Frequency Distribution Unit
FDU-160i

Operation and Maintenance Manual

P/N: 900000136 REV B

For Brandywine Communications products
with the following Part Numbers:
022050001

Safety Warnings

⚠ **WARNING:**

This unit contains lethal AC voltages. Disconnect the unit from the AC supply before removing the cover.

⚠ **WARNING:**

This unit contains dual power supplies. Isolate BOTH power supplied from AC Power before removing the top cover.

⚠ **WARNING:**

The lightning flash with an arrowhead inside of an equilateral triangle is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure. The "dangerous voltage" may be of sufficient magnitude to constitute a risk of electrical shock to people. Do not attempt to repair the unit without first unplugging it.

⚠ **CAUTION:**

The exclamation point inside of an equilateral triangle is intended to alert the user to the presence of important operation and maintenance instructions in the user guide. Only qualified personnel should repair this unit. Several board assemblies contain static sensitive devices. Appropriate procedures must be used when handling these board assemblies.

Revision History:

Revision	Date
Initial Release	8/06/13
A	4/15/15
B	10/30/15

Table of Contents

1 Introduction

The FDU-160i is a high performance signal distribution amplifier designed for use with Brandywine high precision time and frequency sources.

The FDU-160i is contained in a compact 1U rack-mount chassis. The system accepts two of frequency inputs (typically 10MHz). The FDU provides automatic changeover if one of the on-line source inputs fails, and each input is capable of driving all sixteen outputs. Manual source select override is available on the front panel, or through the Ethernet interface.

A variety of status indicators are located on the front panel for instant visual feedback, together with manual controls for source selection.

A 10/100 base T Ethernet interface provides full control over the functionality of the system, including reference selection and output amplitude (on a per channel basis).

User control of the unit is via a built-in Web Browser with user-friendly graphical interface, or via SNMP for system applications.

Applications for the FDU-160i include secure communications systems, satellite ground stations, digital television broadcasting and any system requiring highly reliable frequency outputs.

2 Unpacking the FDU-160i

Remove the FDU-160 from the shipping carton. The following items should be included in the shipment:

1 x FDU-160i
2 x Power supply cables
1 x Quick Start Guide

2.1 Installation

2.1.1 Mounting

The FDU-160i can be installed into a 19" rack mount cabinet either using rack slides or only using the front panel flanges. For static applications, the short depth and lightweight of the FDU-160i ensures that the front panel is not stressed when only the front panel is used for support.

If the FDU-160i is installed on a mobile platform and must survive shock and vibration, the use of slides is required. Slides are installed using 10-32 UNF-2B hardware.

Optional Rack Mount Slides:

P/N 002000123, SLIDE, RACK, 24", 21" TRAVEL, 85 LB
P/N 002000150, SLIDE, RACK, 28", 27" TRAVEL, 80 LB

Original Manufacturer: General Devices Chassis Trak Type C300.

2.1.2 Power

Insert the power cord of the FDU-160i into an electrical socket to power up the unit. The Power LED indicator will illuminate green.

If dual redundant power is required, connect both power sources to independent power sources

2.1.3 Ethernet

Connect one end of an Ethernet patch cable to the FDU-160i Ethernet port J21. Connect the other end of the Ethernet cable to the network with an Ethernet hub or switch.

2.1.4 Frequency Inputs

Connect a frequency input sources to the frequency input connectors J17 and/or J18. Channel A Input is J18, and Channel B is J17.

2.1.5 Frequency Outputs

Connect the frequency outputs J1 through J16 to the coaxial infrastructure.

2.1.6 Console Port

Connect a DB-9F cable to port J20 in order to enable RS-232 access to the unit. (Straight, pin3 is RX pin2 is TX)

2.1.7 Alarm Output Port

Connect a DB-9M cable to port J19 to access the alarm output port. Please see the following diagram for the pinout of the connector:
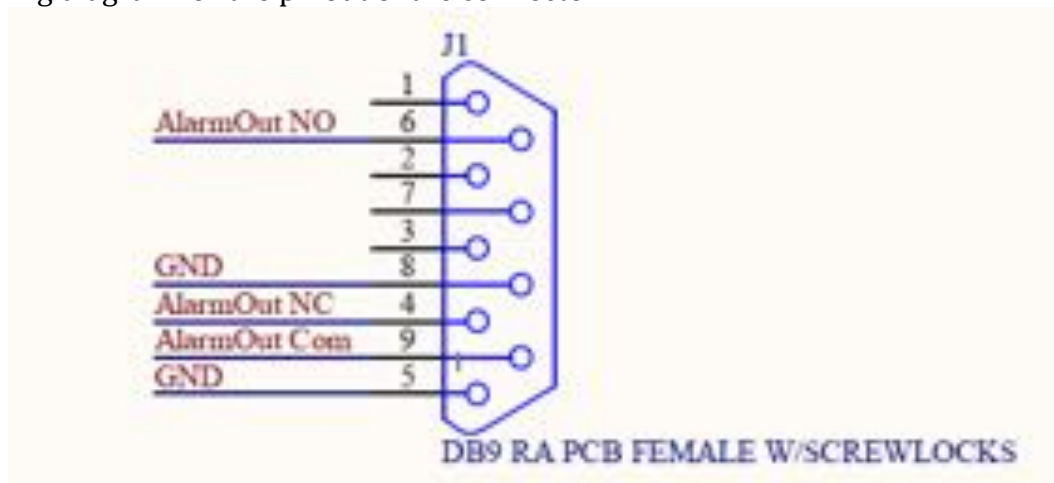

Figure 1 - Alarm output pinout

3   Setting up the FDU-160i

Power on the system by flipping switches SW1 and SW2 on the rear of the unit to the on position. The system will display its power-on cycle on the front panel. The system will use LED lamps D7 through D17 to indicate each octet of the device's IP Address, Network Mask, and Gateway address.

Write these values down and keep them in a safe place.

To display the IP address again, the front panel can be reset by pressing the RESET switch (SW2) on the front panel.

Figure 2 - FDU-160i Showing IP Address

4 Accessing the FDU-160i's Network Interface

Connect to the FDU-160i by entering the unit's IP address into the address bar of the web browser on a PC, Smartphone or Tablet.

Figure 3 - FDU-160i Web Page Interface

Use the dropdown menu to select different functions of the FDU-160i to view the status of the system and to adjust different functions of the unit.

4.1 Accessing Functions on the FDU-160i

To access different functions of the FDU-160i management web page, select the button labeled "MENU" in the top left hand corner of the web page.

4.1.1 Viewing the Current Status of the FDU-160i system

From the "MENU" button, select "General" from the status menu. This shows information such as the current output time, UTC time, up time, the current input reference, the current output format, current system state, alarm status, battery status, and current internal temperature.
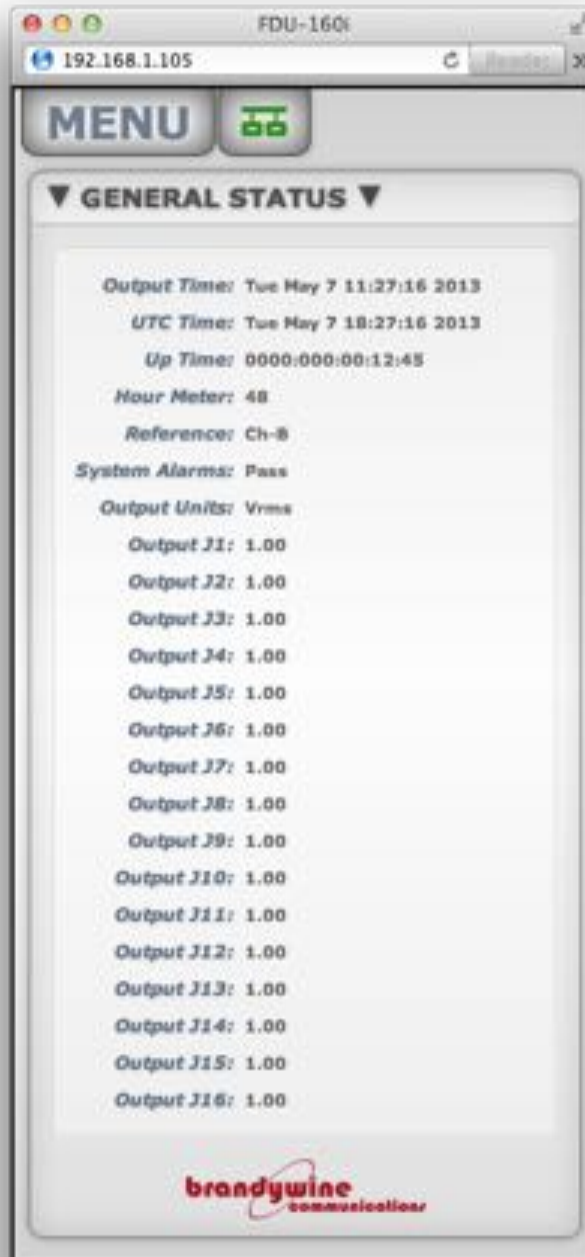

Figure 4 - FDU-160i Status Page

Output Time: The current time of day being displayed or being output by the FDU-160i

UTC Time: The current time of day from the GPS constellation in Universal Time Coordinate (UTC)

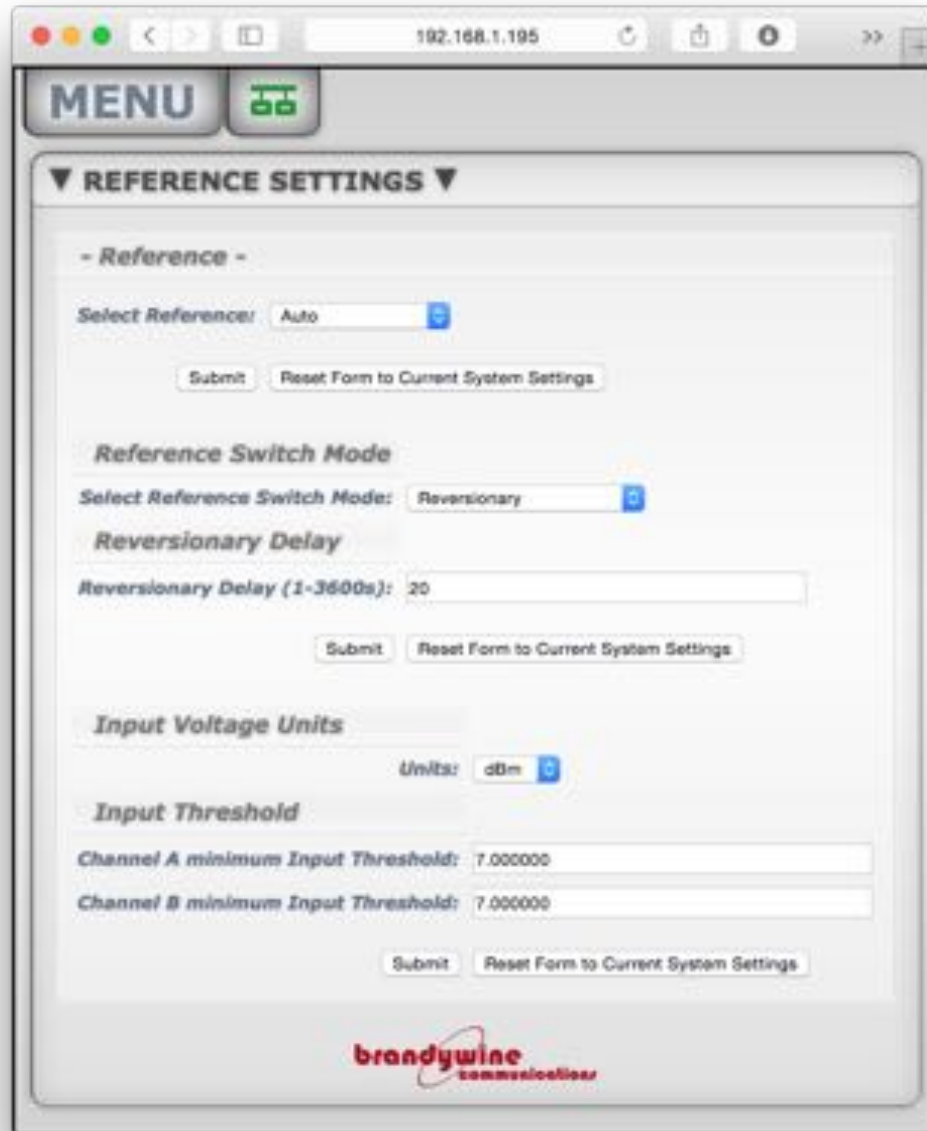**Up Time**: The length of time that the FDU-160i has been powered on

Hour Meter: This is the accumulated number of operating hours since the FDU-160i was first built.

Reference: The current reference input being used by the FDU-160i

System Alarms: If the system is currently displaying any alarms

Output Units: The current unit setting the unit is using

5 Changing the Settings on the FDU-160i

Figure 5 - Reference Settings Page

5.1 Selecting a Reference

From the menu, select "Reference" from the settings submenu. From the "Select Reference" dropdown menu, select between reference sources A (J18) or B (J17).

5.1.1 Changing the reference switch mode.

From the dropdown labeled, "Select Reference Switch Mode," select which mode the unit uses to switch references in the event of a problem. The available modes are listed below.

- **Non-Reversionary:** If the primary reference source fails or is out of threshold, the system will automatically switch over to the secondary reference source, and continue to use the secondary until manually switched back to the primary source, or the secondary source fails and the system automatically switches back to the primary.
- **Reversionary:** The system will switch to the secondary source automatically if the primary source fails or is out of threshold, however once the primary source is restored, the unit will immediately switch back
- **Reversionary with Delay:** The system will automatically switch to the secondary source in the event the primary source fails or is out of threshold. Once the primary source is restored, it will automatically switch back after waiting for a user-specified delay. This setting is useful for helping the unit deal with intermittent problems on a primary frequency source.

5.1.1.1 Adjusting the reversionary delay.

The text box "Reversionary Delay" is used to set the delay time in seconds used when the system is set to the "Reversionary with Delay" Reference Switch mode.

5.1.2 Setting the input units.

The Section labeled "Input Voltage Units" allows the user to change the input reference units on the system. The system can be set to accept input in dBm (default), V_{rms}, or V_{pp}. To set the threshold values, select an amplitude unit first, then set the values.

5.2 Adjusting the Output Settings

Figure 6 - Output Settings

From the main menu, select "Output" from the settings submenu. This lets the user change the Output levels of each individual frequency output. The "units" dropdown selects which units the output settings are in. In this screen the unit's internal clock can also be set.

Figure 7 - Available Output Units

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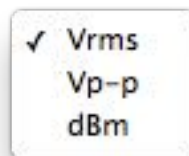
5.3 Changing the IP Address

From the main menu, select "IP" from the settings submenu. From here, the IP Address, Subnet Mask, and Gateway address of the unit can be selected. In addition, it is possible to enable DHCP, however this action is not recommended.

Figure 8 IP Address Settings

5.4   Changing SNMP Settings

From the main menu, select "SNMP" from the settings submenu. From here the Read Community, Write Community, and Trap IP Address can be set.

Figure 9 - SNMP Settings

5.4.1   Monitoring the FDU-160i using SNMP

To monitor the FDU-160i via Simple Network Management Protocol (SNMP), download a MIB file from the Support Downloads section of the Brandywine Communications website. (http://www.brandywinecomm.com/product-support/downloads)

5.5 Changing The Location Setting

From the main menu, select "Location" from the settings submenu. This setting tells the user where the unit is physically located within a facility. (e.g. Room 102)

Figure 10 - Location Setting Screen

5.6 Changing The Access Password

From the main menu, select "Password" from the settings submenu. From here the access password for the unit to prevent other users from changing settings can be set. The current Username and Password are required in order to reset the existing username and password.

The factory default login credentials are:
Username: BRANDYWINE
Password: BRANDYWINE

Figure 11 - Password Settings

6 Alternate Access

If the unit is in an area where it cannot be accessed over the network, but physical access to the device is still possible, the FDU-160i can still be accessed and controlled via RS-232 over the serial port.

6.1.1 User Commands and Responses

The FDU160i Serial port (115200,8,1,1,no parity) provides status and setting data on request from the user.

The user can obtain information from the FDU160i by sending HELP command terminated by CR. The FDU160i will display the HELP MENU as below:

```
--------------------------------------------------------------------------------
        FDU160i System Setup - (925000120) 1.01.05 Jul 9 2013
        SN# 36770 - Hardware Ver: A
--------------------------------------------------------------------------------


COMMAND    Description
--------------------------------------------------------------------------------
HELP            Show this screen
IPADDR          IP Address (set to 0.0.0.0 to enable DHCP) (192.168.1.121)
IPMASK          IP Mask (255.255.255.0)
IPGATEWAY       IP Gateway (192.168.1.1)
MACADDR         MAC Address (00-21-34-00-02-EB)
FACT            Factory Reset to Defaults Setting
RESET           Reset System

Enter a menu command:
```

The FDU160i user commands are described in the table below.

COMMAND	FUNCTION	COMMENTS
HELP	Show Help	Show Help Menu Example: HELP<CR> Displays the above Help Menu.
IPADDR	Set IP Address	Setthe IP Address (decimal number) IP4, IP3, IP2, IP1 and Store into NVM. Example:

		IPADRR<CR> **New Setting**:192.168.1.121<CR> Sets the IP address to 192.168.1.121 and displays the above Help Menu. To enable DHCP enter IP address 0.0.0.0<CR>
IPMASK	Set IP Mask Address	Set/Get the IP Mask Address (decimal number) IP4, IP3, IP2, IP1 and Store into NVM. Example: IPMASK<CR> **New Setting**:255.255.255.0<CR> Sets IP Mask and displays the above Help Menu.
IPGATEWAY	SetGateway Address	Set/Get the Gateway Address (decimal number) Gateway4, Gateway 3, Gateway 2, Gateway 1 and Store into NVM. Example IPGATEWAY<CR> New Setting:192.168.1.1 Sets IP Gateway and displays the above Help Menu.
MACADDR	Set MAC Address	Set/Get the Mask Address (decimal number) Mask4, Mask 3, Mask 2, Mask 1 and Store into NVM. Example: MACADDR<CR> **New Setting**: 00-21-34-00-02-EB<CR> Sets MAC address and displays the above Help Menu.
FACT	Recall Factory defaults	Recall all factory default settings Example: FACT <CR> Are you sure you want to continue (Y/N)? Y

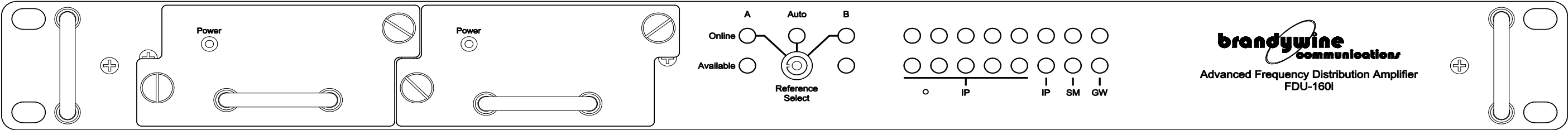|		
		Resets to factory default and displays the above Help Menu.
RESET	Reset the Unit	Reset the Unit Example: RESET <CR> Are you sure you want to continue (Y/N)? Y Reset System Resets the unit and displays the above Help Menu.
	Upgrade Application	Use PIC32 Boot loader Application program to upgrade main application through Ethernet. Follow the below commands: 1. Run the PIC32UBL.exe 2. Check the Ethernet Enable checked box. Make sure the IP Address = 192.168.1.11 and UDP Port = 6234. 3. Press the SW2 button on the front panel of the FDU-160i unit while recycle the power supply so that the program jump to bootloader section. 4. Hit the "Connect" button. 5. Hit the "Load Hex File". Browse to "FDU-160i.hex" to send the hex file. 6. Hit the "Erase-Program-Verify" button. 7. Hit the "Run Application" button.

Table 2

7 Support Information

All Brandywine Communications products come with a one-year warranty.

If the unit is still exhibiting problems not covered by the above troubleshooting guide, please contact us for technical support at support@brandywinecomm.com or call us at 714-755-1050.

If it becomes necessary to return the unit to the factory for repairs, please call us at 714-755-1050 extension 113 to arrange an RMA.

8 Front Panel View

Power Power

A   Auto   B
Online
Available
Reference
Select

○   IP   IP   SM   GW

Advanced Frequency Distribution Amplifier
FDU-160i

9 Rear Panel View