

# ***DSP-D300***

## **ALERT/IFLOWS Decoder**

Revision 2.3



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## Overview

The Timewave DSP-D300 is used to decode and filter radio reporting gauge data packets that transmit in ALERT (Automated Local Evaluation in Real Time) formats over the IFLOWS (Integrated Flood Observing and Warning System). The DSP-D300 connects to the output of the radio receiver, and transmits the decoded data packets either to a Local RS-232 device, a Filtered output for a Satellite RS-232 device, or via a Filtered Ethernet port (for use over the Internet). DSP-D300 adjustments may be done via remote access through the Ethernet port using SSH.

For system requirements and installation information, see *Getting Started* on page 45.

For details on how the D300 works internally, see *∴ Theory of Operation* on page 69.

## DSP-D300 Operation

The DSP-D300 has three categories of user-initiated Commands: Control, Status, and Upgrade. All the Commands must be entered via USB or Ethernet via the Command Prompt.

### ***Ethernet Operation***

The Control and Status can be initiated via the SSH server on the Ethernet port while the unit is streaming ALERT data. See the section *DSP-D300 Shell (Command Line)* on page 10 below.

### ***Serial Operation***

The Serial ports send the IFLOWS packets. All ALERT data must go to a computer with a serial port. Both ports can be connected via the same computer.

### ***USB Operation***

The USB port is for control by the *Control300* program. Please see the chapter on the *Control300 Control Program* on page 24. Access to the *Shell* is at root level automatically from the *Control300* program.

### ***NIST***

The DSP-D300 supports the standard NIST protocol. However, if the D300 is not connected to the Internet, or there is an intervening firewall, this will cause connection problems. To override this, set the NIST time to disabled. This needs to be done from the shell. See *DSP-D300 Shell (Command Line)* on page 10 for instructions on how to use the shell.

```
$ SET NISTHost=Disabled
```

Note: Setting the NISTHost to Disabled will set the internal date to 1970. The internal date may be manually set via the TIME command (page 21).

To re-enable NIST, set it to “Enabled”.

If a “Waiting for NIST server” appears on the boot then the NIST server is inaccessible from the network. To disable the time check, disconnect the Ethernet cable, reboot, and the D300 will boot in Offline mode. Activate the shell and disable NIST as described above. Save, plug in the Ethernet cable, and Reboot.

### ***Status Commands***

A feature of Timewave DSP products is the ability to query them about their status. This includes items such as

- internal operating temperature

- power supply voltage
- port activity
- firmware version numbers

To view this information, either monitor it from the Control300 program (See *Control300 Control Program* on page 24) or type “status” from the command line. See *DSP-D300 Shell (Command Line)* on page 10 for instructions on how to use the shell’s command line.

## **Alarms**

Another feature of the D300 is the alarm generator. Alarms are generated by:

- Watchdog timeout on the packets. (No packet activity for set period of time.)
- (Open for future expansion.)

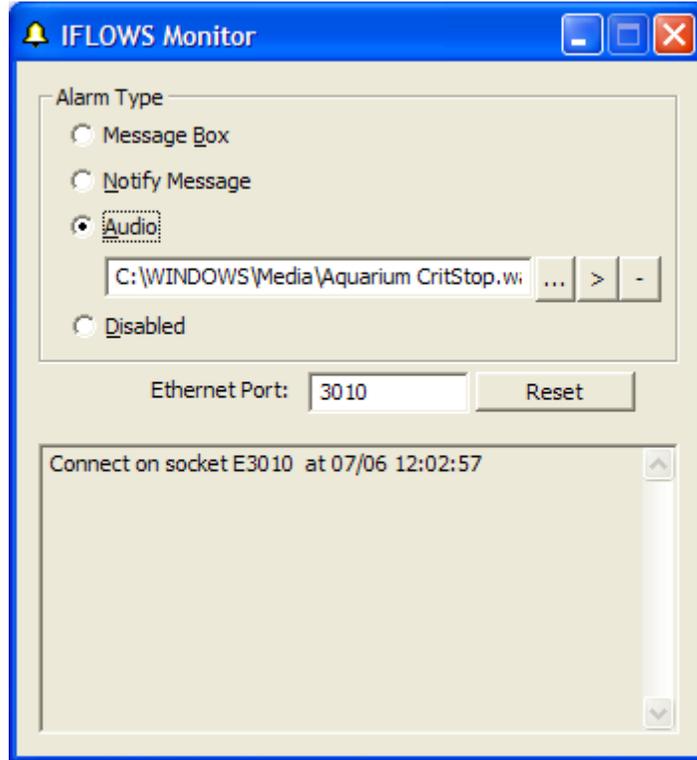
These alarms may be set by entering the timeouts in the SET command line control. See *set* on page 18.

The D300 will send an alarm for special conditions to a monitoring computer. The computer must either have a port monitor running or use the “IFLOWS Monitor”. This program has been is no longer supported, but is described here for clarity.



**Figure 2: IFLOWS Monitor**

The IFLOWS Monitor resides next to the clock on the Notify Bar. It uses an alarm bell icon. By clicking on the icon, a menu appears for exiting or setting the options.



**Figure 3: DSP-D300 Alarm Options Screen**

There are four options for alarms: Message Box, Notify Message, Audio Alarm, or it may be Disabled.

Message Box

This will pop up a message box in the middle of the screen.

Notify Message

This will pop up a notify message off of the monitor icon. See Figure 4 below.

Audio

This will play the WAV file selected.

Disabled

This will disable all pop-up alarms.

Also, all alarms will be shown on the Options window.



**Figure 4: Notify Message Alarm**

## DSP-D300 Shell (Command Line)

The shell is a UNIX style command line that allows the system to be configured. This is similar to a UNIX bash shell or a DOS command prompt. A basic knowledge of command line use is recommended for this section.

### ***Accessing the Shell***

A new box has a “root” account with a password of “foo”. See the section below on *adduser* (page 13) for adding more users.

### **SSH from UNIX or Cygwin**

To connect via SSH to the D300, follow the following procedure:

```
$ssh 192.168.3.238 -lroot
root@192.168.3.238's password: foo

OpenSSH Version OpenSSH_3.7p1, see http://www.openssh.org
Shell Version 1.0, Copyright (c) 2004-2005, Timewave Technology Inc.
Build Jul  1 2005 13:05:22 RC2

$
```

At this point the connection is complete. The “\$” prompt is from the D300 shell. Please note that the password prompt may take up to a minute to appear.

SSH is certified under the FIPS 140-2 regulations, and is applicable in the following modes:

- \*\*AES (128, 192, 256)
- \*Triple-DES
- \*RSA
- \*HMAC-SHA-1
- \*\*HMAC-MD5
- \*HMAC-SHA-1 96
- \*CAST-128
- \*Blowfish
- \*Arcfour
- #HMAC-RipeMD
- #HMAC-MD5 96;

\* indicates an available mode

\*\* indicates a common mode used for SSH 2.0

# indicates a common mode in SSH 2.0 that is not FIPS certified

There are many other modes available to SSH, but are not certified in the FIPS nor are commonly used.

The DSP-D300 connection uses AES or HMAC-MD5 if available.

## SSH from Windows

There are many SSH clients available for Windows. Included on the software CD in the Tools directory is a public domain program called PuTTY. The latest version of this may be retrieved from:

<http://www.chiark.greenend.org.uk/~sgtatham/putty/>

Procedure for PuTTY:

1. Click on "Connection"
2. Type the login name wanted into the "Auto-Login username" box.
3. Click on "Session"
4. Type the IP or URL of the DSP-D300 box into the "Host Name" box.
5. Make sure "SSH" is selected.
6. Click on "Open".
7. A window will pop up, a few seconds later you will be prompted for the password.
8. Enter the password for the login that you entered.
9. The shell should appear.

## Shell Commands

You may get a list of commands by typing "help" at the command line:

```
$ help
Internal Commands:
  adduser user [pass]      add user
  deluser user             delete user
  dnslookup domain        lookup specific domain name
  echo argument           echo the argument to the tty
  last                    list the last 8 users who have logged in
  listusers               list the configured users
  ls [-l]                list the internal stored files
  passwd user pass       set user's password to pass
  ping ipaddr            test a connection
  quit                   disconnect
  reboot                 reboot the device
  regen                  regenerate the keys
  rm file                 remove a virtual file
  set [param=value]      show and change system settings
    load                  abandon changed system settings
    save                  save changed system settings
  stty [value]           show and change terminal settings
  time [-s offlinetime] show [set] time
  uptime                 time since boot
  ver                    show version
  whoami                 show currently logged in user

External Commands:

  iflows [address [on/off/update]]
                                set/get the iflows filter
                                (address="all" to set all)
  status                    show the status
  volume left/right level  set the volume to level (0 to -62 dB)
  gain level                set the gain to level (-24 to 62 dB)
  levelhistory              list recent audio levels
  loadimage image ip       upload new image from ip
```

verifyimage image ip  
compareimage  
updateimage

verify new image from ip  
verify new image from FLASH  
update memory from loaded image

## **adduser**

`adduser user [password]`

Parameters:

*user*

The name of the new user

*password*

The password for the new user. If not given, the password will be blank. See **passwd** for setting the password.

Description:

Adds a user to the user database.

Notes:

There are a total of 5 users possible. The user “root” cannot be renamed.

## **compareimage**

`compareimage`

Description:

Compares a downloaded image (see *loadimage*) with the program already set in the FLASH. Used to determine if a program update is necessary.

## **deluser**

`deluser user`

Parameter:

*user*

The name of the user to remove

Description:

Removes a user from the user database.

Notes:

There are a total of 5 users possible. The user “root” cannot be removed.

## **echo**

`echo argument`

Parameter:

*argument*

Any text

Description:

Copies the text typed.

## format

format *argument*

Parameter:

*argument*

The only allowed value is “FLASH”

Description:

Erases the internal file system. Immediate rebuilding of the encryption keys will ensue at the next boot. See *regen*.

## iflows

iflows [*address* [*setting*]]

Parameter:

*address*

The address from 0-3071 to set. If not given, then the entire filter table will be shown.

*setting*

Turn it off or on or forces an update. If this is not given, then the current setting will be returned.

Description:

Controls the IFLOWS filter.

Notes:

For the setting, “ON”, “YES”, “ENABLE”, and “1” may be used to enable to address. If the entire filter is NOT selected, than updates will be forced before setting the addresses.

This is not a real-time update. There may be a lag of up to 10 minutes for updates. This includes reboot.

## last

last

Description:

Lists the recorded system events.

Notes:

The last 32 system events are recorded. There are three fields in the system event database: User, Type, and Time. If the NIST time check is not enabled, the time may be invalid.

<i>Field</i>	<i>Possible Values</i>	<i>Description</i>
User	<i>Username</i> , root, System Boot	The name of the user who created the event.
Type	SSH Remote, Diagnostic	Remote or Local operation
Time		The time (UTC)

## levelhistory

levelhistory

Description:

List the last 40 recorded dB levels.

Notes:

dB levels are not updated in the shell more than a few times a second.

## listusers

listusers

Description:

List the users currently using the DSP-D300.

Notes:

Any user logged into the console will be “root”.

## loadimage/verifyimage

loadimage *file ipaddress*

verifyimage *file ipaddress*

Parameter:

*file*  
*Ipaddress*

The image file on the TFTP server. Usually “image.bin”  
The IP Address of the TFTP server.

Description:

Downloads a new program image from a TFTP server. *loadimage* will load the new program into memory, whereas *verifyimage* will check the downloaded image against an image already in memory.

## ls

ls [-l ]

Parameter:

-l

Show the long form of the file listing.

Description:

Show the virtual files on the DSP-D300.

Notes:

The format is based on the UNIX *ls* format.

## **passwd**

`passwd user pass`

Parameters:

*user*

The name of the user to change the password for.

*pass*

The new password for the user

Description:

Change a user's password.

Notes:

There cannot be a blank password once the password is set.

## **ping**

`ping URL/IP`

Parameters:

*URL*

The URL address of a domain.

Example: [www.yahoo.com](http://www.yahoo.com)

*IP*

The IP address to test

Example: 216.109.118.68

Description:

Test a connection.

Note:

Unlike the UNIX ping, this will only send one packet to test for a connection.

## **quit**

`quit`

Description:

Exits the shell / Logs out.

## **reboot**

`reboot`

Description:

Reboots the DSP-D300 to activate any saved changes. See also *save*.

Notes:

Changes must be saved with *save* before rebooting.

## **regen**

regen

Description:

Regenerates the SSH keys.

Notes:

1. This can take up to half an hour.
2. Local keys on the calling PC will need to be reset to allow logins from the client SSH.

## **rm**

rm *file*

Parameter:

*File*

Virtual file to remove.

Description:

Removes a file from the virtual filesystem.

Notes:

1. The virtual file SYS.DAT cannot be removed.
2. Removing the SSH keys will force an automatic key regen at the next boot. See *regen*.

## set

set [*setting=value*]

Parameter:

*setting*  
*Value*

What to set  
The value to set it to

Description:

Sets a system operating parameter.

Example:

```
$ set
  IPAddress=216.43.106.185
  IPMask=255.255.255.248
  Gateway=216.43.106.190
  MACAddress=00:40:9D:23:E3:1E
  DNSServer1=209.253.113.18
  DNSServer2=209.253.113.10
  PacketTimeout=300 seconds
  PacketTimeoutPort=3010
  PacketTimeoutAddr=192.168.3.60
  PacketMode=EIF
  TelnetServer0=test1.timewave.com (216.43.106.188)
  TelnetPort0=3000
  TelnetRetry0=30 seconds
  TelnetMode0=Raw
  NIST host=Enabled
                207.200.81.113 nist1.aol-ca.truetime.com - TrueTime, AOL
facility, Sunnyvale, California

$ set ipaddress=216.43.106.186
$ save
Saved. Reboot to activate changes.
$
```

Notes:

1. After changing a setting, the *save* command must be used to save the changes.
2. If changes are made but have not been saved, the *load* command may be used to restore them to the last saved values.
3. After saving the changes, they will not be used until a *reboot*.
4. There are several standard settings:

<i>Field</i>	<i>Possible Values</i>	<i>Description</i>
IPAddress	IP Address	The IP address of the DSP-D300
IPMask	IP Address	The network mask.
Gateway	IP Address	The network gateway.
MACAddress	IP Address	The MAC address for the DSP-D300. Not changeable.
DNSServern	IP Address	The IP address of the primary, secondary, and tertiary DNS servers.
PacketTimeout	0- 1073741823 seconds	The idle timeout for packets. If no packet is received within the timeout, a warning alarm is sent.
PacketTimeoutPort	Any port from 1 to 64000	The port for the Alarm. Standard is 23.
PacketTimeoutAddr	IP Address	The destination for the Alarm.
PacketMode	EIF or BDF	The mode the packets are sent to the server.
TelnetServern	URL or IP address	The URL or the IP address of the telnet server to connect to. <i>n</i> represents the server number from 0 to 14. Set the URL to "0" to disable the telnet client connection.
TelnetPortn	Any port from 1 to 64000	The port for the Telnet connection. Standard is 23.
TelnetRetry	1-300	The number of seconds to wait to retry a failed telnet connection.
TelnetModen	Raw or Standard	The type of telnet connection. Raw just sends the packets. Standard will implement the telnet protocol.
NIST host	IP Address	The discovered NIST host. Not user changeable.

## status

status

Description:

Give the system status.

Notes:

There are several parameters for the status:

CPU Temperature	Current board temperature.
Board Voltage	Current board voltage. Should be around 17 VDC.
COM1 I/O	Bytes in and out the primary COM port and Telnet Clients.
COM2 I/O	Bytes in and out the secondary COM port.
Signal Level	The current audio level.
Signal Gain	The current audio gain.
CPU Uptime	How long the main processor has been running.
CPU Status	The CPU status byte in hexadecimal.
Telnet Port	Connection status for Telnet.
Shell Online	Whether the shell is online or not.

## stty

stty *value*

Parameter:                    *Value*                    The value to change.

Description:  
      Sets the tty interoperability options.

Notes:  
      It is recommended that this be left with the defaults.

## time

time [-s date time]

Parameter:                    *-s*                    Enables set mode.  
                              *Date*                    The date in mm-dd-yy.  
                              *Time*                    The time in hh:mm:ss.

Description:  
      Returns/sets the system time.

Notes:  
      The system time is polled from a NIST server. The best server is determined at boot time. If there are no NIST servers available, or the shell is operating offline, then the time will be in seconds since booting.  
      If the NIST server is offline, the time may be set via the *-s* parameter. If a date before 2000 is desired, then use the full date.

Example:  
\$ time  
Mon, Jan 1, 1970 12:00:00 am CDT  
\$ time -s 12-22-04 12:42:32  
\$ time  
Wed, Dec 22, 2004 12:42:35 pm CDT  
\$

## updateimage

updateimage

Description:  
      Writes a downloaded image (see *loadimage*) to the internal FLASH. *Warning!* This will commit the update. The next boot will load the new image.

## **uptime**

uptime

Description:

Gives the time the Ethernet driver has been operational and the system load average (should be around 4.0).

## **ver**

ver

Description:

Returns the DSP-D300 shell interface version.

Example:

```
OpenSSH Version OpenSSH_3.7p1, see http://www.openssh.org  
Shell Version 1.0, Copyright (c) 2004, Timewave Technology Inc.
```

## **volume**

volume [left/right] level

Parameter:

*left/right*  
*Level*

Which channel.

The level to set the volume attenuation. 0 to -62 dB.

Description:

Sets the system volume.

## **whoami**

whoami

Description:

Who logged in to use the current shell.

# Control300 Control Program

The Control300 program is for configuring, monitoring, and diagnosing the DSP-D300 via the USB port.

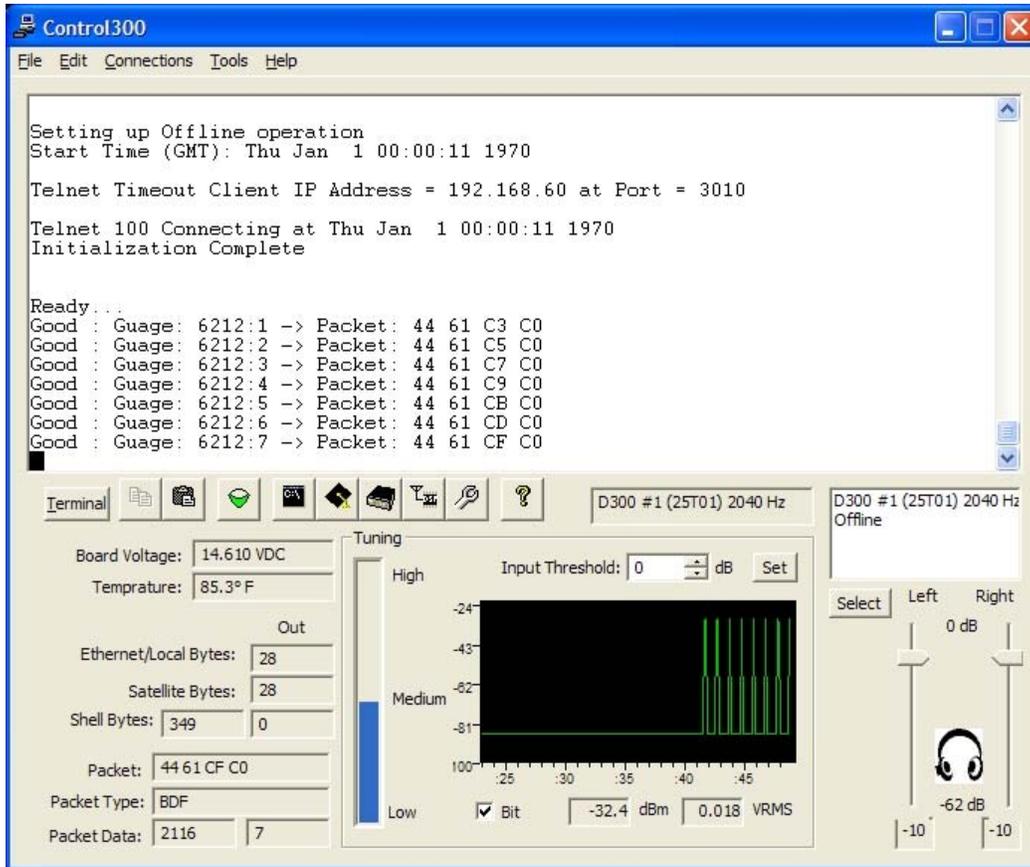


Figure 5: DSP-D300 Control300 Start Screen

After startup, a screen similar to the one above will be seen. At this point, the DSP-D300 should be up and running. If the monitored values are empty, please see *Appendix: Troubleshooting* on page 78.

Value	Meaning
Board Voltage	The power supply voltage. + 14VDC to +18VDC.
Temperature	The main processor temperature. Should be about 100° with 70° room temperature.
xxx Bytes	The number of bytes sent in or out a specific port. A packet is 4 bytes.
Packet	The last packet sent.
Packet Type	The last packet type (decoded).
Packet Data	The last packet data (decoded).
Tuning	The signal level after the gain. This is adjusted digitally via the Input Threshold. It may also be adjusted by the volume controls on the input device.

Input Threshold dBm	The amount of digital gain to add to the input signal. See <i>Adjusting Input Threshold</i> below. The digital level of the audio into the D300. This is measured in dBm. If you are using 300 $\Omega$ termination it is necessary to set whether the line is terminated in the Options.
Left/Right Volume	The output volume (attenuation). The left channel is the adjusted input signal, whereas the right channel is the diagnostic output.

To interact with the serial data being shown on the terminal monitor, click on Terminal and all keystrokes will be captured and sent in dumb terminal mode.

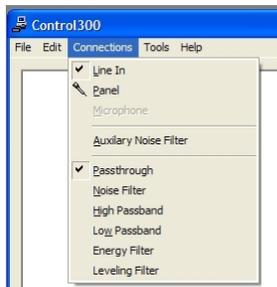
The terminal monitor has many messages displaying the status of the D300. These include cable status, packet decoded information, and “telnet” connection status..

### Edit Menu



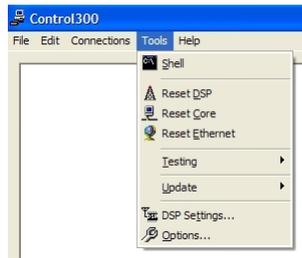
Copy	Copy the selected text in the terminal window.
Paste	Paste the clipboard to the terminal window.
Filter	Edit the IFLOWS filter. See <i>Setting the IFLOWS filter</i> on Page 33.

### Connections Menu



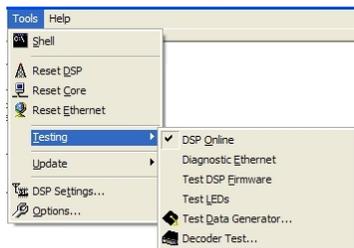
Line In	Use the RJ-45 audio input on the back of the unit.
Panel	Use the microphone mount on the front of the unit (optional).
Auxiliary Noise Filter	Enable an extra noise filter (optional).
Noise Filter	
Passthrough	Send the audio data directly. The rest of the connection types are for diagnostic purposes.

## Tools Menu



Shell	Activate the shell. See <i>Shell</i> below.
Reset DSP	Reset the DSP processor. This needs to be done following a DSP Firmware update. See <i>DSP</i> on page 65.
Reset Core	Reset the Core processor. This needs to be done following a Core Firmware update. See <i>Core CPU</i> on page 56. Warning: This will reset your USB connection.
Reset Ethernet	Reset the Ethernet processor. This needs to be done following a Ethernet Firmware update. See <i>Ethernet</i> on page 66.
DSP Settings	Set the DSP settings. See <i>DSP Settings</i> on page 34.
Ethernet Settings	Set the Ethernet settings for the Ethernet module. See <i>Ethernet Settings</i> on page 30.
Options	Set the Control300 options. See <i>Options</i> on page 30.

## Tools/Testing Menu



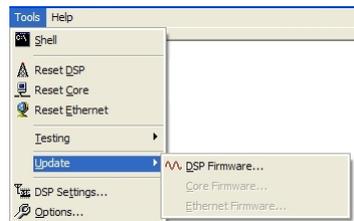
DSP Online	Override the Core processor's connection to the DSP processor. DO NOT USE without being directed to do so by Timewave support.
Diagnostic Ethernet	Restart the Ethernet module in diagnostic mode. DO NOT USE without being directed to do so by Timewave support. This option is not available on new units.
Test DSP Firmware	Checks to see if the DSP Firmware is loaded.
Test LEDs	Test the D300's LEDs.
Test Data Generator	Generate test packets from the PC's sound card. This requires that the PC's sound card is connected to the input of the D300. See <i>Test Data Generator</i> on page 35.

Decoder Test Start the Decoder test wizard. This requires that the PC's sound card is connected to the input of the D300. See *D300 Decoder Test* on page 36.



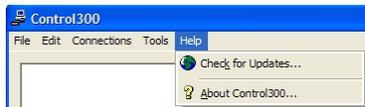
**WARNING!** Many of the testing commands are for experts only. Do not use without being told to do so for support personnel.

## Tools/Update Menu



DSP Firmware Update the DSP Firmware. See *DSP* on page 65.

## Help Menu



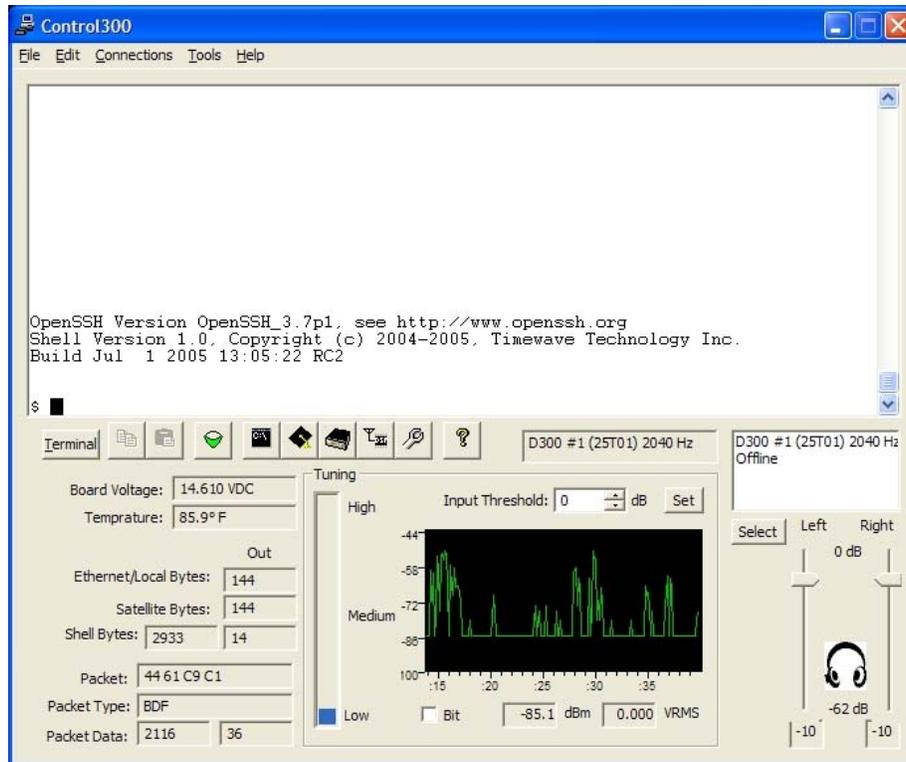
Check for Updates This will launch the default browser with the DSP-D300 update page.  
About Control300 This will show the about box.



Figure 6: Control300 About Box

## Shell

To use the Timewave Shell, click on the Shell button ().



**Figure 7: DSP-D300 Control300 Shell Screen**

At any time text may be selected and copied to the clipboard. A paste operation will send the text to the D300. Either click on the Copy and Paste buttons or right click on the text to get a context menu. For more details on the shell, see page *DSP-D300 Shell (Command Line)* on page 5.

The shell is operated from the Control300 program for diagnostic purposes ONLY.

## Adjusting Input Threshold (Tuning)

The Input Threshold must be adjusted to match the audio signal from the radio. Adjust the level until the Tuning is at the “Medium” point on the level indicator when a signal is received. This should plot between around -35 dBm and -25 dBm on the histogram. Note: this is a change from earlier models that plotted to between -15 dBm and -5 dBm.

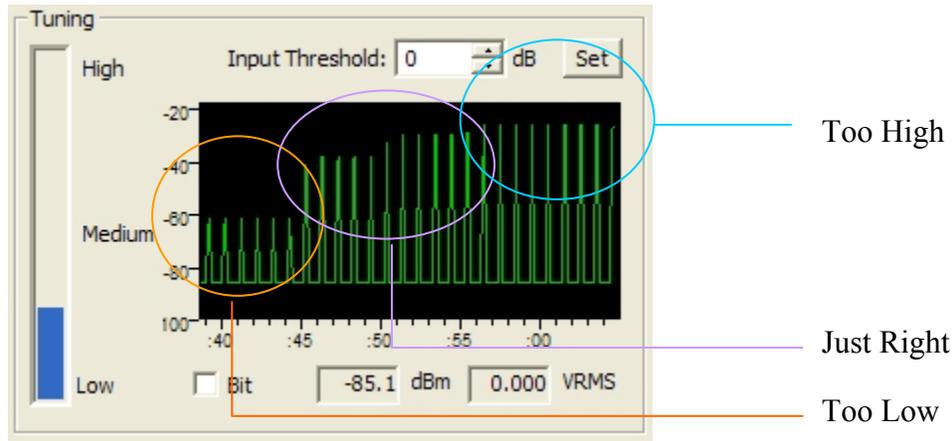


Figure 8: Control300/DSP-D300 Input Threshold

Note: In order to activate the changes, the DSP will reset every time the level is changed. This is normal.

## Manual Tuning

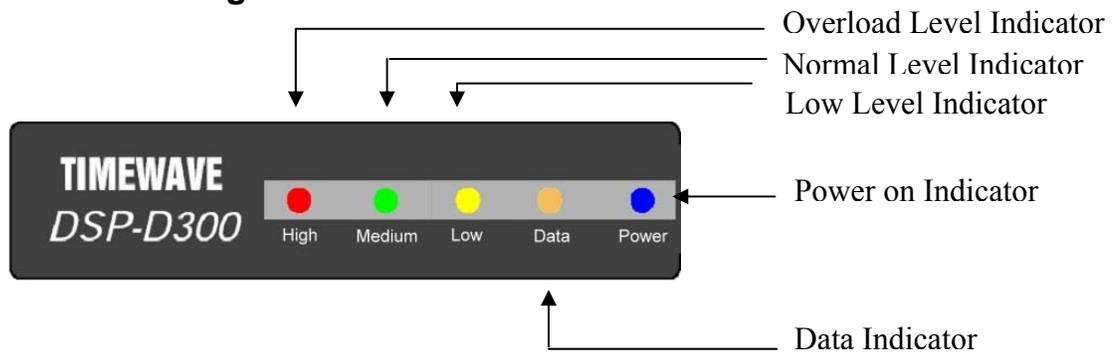


Figure 9: DSP-D300 Front Panel

The Normal or (Medium) indicator illuminates when the input audio data levels from a receiver are adequate for decoding. The Overload or (High) indicator illuminates when the input audio data level from a receiver exceeds the maximum specified level for the DSP-D300. The normal indicator should always be continuously lit or flashing when receiving a nominal signal to be decoded. The Low indicator illuminates when the signal is insufficient for decoding. The DSP-D300 may not decode input signal data if the Normal (Medium) indicator is not

illuminated or flashing, if the Overload (High) indicator is flashing, or if the Low indicator is continuously illuminated.

## Ethernet Settings

From the *Tools* menu, pick *Ethernet Settings*. The Control300 program will scan the Ethernet settings from the Ethernet module. This may take 10-20 seconds.

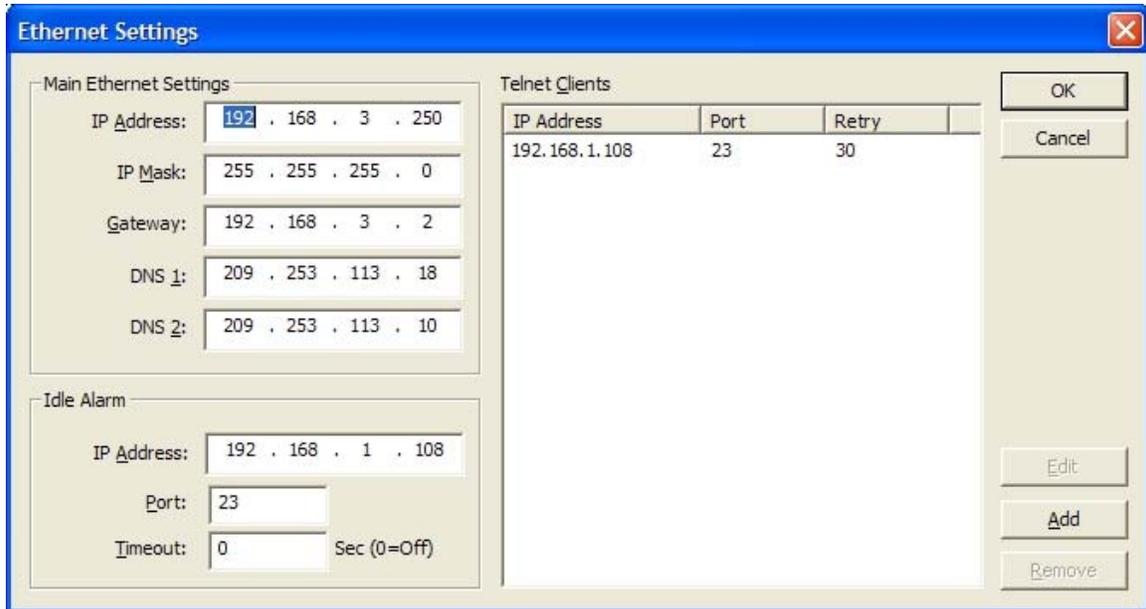


Figure 10: DSP-D300 Control300 Ethernet Settings

Adjust the settings to match those required. Up to 10 telnet clients may be added. More than 10 telnet clients may derogate operation.

See also the *set* command on page 18.

After changing the settings, the Ethernet module needs to be reset. See *Tools Menu* on page 26 .

## Options

From the *Tools* menu, pick *Options*. You may also click on the Options button ().

## General

The general tab is for the Control300 basic setup.

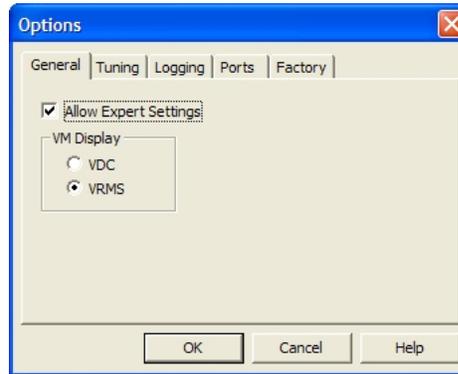


Figure 11: Control300 General Options

Allow Expert Settings	Allow expert specific settings from Control300. This requires a good knowledge to how the D300 works.
VM Display	This is the Input Level voltage readout on the main display. It may be set to VDC or VRMS.

## Tuning Options

The tuning tab is for the D300 tuning options.

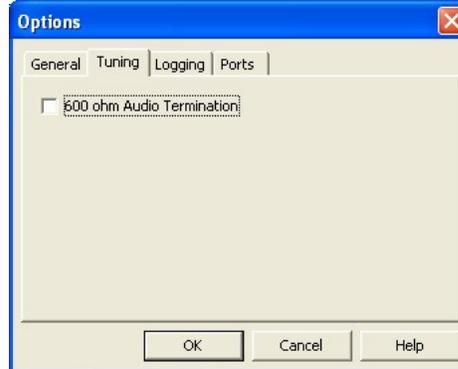
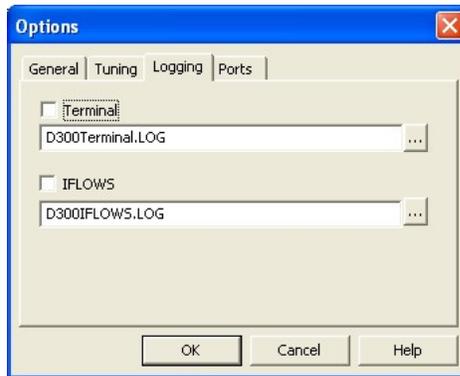


Figure 12: Control300 Tuning Options

600 ohm Audio Termination	Whether the audio cable has a 600 $\Omega$ termination.
---------------------------	---

## Logging

The Control300 program can log the packet directly from the demodulator. This may be used for comparison with port output doing diagnostics. Also the text shown on the Control300 monitor may be logged. Choose *Tools/Options/Logging...* to setup the log.



**Figure 13: Control300 Log setup**

To Log the monitor data, set the Terminal filename and then make sure that “Terminal” is checked.

To Log the IFLOWS data, set the IFLOWS filename and then make sure that “IFLOWS” is checked.

For the log format, see *Log Format* in the *CommReadTW Diagnostic Program* section.

## Log Format

The log generated is in the following log format:

Date Time Region xxx, Gage xxxx report xx in xxx on port xxx [xx xx xx xx]

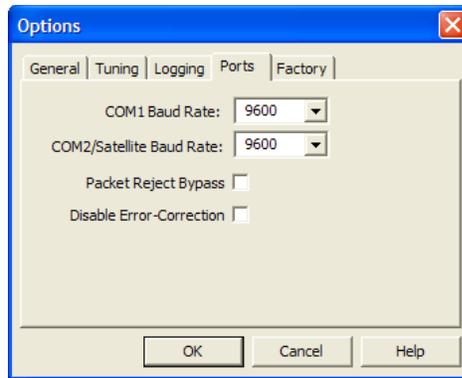
### Examples:

```
08/25 13:57:57 Region 0, Gage 6923 report 38 in EIF on port C300 [CB 6C 13 24]
08/25 13:57:57 Region 5, Gage 6923 report 38 in EIF on port 5 [CB 6C 13 24]
08/25 13:57:57 Region 5, Gage 6923 report 38 in EIF on port E3000 [CB 6C 13 24]
```

The misspelling of gauge is part of the standard format. For the D300 the port “D300” has been defined. For TCP ports, the format “Exxxx” for the TCP port has been defined.

## Ports

The ports tab is for the D300 baud rates and satellite connection type.



**Figure 14: Control300 Port Options**

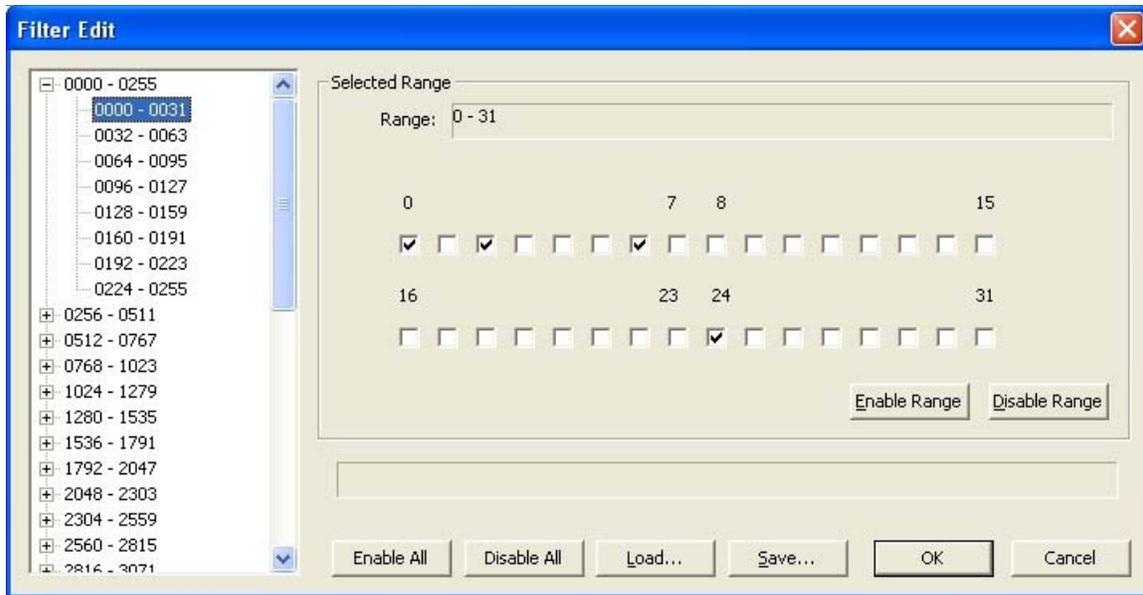
Bypass	Bypass the packet checking system and send packets that are not certified to the satellite port. This will also disable the filter. See <i>Setting the IFLOWS filter</i> .
Disable Error-Correction	Disable the Error-correction in the DSP. This will send the packet even if it is of a bad format or incorrect length. This option is for use with 3 <sup>rd</sup> party correction software.
COM1 Baud Rate	Set the baud rate for the local COM port.
COM2 Baud Rate	Set the baud rate for the satellite COM port.

### ***Setting the IFLOWS filter***

The IFLOWS filter can be edited from Control300.



Show/Edit the filter.



**Figure 15: DSP-D300 Control300 Filter Editor**

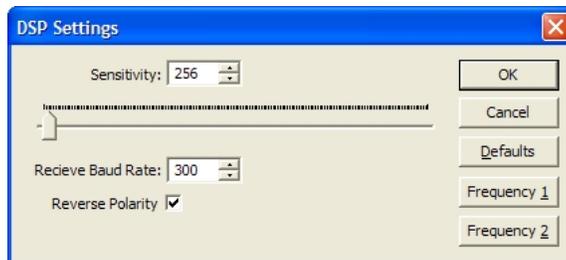
Choose the range to edit from the tree on the left. Adjust the filter by clicking on the address to turn off or on. To disable or enable all addresses, click on Enable All or Disable All. Enable Range and Disable Range work just on the selected range.

The filter may be saved for future use. Choose Save to save the filter. Load reads it back in.

Check on OK to activate the changed filter. This will implemented immediately, unlike the command line updates (see page 15, *IFLOWS*).

### **DSP Settings**

The DSP can be configured in case of a non-standard site installation. Select the *Tools/DSP Settings* menu entry or click on the DSP Settings button (  ).



**Figure 16: DSP-D300 Control300 DSP Settings**

The Baud Rate and Polarity settings should not be modified unless told to do so by Timewave support.

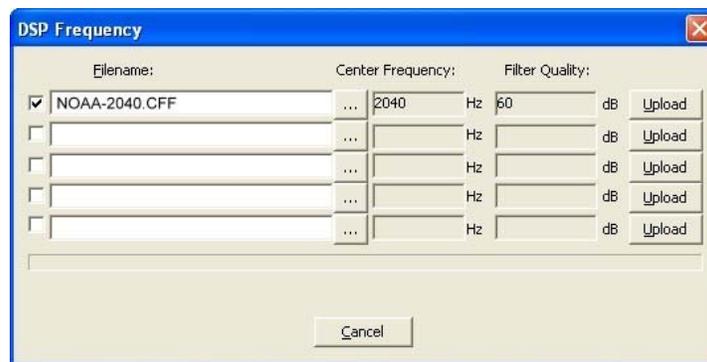
Sensitivity controls the amplitude detection for the decoding. This should be left at 256. It may be increased or decreased for high-noise environments.

The Defaults button will set all the parameters back to their factory defaults.

The Frequency button will show the Frequency Settings Editor. See *Changing the Receive Frequency* below. The second frequency button does not affect the DSP.

## **Changing the Receive Frequency**

The DSP-D300 allows for the loading of different DSP “filters” that receive different frequencies of telemetry data. This option is found in the DSP Settings.



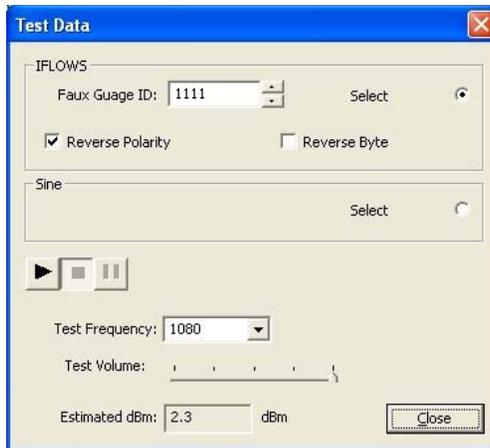
**Figure 17: DSP-D300 Control300 Frequency Editor**

Select the CFF filters that will be wanted, then choose “Upload” to choose a specific filter. **ONLY ONE FILTER CAN BE USED AT A TIME!** Uploading a filter will replace any filter already uploaded. The check mark shows which filter is currently uploaded.

Note: Until the first filter is uploaded, the D300 will use a default 2040 center frequency filter.

## **Test Data Generator**

The Control300 program can generate its own test data. Choose *Tools/Testing/Test Data* or click on the test data generator button ()



**Figure 18: DSP-D300 Control300 Test Data Generator**

The data will be generated to the Test Frequency that is set. The volume is in estimated dBm, which is what the level would be if the soundcard was playing the audio directly. Many soundcards attenuate output so this may be 6-12 dB less than estimated.

For IFLOWS test packets, set the Gauge ID for the wanted gauge. Standard IFLOWS has reversed polarity and standard byte order. Click on the select for IFLOWS.

For a sine wave, click on the select for Sine.

Click on the play () button. IFLOWS will be generated in BDF format every 1.5 seconds. A sine wave is continuous.

The test frequency will generate packets or a sine wave at that center frequency. A non-standard frequency may be typed into the box.

The test volume is the Sound Card wave output level. This ideally should be set at a calibrated 0 dBm, for many sound cards this is between 10 and 14 estimated dBm. See *D300 Decoder Test* to determine a calibrated Sound Card dBm.

### ***D300 Decoder Test***

The Control300 program (version 2.0 only) can run decoding tests on the attached D300. This may be used to check the calibration and/or operability of a D300. Choose

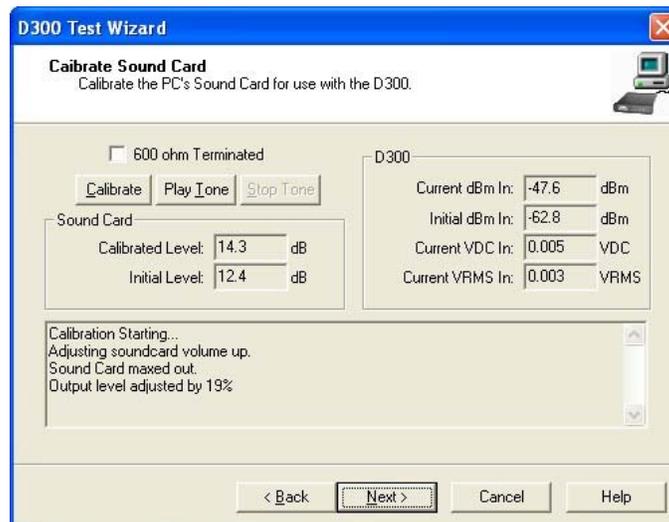
*Tools/Testing/Test Decoder* from the menu or click on the decoder test button () button.



**Figure 19: DSP-D300 Control300 Test Decoder Start**

The data will be generated to the Frequency that is set on the D300 (see *Changing the Receive Frequency* above).

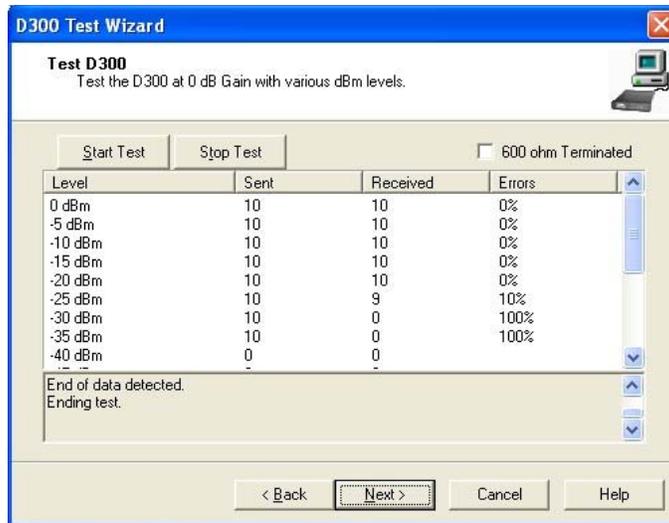
The first task is to calibrate the Sound Card in the PC. This allows the output to be scaled correctly.



**Figure 20: DSP-D300 Control300 Test Decoder Sound Card Calibration**

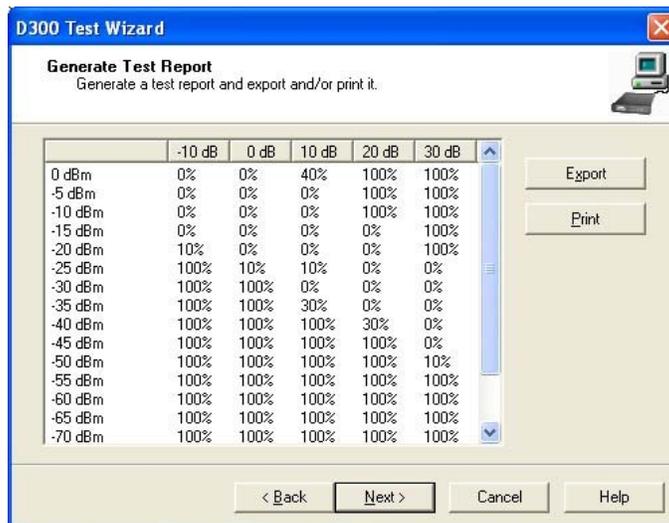
When “Calibrate” is pressed, a sine wave will be generated (this may cause the generation of several bad packets). Zero dBm is the goal. Note that the D300 gain will be reset to Zero. Note: The Calibrated Level is useful to remember for use in the *Test Data Generator*.

The next step is to run the actual test.



**Figure 21: DSP-D300 Control300 Test Decoder Test**

When “Start Test” is pressed, a series of IFLOWS packets will be generated at various sound levels. This will take several minutes. The dB range of the unit may be determined from this. This test will be done with the gain of -10, 0, 10, 20, and 30 dB. Click “Next” to test the next gain level.



**Figure 22: DSP-D300 Control300 Test Decoder Results**

The results of the five tests are shown on the Report page. The results may be exported to an Excel™ worksheet<sup>1</sup> or may be printed.

<sup>1</sup> Excel™ is a Trademark of the Microsoft Corporation.

DSP-D300 Decoder Test at 1000 Hz

Computed Results:

Filter	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>	F <sub>5</sub>
5 dBm	10%	8%	40%	100%	100%
5 dBm	2%	4%	1%	100%	100%
10 dBm	2%	4%	8%	100%	100%
15 dBm	2%	4%	8%	1%	100%
20 dBm	10%	8%	10%	2%	100%
25 dBm	100%	100%	100%	0%	0%
30 dBm	100%	100%	8%	2%	2%
35 dBm	100%	100%	80%	100%	100%
40 dBm	100%	100%	100%	30%	210%
45 dBm	100%	100%	100%	100%	0%
50 dBm	100%	100%	100%	100%	10%
55 dBm	100%	100%	100%	100%	100%
60 dBm	100%	100%	100%	100%	100%
65 dBm	100%	100%	100%	100%	100%
70 dBm	100%	100%	100%	100%	100%
75 dBm	100%	100%	100%	100%	100%
80 dBm	100%	100%	100%	100%	100%

10 dB		0 dB		0 dB		20 dB		20 dB	
Filter	Passband								
5 dBm	10								
5 dBm	10								
10 dBm	10								
15 dBm	10								
20 dBm	10								
25 dBm	10								
30 dBm	0								
35 dBm	0								
40 dBm	0								
45 dBm	0								
50 dBm	0								
55 dBm	0								
60 dBm	0								
65 dBm	0								
70 dBm	0								
75 dBm	0								
80 dBm	0								

DSP-D300 Control300  
Sunday, April 24, 2005 10:13 PM

Figure 23: DSP-D300 Control300 Test Decoder Printed Results

The final wizard screen allows the restoration of the settings of the D300 and the Sound Card to the original settings.

### Resetting the Processors

The three main processors can be individually reset. This is primarily for use in upgrading firmware. The reset commands may be found on the tools menu as described on page 26.

# CommReadTW Diagnostic Program

The CommReadTW program is for test logging the DSP-D300 data on the destination host. It monitors the incoming ports for IFLOWS data and logs it.

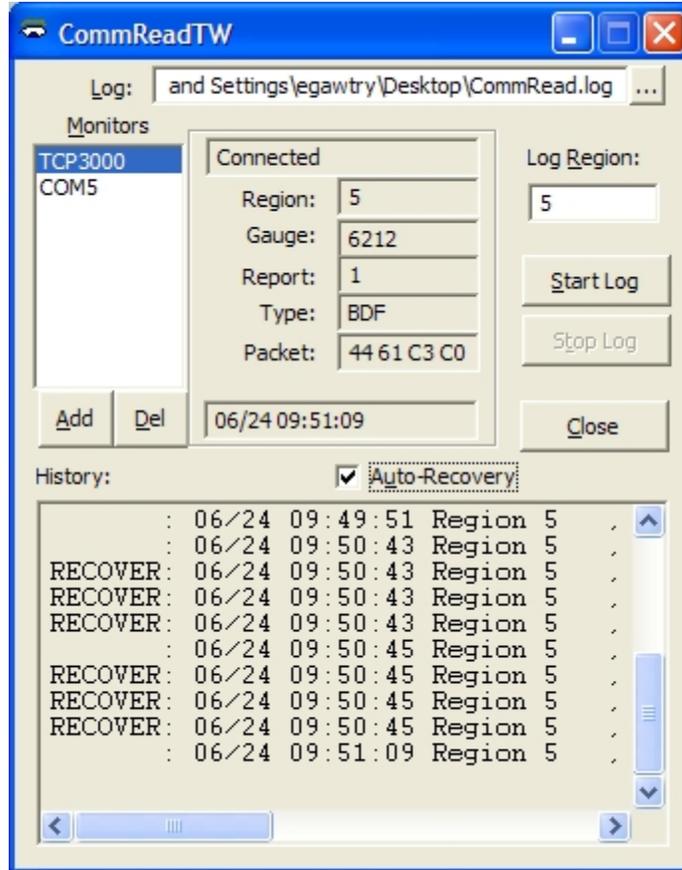
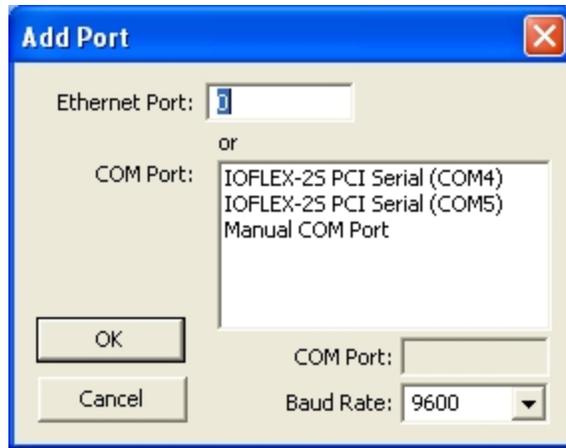


Figure 24: DSP-D300 CommReadTW Screen

## ***Adding a Port***

To add a port, click on **Add**.



**Figure 25: DSP-D300 Add Port Screen**

Either enter a TCP port number, or choose a COM port to watch. If the COM driver is non-standard, choose **Manual COM Port** and enter the port number in the COM Port box.

Note: Ethernet port 23 is standard for Telnet.

### ***Auto-Recovery***

Auto-Recovery takes partial packets and attempts to recover data from them. It is useful for high noise environments, but may result in faulty data. This was always on in the original CommRead system.

This is done by taking two packets of data and attempting all possible combinations of data between them.

<b>Real Packet</b>	<b>44</b>	<b>61</b>	<b>C5</b>	<b>C0</b>
Recovered	61	C5	C0	50
Recovered	C5	C0	50	7F
Recovered	C0	50	7F	2A
<b>Real Packet</b>	<b>50</b>	<b>7F</b>	<b>2A</b>	<b>12</b>

Note that the second real packet may not have been entirely read (it may be a remnant or extra information sent by the DSP) so it may not appear in the log.

# LogCompareTW Diagnostic Program

The LogCompareTW program is for comparing the various logs that may be generated via the IFLOWS system. This program is not automatically installed with the D300 software. It may be found in the Tools folder on the distribution CD.

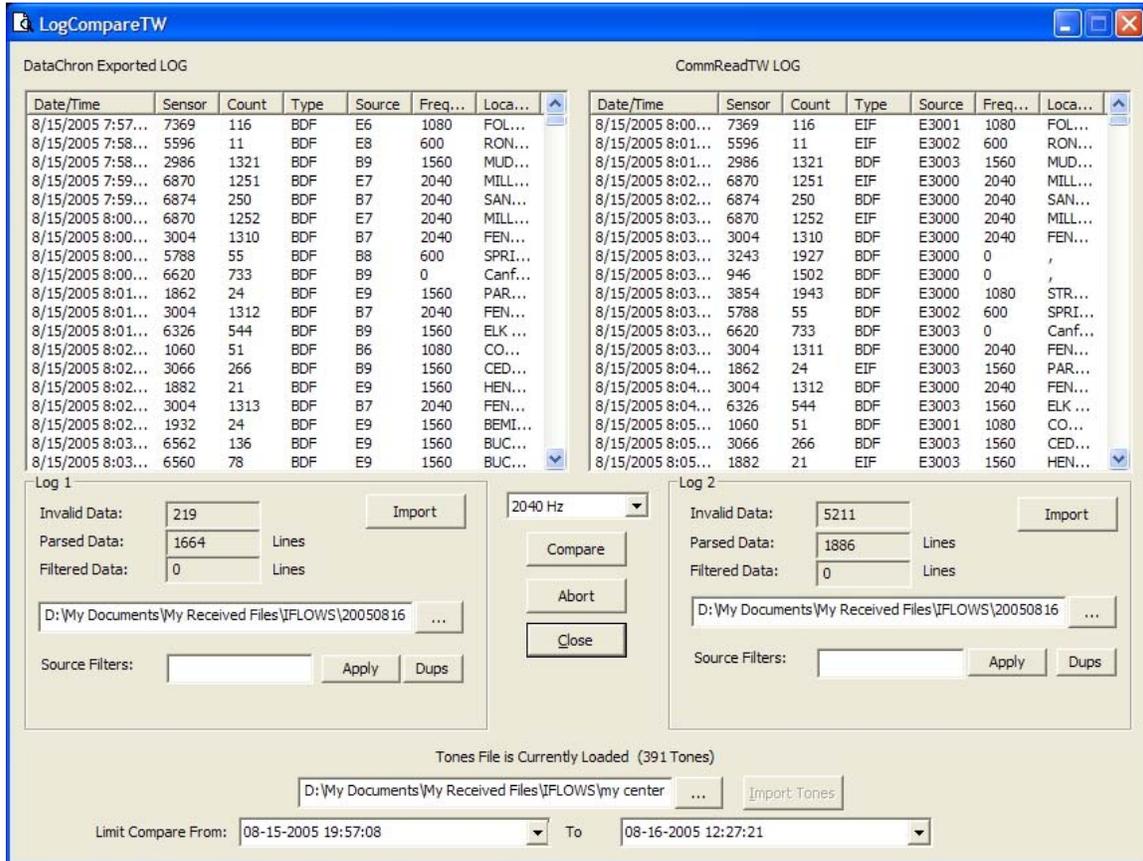


Figure 26: DSP-D300 LogCompareTW Screen

## Procedure:

- Select the center tone file and click on “Import Tones”. It is necessary to do this first so that the log import will have a tone cross-reference. This is the “CONFIGURATION.txt” file.
- Select the log file for each side and click on the matching “Import”. For a large log file this may take a few minutes. The log type will be automatically detected.

Type	Description
DataChron	This is an exported file from the DataChron table in the swatch (that's stormwatch, not a cheap watch from Switzerland). This should be comma delimited with column headers.
CommRead	This is an old-style CommRead log.
CommReadTW	This is a new-style CommReadTW log.

---

Control300 This is a IFLOWS log file generated by Control300.

- Select a center tone frequency for compare filtering. This will not change the imported data. This only affects the compared data. If there is no center tone file, leave this at “All Frequencies”.
- Click on “Compare”. See *Comparing*, below.

## Comparing

To compare the imported files, click on “Compare”. The two imported databases will be compared for size and matching entries.

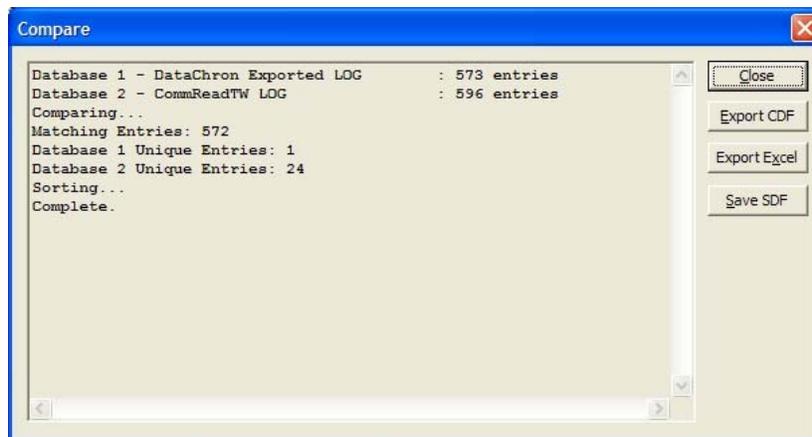


Figure 27: DSP-D300 LogCompareTW Compare Screen

There are several types of reports that may be generated. This are:

Report	Description
Export CDF	This will create a comma delimited file (CDF) of the compared data.
Export Excel	This will create an Excel (XLS) worksheet.
Save SDF	This creates a preformatted space delimited file (SDF).

## Filtering

The imported databases (especially DataChron) may contain a lot of data from sources other than that wanted for comparison. The databases may be filtered for source and duplicates; the comparison may be filtered by frequency (if a tone file is loaded) and date.

### Duplicates

Sometimes there are duplicates in a log file. A gauge occasionally sends two packets right after another that have the same data. Clicking on “Dups” will automatically remove duplicate entries.

## **Source**

When set, only the sources listed will be allowed. For example, on the CommReadTW log, maybe only input from port E3005 is wanted for comparison. Enter E3005 into the Source Filter box and click “Apply”. To reset, click on “Import” again to re-import the log.

## **Frequency**

After a Tone file is loaded, the frequency may be selected to limit matches to a certain frequency. Supported are 600, 1080, 1560, 2040, and 2560. If a tones file is not loaded there is no way of determining frequency for a specific gauge, so this should be left at “All Frequencies”.

## **Time**

After importing, the date range will reflect the maximum date ranges of the logs imported. If a subset range for comparison is desired, select it before clicking on “Compare”.

## Appendix: Installation

Installing the DSP-D300 hardware and software.

### **Getting Started**

#### **Check the Package Contents**

The DSP-D300 comes with the following materials:

##### **Package Contents**

- DSP-D300 unit
- Windows Software CD
- 13V DC, 700 mA Power Supply
- DSP-D300 Manual
- 2 RS-232 serial cable assemblies – DB-9m to DB-9f
- 1 Ethernet cable assembly RJ-45 to RJ-45 – 6 ft.
- 1 Audio Data cable assembly RJ-45 to open end – 6 ft.
- 1 Audio monitor cable assembly –  $\frac{1}{8}$ " (3.5 mm) stereo plug to  $\frac{1}{8}$ " (3.5 mm) stereo plug – 6 ft.
- 1 USB cable assembly USB "A" to USB "B"

Check to make sure that they are all present.

---

#### **Other Hardware Needed**

The DSP-D300 is designed to interface with existing hardware. Make sure that the following Hardware is present:

1. A Windows based PC.

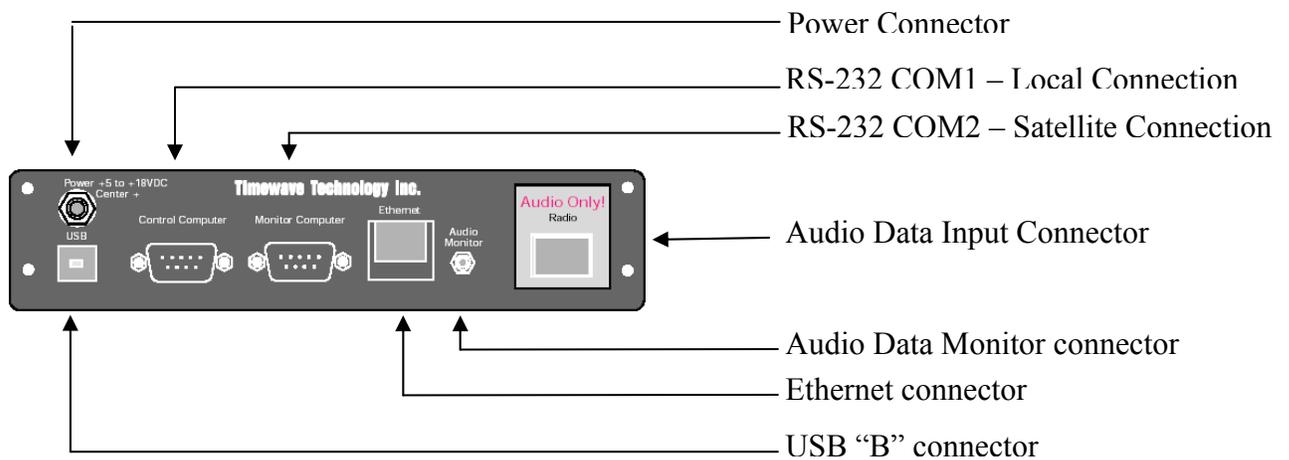
##### **Computer System Requirements**

- Windows 98SE, Windows ME, Windows 2000, Windows XP, Windows 2003, or Windows Vista. Windows XP or Vista recommended
  - Minimum Pentium III 650 MHz, Recommended Pentium 4 1.2 GHz
  - COM port (RS-232) and/or Ethernet port
  - USB port, version 1.1 or higher
  - 15 MB Free disk space
  - USB "A" to "B" Device cable needed for USB support
  - 16-bit Soundcard with  $\frac{1}{8}$ " (3.5 mm) audio out jack (recommended)
2. A radio receiver.
  3. Tools to connect Audio Data cable to Radio Receiver.
  4. Open Ethernet connection (for Ethernet use).

- a. Static IP address.
  - b. Gateway IP address
  - c. DNS Server IP addresses
  - d. Telnet/TCP server IP addresses for packets
  - e. Alarm server IP address
5. Administrator access to the Windows PC for NT based PCs (Win95 based already have administrator access).

## Connecting the Cables

*Note: DO NOT CONNECT THE POWER AT THIS TIME!*



**Figure 28: DSP-D300 Back Panel**

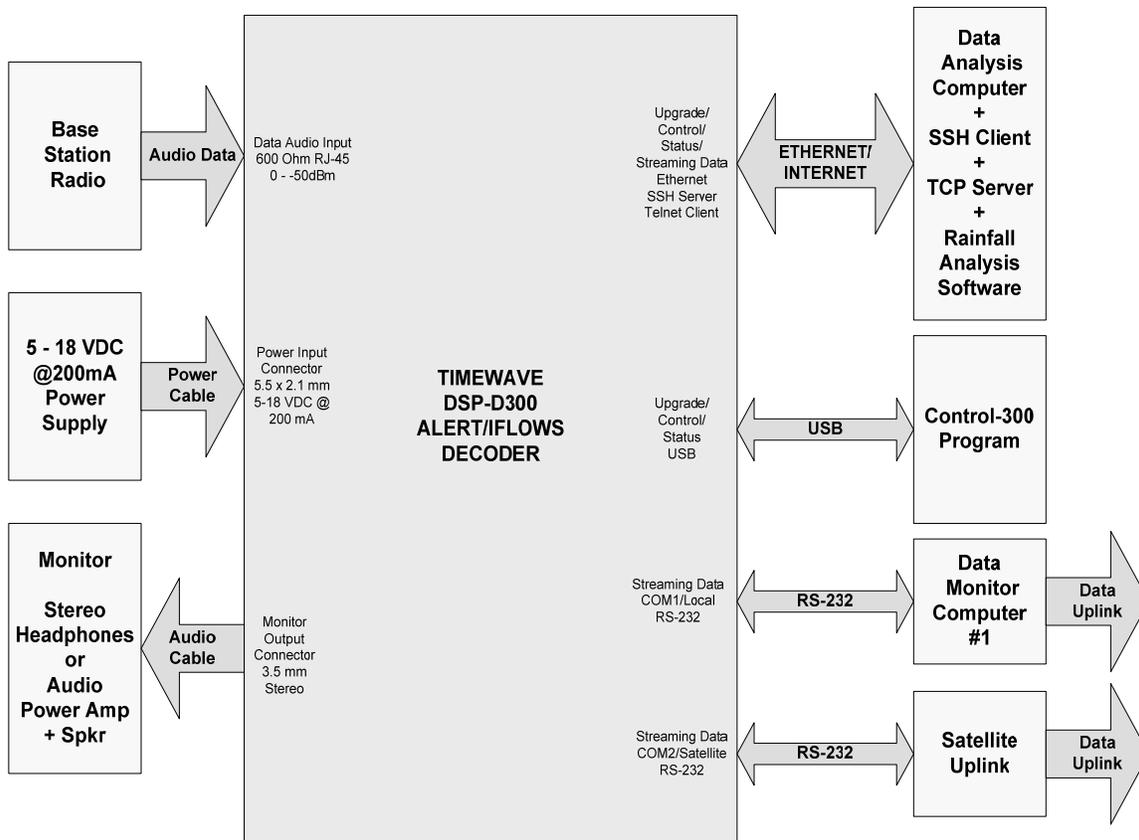
### 1a. For systems with serial connections:

Connect the RS-232 cables between the DSP-D300 and the destination Hardware.

### 1b. For systems with Ethernet connections:

Connect the Ethernet cable between the DSP-D300 and the hub. Make sure that you do NOT connect the Ethernet cable to the Radio Audio Jack!

2. Connect the open end of the Audio Cable to the Receiver (usually there is an audio bus of some sort).
3. Plug the Audio Cable into the Audio Jack. Do not confuse the Audio Jack with the Ethernet connector.
4. Connect the USB cable from the DSP-D300 to the PC.



**Figure 29: DSP-D300 Installation Block Diagram**

## Install the Software

This will install Control300, CommReadTW and LogCompareTW.

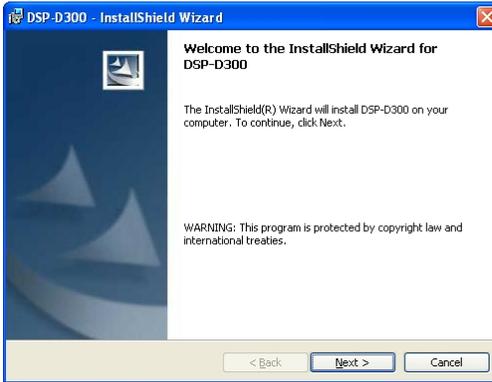
The Control300 software is the USB monitoring and configuration software for the DSP-D300 (See *Control300 Control Program* on page 24). Control300 lets users receive data packets and allows the user to configure and program the unit locally.

The CommReadTW software is a diagnostic monitoring program for receiving Ethernet (Internet) packets. (See *CommReadTW Diagnostic Program* on page 40.)

The LogCompareTW software is a diagnostic program for comparing logs generated by different receiving softwares. (See *LogCompareTW Diagnostic Program* on page 5.)

This setup procedure is identical for all versions of Windows.

1. Insert the DSP-D300 setup CD. The setup screen should automatically appear. If it does not, your system probably has Auto-Insert notification disabled, and you need to run SETUP from the CD. This may be done by typing “D:\Setup” (where D is the CD drive letter) from the Start → Run menu. If you have an old version of the Windows Installer, it will be automatically updated at this point.



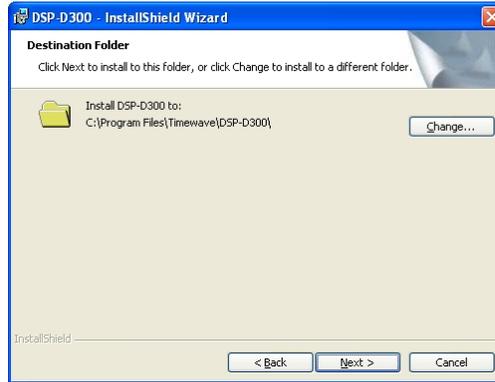
**Figure 30: Setup Start Screen**

2. Click “Next”.



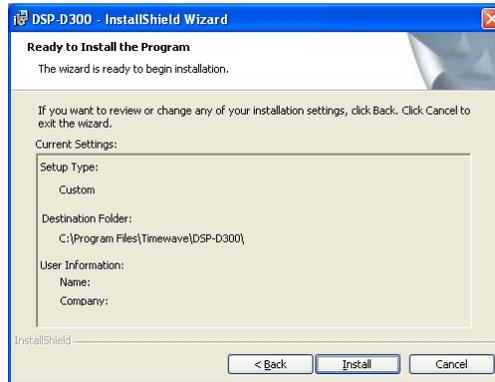
**Figure 31: Setup EULA Screen**

3. Indicate that you accept the terms and then click on “Next”.



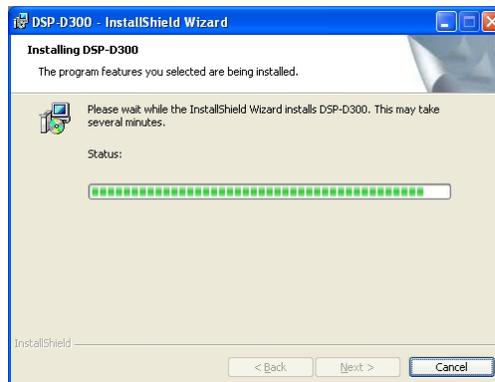
**Figure 32: Setup Chose Folder Screen**

4. Choose the folder to install the DSP-D300 tools into. When complete, click on “Next”.



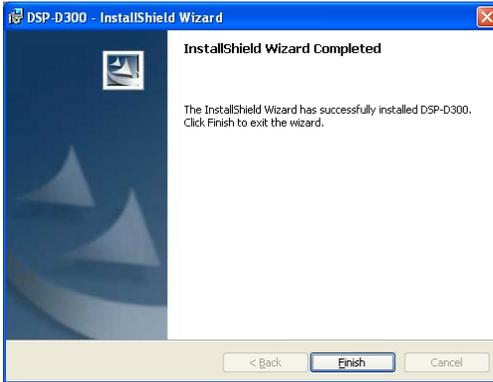
**Figure 33: Setup Review Screen**

5. Review to make sure that you are installing to the location that you want. When complete, click on “Install”.



**Figure 34: Setup Installation Screen**

6. Wait for the installation to complete.



**Figure 35: Setup Complete Screen**

7. When installation is complete, click on “Finish”.

---

## Turning it all on

Applying power to the DSP-D300 for the first time will have several effects:

1. The Windows USB driver will install.
2. The tuning will have to be grossly adjusted.

Insert the power cord into the DSP-D300. All the LEDs will light for 2 seconds.



The power LED will remain lit.

---

## Installing the USB driver

Note: This is the most probable sequence. Driver installation procedures vary greatly for different versions of Windows.

1. The New Hardware wizard should start. If not, then choose *Add Hardware* in the Control Panel.

2. Choose *Install the software automatically*.  
Click on *Next*.



3. Wait for the installation.



4. Click on *Finish*.

Note: If the driver is not found with the automatic driver installation, Click on *Back* to get to the start screen, and choose *Install from a List or Specific Location*. When asked, type the location of the DSP-D300 software installation. This is typically “C:\Program Files\Timewave\DSP-D300”.

---

## Setting up the DSP-D300 for the first time

1. Connect to the DSP-D300 via the Control300 program (page 24).

Note: If this is the first use, the SSH manager on the DSP-D300 may have to create the encryption polynomials. This may take up to 20 minutes. During this time the Ethernet will be unavailable.

2. Click on the DSP-D300 box listed in the connection box that is in the middle of the right side of the screen. In this example, **D300 #1 (25T01)**. Click on *Select* to activate the connection.

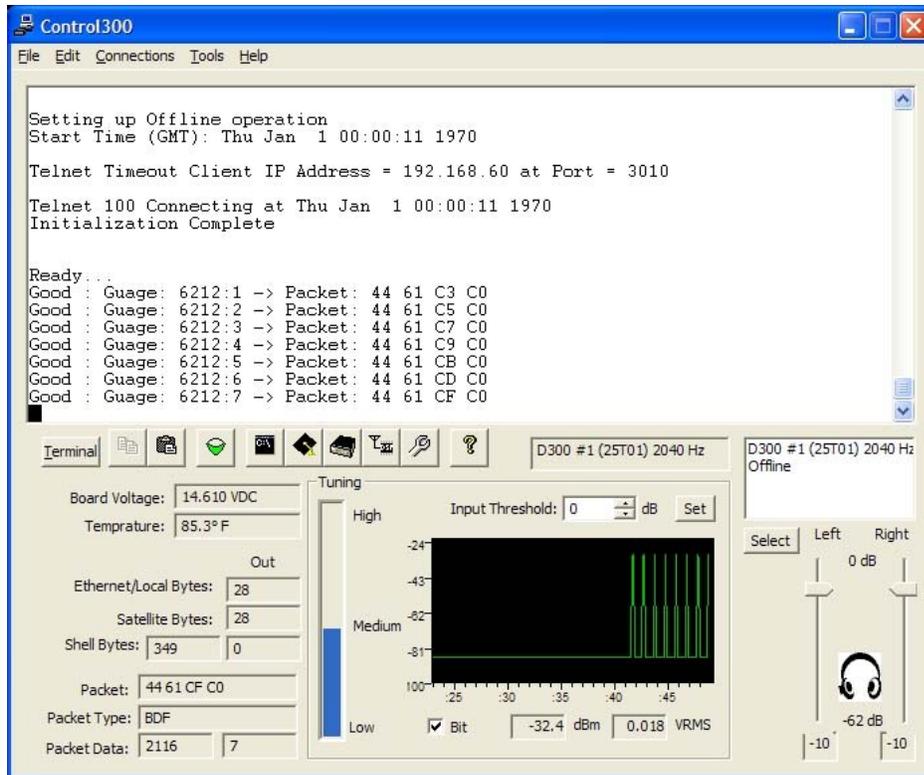


Figure 36: Control300 start screen

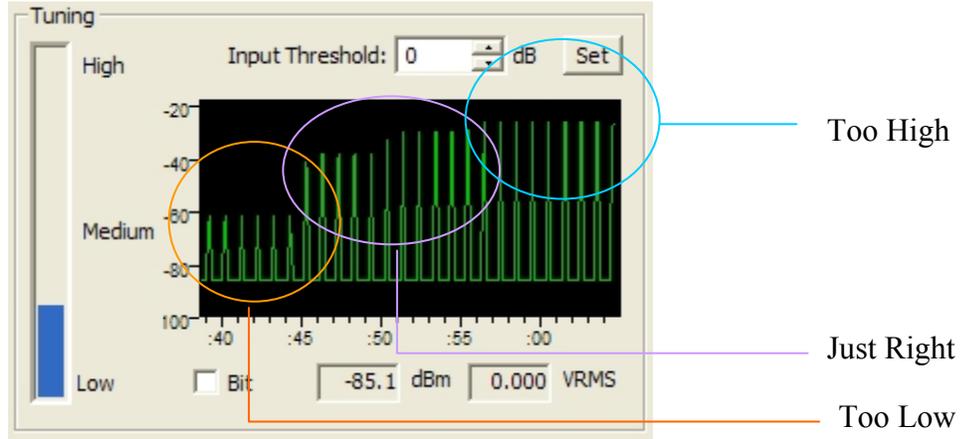
3. Check the Input Threshold (otherwise known as Gain). Make sure it is at “0” (zero) for initial setup.
4. Choose *DSP Settings* from the *Tools* menu (page 34).
5. Make sure that *Sensitivity* is set for 256. *Baud Rate* should be 300, and *Reverse Polarity* should be checked. Click on *Frequency 1*. Choose the frequency file that is wanted (typically 2040) and click on *Upload*.
6. Click on *OK* when you get back to the *DSP Settings* screen.
7. Click on the *Filter* under the *Edit* menu.
8. Click *Enable All*, and then click on *OK*.

## Tuning

See *Adjusting Input Threshold* on Page 29.

1. Wait for a packet. It should appear on the histogram (the scrolling box that looks like an EKG) as an upward spike.
2. Line up the dBm level on the left of the histogram to see what it reached. Add -25 dBm from that and enter the difference into the *Input Threshold* and click on the *Set* button next to it. Typically, this should be anywhere

from 0 if it was already in the -25 dBm range to 30 if it only was reaching -55 dBm.



To use Input Threshold, set the desired change in gain; then click on Set. When packets are being properly decoded, they will be seen on the main display.

3. The DSP will reset and the next packet should pop up into the -25 to -32 dBm range. Keep adjusting until it does.

### Setting up the Ethernet connection

1. Start the Shell by clicking on the *Shell* command under the *Tools* menu (page 10). You may also use the GUI, but the command line is recommended.
2. Reset the root password from the default (“foo”) (page 17).
3. Add any additional users and set their passwords (page 13).
4. Reboot (page 17).

---

### Factory Reset

The DSP-D300 may be reset to factory defaults for DSP and IP Address. This will allow access to the unit for further changes. This should only be used if a unit is inaccessible due to improper settings.

1. Connect to COM1 from a terminal program. HyperTerminal will work.
2. The default Baud Rate is 9600, but the speed may have been altered. If you have Control300 running, check the COM1 setting. The other settings are n,8,1.
3. Hit the Enter key, type “reset”, and then hit the Enter key once again. Wait a minute (not 50 or 30 seconds!) for everything to update. Cycle the power to the unit by unplugging the power cable from the back of the unit and reinserting it.



**NOTE!** The software and firmware for the DSP-D300 units is updated several times a year.

For the latest versions please check the D300 web site at:

<http://www.timewave.com/support/DSP-D300>

## Appendix: Updating the PC Software

The DSP-D300 comes with a CD that contains the latest officially NOAA approved version of all the PC software.

However, there is usually a beta version available on the web site that is undergoing testing and the approval process.



**NOTE!** The software and firmware for the DSP-D300 units is updated several times a year.

For the latest versions please check the D300 web site at:

<http://www.timewave.com/support/DSP-D300>

When an updated software program is downloaded, check to see if there is a setup program included. If so, run the setup program to update your software. Otherwise, unzip the software update into your *C:\Program Files\Timewave\DSP-D300* folder. Overwrite the older versions there.

## Appendix: Updating the Firmware

The three main processors and two sub-processors can be individually updated. It is recommended that all the processors be updated at the same time for compatibility purposes, however within a point update updates may be intermixed unless specified otherwise.

For instance, if updating from 2.1.60612 to 2.2.70503, then a full update is needed on all three sections; but if updating from 2.2.70302 to 2.2.70503, then it may be done one section at a time.



**WARNING!** Do not attempt to update the Firmware unless specifically told to do so by Timewave Technology.



**NOTE!** Each part of the update must be done COMPLETELY. A partial update may result in a non-functional unit.

ALWAYS check the Timewave website for the latest versions of the Firmware. DO NOT use more than one version on a D300 box. There will be updates in the same version (new build dates).

The firmware may be procured from:

<http://www.timewave.com/support/DSP-D300/d300support.htm>

The current version of the Firmware may be determined by these steps:

From Control300, click on *Help- About*.



Figure 37: Control300 About Box

The version of the CPU and the DSP will be displayed.

To get the Ethernet Firmware version, start the Shell. The version will be listed.

There is no way to determine the COM sub-processor version. It must be updated when the CPU processor firmware is updated so it should be the same version.

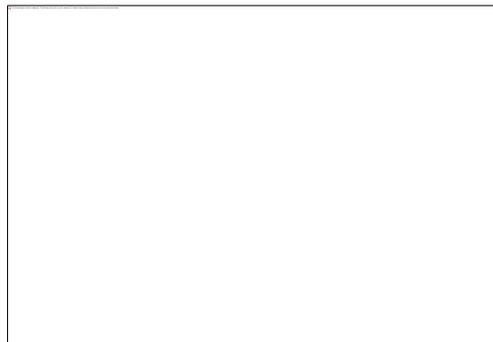
### **Core CPU**

The Core CPU has two parts, the CPU and the two COM interface processors. For an full update, ALL THREE need to be updated. For this section, an EC2/USB Debug Adapter from Silicon Labs is required.



### **WARNING!**

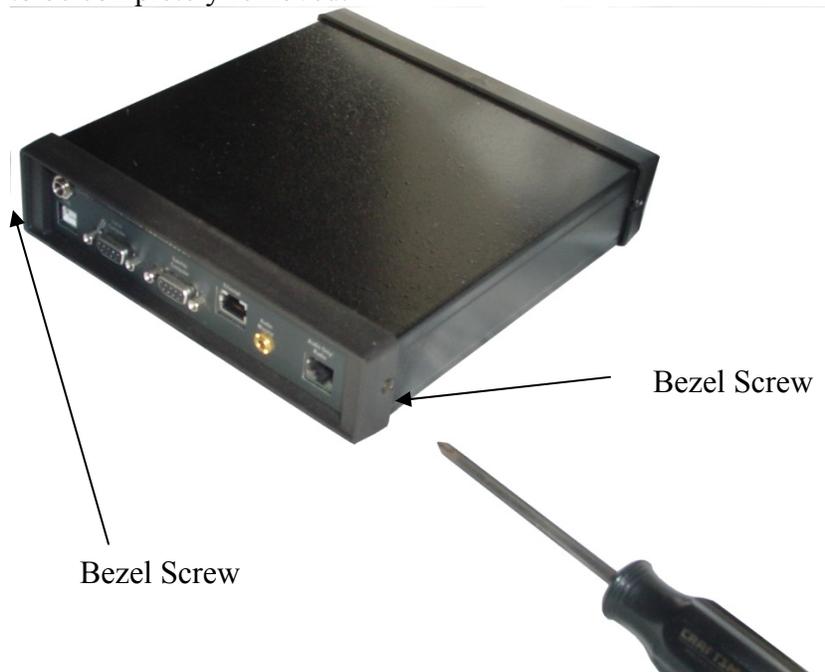
If the D300 serial number is less than 25100, the CPU must use CPU firmware versions older than version 2.2. If the serial number is greater or equal to 25100, then it is upgradable to any version of the firmware.



For a quick firmware update, if version 3 or higher of the firmware is already installed, the firmware upgrade from the software may be used instead of this procedure

Do not worry if some part of this is done incorrectly; just repeat the procedure listed here.

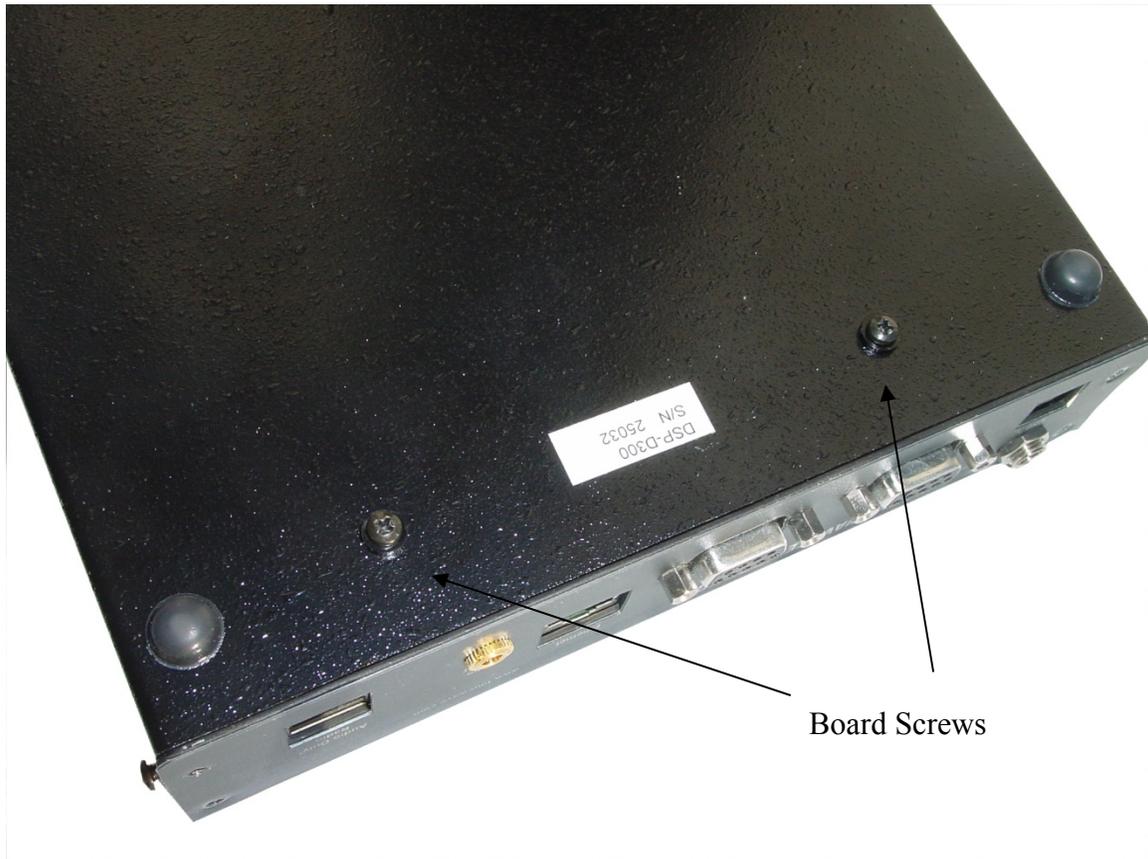
1. Disconnect the D300 from all connections. Make sure that the two 8 pin connectors are clearly labeled. When reconnecting these must not be connected to the incorrect sockets.
2. Locate the two screws holding the rear bezel in place. Loosen them. They do not need to be completely removed.



3. Remove the bezel and locate the four back panel screws. Remove them.



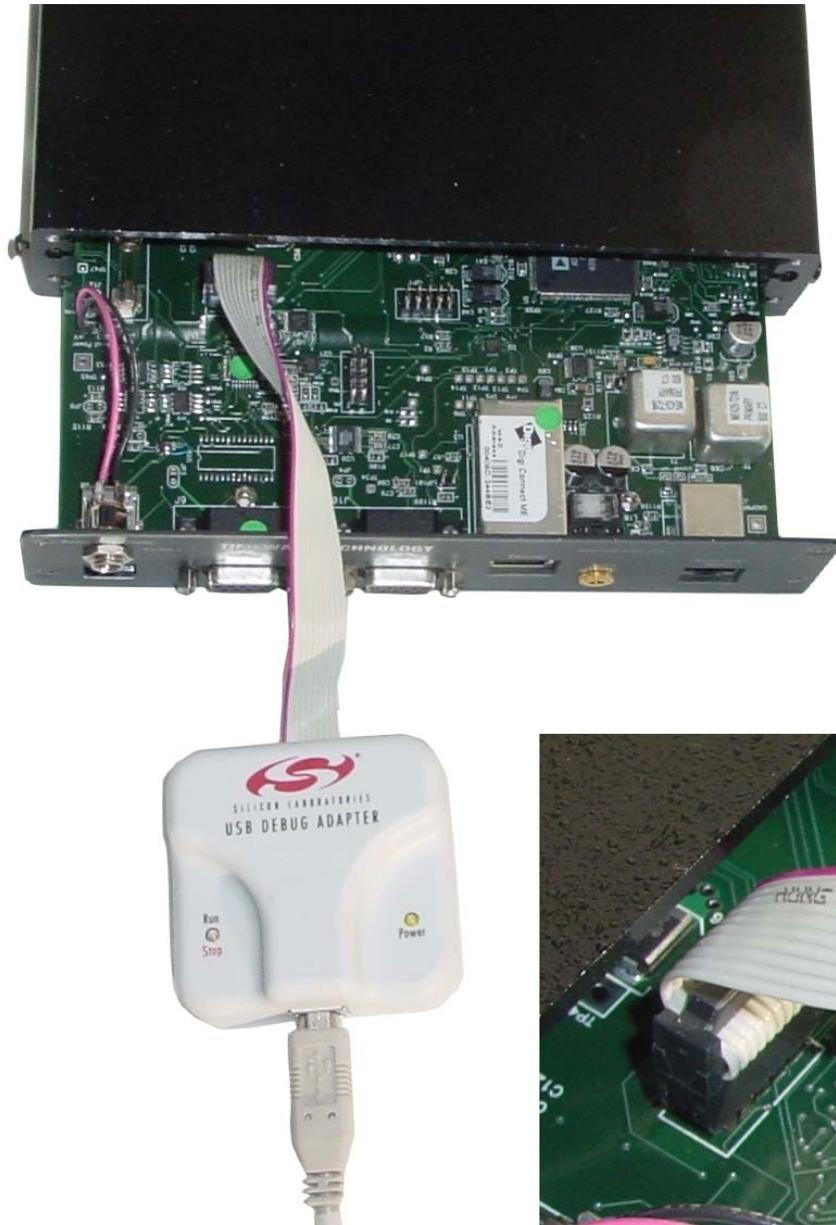
4. Flip the box over. Remove the two circuit board screws. These may have washers.



5. Slowly and carefully pull out the back panel 2.5 inches until the CPU JTAG connector is exposed. **DO NOT pull the board out any further!** Doing so will pull out the front panel connectors.

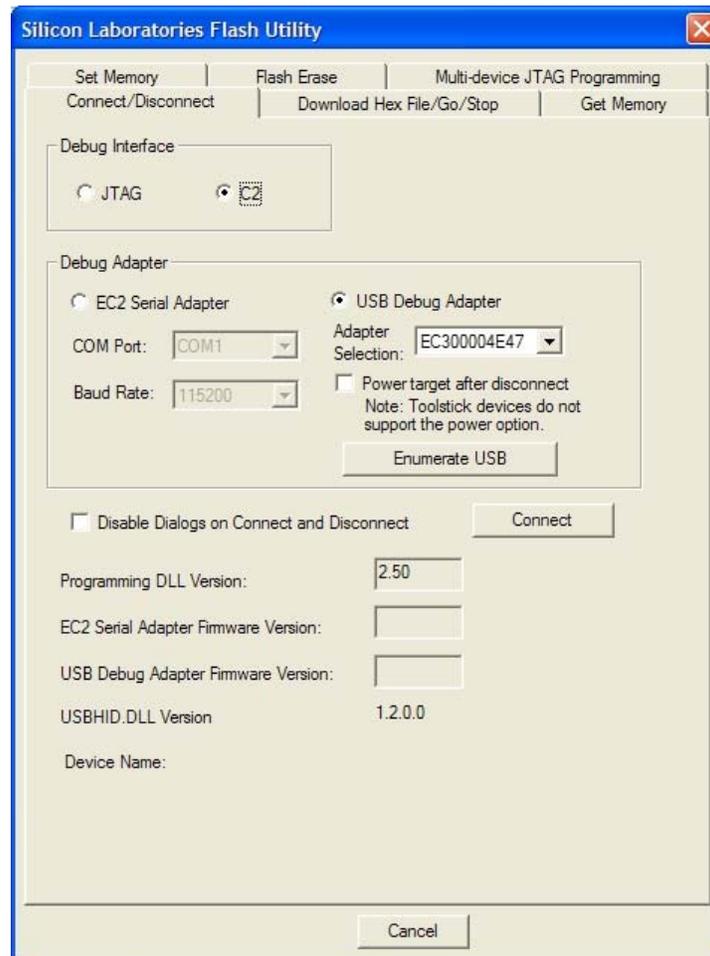


6. Connect the USB Debug Adapter JTAG Programmer. Make sure the ribbon cable has the red stripe facing the correct direction. Also plug in the power cord AFTER the Debug Adapter is connected.

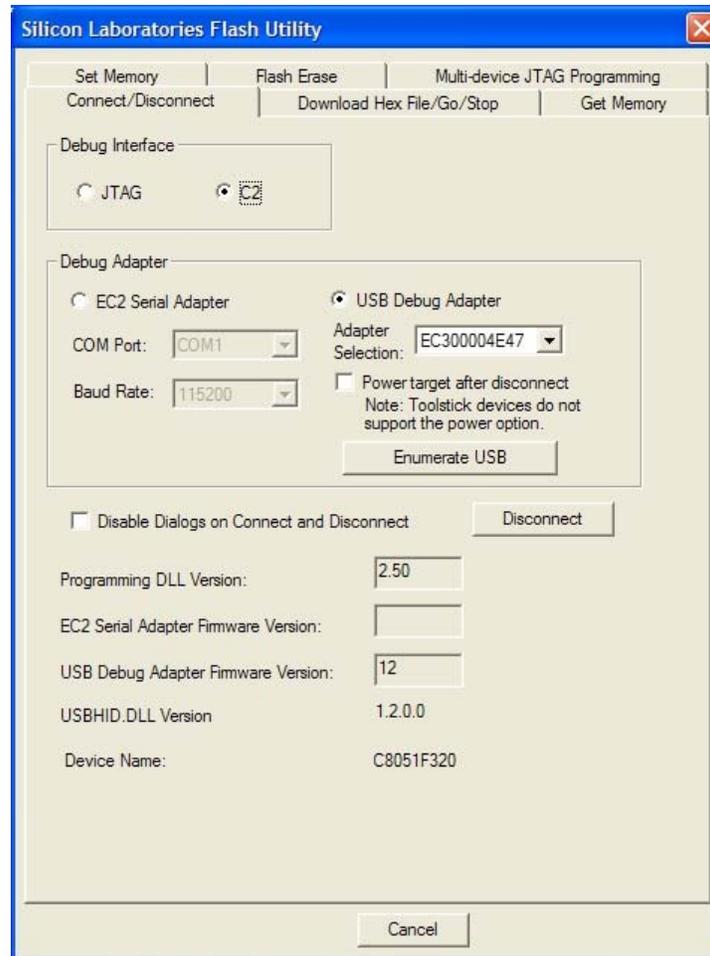


7. Load the USB Debug Adapter software. This is located in the tools folder of the installation CD and is called **FlashUtil.exe**. You may also download it from Silicon Labs at

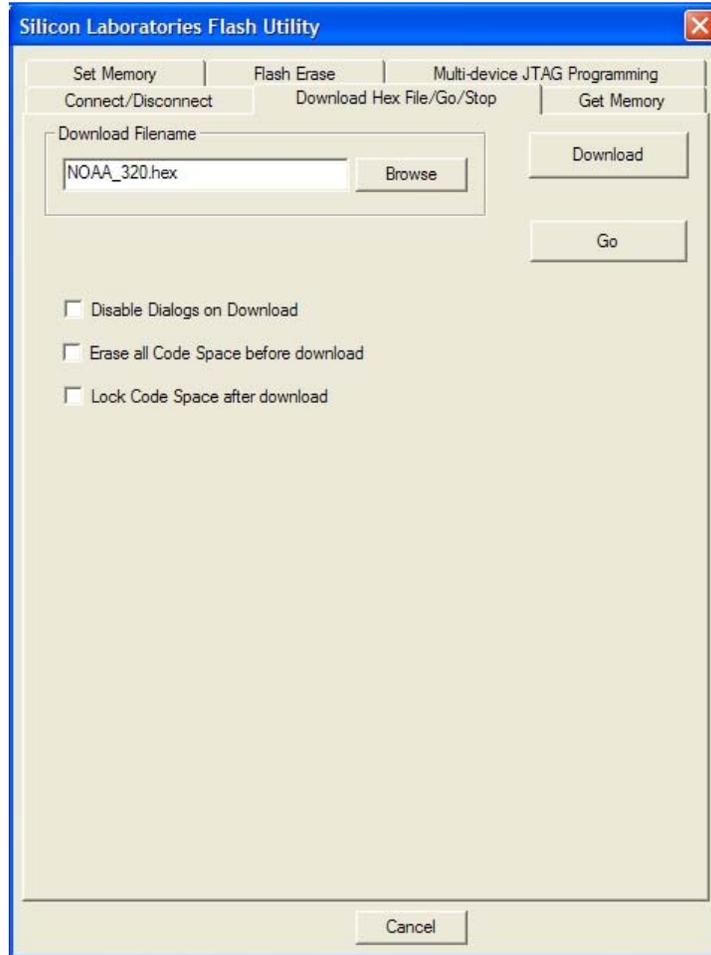
[http://www.silabs.com/tgwWebApp/public/web\\_content/products/Microcontrollers/en/mcu\\_winflashutility.htm](http://www.silabs.com/tgwWebApp/public/web_content/products/Microcontrollers/en/mcu_winflashutility.htm)



- Click on C2 and your adapter type, otherwise use the default connection options. Click on “Connect”. You will get a message box saying that it connected. Click on “OK”. You will see the Debug adapter version and the device name on the screen.



9. Click on the “Download Hex File” Tab. Click on “Browse” and select the CPU HEX file update.



10. Click on “Download”. A dialog will appear and download the file. When complete, click on “OK”. Click on the Connect/Disconnect tab, then click on “Disconnect”. Close the utility.

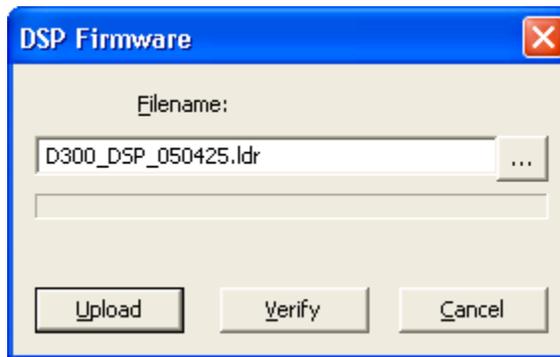
11. Move the USB Debug Adapter JTAG Programmer Cable to one of the COM JTAG connectors. Make sure the ribbon cable has the red stripe facing the correct direction. Right on the top connector and facing the back on the bottom connector. The red stripe should match the end of the connector with the white “1” on the board.



12. Repeat steps 7-10 with the COM HEX file for BOTH connectors.
13. Disconnect the USB JTAG Programmer and reassemble the D300.

## DSP

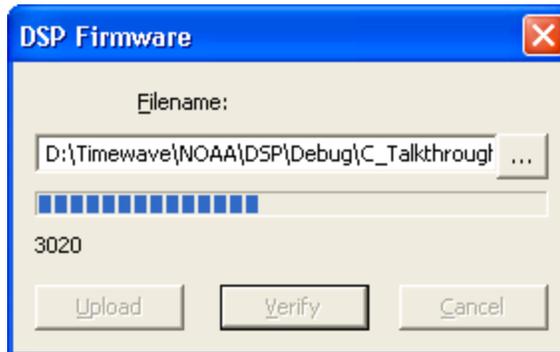
Choose *DSP Firmware* from the *Tools/Update* menu.



**Figure 38: DSP-D300 Firmware update screen**

Enter the Filename of the LDR file and click on “Upload”. The file will be uploaded to the DSP-D300.

Verify the upload by clicking on Verify. DO NOT skip the verify. If there is a problem with the upload that is not fixed, the system will need factory technicians to repair the unit.



**Figure 39: DSP-D300 Firmware verify screen**

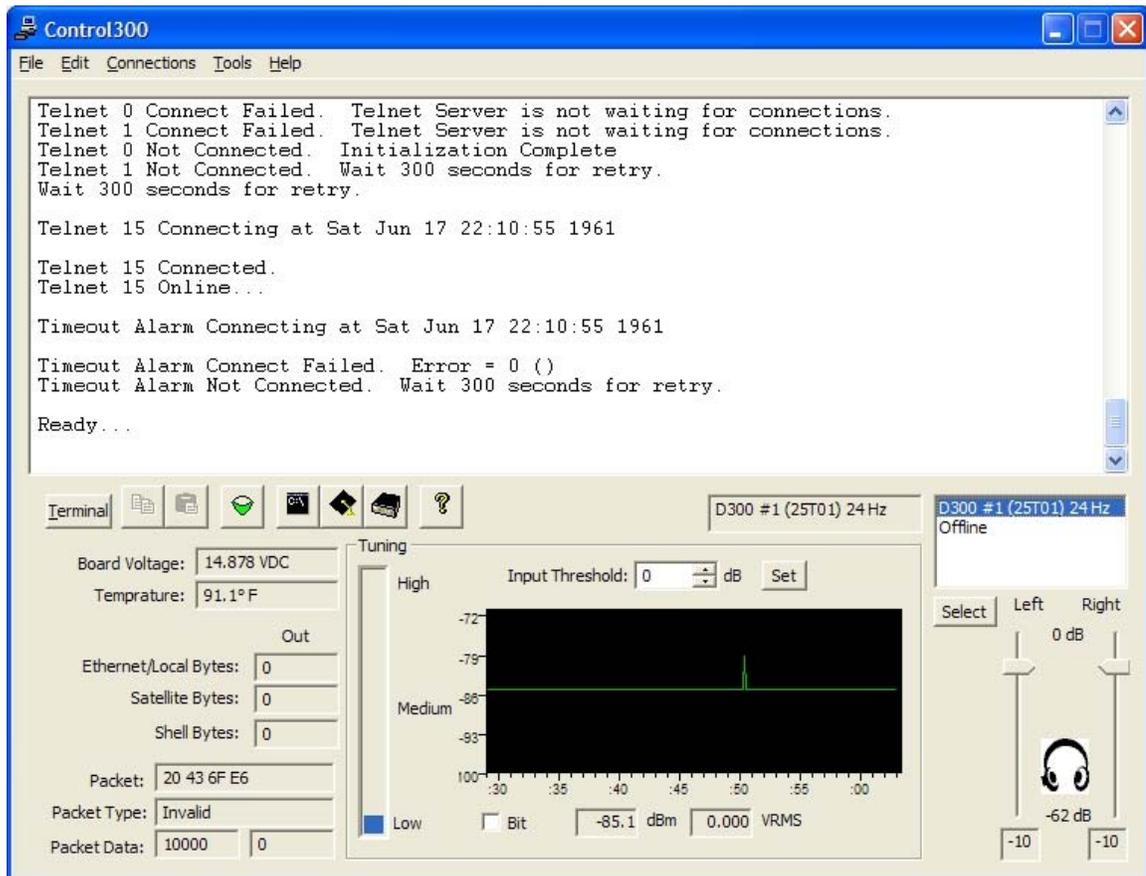
Each step will display a message upon error or completion.

The “Cancel” will change into “Close”. Click on the “Close”. Choose *Tools/Reset DSP* to activate changes.

## Ethernet

The Ethernet update requires that a TFTP server is available.

1. Wait for the “Ready” prompt. This will take about a minute. Make sure that there is no message saying that the D300 is working in “Offline” mode.



2. Start the Shell. You may log in via SSH remotely instead if desired.
3. Start your TFTP server on a machine connected to the network. Make sure that you know the IP address of the TFTP server. If you need a server, you may download a Windows one from SolarWinds.net. SolarWinds continually changes the link, but it can easily be found from the main page at <http://www.solarwinds.net>.
4. Copy the “image.bin” file into the TFTP share folder. You may need to rename the “imagev220\_200xxxxx.bin” to “image.bin”. Read the following warning.



## WARNING!

Take a look at the image version number (the *xxx* in `imagevxxx_`). If the image file has an odd number, then it is for a Version 2 Ethernet module, otherwise it is Version 1 firmware.

Example: `imagev220_20070503.bin` is Version 1.

Example: `imagev225_20070503.bin` is Version 2.

To determine which version of the Ethernet module is in the DSP-D300, either check the serial number or check the version displayed in the shell. If it gives a version for SSL, then it is the Version 2. Contact Timewave for information if you are not sure.

Serial Numbers for the Version 1 Ethernet Module: (v220 firmware): 25000, 25001, 25003-25039, 25041

All other D300 Boxes will have the Version 2 Ethernet Module.

5. From the “\$” prompt, type the following:

```
$ loadimage image.bin 192.168.1.100
```

Where the IP address is the IP address of the TFTP server.

6. Wait for the download.
7. Type the following to make sure the image is good:

```
$ verifyimage image.bin 192.168.1.100
```

Where the IP address is the IP address of the TFTP server. This will redownload and compare the files.

8. To update the firmware, type “`updateimage`”. This may take 10 minutes. **DO NOT disconnect the power during this operation!** Doing so will require that the unit be sent back to Timewave for repairs. Wait for the prompt to reappear. You may hit *Enter* to see if the prompt has returned if you believe the update has finished.

```
$ updateimage
```

9. Reboot the Ethernet module by typing “`reboot`” or cycling the power.

```
$ reboot
```

## Appendix: About Timewave



Timewave Technology Inc. designs, manufactures, and sells leading-edge digital and voice communications products and instrumentation products to the world-wide military, government, industrial, and amateur radio marketplaces. Timewave's cost effective communication products enhance and upgrade the efficiency of new and existing radio and digital systems to the latest technology levels. Timewave's instrumentation products combine Timewave's extensive signal processing technology with its communication technology to create innovative networked and remote access solutions.

This product is the DSP-D300, a DSP-based, network-enabled decoder for the ALERT/IFLOWS data system. The DSP technology provides superior data recovery from noisy radio signals. Remote reprogramming of the powerful DSP-D300 DSP resources opens the door for the new ALERT protocol as it evolves and is implemented. The secure network technology effectively puts the ALERT system on the Internet, bypassing higher cost data delivery systems such as satellites and dedicated microwave systems.

Timewave was established in 1984 in St. Paul, Minnesota. All Timewave products are manufactured in the U.S.A.

Timewave Technology Inc.  
1025 Selby Ave., Suite 101  
St. Paul, MN 55104 U.S.A.  
Voice: (651) 489-5080  
Fax : (651) 489-5066  
E-mail: [sales@timewave.com](mailto:sales@timewave.com)

Please check the Timewave web site for the latest information.

## Appendix: Change Log

### Version 2.3

- Updated to match the Software/Firmware version number.
- Fixed several cosmetic problems.
- Added Software Update section.
- Updated Firmware Update section.
- Updated Flow Diagrams.

### Version 1.3b

- Added unplug detect to the Ethernet Module.

### Version 1.3

- Updated Ethernet module.
- Added Control300 Ethernet setup interface.

### Version 1.2

- Finalized software.

### Version 1.1.5e

- Updated CommReadTW for production operation.
- Added LogCompareTW.

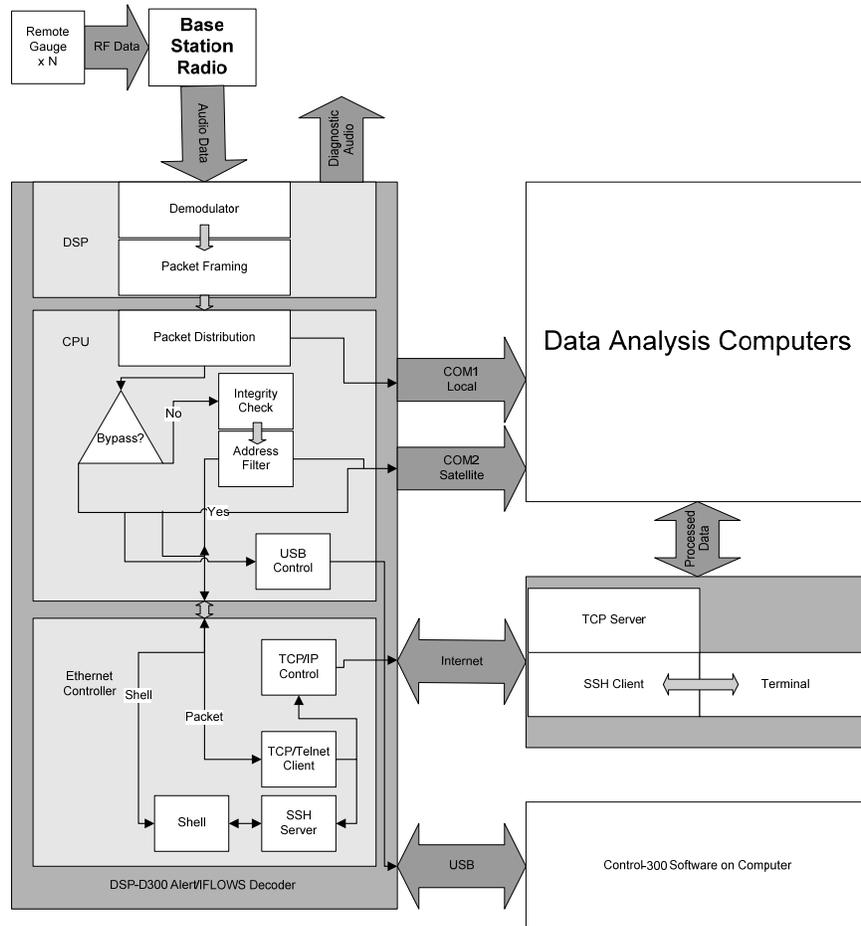
### Version 1.1.5

- Added timing error-correction to the DSP.
- Added missing packet info error-correction to the DSP.
- Added Histogram.
- Changed to dBm measurement.
- Added Test Data Generation.
- Added Test Decoder Wizard.

### Version 1.1

- Increased DSP Dynamic Range for receiving.
- Added multiple telnet clients.
- Added Factory Reset
- Changed filter setup to be more intuitive, both from the command line and from the Filter Setup Dialog.
- Added Decibel indicator to Control300 screen.
- Moved Sensitivity (TTY Threshold) to separate dialog.
- Added Win98SE support for Control300.
- Fixed Timeout issue with CommReadTW.

# Appendix: Theory of Operation



DSP-D300 Data Flow Diagram

Copyright © 2004 Timewave Technology Inc.



**Figure 40: DSP-D300 Data Flow Diagram**

The DSP-D300 uses Digital Signal Processing (DSP) technology to provide superior data recovery from noisy radio signals. Figure 40 shows how the DSP-300 processes information. FM Audio from a Base Station Radio receiver is demodulated and each incoming data packets is converted to binary. Binary data is then sent to a packet distributor in the CPU, which passes the packets to COM (Local), where it appears as RS-232 serial data; the IFLOWS Packet Checker; to USB Control; and to the Ethernet Controller.

The IFLOWS Packet Checker makes sure the packet is valid, and then sends it through the filter and then on to COM2 for Satellite transmission.

The Ethernet Controller uses the TCP/Telnet client to send the packet to the remote TCP/Telnet server.

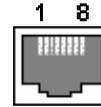
The USB Control sends the data to a computer, if connected, with the Control300 software installed on it. It will cache the latest packet of data so if the Control300 software computer is connected later, the packet will be shown and logged.

## Appendix: Connectors and Pinouts

### Audio Data Input Connector

Type: RJ-45 (**AUDIO ONLY!**)

1. Audio from receiver - 600 Ohm balanced +
2. Audio from receiver - 600 Ohm balanced -
3. Transmit Audio output from DSP-300 - 600 Ohm balanced +
4. Return for control lines (ground)
5. Squelch from receiver (future)
6. Transmit Audio output from DSP-300 - 600 Ohm balanced -
7. Transmit key line (low during transmit)
8. Not Used



### Ethernet Connector

Type: RJ-45 (**ETHERNET ONLY!**)

1. TXD+
2. TXD-
3. RXD+
4. POE+
5. POE+
6. RXD-
7. POE-
8. POE-



### Audio Data Monitor Connector

Type: 3.5 mm stereo phone jack

Tip: Left channel audio

Ring: Right channel audio (not used on DSP-D300)

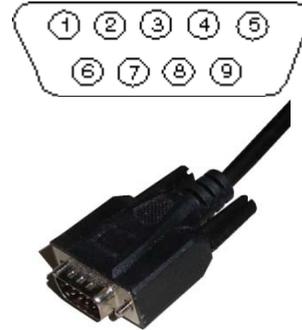
Sleeve: Audio return



### RS-232 Data Monitor Connector

Type: DB-9F

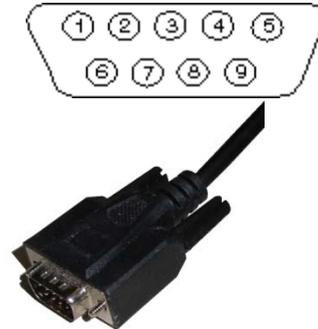
1. NC
2. TX
3. RX
4. NC
5. Return (ground)
6. NC
7. NC
8. NC
9. NC



### RS-232 Data Control Connector

Type: DB-9F

1. NC
2. TX
3. RX
4. NC
5. Return (ground)
6. NC
7. NC
8. NC
9. NC

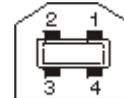


### USB Connector

Type: USB "B"

Signal: USB Full Speed (12 MHz)

1. +VBUS
2. DIN
3. DOUT
4. Return (Ground)



### Power Connector

Type: DC Power coaxial – 5.5 x 2.1 mm, center positive

Signal: 5 to 18 VDC, 200 mA.

# I/O Assignment Table

	<b>RJ-45 Audio</b>	<b>Aux Audio (optional)</b>	<b>Monitor Audio</b>	<b>Ethernet</b>	<b>RS-232 #1 Local</b>	<b>RS-232 #2 Satellite</b>	<b>USB</b>
RX Audio Data In	√	√	√				
TX Audio Data Out	√		√				
TX keying (option)	√						
RX Squelch IN (option)	√						
Telnet/TCP Client				√			
Shell				√			√*
Control Commands				√			√*
Status Commands				√			√*
Streaming Data Out				√	√	√	√*
Checked Data Out				√		√	
Upgrade DSP							√*
Upgrade Ethernet				√			
Upgrade CPU							√*

\* Via Control Software Only

## Appendix: IFLOWS Packets

An IFLOWS packet is a four byte compressed form of the IFLOWS gauge data. Over time, there have evolved three primary packet types: ADF, BDF, and EIF.

### **ADF**

ADF (ASCII Data Format) is the oldest of the IFLOWS data types. Supporting only 99 gauges and a data range up to 99, it is rarely used any more.

Byte 0	Byte 1	Byte 2	Byte 3
Gauge 10s	Gauge 1s	Data 10s	Data 1s

This is better known as BSD number format. The ADF key is 0011 for all the high nibbles.

### **BDF**

BDF (Binary Data Format) is the most common of the IFLOWS data types. Supports 8191 gauges and a data range of 2047.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	0	1	A <sub>5</sub>	A <sub>4</sub>	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>
Byte 1	0	1	A <sub>11</sub>	A <sub>10</sub>	A <sub>9</sub>	A <sub>8</sub>	A <sub>7</sub>	A <sub>6</sub>
Byte 2	1	1	D <sub>4</sub>	D <sub>3</sub>	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	A <sub>12</sub>
Byte 3	1	1	D <sub>10</sub>	D <sub>9</sub>	D <sub>8</sub>	D <sub>7</sub>	D <sub>6</sub>	D <sub>5</sub>

Note the presets on bits 6 and 7. This is the BDF key. Note that some documentation has bit 7 of bytes 2 and 3 set to 0, and some has it set to 1. They should be set to 1.

### **EIF**

EIF (Enhanced IFLOWS Format) is the newest of the IFLOWS data types (as of 2005). It also supports 8191 gauges and a data range of 2047. However, it uses a checksum to make sure that the packet is valid.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	1	1	A <sub>5</sub>	A <sub>4</sub>	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>
Byte 1	D <sub>0</sub>	A <sub>12</sub>	A <sub>11</sub>	A <sub>10</sub>	A <sub>9</sub>	A <sub>8</sub>	A <sub>7</sub>	A <sub>6</sub>
Byte 2	D <sub>8</sub>	D <sub>7</sub>	D <sub>6</sub>	D <sub>5</sub>	D <sub>4</sub>	D <sub>3</sub>	D <sub>2</sub>	D <sub>1</sub>
Byte 3	C <sub>5</sub>	C <sub>4</sub>	C <sub>3</sub>	C <sub>2</sub>	C <sub>1</sub>	C <sub>0</sub>	D <sub>10</sub>	D <sub>9</sub>

Note the presets on bits 6 and 7 on byte 0. This is the EIF key combined with the CRC. The CRC is symmetric so that the CRC for the four bytes equals 0 when the CRC is in the packet.

```
// Get the CRC polynomial for the entry.
// See: http://docs.afws.net/supportsite/iflows/enhanced\_iflows\_format.htm
BYTE jp_getcrc(BYTE * eifmsg)
{
    BYTE rem;
    BYTE curbyte;
    int bytecnt, bitcnt;

    rem = 0;
    for( bytecnt = 0; bytecnt < 4; ++bytecnt )
    {
        curbyte = eifmsg[bytecnt];
        for(bitcnt = 0; bitcnt < 8; ++bitcnt)
        {
            rem >>= 1;

            if ( ( curbyte & 0x01 ) == 0x01 )
                rem |= 0x80;

            curbyte >>= 1;

            if ( ( rem & 0x02 ) == 0x02 )
                rem ^= 0x9a;    // XOR 10011010
        }
    }
    return rem;
}
```

Note: This is from the NWS web site. Please visit the website for a more complete explanation.

## Appendix: Troubleshooting

- When connecting the Control300, there is no data.
  - Reset the DSP-D300.
  - Make sure the USB Cable is plugged in.
  - Exit and restart the program.
  - Adjust the Input Threshold. See page 29.
- After booting, the boot information from the Ethernet module does not appear.
  - Wait 2 minutes.
  - Reset the DSP-D300.
- The D300 will not connect to the Ethernet.
  - Check the Link light to make sure that there is a link.
  - Reset the DSP-D300, watch the output from the Ethernet module. If it says Offline, then there is not connection detected. Recheck the link connection.
- The Control300 software will not setup the Ethernet from the GUI.
  - Reset the DSP-D300.
  - If using version 2 of Control300, try version 3. It is downloadable from <http://www.timewave.com/support/DSP-D300>
  - Use the manual command line method for setting the Ethernet.
- The Audio data will not decode.
  - Check the input level.
  - Check the output level. It should be 1 Volt at 0 dB gain (Input Threshold). Make sure the outputs are not attenuated while testing.
  - Check to make sure the correct DSP filter is loaded. See page 35.
- When trying to update firmware, the program will not upload.
  - Exit the Control300 program.
  - If there weren't any errors reported, it just didn't work, reset the DSP-D300. Otherwise DO NOT RESET the D300!
  - Remove and reinsert the USB cable.
  - Restart the Control300 program.
  - Update the Control300 program to the newest version.
- After updating firmware, the program will not execute (no LEDs and/or cannot connect to the USB port)..
  - Exit the Control300 program.
  - Reset the DSP-D300. Unplug and replug the power cable.
  - Restart the Control300 program.

- When booting, the D300 hangs while trying to connect to NIST.
  - Disconnect the Ethernet cable, cycle the power, then run the shell and set the NISThost to “Disabled”. Save and reboot. See page 7.
- The time says that it is 1970.
  - This is due to being unable to connect to NIST. Determine if there is a external Internet connection for the site, and make sure the NIST ports are not blocked. If so then enable the NIST server. See page 7.
- My computer was stolen and the SSH keys were compromised.
  - Connect to the DSP-D300 and regenerate the keys. See page 17.
- I can't set the pick Diagnostic Outputs, they are all grayed out.
  - These are settable in expert mode only. See page 31.
- The screen is grayed out and I can't see the new D300 data.
  - If using Version 3 or newer software, check your connections, Restart the monitoring by clicking on the device ID,
- The serial number for my D300 is scrambled or blank.
  - Restart the Control300 software.
  - Restart the D300 and the Control300 software.
  - Reboot Windows.
- There are no USB connections listed for D300 devices.
  - Restart the Control300 software.
  - Using *Device Manager* from *Control Panel*, check to make sure that there is a DSP-D300 device listed.
  - Uninstall the drivers by using “Remove” from the *Device Manager*.
    - If the driver cannot be seen, try “Show Hidden Devices” from the *View* menu.
      - If it still is missing, try the procedure outlined by Microsoft in Knowledge Base article 315539.  
<http://support.microsoft.com/default.aspx?scid=kb;EN-US;Q315539>
    - Reboot, then reinstall the drivers.
    - Restart Control300.
- The LEDs do not light up in the front of the D300, but everything else works.
  - Follow the procedure described on page 56 on opening the box. Take a look at the connectors on the front of the board on left side as you look at the picture. Make sure all five connectors are plugged in.
- I accidentally plugged the Audio Cable into the Ethernet connector.
  - Send the D300 back to Timewave for repairs.

- I accidentally used the wrong firmware/file for an update.
  - If the file was for the CPU or COM, redo the update. If it is older than version 3, then the hardware update procedure is needed.
  - Send the D300 back to Timewave for repairs.

---

If there is still a problem, contact Timewave Technical Support.

Timewave Technical Support  
1025 Selby Ave, Suite 101  
St. Paul, MN 55104  
(651) 489-5080  
[support@timewave.com](mailto:support@timewave.com)

# Appendix: Specifications

## Processors

- 400 MHz 32-bit DSP processor with 24 bit A/D
- 50 MHz 32-bit ARM RISC processor for Ethernet
- 25 MHz USB processor

## Memory

- 4 MB Flash (option - expandable to 8 MB)
- 8 MB RAM

## Input/Output

- Radio audio interface: 600 Ohm balanced, transformer isolated, RJ-45
- Monitor Audio output: Remote level control, 150 mW into 16 Ohms, 3.5 mm stereo jack
- Input sensitivity: Adjustable from -50 dBm to 0 dBm
- Demodulator: FSK , 300 bps, 240 Hz shift
- Demod. center frequencies: 600 Hz, 1080 Hz, 1560 Hz, 2040 Hz (default), 2520 Hz., other frequencies/shift/bps optional
- Decode protocol: ALERT/IFLOWS (ADF, BDF, EIF)
- ALERT/IFLOWS ID range: 0000-8191 (remote and local programmable configuration)
- Digital I/O: Ethernet with address filtering (10/100 base/T) (RJ-45 connector)  
USB control interface (2.0 compatible) (USB type B)  
RS-232C non-filtered (DB-9 connector)  
RS-232C with address filtering (DB-9 connector)
- Terminal data rates: RS-232 – 300-9600 bps  
Ethernet -10/100 Mbps  
USB -12 Mbps
- Ethernet protocols:
  - SSH 2.0 (U.S. Government Specification) (Secure Shell)
  - Telnet (RAW and with Protocol)
- Time/Date: NIST synchronized via internet
- Diagnostics: Local and remote IFLOWS status, system temperature, system power supply voltage.

## Physical

- Enclosure: Extruded Aluminum, rack mount option, NEMA option
- Size: 7.6 in. wide x 8.5 in. deep x 1.9 in. high
- Weight: 2.0 lb. (0.9 Kg.)
- Operating Temp.: -20° C to 50° C
- Power: +5 to +18 VDC @200 mA.  
(5.5 mm x 2.1 mm coaxial power jack, center +)

## Software

- USB Control: Control, configuration, logging and diagnostics  
( Windows 2000/XP/Vista)
- Ethernet: Client diagnostic packet logger (Windows 2000/XP/Vista)
- COM port: Client diagnostic packet logger (Windows 2000/XP/Vista)
- Log Report Generator: Optional – parses packet logs and generates usage reports  
(Windows 2000/XP/Vista, Linux)

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## Glossary

<b>Administrator</b>	The main user on Windows that has access to everything. See “root”.
<b>ALERT</b>	<b>A</b> utomated <b>L</b> ocal <b>E</b> valuation in <b>R</b> eal <b>T</b> ime. A series of protocols used to transmit remote gauge data.
<b>CDF File</b>	<b>C</b> omma <b>D</b> elimited <b>F</b> ile. Database file in text format. Entries are separated by commas.
<b>Core Processor/CPU</b>	The data transfer processor.
<b>COM Processor</b>	The communications sub-processor.
<b>DSP</b>	<b>D</b> igital <b>S</b> ignal <b>P</b> rocessing. Use of computer algorithms to digitally process sound.
<b>DSP Processor</b>	The processor that decodes the FSK radio signal and gets the decoded bytes.
<b>Ethernet Processor</b>	The Internet server for SSH on the D300. Also retrieves the time, sends the Raw TCP data, and contains the shell.
<b>FIPS</b>	<b>F</b> ederal <b>I</b> nformation <b>P</b> rocessing <b>S</b> tandard. All government computer operations must follow this standard.
<b>Firmware</b>	The program embedded on chips.
<b>IFLOWS</b>	<b>I</b> ntegrated <b>F</b> lood <b>O</b> bserving and <b>W</b> arning <b>S</b> ystem. The network of gauges that transmits the ALERT data.
<b>Input Threshold</b>	Digital Gain.
<b>IP</b>	<b>I</b> nternet <b>P</b> rotocol. A method of addressing other machines across the Internet.
<b>Message Box</b>	A small window that pops up in the middle of the screen.
<b>Multitask</b>	Do several things at the same time. Usually at the expense of slowing down each of the tasks.
<b>NIST</b>	<b>N</b> ational <b>I</b> nstitute of <b>S</b> tandard <b>T</b> ime. The time standard.
<b>Notify Message</b>	A message that appears down by the clock.
<b>Raw Socket/Raw TCP</b>	A connection across the Internet without any protocols.
<b>root</b>	The main user on UNIX that has access to everything. See “Administrator”.
<b>SDF File</b>	<b>S</b> pace <b>D</b> elimited <b>F</b> ile. Database file in text format. Entries are separated by even spaces.
<b>Shell</b>	A command line interface.

<b>Software</b>	The programs on a PC.
<b>SSH Server</b>	<b>Secure Shell Server.</b> An encrypted connection to the Shell.
<b>TCP</b>	<b>Transport Control Protocol.</b> A connection to a computer from an Ethernet.
<b>TFTP</b>	<b>Trivial File Transfer Protocol.</b> A method of transferring operating system files over Ethernet.
<b>Telnet</b>	An unencrypted connection to a Shell. Uses Telnet Protocol to maintain formatting.
<b>UNIX</b>	A multitasking operating system. Linux is a version of UNIX., other versions are BSD, Ultrix, etc.
<b>USB</b>	<b>Universal Serial Bus.</b> A method of connecting computer peripherals. There are three versions: Standard (Low, 1.0), Full (1.1), and High (2.0).
<b>Watchdog</b>	A procedure that keeps a timer and does something if nothing happens during that time. An event restarts the timer.

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