### Overview

The General Dynamics SATCOM Technologies 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 up-convert an IF up-link frequency block to a corresponding Ku-Band RF transmit frequency block, or down-convert a Ku-Band RF receive frequency block to a corresponding IF down-link 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 redundancy. In a redundant system, a backup converter can be switched in automatically or manually to replace a faulted unit; the failed module may be removed and replaced while the others remain operational.

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.

### 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 I/O M/C interface
- Standard 19” rack panel, 3.5” high (2 RU), with 22” chassis slides; chassis is 24” deep
**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 or two independent, single-thread modules.
- Monitors internal power supply modules for faults.
- Front panel controls and status indicators.
- Ethernet Interface: 1000BaseT/10/100BaseT/100BaseTX/10BaseT with option for 100BaseT via co-axial.
- Firmware Updates via secure protocol.
- RS-232C/485/422 Serial Interface.
- Redundant Control Modes: Auto Mode: A failed 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.

**RF Module Bands**

<table>
<thead>
<tr>
<th>Downconverters</th>
<th>Input LO Frequency</th>
<th>Output</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.70-11.75 GHz</td>
<td>9.75 GHz</td>
<td>950-2000 MHz</td>
<td>DKFX</td>
</tr>
<tr>
<td>11.70-12.75 GHz</td>
<td>10.75 GHz</td>
<td>950-2000 MHz</td>
<td>DKJX</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upconverters</th>
<th>Input LO Frequency</th>
<th>Output</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>950-1700 MHz</td>
<td>12.80 GHz</td>
<td>13.75-14.50 GHz</td>
<td>LKFX</td>
</tr>
</tbody>
</table>

**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: Converter, Logic Board, Power Supply, Touchscreen, Fan Assembly.

**Cooling Fans**
- The MBC has two cooling fans mounted on an easy-to-replace fan assembly.
### Downconverter Module Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Notes</th>
<th>Min.</th>
<th>Nom./Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Input Power</td>
<td>At maximum gain</td>
<td>-10</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Input VSWR</td>
<td>Ratio Return Loss</td>
<td>1.25</td>
<td>:1 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/F Output VSWR</td>
<td>Ratio Return Loss</td>
<td>1.5</td>
<td>:1 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LO Leakage</td>
<td></td>
<td>-50</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Input Frequency</td>
<td>Auto Detect</td>
<td>±1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Input Power</td>
<td>At module</td>
<td>±7.5</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Output at 1 dB Compression (P1dB)</td>
<td></td>
<td>±15</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Order Intercept Point</td>
<td>I/F Output, at max. gain</td>
<td>+26</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td>At max. gain setting</td>
<td>24</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Step Resolution</td>
<td></td>
<td>0.1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustable Gain Range</td>
<td></td>
<td>25</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>Full band, at max. gain</td>
<td>± 1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per 40 MHz, at max. gain</td>
<td>± 0.25</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Stability</td>
<td>Over temperature</td>
<td>± 1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per week, constant temp.</td>
<td>± 0.5</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per week and over temp.</td>
<td>± 1.5</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-Band Spurious</td>
<td>Signal-related</td>
<td>±60</td>
<td>dBc</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-signal-related</td>
<td>±70</td>
<td>dBc</td>
<td></td>
<td></td>
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<tr>
<td>Harmonics</td>
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<td>±50</td>
<td>dBc</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>±45</td>
<td>dBc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise Figure</td>
<td>At maximum gain</td>
<td>±15</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>±16</td>
<td>dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>Voltage</td>
<td>12</td>
<td>Vdc</td>
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<tr>
<td></td>
<td>Power</td>
<td>12</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Range</td>
<td>Operating network</td>
<td>0</td>
<td>°C</td>
<td>±50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage</td>
<td>-40</td>
<td>°C</td>
<td>±85</td>
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### Upconverter Module Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Notes</th>
<th>Min.</th>
<th>Nom./Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Input Power</td>
<td>Ratio Return Loss</td>
<td>1.25</td>
<td>:1 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Input VSWR</td>
<td>Ratio Return Loss</td>
<td>1.5</td>
<td>:1 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/F Leakage</td>
<td></td>
<td>-50</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Input Frequency</td>
<td>Auto Detect</td>
<td>±1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Input Power</td>
<td>At module</td>
<td>±7.5</td>
<td>dBm</td>
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<td></td>
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<td>Power Output at 1 dB Compression (P1dB)</td>
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<td>±15</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>I/F Output, at max. gain</td>
<td>+26</td>
<td>dBm</td>
<td></td>
<td></td>
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<tr>
<td>Gain</td>
<td>At max. gain setting</td>
<td>24</td>
<td>dB</td>
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<td></td>
</tr>
<tr>
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<td></td>
<td>0.1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td>25</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>Full band, at max. gain</td>
<td>± 1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per 40 MHz, at max. gain</td>
<td>± 0.25</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Stability</td>
<td>Over temperature</td>
<td>± 1</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per week, constant temp.</td>
<td>± 0.5</td>
<td>dB</td>
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</tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Internal Reference Standard</td>
<td>Aging per day</td>
<td>±30</td>
<td>ppb</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aging after 10 years</td>
<td>±1</td>
<td>ppb</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>±50</td>
<td>ppb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Reference Requirements Frequency</td>
<td>Power Level</td>
<td>All RF bands</td>
<td>5 or 10 MHz</td>
<td>5 Ohms</td>
<td></td>
</tr>
<tr>
<td>Frequency Tolerance</td>
<td>Power Level Impedance</td>
<td>±5</td>
<td>ppm</td>
<td>±5</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>Ref PLL Bandwidth</td>
<td>±50</td>
<td>Hz</td>
<td>-105</td>
<td>dB/Hz</td>
</tr>
<tr>
<td>Ext. Ref. Phase Noise Req.</td>
<td></td>
<td>±135</td>
<td>dB/Hz</td>
<td>-10</td>
<td>dB/Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±145</td>
<td>dB/Hz</td>
<td>-10</td>
<td>dB/Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±150</td>
<td>dB/Hz</td>
<td>-10</td>
<td>dB/Hz</td>
</tr>
</tbody>
</table>

### Reference Performance

<table>
<thead>
<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>±50</td>
<td>ppb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Reference Requirements Frequency</td>
<td>Power Level Impedance</td>
<td>All RF bands</td>
<td>5 or 10 MHz</td>
<td>5 Ohms</td>
<td></td>
</tr>
<tr>
<td>Frequency Tolerance</td>
<td>Power Level Impedance</td>
<td>±5</td>
<td>ppm</td>
<td>±5</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>Ref PLL Bandwidth</td>
<td>±50</td>
<td>Hz</td>
<td>-105</td>
<td>dB/Hz</td>
</tr>
<tr>
<td>Ext. Ref. Phase Noise Req.</td>
<td></td>
<td>±135</td>
<td>dB/Hz</td>
<td>-10</td>
<td>dB/Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±145</td>
<td>dB/Hz</td>
<td>-10</td>
<td>dB/Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±150</td>
<td>dB/Hz</td>
<td>-10</td>
<td>dB/Hz</td>
</tr>
</tbody>
</table>
### Phase Noise Performance

<table>
<thead>
<tr>
<th>Offset</th>
<th>Downconverter</th>
<th>Upconverter</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Hz</td>
<td>-36</td>
<td>-36</td>
</tr>
<tr>
<td>100 Hz</td>
<td>-66</td>
<td>-66</td>
</tr>
<tr>
<td>1 kHz</td>
<td>-76</td>
<td>-76</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-86</td>
<td>-86</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-96</td>
<td>-96</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-106</td>
<td>-106</td>
</tr>
</tbody>
</table>

### System Performance

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF port VSWR</td>
<td>1.3:1 max. (17.7 dB RL)</td>
</tr>
<tr>
<td>IF port VSWR</td>
<td>1.6:1 max. (12.7 dB RL)</td>
</tr>
<tr>
<td>System RF Losses (typ.)</td>
<td>2 dB</td>
</tr>
<tr>
<td>System IF Losses (typ.)</td>
<td>1 dB</td>
</tr>
<tr>
<td>Gain Flatness (typ.)</td>
<td>Add ±0.3 dB to module specification</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>Add +2 dB to module specification</td>
</tr>
<tr>
<td>Reference Input Power</td>
<td>0 to +10 dBM</td>
</tr>
</tbody>
</table>

### Power Supply

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Input (dual line input)</td>
<td>90–264 Vac, 47–63 Hz; 60 W typical</td>
</tr>
<tr>
<td>DC Output</td>
<td>12 V, 250 W over 0 to +50 °C</td>
</tr>
</tbody>
</table>

### Connector Interfaces

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

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

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### Modular Block Converter Systems Ku-Band

#### Outline Drawing

![Outline Drawing](image)

#### 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:

  - **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
  - **RF Modules** To order single modules separately:
    - 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
    - **Spares Kit**
      - Includes 1 Fan Assembly, 1 Power Supply Module, 1 Logic Module, and 1 Display Module. Converter modules sold separately.

- **Note:** Standard configuration includes only one type of RF module per chassis.
- **Note:** To order a blank module cover plate, use part number MPAN-30281.
- **Note:** PS modules can also be ordered separately, part number AMAX-30271-1.