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MODEL 2116-139 Block Downconverter

1.0 General

1.1 Equipment Description
The 2116-139 Block Downconverter converts 13.95 - 14.45 GHz to 1.20 - 1.70 GHz with low phase noise and flat frequency response. Frequency translation is via a 12.75 GHz local oscillator. Front panel LEDs provide indication of DC Power, External 10 MHz, and PLL Alarm. The gain is +35 dB. Connectors are SMA female for the RF and BNC female for the L-Band and external reference input and reference output. A three-way switch controls which 10 MHz reference is being used. In the INT position, the internal reference is used, in the EXT position, the external reference is used, and in the AUTO position, the internal reference is used unless a 3 dBm ± 3 dB, 10MHz reference signal is connected to the external reference input. The 2116 is powered by a 100-240 ±10% VAC power supply, and housed in a 1 3/4” x 19” x 14” rack mount chassis.

**FIGURE 1.1** Front and Rear Panels

**FIGURE 1.2** Block Diagram
1.2 Technical Characteristics

**TABLE 1.0 2116-139 Downconverter Specifications***

### Input Characteristics
- **Impedance/Return Loss**: 50 Ω / 14 dB (see TABLE 2.2 for connector options)
- **Frequency**: 13.95 to 14.45 GHz
- **Noise Figure, max.**: 20 dB, max gain
- **Input Level Range**: -55 to -35 dBm
- **Input 1dB Compression**: -25 dBm

### Output Characteristics
- **Impedance/Return Loss**: 50 Ω / 14 dB (see TABLE 2.2 for connector options)
- **Frequency**: 1.20 to 1.70 GHz
- **Output Level**: -20 to 0 dBm
- **Output 1dB Compression**: +10 dBm

### Channel Characteristics
- **Gain**: +35 dB ± 2 dB
- **Image Rejection**: > 60 dB
- **Spurious, Inband**: < -60 dBC (0 dBm output level)
- **Spurious, Out of Band**: LO < -70 dBm
- **Intermodulation**: < -55 dBC for two carriers each at -10 dBm out
- **Frequency Response**: ±1.5 dB, 1.20 to 1.70 GHz; ± 0.5 dB, 40 MHz BW
- **Frequency Sense**: Non-inverting

### LO Characteristics
- **LO Frequency**: 12.75 GHz
- **Frequency Accuracy**: ± 0.01 ppm max over temp internal reference
- **10 MHz Input/Output Level**: +3 dBm ± 3 dB

<table>
<thead>
<tr>
<th>Phase Noise @ Freq</th>
<th>100 Hz</th>
<th>1kHz</th>
<th>10kHz</th>
<th>100kHz</th>
<th>1MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>dBC/Hz</td>
<td>-65</td>
<td>-80</td>
<td>-85</td>
<td>-100</td>
<td>-110</td>
</tr>
</tbody>
</table>

### Controls, Indicators
- **Power**: Green LED
- **PLL Alarm**: Red LED, External contact closure
- **Ext 10 MHz**: Yellow LED, Indicates Ext 10 MHz reference is selected (rear panel sw)

### Other
- **RF Connector**: SMA 50Ω female (see TABLE 2.2 for other options)
- **L-Band Connector**: BNC 50Ω, female (see TABLE 2.2 for other options)
- **10 MHz Connectors**: BNC 50/75Ω, female
- **Alarm Connector**: DB9, female - NO or NC contact closure on Alarm
- **Size**: 19 inch, 1RU Standard Chassis 1.75” High X 14.0” Deep
- **Power**: 100-240 ±10% VAC, 47-63 Hz, 45 watts max.

### Options
- **Connector options**: See TABLE 2.2

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*+10°C to +40°C; Specifications subject to change without notice.*
2.0 Installation

2.1 Mechanical - The 2116-139 consists of one RF PCB housed in a 1 RU (1 3/4 inch high) by 12 inch deep chassis. A switching, ± 12, +24, +5 VDC power supply provides power for the assemblies. The 2116-139 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2116-139 is assembled.
2.2 Rear Panel Input/Output Signals

Figure 2.1 shows the input and output connectors on the rear panel.

**TABLE 2.1 J11 Pinouts (DB9)**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not Used</td>
</tr>
<tr>
<td>2</td>
<td>Not Used</td>
</tr>
<tr>
<td>3</td>
<td>Not Used</td>
</tr>
<tr>
<td>4</td>
<td>Not Used</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>Alarm Relay: Common</td>
</tr>
<tr>
<td>7</td>
<td>Alarm Relay: Normally Open</td>
</tr>
<tr>
<td>8</td>
<td>Not Used</td>
</tr>
<tr>
<td>9</td>
<td>Alarm Relay: Normally Closed</td>
</tr>
</tbody>
</table>

**TABLE 2.2 Connector Options**

<table>
<thead>
<tr>
<th>L-Band</th>
<th>RF</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNC, 50Ω (STD)</td>
<td>SMA, 50Ω (STD)</td>
</tr>
<tr>
<td>BNC, 75Ω</td>
<td>Type N, 50Ω</td>
</tr>
<tr>
<td>Type F, 75Ω</td>
<td>Type N, 50Ω</td>
</tr>
<tr>
<td>SMA, 50Ω</td>
<td></td>
</tr>
</tbody>
</table>

2.3 Front Panel Indicators

The following are the front panel indicators.

**FIGURE 2.2 2116-139 Front Panel Controls and Indicators**
2.4 Installation / Operation

2.4.1 Installing and Operating the 2116-139 Downconverter

1. Connect a -55 dBm to -35 dBm signal to RF INPUT, J101 (Figure 2.1).
2. Connect the L-BAND OUTPUT, J101, to the external equipment.
3. Connect 100-240 ±10% VAC, 47 - 63 Hz to AC connector on the back panel.
4. Be sure DS1 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2).
5. Select either INT (for internal 10MHz ref), AUTO (for internal 10MHz ref UNLESS an external 10MHz, 3 dBm signal is connected to J2), or EXT (for external 10MHz, 3 dBm ref that is inserted at J2) on rear panel switch S1 (Figure 2.1).
6. If EXT is selected or AUTO is selected and there is a 10MHz, 3 dBm signal at J2, check that DS3 (yellow, Ext 10MHZ) is on (Figure 2.2).
7. Check that a 10MHz, 3 dBm ±3 dB signal is present at the 10MHZ REF OUTPUT (J8) (Figure 2.1).
8. AC Fuse - The fuse is a 5 mm X 20 mm, 2 amp slow blow (Type T) and is inserted in the far slot in the drawer below the AC input as shown in Figure 2.3. There is a spare fuse in the near slot. If a fuse continues to open, the power supply is most likely defective.

![Fuse Location and Spare Fuse](image_url)
2.5 Environmental Use Information

A. **Rack-Mounting** - To mount this equipment in a rack, please refer to the installation instructions located in the user manual furnished by the manufacturer of your equipment rack.

B. **Mechanical Loading** - Mounting of equipment in a rack should be such that a hazardous condition does not exist due to uneven weight distribution.

C. **Elevated Operating Ambient Temperature** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to $T_{mra}$.

D. **Reduced Air Flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Additional space between unit may be required.

E. **Circuit Overloading** - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have on over current protection and supply wiring. Appropriate consideration of equipment name plate rating should be used, when addressing this concern.

F. **Reliable Earthing** - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connection to the Branch (use of power strips).

G. **Top Cover** - There are no serviceable parts inside the product so, the Top Cover should not be removed. If the Top Cover is removed the ground strap and associated screw MUST BE REINSTALLED prior to Top Cover screw replacement. FAILURE TO DO this may cause INGRESS and/or EGRESS emission problems.