

# ACU-1000 Manual Addendum Replacement of DSP-1 with DSP-2

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Note: All provisions of this addendum apply to the DSP-2 when used in either the ACU-1000 or ACU-T.



# 1 Purpose

The DSP-1 module is being replaced by the "New & Improved" DSP-2 Module. This new module is functionally equivalent with the DSP-1, but has a number of new features:

- Chief among them are that it has Ethernet connectivity built in.
- Its newer Digital Signal Processor will allow Raytheon to provide a number of other upgrades and enhancements in the future. There is no more room for expansion of features with the DSP-1.

This addendum explains how to use the DSP-2 module in place of the DSP-1 to provide the same features as the DSP-1. Subsequent addendums will explain how to make use of the new features of the DSP-2.

# 2 DSP-2/DSP-1 Compatibility

While the DSP-2 module has capabilities above and beyond those of the DSP-1, it is very easy to use the DSP-2 simply as a DSP-1 replacement. Simply transfer the DSP-1 JP1 and JP2 settings to the DSP-2 and leave the other jumpers in their factory default positions.

# 2.1 Interfacing

# 2.1.1 Audio Input Configuration

The DSP-2 audio input circuitry and setup method is identical to that of the DSP-1. See Section 2.4.

Some early revision modules had a different audio input circuit; this is covered in Section 6.

### 2.1.2 Interface Cables

All existing interface cables for DSP-1 modules (for radios, satellite phones, dispatch terminals, etc.) are fully compatible with the DSP-2.

# 2.1.3 Network Cables

A pair of CAT5 cables is included in the ACU-1000 accessory kit to assist in the setup & use of the new module. The proper cable for a direct connection between a computer's Ethernet port and the module's front panel RJ-45 jack for module browsing and configuration is a CAT5 crossover cable (typically red in color, P/N 0314-000024). A standard CAT5 network patch cable (P/N 0313-070000) is the proper interface from a network to the module's RJ-45 jack. These are standard network cables; cables in varying lengths are widely available.

# 2.2 Remote Control Via The ACU Controller

The ACU Controller treats the DSP-2 exactly as it does the DSP-1. Future versions of the ACU Controller will be created that provide a means to control new DSP-2 features as they become available. Of course, any new versions of the ACU Controller will work with both the DSP-1 module and DSP-2 modules.

# 2.3 Use Of DSP-2 And DSP-1 Modules In The Same Chassis:

An ACU-1000 may contain any combination of DSP-1 modules and DSP-2 modules.



# 2.4 DSP-2 and DSP-1 Jumper Settings

This section describes the jumper settings for each module and how to set the audio input jumper settings for quick replacement of a DSP-1 with a DSP-2 and vice-versa. The JP1, JP2 audio input configuration jumpers perform identical functions on the two modules but are located in different positions on the module. The DSP-2 contains two additional jumpers explained in Section 2.4.2 and Section 2.4.3.



Figure 2 DSP-1 Jumpers



#### 2.4.1 Audio Input Configuration Jumpers JP1 and JP2

The audio input configuration circuitry of the DSP-2, including the functions of Jumpers JP1 and JP2, is identical to that of the DSP-1, though the jumpers are located in a different position as can be seen in the illustrations. The audio input configuration options are Unbalanced (single-ended) High Impedance, Balanced High Impedance, and Balanced Low Impedance (600 ohms), configured as indicated in Table 1:

Table 1RX Audio Input Configuration					
Bal/UnBal Impedance		DSP-1 & DSP-2 Jumper Setting			
		JP1	JP2		
Balanced	600 ohms	LO Z	BAL		
Balanced	High	HI Z	BAL		
Unbalanced	600 ohms	N/A	N/A		
Unbalanced	High	Don't Care	UNBAL		

Note: An early revision of the DSP-2 did not use this audio input configuration scheme. To set the audio input configuration on a module that does not have JP1 or JP2, refer to Section 6 of this addendum.

Note: When using unbalanced (single-ended) RX audio, a proper ground reference is required. Wire the RX audio to the DSP-2 RXA terminal. Provide the internal ground reference by shorting the DSP-2 RXB terminal to the DSP-2 Analog Ground Pin. Provide the external reference by connecting this line to the analog ground terminal of the radio; if the radio port does not have a separate terminal for analog ground, tie to the radio's single ground terminal.

Interface cables sold by Raytheon are wired to comply with this note.

### 2.4.2 Restore Defaults Jumper JP22

This jumper applies only to the VoIP "Extended Features" of the DSP-2. It has no affect for the DSP-2 when it's used simply as a DSP-1 replacement. See Section 4.

### 2.4.3 Future Use Jumper JP50

This jumper has no use at this time. In the future it may be used to select an optional feature that has been requested by Raytheon customers and added to the DSP-2 firmware. If so, this new feature will be enabled by placing the JP50 jumper in positions 1&2. Be sure to leave JP50 in positions 2&3 unless a special function is defined and you want to enable it.



Table 2DSP-2 Factory Default Jumper Positions			
Jumper	Default	Setting	
JP1, Balanced Input Impedance	1-2	Low Z (600 ohms)	
JP2, Input Balanced/Unbalanced	2-3	Balanced	
JP22, Restore Factory Defaults	2-3	Normal (Do not restore)	
JP50, Reserved for future use	2-3	No function at this time	

# **3 DSP-2 Extended Features Overview**

The DSP-2 is a functional superset of the DSP-1, in that it will perform all the "classic" DSP-1 functions in an ACU-1000 or ACU-T, and also contains additional, extended features beyond that of the DSP-1.

This section of the addendum will address the description, selection and configuration of the extended capabilities of the DSP-2.

# 3.1 Extended Features

### 3.1.1 VOIP (Voice Over Internet Protocol) : NXU-2 Standalone Mode:

This mode allows the DSP-2 to behave the same as an NXU-2. In this mode, the DSP-2 will be invisible to the ACU, and provide RX/TX/AUX IO to the rear panel (DB-15 connectors) of the ACU, while allowing VOIP connections to other NXU-2's attached to the network. (Note: If you are unfamiliar with the capabilities and functionality of the NXU-2, please consult the website.

### 3.1.2 VOIP (Voice Over Internet Protocol) : Hybrid DSP-1/NXU-2 Mode:

This mode allows the DSP-2 to behave as if it were a combination of DSP-1 and NXU-2, while powered and installed in the ACU-1000 or ACU-T chassis. In this mode, the DSP-2 is visible to the ACU and controller software, and remote NXU-2 audio links are available for cross connecting within the ACU-1000 or ACU-T.

# 3.2 Provisioning

In either of the extended modes, the DSP-2 needs to be configured for VOIP operations, similar to that of an NXU-2. Configuration is accomplished via PC / Browser / Ethernet web access.

As shipped from the factory, the default configuration of the DSP-2 is to behave identically to a DSP-1: this is known as "DSP-1 Classic" mode, and no network provisioning is required.

To activate one of the extended modes, the user must connect the DSP-2 to the user's Ethernet LAN via the front panel RJ-45 Ethernet connector, via a "straight" Ethernet cable to a switch or router which is also connected to a PC with network access to the same switch or router.

The user must browse (using a web browser like "Internet Explorer") to the IP address of the DSP-2. The default address of the DSP-2 as shipped from the factory is "192.168.1.200". (After provisioning, this IP address may be changed to comply with the user's LAN management scheme).



# 3.3 Information

Upon successfully browsing to the DSP-2, a screen similar to Figure 3 will appear. This page contains a summary of the current DSP-2 operating status and configuration.

Items on the left side are relevant to VoIP / networking issues, while items listed on the right side report other operational options.



Figure 3 Information screen



# 3.4 Configuration

To provision the DSP-2 for VoIP operation, select the "**Configuration**" link that appears at the top of the page (see Figure 4).

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Unit is a:	Server 💌	Subnet Mask:	255 255 255	. 0
Communications	mode: Normal	Gateway IP:	0.00	. 0
VOIP Port:	1221	Remote IP:	0 0 0	. 0
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Serial port data bit	ts: 8 💌	Duplex:	Full 💌	
Serial port stop bit	ts: 1 💌	COR Inhibit Time (mS	): 0 💌	
Serial port parity:	None 💌	COR sense:	Low active (H/W)	<b>-</b>
VOX Hangtime (m	s): 500 💌	DSP-2 mode :	DSP-1 Classic	•
RX Input Level:	2:0db 💌	TX Output Level:	2:0db 💌	
	Save Changes	Clear Changes		
	Copyright © 2004 Raytheon Co	rporation. All Rights Res	erved	-
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Figure 4Configuration Screen

Configuration changes to the DSP-2 are made either by selecting a field and entering text, or by making a selection from pull-down boxes. Descriptions of each of these fields, and the options each contains, are presented in the next section.

**Note**: For any operational changes to take effect, you must **SAVE CHANGES** via the "Save Changes" button.



#### 3.4.1 Configuration Screen Field Descriptions:

#### Name:

The user may enter text in this field that identifies this DSP-2. The name should uniquely identify this unit, from all other units on the network.

#### Unit is a:

The pull down menu allows the user to choose either "server" or "client" mode. VoIP operation requires pairing of clients and servers.

#### Communications Mode:

The pull down menu allows the user to configure for either "normal", "broadcast", "connectionless", or "multicast" modes of VoIP communications.

#### **VOIP** Port:

The user may enter numeric text in this field (1-65535 decimal) defining which port to use for the VoIP traffic.

#### Command Port:

The user may enter numeric text in this field (1-65535 decimal) defining which port to use for network command traffic.

#### Serial Port Baud Rate:

The pull down menu allows the user to configure the baud rate for the serial communication channel on the DB-15 connector of the ACU-1000 slot. Nine baud rates are available: 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.

#### Serial Port Data Bits:

The pull down menu allows the user to configure the number of data bits for the serial communication channel on the DB-15 connector of the ACU-1000 slot. Two choices are available: 7 or 8 bits.

#### Serial Port Stop Bits:

The pull down menu allows the user to configure the number of stop bits for the serial communication channel on the DB-15 connector of the ACU-1000 slot. Two choices are available: 1 or 2 bits.

#### Serial Port Parity:

The pull down menu allows the user to configure the parity for the serial communication channel on the DB-15 connector of the ACU-1000 slot. Three choices are available: even, odd, or none.

#### *VOX Hangtime (mS):*

The pull down menu allows the user to configure the VOX hangtime in milliseconds. Five hangtimes are available: 500ms, 1000ms, 2000ms, 3000ms, and 4000ms.



#### IP Address:

The user may enter numeric text (0-255 decimal) into each of the four fields that define the unique Internet Protocol address of the unit. Note: upon saving the changes, the user will need to browse to the new address to continue configuration.

#### Subnet Mask:

The user may enter numeric text (0-255 decimal) into each of the four fields that define the unique Internet Protocol mask of the unit. Note: upon saving the changes, the user will need to browse to the new address to continue configuration.

#### Gateway IP:

The user may enter numeric text (0-255 decimal) into each of the four fields that define the gateway address that the unit will use for resolving external network accesses.

#### Remote IP:

The user may enter numeric text (0-255 decimal) into each of the four fields that define the unique Internet Protocol address of the remote VoIP unit that is paired with this unit.

#### Remote Port:

The user may enter numeric text in this field (1-65535 decimal) defining which port to use when connecting to its paired unit for VoIP traffic.

#### Voice Compression:

The pull down menu allows the user to configure the voice compression (vocoder) that is used for VOIP audio traffic. Five choices are available: GSM at 13Kbps, ADPCM at 16Kbps, ADPCM at 24Kbps, ADPCM at 32Kbps, and PCM at 64Kbps. If the unit is a server, adaptation to the incoming client vocoder is automatically selected to match the client request.

#### Duplex:

The pull down menu allows the user to configure the VOIP channel for either full or half duplex operation.

#### COR Inhibit Time (mS):

The pull down menu allows the user to configure the COR inhibit time. Six options are available: 0ms, 500ms, 1000ms, 2000ms, 3000ms, 4000ms.

#### COR Sense:

The pull down menu allows the user to configure the COR sense. Three options are available: active low, active high, and VOX.

#### DSP-2 Mode:

The pull down menu allows the user to configure the operating mode of the DSP-2. Four major modes are supported:

1. DSP-1 Classic:	unit behaves as a DSP-1
2. Hybrid DSP-1 / NXU-2:	unit behaves as a combination DSP-1 and NXU-2(VoIP)
3. NXU-2 Standalone:	unit behaves as a NXU-2(VoIP) and is invisible to ACU
4. Test:	test mode: for factory use only with loopback fixture.



#### RX Input Level:

The pull down menu allows the user to adjust the receive input level for receive audio. Five levels are supported: +12db, +4db, 0db, -4db, and -12db. Note: these adjustments are only relevant when operating in "NXU-2 standalone mode".

### TX Output Level:

The pull down menu allows the user to adjust the transmit output level for transmit audio. Five levels are supported: +12db, +4db, 0db, -4db, and -12db. Note: these adjustments are only relevant when operating in "NXU-2 standalone mode".

# 3.5 Connection Management

Client VOIP sessions may be managed by browsing to the "**Connection Management**" link at the top of any of the unit's web pages. Figure 5 shows the "Connection Management" screen. Management may be used for forcing a new "server" to be used, or for connecting or disconnecting an existing link to a server.

### Server IP:

The user may enter numeric text (0-255 decimal) into each of the four fields that define the unique Internet Protocol address of the server unit that is paired with this unit.

#### Connect / Disconnect:

The user may request that a connection to the server be established by activating the "CONNECT" button.

The user may request that the connection to the server be broken by activating the "**DISCONNECT**" button.

Note: Requests will be processed only after activating the "Perform Selected Action" button.

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CONNECT C DISCONNECT							
Perform Selected Action							
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Figure 5 Connection Management



# 3.6 Connection Status

VOIP session status may be monitored by browsing to the "**Connection Status**" link at the top of any of the unit's web pages. A variety of statistics for the session are presented (see Figure 6).



Figure 6 Connection Status



# 3.7 Manual

A subset of the ACU-1000 manual regarding DSP-1 (and DSP-2) configuration issues may be viewed online by browsing to the "Manual" link at the top of any of the unit's web pages (see Figure 7). Full documentation is available on the website. Additional links from within the DSP-2's "Manual" page may be browsed for viewing jumper locations, and a photo of the DSP-2 board.

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Figure 7 Manual

#### **Restoring Factory Defaults** 4

In rare circumstances, there may be the need to completely restore the DSP-2 to the original configuration that was established when the module was manufactured. The procedure for doing this follows. (Does not apply to audio input configuration).

#### **Equipment Required:**

- 1. Extender Card (supplied in the Accessory Kit).
- 2. ACU-1000 or ACU-T



#### **Procedure:**

- 1. Power down the ACU-1000 (ACU-T).
- 2. Remove the DSP-2 from the rack.
- 3. Install the extender card into the now empty slot.
- 4. Install the DSP-2 into the extender card.
- 5. Configure the "Restore Factory Defaults" jumper JP22 [center to right].
- 6. Power up the ACU-1000.
- 7. Wait 10 seconds. (The LEDs will repeatedly sequence...)
- 8. **Remove** the bridging block from **JP22** (while powered).
- 9. Wait 15 seconds. (The DSP-2 will complete the reset sequence)
- 10. Power off the ACU-1000.
- 11. Remove the DSP-2 from the extender card.
- 12. Remove the extender card from the ACU-1000.
- 13. Re-install the bridging block on jumper JP22 [left to center].
- 14. Install the DSP-2 back into the vacant slot in the ACU-1000.
- 15. Power up the ACU-1000.
- 16. Finished

NOTE: Jumper Locations Shown on Figure 1.

#### **Results:**

The completion of the above procedure will re-establish the original factory configuration to the DSP-2. In summary, the factory defaults are shown in Figure 8.

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Serial port data b	its: 8 💌	Duplex:	Full 💌					
Serial port stop b	its: 1 💌	COR Inhibit Time (mS)	): 0 💌					
Serial port parity:	None 💌	COR sense:	Low active (H/W)	-				
VOX Hangtime (n	nS): 500 💌	DSP-2 mode :	DSP-1 Classic	•				
RX Input Level:	2:0db 💌	TX Output Level:	2:0db 💌					
	Save Changes	Clear Changes						
	Copyright © 2004 Raytheon C	corporation. All Rights Res	erved					
é				🔮 Internet				

Figure 8 Restored Factory Defaults



#### 5 Software Updates

The DSP-2 is designed to support software updates in the field. Should it become necessary to install updates to the software, the following process should be followed.

#### **Equipment Required:**

- 1. PC with Internet network access via a browser (e.g. the Internet Explorer).
- 2. Ethernet access via an Ethernet switch (for the DSP-2 connection).
- 3. Ethernet cable.
- 4. DSP-2 installed in the ACU-1000 / ACU-T.
- 5. DSP-2 software and installation software available from the website.
- 6. The IP address of the networked DSP-2.

#### **Procedure:**

- 1. Use the PC connected to the Internet to browse to the website.
- 2. Download the DSP-2 software by right clicking on "dsp2\_update.zip", and choose "save target as".... Browse to a local folder on your computer to deposit it, then "save".
- 3. Unzip the files in the zip archive.
- 4. Connect the DSP-2 to the LAN via the switch and Ethernet cable.
- 5. Launch the "autoupdate" software by navigating to the folder where it was unzipped / saved, and double clicking on the file "autoupdate.exe".
- 6. A dialog box similar to the one shown below will appear:

						×
IP address:	192	. 168		1	. 200	Find
FileName:	c:\some	vhere\ds	p2_ap	p.s19		Browse
🔽 Rebo	ot when c	omplete			Update	Dismiss

- 7. Enter the IP address of the DSP-2, the path to "dsp2\_app.s19" (the update software), and insure that the "Reboot when complete" checkbox is checked.
- 8. Click the "Update" button, and a status bar will appear, showing the update progress.



9. After a short delay (10-15 seconds), the following dialog will appear: the DSP-2 will be reset and restarted with the new software activated.



- 10. Click OK to close the "AutoUpdate" dialog.
- 11. Verify the new version of the software has been loaded correctly by browsing to the IP address of the DSP-2, and validating the "Firmware version" matches the latest release (per web site).



12. This completes the process for updating the DSP-2 software.



# 6 Early Revision DSP-2 Input Configuration

This section describes the jumper settings some early version DSP-2 modules that had a different audio input interface. This configuration did not work as well with some radios when the ACU-1000 was powered down.



Figure 9 Early Revision DSP-2 Jumper Locations

#### 6.1.1 Receive Audio Configuration

	Table 3	RX Audio Input Configuration		
Bal/UnBal	Impedance	DSP-1 & Current DSP-2		Early Rev DSP-2
		JP1	JP2	J23
Balanced	600 ohms	LO Z	BAL	2-3
Balanced	High	HI Z	BAL	N/A
Unbalanced	600 ohms	N/A	N/A	N/A
Unbalanced	High	Don't Care	UNBAL	1-2

Figure 9 shows the jumper locations for the early revision DSP-2. Table 1 provides the proper settings to achieve the desired RX Audio configuration for DSP-1 modules, and both revisions of DSP-2 modules. Two differences to note: The DSP-2 jumper J23 affects the input configuration by setting an input that is read by the DSP-2's control circuitry, while JP1 and JP2 actually route the audio. Also, the early revision DSP-2 does not have a Balanced, High Impedance setting.

Note: When using unbalanced (single-ended) RX audio, a proper ground reference is required. Wire the RX audio to the DSP-2 RXA terminal. Provide the internal ground reference by shorting the DSP-2 RXB terminal to the DSP-2 Analog Ground Pin. Provide the external reference by connecting this line to the analog ground terminal of the radio; if the radio port does not have a separate terminal for analog ground, tie to the radio's single ground terminal.

Interface cables sold by Raytheon are wired to comply with these instructions.

# 6.1.2 DC Blocking in Audio Input

The early revision DSP-2 also has the ability to add capacitive coupling to the RX input in case DC blocking is required. See Figure 9 for the location and settings positions for J15. Note that this coupling is not required for any radio interface cables purchased from us. These cables already have DC Coupling built-in if it's required. The DC blocking feature is included to assist customers who are designing an interface cable in the field.

### 6.1.3 Restore Defaults Jumper J22

This jumper performs identically to its function in the later revision DSP-2; it applies only to the VoIP "Extended Features" of the DSP-2. It has no affect for the DSP-2 when used simply as a DSP-1 replacement. See Section 4.

Table 4Early Revision DSP-2 Factory Default Jumper Positions		
Jumper	Default	Setting
J23, RX Audio Configuration	2-3	Balanced, Low Z
J15, RX Audio Input Coupling	2-3	DC Coupled (No DC Blocking)
J22, Restore Factory Defaults	2-3	Normal (Do not restore)

If you have any questions not answered by this addendum or need further assistance on the functions or use of the DSP-2, contact Customer Service at 919-790-1011. Please ask the operator for Technical Assistance.



NOTES: