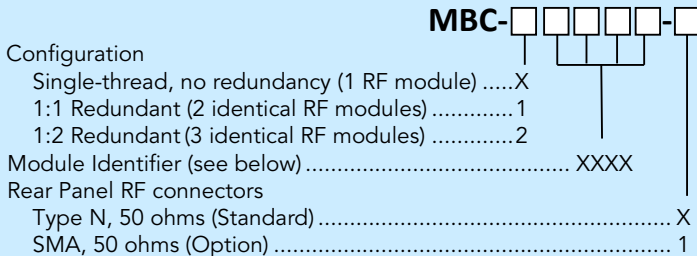4. MATING CONNECTORS INCLUDED BUT NOT SHOWN.

Outline 30999-3

Part Number/Ordering Information

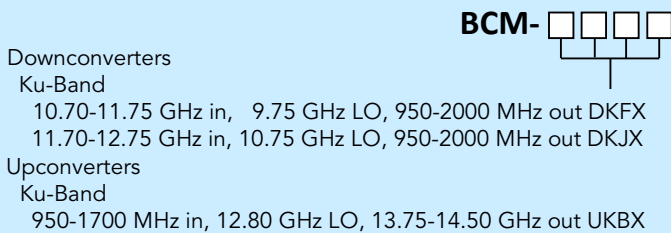**Top-Level Configuration**   Includes rack chassis with 2 power supply modules and choice of 1 (single-thread), 2 (1:1 redundant), or 3 (1:2 redundant) RF modules:

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 Module, and 1 Display Module. Converter modules sold separately.

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For more detailed information, please refer to the corresponding CPI technical description if one has been published, or contact CPI. Specifications may change without notice as a result of additional data or product refinement. Please contact CPI before using this information for system design.