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# Model VDE026
# MPEG-2/H.264 Decoder Module

## User's Manual

**Document No. 640-003015 Rev. A**

**February 25, 2008**

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# MODEL VDE026 MPEG-2/H.264 DECODER MODULE

## User's Manual

## Document No. 640-003015

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# 1 INTRODUCTION

## 1.1 SCOPE

This document describes the setup, control, I/O interface, and operation of Delta Digital Video's Model VDE026 Decoder Module.

## 1.2 OVERVIEW

The Model VDE026 is a single circuit board decoder unit in 6U VME configuration. A top view of the board is shown in Figure 1-1 and the front panel in Figure 1-2. It receives an MPEG-2 Transport Stream, compliant with system standard ISO 13818-1, via an Ethernet interface from a remote encoder. The Transport Stream includes video compressed in accordance with MPEG-2 or H.264 standards (as determined by the encoder) and audio compressed in accordance with the ADPCM standard. Decoding compression selection is automatic. The transport stream is demultiplexed into its elementary components: video, audio, timing, and system information. The video and audio information are decompressed and converted to user accessible formats. Companion encoders, such as the Model 6010R or 6021R can be provided to complete an MPEG-2/H.264 based video, audio, and data communication system. A port for remote control via an RS-232 control port located on the front panel for user configuration and control. The Ethernet interface provides a second method of control using TCP protocol. All control information is retained in non-volatile memory and is reloaded after power is restored. Either method of control provides for convenient computer downloading of commands.

The unit has one video input connector which is used to gunlock the video output signals

The unit has four video output connectors. Video is available from each simultaneously. There is one analog composite NTSC output, one analog NTSC S-Video output, and two digital SDI video outputs. The video information is decompressed according to the industry standards ISO 14496-10 (H.264) and ISO 13818-02 (MPEG-2) compression algorithms.

The unit outputs either one stereo or two independent line level audio signals. The audio information is decompressed according to the ADPCM algorithm at 8ksps / 64 kbps per channel.



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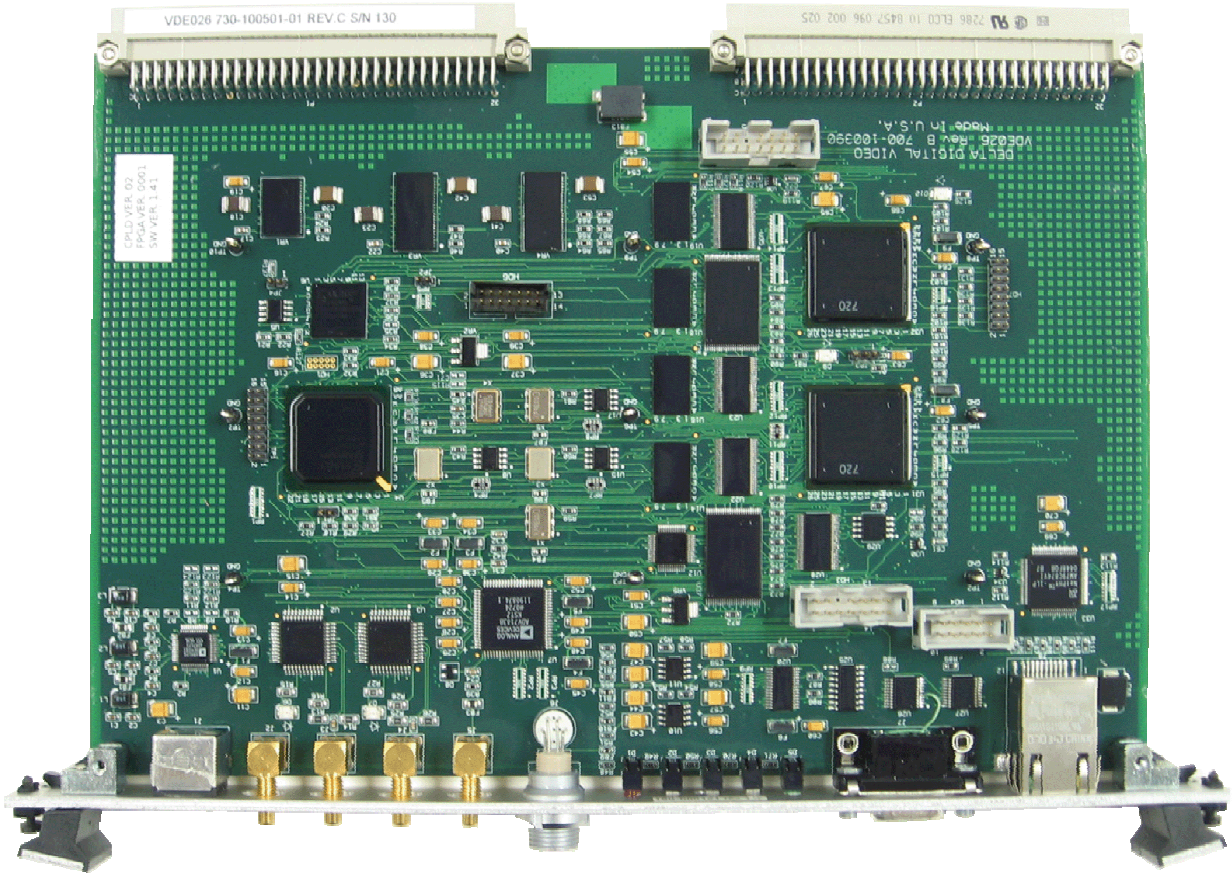



**Figure 1-1: Model VDE026 Decoder**




**Figure 1-2: VDE026 Front Panel**



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# 2 USING THE MODEL VDE026 DECODER

## 2.1 PHYSICAL DIMENSIONS

The Model VDE026 is configured as a standard single 6U VME PC board. The unit is 9.187 inches high, and 6.299 inches deep. This unit is intended to be mounted in a 0.8-inch slot in a standard VME rack type chassis.

Power (5.0 Vdc) must be provided through the rear mounted VME interface. Other voltages needed are generated on the board.

All external signal interface connectors are mounted on the front panel.

## 2.2 FRONT PANEL INDICATORS AND CONNECTORS

The Model VDE026 has no front panel controls. See Figure 1-2. Decompression mode selection is automatic and all output signals are available simultaneously. The front panel contains eight connectors providing interface for external signals including control. The front panel also contains five LEDs indicating operational status. There are also four LEDs mounted on the board to provide indications useful for maintenance. The connectors and the LED indicators and their functions are described in the following sections. Figure 1-2 shows the front panel and the location of the indicators and connectors.

The VDE026 is controlled using the RS-232 control port, J7, or the Ethernet interface connector J8.

### 2.2.1 Front Panel Indicators

The unit has five LEDs visible on the front panel. These LEDs provide operational status information as described in Table 2-1.

**Table 2-1: Front Panel Indicators**

| LED | Name | Function |
|---|---|---|
| D1 | Fault | OFF; No faults<br>RED; Fault |
| D2 | V Act | OFF; No video in transport stream<br>Green; Good video in transport stream<br>Red; Video with errors in transport stream |
| D3 | A Act | OFF; No audio in transport stream<br>Green; Good audio in transport stream<br>Red; Audio with errors in transport stream |
| D4 | D Act | OFF; No user data in transport stream<br>Green; Good user data in transport stream<br>Red; User data with errors in transport stream |
| D5 | Power | OFF; No power present<br>Green; Power is present |



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### 2.2.2 Front Panel Connector Functions

The VDE026 has eight front panel connectors. The identification and functions of the front panel connectors are defined in Table 2-2. Pin-outs and detailed descriptions are provided in Section 2.5.

**Table 2-2: Front Panel Connectors**

| Designation | Name | Type | Function |
|---|---|---|---|
| J1 | S-Video | Mini DIN CP-2540 | S-Video Out |
| J2 | CVBS | SMC | Composite Video Out |
| J3 | SDI A | SMC | Digital SDI Video Out A |
| J4 | SDI B | SMC | Digital SDI Video Out B |
| J5 | Gen Lock | SMC | Analog Video or Sync IN |
| J6 | Audio | 6-pin Lemo | Two Audio Ch Out or one Audio Stereo Pair |
| J7 | Remote | 9-pin DB | RS-232 Control |
| J8 | Ethernet | RJ-45 | Ethernet Interface |
| | | | |
| P1 | VME-P1 | 96-pin VME | Power Input and system interface |
| P2 | VME-P2 | 96-pin VME | Power Input and system interface |

## 2.3 ON-BOARD INDICATORS, TEST POINTS, AND HEADER ACCESS

The VDE026 board contains a number of indicators, test points, and headers to support board maintenance. These are not required for operation and are useful only to provide additional board status information, and ability to program certain functions initially or for upgrade. The following sections describe these features.

### 2.3.1 On-Board Indicators

**Table 2-3: On-Board Indicators**

| LED | Name | Function |
|---|---|---|
| D6 | SDI A | ON; SDI A is operational OFF; Fault |
| D7 | SDI B | ON; SDI B is operational OFF; Fault |
| D9 | Controller DSP | FLASHING; Controller is operational OFF; Fault |
| D10 | Decoder DSP | FLASHING; Decoder is operational OFF; Fault |



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### 2.3.2 On-Board Header Access

**Table 2-4: On-Board Headers**

| Designation | Name | Type | Function |
|---|---|---|---|
| HD1 | CPLD Test Point | 10-pin | For initial test at factory |
| HD3 | Cntlr Pgming | 14-pin | For initial flash at factory only |
| HD4 | Debug (RS-232) | 10-pin | For initial test at factory |
| HD5 | Decoder Pgming | 14-pin | For initial flash at factory only |
| HD6 | Xilinx Pgming | 14-pin | For initial flash at factory only |
| HD7 | Decoder test point | 16-pin | For initial test at factory |

### 2.3.3 On-Board Test Points

**Table 2-5: On-Board Test points**

| Designation | Name | Type | Function |
|---|---|---|---|
| TP1 | Xilinx test point | 16-pin Hdr | Initial factory test |
| TP2 - 10 | Ground | Single Pin | Ground Access |

### 2.3.4 On-Board Jumpers

**Table 2-6: On-Board Jumper Functions**

| Designation | Name | Type | Function |
|---|---|---|---|
| JP-1 | Clock | 2-pin | Future use: |
| JP-2 | Board Reset | 2-pin | Short: Resets board<br>Open: Normal operation |
| JP-3 | Controller TP | 3-pin | Access to controller DSP |
| JP-4 | Reset Override | 2-pin | Factory Use Only |

## 2.4 REAR MOUNTED CONNECTORS

The rear-mounted connectors conform to standard VME type and location. The connector functions include VCC input, ground, and cross-connects for internal configuration. The pin outs and functions are defined in Table 2-7and 2-8.



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### 2.4.1 VME Connector P1

**Table 2-7: VME Connector P1 Pin Out**

| Pin | Function | | Pin | Function | | Pin | Function |
|---|---|---|---|---|---|---|---|
| A1 | Not Used | | B1 | Not Used | | C1 | Not Used |
| A2 | Not Used | | B2 | Not Used | | C2 | Not Used |
| A3 | Not Used | | B3 | Not Used | | C3 | Not Used |
| A4 | Not Used | | B4 | **BGO IN Tied to B5** | | C4 | Not Used |
| A5 | Not Used | | B5 | **BGO OUT Tied to B4** | | C5 | Not Used |
| A6 | Not Used | | B6 | **BG1 IN Tied to B7** | | C6 | Not Used |
| A7 | Not Used | | B7 | **BG1 OUT Tied to B6** | | C7 | Not Used |
| A8 | Not Used | | B8 | **BG2 IN Tied to B9** | | C8 | Not Used |
| A9 | **Ground** | | B9 | **BG2 OUT Tied to B8** | | C9 | **Ground** |
| A10 | Not Used | | B10 | **BG3 IN Tied to B11** | | C10 | Not Used |
| A11 | **Ground** | | B11 | **BG3 OUT Tied to B10** | | C11 | Not Used |
| A12 | Not Used | | B12 | Not Used | | C12 | Not Used |
| A13 | Not Used | | B13 | Not Used | | C13 | Not Used |
| A14 | Not Used | | B14 | Not Used | | C14 | Not Used |
| A15 | **Ground** | | B15 | Not Used | | C15 | Not Used |
| A16 | Not Used | | B16 | Not Used | | C16 | Not Used |
| A17 | **Ground** | | B17 | Not Used | | C17 | Not Used |
| A18 | Not Used | | B18 | Not Used | | C18 | Not Used |
| A19 | **Ground** | | B19 | Not Used | | C19 | Not Used |
| A20 | Not Used | | B20 | **Ground** | | C20 | Not Used |
| A21 | **IACK IN Tied to A22** | | B21 | Not Used | | C21 | Not Used |
| A22 | **IACK OUT Tied to A21** | | B22 | Not Used | | C22 | Not Used |
| A23 | Not Used | | B23 | **Ground** | | C23 | Not Used |
| A24 | Not Used | | B24 | Not Used | | C24 | Not Used |
| A25 | Not Used | | B25 | Not Used | | C25 | Not Used |
| A26 | Not Used | | B26 | Not Used | | C26 | Not Used |
| A27 | Not Used | | B27 | Not Used | | C27 | Not Used |
| A28 | Not Used | | B28 | Not Used | | C28 | Not Used |
| A29 | Not Used | | B29 | Not Used | | C29 | Not Used |
| A30 | Not Used | | B30 | Not Used | | C30 | Not Used |
| A31 | **Bypassed** | | B31 | Not Used | | C31 | **Bypassed** |
| A32 | **VCC (+5Vdc)** | | B32 | **VCC (+5Vdc)** | | C32 | **VCC (+5Vdc)** |



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### 2.4.2 VME Connector P2

**Table 2-8: VME Connector P2 Pin Out**

| Pin | Function | | Pin. | Function | | Pin No. | Function |
|---|---|---|---|---|---|---|---|
| A1 | Not Used | | B1 | **VCC (+5Vdc)** | | C1 | Not Used |
| A2 | Not Used | | B2 | **Ground** | | C2 | Not Used |
| A3 | Not Used | | B3 | Not Used | | C3 | Not Used |
| A4 | Not Used | | B4 | Not Used | | C4 | Not Used |
| A5 | Not Used | | B5 | Not Used | | C5 | Not Used |
| A6 | Not Used | | B6 | Not Used | | C6 | Not Used |
| A7 | Not Used | | B7 | Not Used | | C7 | Not Used |
| A8 | Not Used | | B8 | Not Used | | C8 | Not Used |
| A9 | Not Used | | B9 | Not Used | | C9 | Not Used |
| A10 | Not Used | | B10 | Not Used | | C10 | Not Used |
| A11 | Not Used | | B11 | Not Used | | C11 | Not Used |
| A12 | Not Used | | B12 | **Ground** | | C12 | Not Used |
| A13 | Not Used | | B13 | **VCC (+5Vdc)** | | C13 | Not Used |
| A14 | Not Used | | B14 | Not Used | | C14 | Not Used |
| A15 | Not Used | | B15 | Not Used | | C15 | Not Used |
| A16 | Not Used | | B16 | Not Used | | C16 | Not Used |
| A17 | Not Used | | B17 | Not Used | | C17 | Not Used |
| A18 | Not Used | | B18 | Not Used | | C18 | Not Used |
| A19 | Not Used | | B19 | Not Used | | C19 | Not Used |
| A20 | Not Used | | B20 | Not Used | | C20 | Not Used |
| A21 | Not Used | | B21 | Not Used | | C21 | Not Used |
| A22 | Not Used | | B22 | **Ground** | | C22 | Not Used |
| A23 | Not Used | | B23 | Not Used | | C23 | Not Used |
| A24 | Not Used | | B24 | Not Used | | C24 | Not Used |
| A25 | Not Used | | B25 | Not Used | | C25 | Not Used |
| A26 | Not Used | | B26 | Not Used | | C26 | Not Used |
| A27 | Not Used | | B27 | Not Used | | C27 | Not Used |
| A28 | Not Used | | B28 | Not Used | | C28 | Not Used |
| A29 | Not Used | | B29 | Not Used | | C29 | Not Used |
| A30 | Not Used | | B30 | Not Used | | C30 | Not Used |
| A31 | Not Used | | B31 | **Ground** | | C31 | Not Used |
| A32 | Not Used | | B32 | **VCC (+5Vdc)** | | C32 | Not Used |

## 2.5 FRONT PANEL CONNECTOR DESCRIPTIONS

The front panel contains all of the input and output signal connections for the Model VDE026 except for power. All connectors as described below are directly accessible. Table 2-9 summarizes the Video Output connectors. (Note that the S-Video output and



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the composite video output, Section 2.5.2, as well as the digital SDI video outputs are available simultaneously).

### 2.5.1 S-Video Output Connector

The S-VIDEO OUT connector outputs an analog video signal from the Model VDE026 decoder. This signal is in either NTSC or PAL format as determined by the encoder settings.

**Table 2-9: Video Output Connectors**

| Conn Name | Conn Type | Pin | Signal | Level |
|---|---|---|---|---|
| SDI Digital Video Out | SMC | Center | Video | 0.8 Vp-p |
| | | Shield | Ground | Ground |
| Composite Video Out | SMC | Center | Video | 1.0 Vp-p |
| | | Shield | Ground | Ground |
| S-Video Out | Mini DIN Socket (CP-2540) | 1 | Chroma | 0.3 Vp-p |
| | | 2 | Luminance | 1.0 Vp-p |
| | | 3 | Ground | Ground |
| | | 4 | Ground | Ground |

The S-Video output connector is a standard 4-pin mini DIN connector that carries a 1.0 Vp-p luminance and 0.3 Vp-p chrominance signal. Figure 2-1 shows the pin locations for the 4-pin mini DIN S-Video connector looking at the rear of the connector.

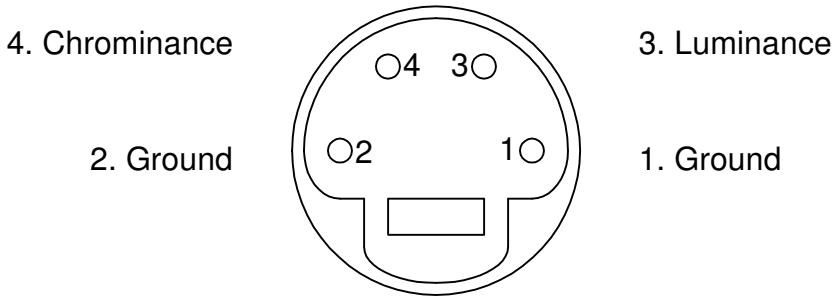



**Figure 2-1: S-Video Connector**

### 2.5.2 Composite Video Output Connector

The composite video output connector is a standard SMC 75 Ohm connector that carries a 1.0 Vp-p composite video signal, PAL or NTSC. The center pin carries the signal; the outer ring is connected to ground. See also Table 2-9.

### 2.5.3 SDI Video Output Connectors, J3 and J4

Two digital SDI video outputs, J3 and J4, are provided simultaneously on the front panel of the VDE026. The SDI connectors are both standard SMC 75 Ohm connectors. The



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SDI signal is a 0.80 Vp-p digital signal at 270 Mbps. The signal meets SMPTE 259M-2006 standard. It may be in PAL or NTSC format. The center pin carries the digital signal, the outer ring is connected to ground.

### 2.5.4 Genlock Video Input Connector, J5

The VDE026 can lock its internal functions to synchronize (genlock) its output analog video signals to an input analog video signal on J5. An NTSC signal is required if the encoder is transmitting NTSC video or a PAL signal if the encoder is transmitting PAL video. The center pin carries the signal, the outer ring is connected to ground.

### 2.5.5 Audio Output Connector, J6

The Audio-Out connector is a female Lemo stereo audio connector (part number ECG-1B-306.CLL). The mating connector is part number FCG-1B-306.CLAD.76. This connector provides for the output of two balanced or unbalanced, line level analog audio signals transmitted from the far end encoder via the Ethernet interface. This audio is decompressed and converted to analog. The signal level is nominally 1.0 Vp-p and the output impedance is 80 to 100 ohms. Table 2-10 shows the pin assignments. Figure 2-2 shows the pin location.

**Table 2-10: Audio Out Connector**

| PIN | SIGNAL |
|---|---|
| 1 | Right + |
| 2 | Right - |
| 3 | Ground |
| 4 | Left + |
| 5 | Left - |
| 6 | Ground |

Figure 2-2 shows the pin location for the audio connector. This drawing shows the view looking at the rear panel.

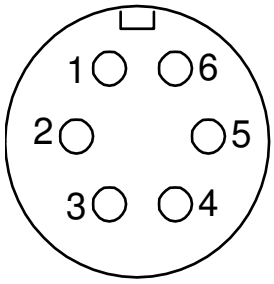



**Figure 2-2: Audio Connector Pin Locations**



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### 2.5.6 Remote Control Connector

The Control Port provides a bi-directional, asynchronous, RS-232 communications channel for user control of the VDE026. Control procedure is discussed in Section 3. The control port connector is a DB-9S female and is wired as an RS-232 DCE interface. The pin assignments are shown in Table 2-11.

The Control Port interface is configured for a baud rate of 9600 bps, with 8 data bits, and 1 stop bit. The interface is asynchronous with no parity bit generation or checking. Hardware handshaking is not provided.

**Table 2-11: Control Port Connector**

| PIN | SIGNAL | DIR |
|---|---|---|
| 1 | Chassis Ground | --- |
| 2 | TxD | Output |
| 3 | RxD | Input |
| 5 | Signal Ground | --- |

In addition to control and setup via the Control Port, J7, the Model VDE026 decoder can be controlled via the Ethernet Port, J8. See Section 4 for a description of the Ethernet Interface.

### 2.5.7 Ethernet Connector, J8 (Transport Stream Input and Control)

The MPEG transport stream enters the VDE026 decoder through the Ethernet connector, J8. The Ethernet interface connector is an 8-pin RJ-45 connector that provides the transport stream connection between the unit and the Ethernet network. This connector is wired as a full-duplex Ethernet interface. The VDE026 can also be controlled using this connector. The pin assignments are shown in Table 2-12.

**Table 2-12: Ethernet Interface Connector**

| Ethernet, J5 PIN # | SIGNAL |
|---|---|
| 8-Pin RJ-45 | |
| 1 | Transmit + |
| 2 | Transmit - |
| 3 | Receive+ |
| 4 | Not Used |
| 5 | Not Used |
| 6 | Receive - |
| 7 | Not Used |
| 8 | Not Used |



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# 3 CONFIGURATION AND CONTROL

The VDE026 decoder can be configured in two ways; via the RS-232 Remote Control Port or via the Ethernet Port. The following discussions are augmented by download and control details in Appendix A.

## 3.1 CONFIGURATION AND CONTROL VIA THE REMOTE CONTROL PORT

Configuration and control of the Model VDE026 is achieved either through the Ethernet port or through the control port. The control port is an RS-232 interface using a simple ASCII protocol. This protocol is used to accommodate a system control computer that will automatically configure the VDE026.

The ASCII control interface through the Remote Control port operates at 9600 baud, 8 data bits, no parity, and one stop bit. There is no hardware handshaking. The VDE026 accepts requests on the RS-232 interface and issues a response for each request received. All ASCII requests consist of a three-character mnemonic (optionally followed by an '=' character and a parameter value) terminated by a single carriage return character (\r = 0x0D hex). ASCII responses consist of a single line or multiple lines where each line is terminated by a carriage return followed by a line feed character (\n = 0x0A hex). If successful, the entire response is terminated by the characters "OK>". If not successful, the VDE026 will respond with an empty line followed by the characters "En>" where n is a number describing the error. See Table 3-1.

**Table 3-1: Control Protocol Error Code Descriptions**

| Error Code (n) | Description |
|---|---|
| 0 | Invalid Characters or Message Format |
| 1 | Unknown Message ID |
| 2 | Value Out of Range or Invalid |
| 3-9 | Reserved |

The setup and control requests are listed in Table 3-2. The Request column lists the three-character mnemonic. The Type column indicates whether the mnemonic is a write-only command (W), a read-only query (R), or a read/write parameter (RW). Default values are indicated with a * in the Values column. All read/write parameters are preserved between power-up cycles.

For all requests of type RW, the value of the parameter can be changed by following the request mnemonic by the '=' character and the value of the parameter. An ASCII query consists of the mnemonic only, with no '=' character. Parameters can be decimal integers or a special string such as the dotted quad of the IP address format.



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For example, the following sequence shows setting of the local IP address followed by a query of the same value:

Request: ILA=10.10.0.1\r

Response: \r\nOK>

Request: ILA\r

Response: 10.10.0.1\r\nOK>

### 3.1.1 Verbose and Quiet Modes

There are two special messages which set the mode of the control and status interface.

GEC sets the character echo mode. When GEC=0, characters received by the unit are not echoed back to the sender. This mode is appropriate when a computer is providing control of the unit. When GEC =1, characters received by the unit are echoed back to the sender. This mode is appropriate when an ASCII terminal or computer program such as HyperTerminal is used, and the operator wants to see the charactrs that are sent to the unit. Note that in echo mode, a<cr> which is not followed by a <lf> will automatically be expanded to <cr><lf> when echoed.

GVB sets the reply mode of the unit. When GVB=0, the unit is in the Quiet Mode, and is set to reply with a minimum amount of information. This mode is appropriate when a computer is providing control of the unit. For example, in response to a parameter readback, the unit only responds with the parameter value.

OK>VIN<cr>

VIN=0<cr><lf>

OK>

When GVB=1, the unit is in the Verbose mode, and is set to reply with more user-friendly information. This mode is appropriate when an ASCII terminal or computer program such as HyperTerminal is used with a human operator. For example, in response to a parameter readback, the unit responds with a more descriptive response:

OK>VIN<cr>

VIN – VIDEO: INPUT SOURCE = (0) COMPOSITE<cr><lf>



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**Table 3-2: MODEL VDE026 ASCII Control Protocol**

| Request Mnemonic | Type | PARAMETER | VALUES |
|---|---|---|---|
| **General Configuration** | | | |
| GVR | R | VERSION - Displays VDE026 software versions, software build dates. For example, version would be 1.00 and date Jan 1 2005. | CTRL SW VERSION xxxxxx<br>CTRLSW BUILD DATE xxxxx<br>CTRL SW BUILD TIME xxxxxx<br>DEC SW VERSION xxxx<br>DEC SW BUILD DATE xxxxxx<br>DEC SW BUILD TIME xxxxxx |
| GEC | RW | CONTROL INTERFACE ECHO | *0 (no echo)<br>1 (echo received characters) |
| GVB | RW | CONTROL INTERFACE MODE | *0 (Quiet)<br>1 (Verbose) |
| GVA | RW | VIDEO ALGORITHM | 0 (MPEG-2)<br>*1 (H.264) |
| GDF | W | SYSTEM DEFAULTS – Loads the factory default values for General parameters. | EXECUTE |
| GST | R | GET STATUS | Displays all parameter values |
| GLC | W | LIST GENERAL COMMANDS | EXECUTE |
| **Video Configuration** | | | |
| VMD | RW | VIDEO OUTPUT | * (Decoded Video )<br>1 (Color Bars) |
| VRH | R | VIDEO RESOLUTION - HORIZONTAL | |
| VRV | R | VIDEO RESOLUTION – VERTICAL | |
| VFD | R | VIDEO FRAMES DECODED | |
| VDF | W | VIDEO DEFAULTS | EXECUTE |
| VST | R | GET VIDEO STATUS | Displays all video parametewrs |
| VLC | W | LIST VIDEO COMMANDS | EXECUTE |
| **Audio Configuration** | | | |
| ACB | | AUDIO CHANNEL BIT RATE | 0 (32 kbps)<br>*1 (64 kbps)<br>2 (128 kbps) |
| ADF | W | AUDIO DEFAUTS | EXECUTE |
| AST | R | GET AUDIO PARAMETERS | Displays all audio parameters |
| ALC | R | LIST AUDIO COMMANDS | Displays all audio commands |
| **Network Configuration** | | | |
| IMO | RW | IP Mode – Determines whether network addresses are selected dynamically via DCHP or statically by the ILA, IGA, and ISM commands | 0 = Use selected fixed addresses<br>*1 = Use DHCP/BOOTP to automatically configure the LOCAL ADDRESS, GATEWAY ADDRESS, and SUBNET MASK |



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| Request Mnemonic | Type | PARAMETER | VALUES |
|---|---|---|---|
| ILA | RW | LOCAL IP ADDRESS – Selects fixed local IP address | X.X.X.X where X = any value 0-255 (10.4.128.76) |
| ILM | RW | SUBNET MASK – Selects net mask | X.X.X.X where X = any value 0-255 (255.254.0.0) |
| ILG | RW | GATEWAY ADDRESS – UDP packets will be sent to the Gateway (or Router) if the Remote IP Address is not on the local network segment. | X.X.X.X where X = any value 0-255 (10.4.128.1) |
| ILP | RW | LOCAL PORT | 0 to 65535 (8000) |
| IMG | RW | MULTICAST GROUP | 224.0.0.0 to 239.5.5.5 (239.1.2.3) |
| IAA | R | ASSIGNED ADDRESS - Address assigned by DHCP | X.X.X.X where X = any value 0-255 |
| IAM | R | ASSIGNED SUBNET MASK - Subnet mask assigned by DHCP | X.X.X.X where X = any value 0-255 |
| IAG | R | ASSIGNED GATEWAY - Gateway assigned by DHCP | X.X.X.X where X = any value 0-255 |
| IDF | W | NETWORK DEFAULTS - Load the factory default values for the network parameters | EXECUTE |
| IST | R | GET IP PARAMETERS | Displays IP Interface Parameters |
| ILC | R | LIST IP COMMANDS | Displays all IP Interface Parameters |
| IMA | R | ETHERNET ADDRESS – Reports the MAC (physical) address of the VDE026 | XX:XX:XX:XX:XX:XX where X is a hexadecimal digit |
| ITR | R | RECEIVED | |
| IRP | R | RECEIVED PACKETS – Reports the number of packets received by the VDE026. | |
| IRB | R | RECEIVED BYTES – Reports the number of bytes received by the VDE026 | |
| IRR | R | RECEIVED BIT RATE | |

## 3.2 CONFIGURATION AND CONTROL VIA THE ETHERNET PORT

This section describes the protocol for controlling VDE026 Decoder over the Ethernet interface.

### 3.2.1 Introduction

Ethernet control messages are sent and received using the TCP protocol. Ethernet control commands are generated by a user through the GUI of controlling software, or automatically by a controlling computer. The VDE026 processes the commands and sends an Ethernet control response back to the controlling computer.



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### 3.2.2 Control Protocol

The Delta Ethernet Control protocol uses the TCP/IP protocol along with message delimiters to encapsulate commands sent to and responses sent from the VDE026.

The commands and responses use the same format as the Remote Control Port, which is described in Section 3.1. The commands are three character codes, with responses terminated by an 'OK>' or error code.

### 3.2.3 TCP Connection

The VDE026 will listen for Ethernet Control messages on TCP port 2000. The VDE026 will accept commands up to 256 bytes long and will generate responses up to 32768 bytes long.

Once the VDE026 receives an Ethernet control message from a controlling computer, it will keep that connection open until the controlling computer closes it. During the time the connection is open, the VDE026 will not accept Ethernet control messages from other sources.

### 3.2.4 Message Delimiters

The TCP protocol provides a reliable connection for transmission of data. However, TCP is a stream-oriented protocol, which means the number of bytes transmitted is not always received as a single block. For example, a message of 100 bytes could be received in 2 blocks of 50 bytes each. Or, two messages of 50 bytes could be received in a block of 75 bytes (containing the whole first and half of the second message) and a block of 25 bytes.

To ensure that a complete command is processed, the Delta Ethernet protocol uses delimiters to encapsulate each command and response message. At the transmitter, each message is prefaced with a start delimiter and is terminated by an end delimiter. The delimiters are values that will never appear in the message they are encapsulating. The values for the delimiters are:

| | |
|---|---|
| Start Delimiter | 0x02 |
| End Delimiter | 0x03 |

The receiver parses the incoming TCP stream, looking for the delimiters and extracting and processing the encapsulated messages

### 3.2.5 EXAMPLE

The following example shows how the value of a parameter (IMO, the Networking mode) is retrieved from the Delta unit. The following packet is sent to the Delta unit, with the top row representing the hex value of the byte and the bottom row representing the corresponding ASCII character, if any:



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| | | | | | |
|---|---|---|---|---|---|
| TCP HEADER | 02 | 49 'I' | 4D 'M' | 4F 'O' | 03 |

The following response is received from the Delta Unit (when not in Verbose mode):

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCP HEADER | 02 | 49 'I' | 4D 'M' | 4F 'O' | 3D '=' | 30 '0' | 0D | 0A | 0D | 0A | 4F 'O' | 4B 'K' | 3E '>' | 03 |

## 4 ETHERNET INTERFACE

The Ethernet interface can be connected to a 10 Mbps or a 100 Mbps Ethernet network. The VDE026 decoder receives data over Ethernet using the TCP/IP protocol stack. The layers of the TCP/IP stack are shown in Table 4-1.

The VDE026 uses the User Datagram Protocol (UDP) to receive an MPEG2 transport stream containing audio and video. UDP is more suited to streaming media than TCP because it does not require acknowledgement or retransmission of packets thus providing maximum data throughput and better video/audio performance

The VDE026 uses the Transmission Control Protocol (TCP) to receive Ethernet control commands and transmit Ethernet control responses. The Ethernet control is described in Section 3.2.

**Table 4-1: TCP/IP Stack**

| | | |
|---|---|---|
| Transport Layer | UDP | TCP |
| Network Layer | IP | |
| Physical Layer | Ethernet | |

In order for the VDE026 to receive UDP packets properly, the VDE026 must be configured with appropriate IP addresses and port numbers. These addresses depend on the network to which the encoder and decoder are connected and should be supplied by the network administrator. The Ethernet configuration parameters are listed in Section 3. The Local Address is the IP address of the VDE026 itself.

Although the VDE026 allows port numbers in the entire 0-65535 range, most port numbers below 1000 are reserved for IETF protocols, so the port numbers entered should be higher than 1000. Also, network firewalls are sometimes configured to block certain port numbers. Consult your network administrator to determine which ports can be used.

The VDE026 can optionally be configured to use the Dynamic Host Configuration Protocol (DCHP) to automatically obtain its IP settings. For DHCP to work there must be a DHCP server on the same network segment as the VDE026. If DHCP is successful, the IP settings will be overridden by the IP settings supplied by the DHCP server.



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# 5 MODEL VDE026 DECODER SPECIFICATIONS

The following are the specifications for the Model VDE026 Decoder Module.

## 5.1 MPEG-2 INPUT TRANSPORT STREAM

- The transport stream with an effective data rate between 64 kbps and 10 Mbps (set by compatible encoder) is received over a 10/100 Mbps Ethernet network.
- Consists of:

  Transport Stream; ISO/IEC 13818-1 (System) standard.

  Compressed video in accordance with the following;

  ISO/IEC 14496-10 MPEG-4/H.264 standard.

  ISOIEC13818-2 MPEG-2 video,

  ISO-IEC 11172-2 MPEG-1 video,

  Compressed audio; ADPCM standard.

## 5.2 OUTPUT SIGNALS

- Output Video: All video signals are available simultaneously and may be in either NTSC or PAL format.

  Analog: One analog (30fps) composite video, 1.0 Vp-p; ANSI/SMPTE 170M-2004 and One S-Video; Luminance 1 Vp-p, Chroma 0.3 V.

  Digital: Two digital video signals; ANSI/SMPTE - 259M -1997
- Audio**:** Stereo pair or two independent 7 kHz signals, 1.0 Vrms into 600 Ohms balanced. Modes – none, left, left and right.

## 5.3 CONTROL SIGNAL

- Duplex RS-232C for configuration and setup at 9600 bps, 8 data,1 start, 1 stop, and no parity bits via connector J7. Data rates up to 115.2 Kbps are available for upgrade.

## 5.4 SIGNAL PROCESSING

- Resolution - D1 (720x480), 2CIF (720x240), CIF (352x240), QCIF(176x120), D1 (720x 576), 2CIF (720x288), CIF 352x 288), or QCIF (176x144) as set by the encoder.
- I-only, IP, and IPB Modes as set by the encoder.



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## 5.5 POWER REQUIREMENTS

- Voltage: 5 Vdc (other voltages are derived on board as required)
- Power: **Less than 10 Watts**

## 5.6 PHYSICAL CONFIGURATION

- Standard VME 6U configuration
- Width Mounts in a standard 0.8 inch VME slot.
- Depth 6.299 inches
- Height 9.187 inches

## 5.7 CONNECTORS

- Ethernet (Transport Stream) RJ-45 (J9)
- Audio Out Lemo ECG-1B-306.CLL (J6)
  Mating Connector Lemo FCG-1B-306.CLAD.76
- Composite Video Out SMC (J2)
- S-Video Out Mini Din S-Video (J1)
- Digital Video Out (2) SMC (J3 and J4)
- Genlock In SMC (J5)
- Control Port DB-9S Female (J7)
- DC Power Via VME Connector (P1 and P2)



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# APPENDIX A



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# MODEL VDE026
# VME MPEG2 / H.264 DECODER CARD
# SOFTWARE AND FIRMWARE
# DOWNLOAD PROCEDURE USING THE
# CONTROL AND STATUS PORT

## Version 2.0
## 07 JAN 2008



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## REVISION LOG

Version 1.0

- Original release

Version 2.0

Procedure to upgrade Dual DSP software from V1.43 to V1.44

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# 1 INTRODUCTION

This document contains the procedure for updating the VDE026 MPEG2/H.264 Decoder card using the Control and Status port. This port can be used to update the operational software and the firmware on the card.

The VDE026 has two DSPs, a Controller DSP and a Decoder DSP, both of which can be updated. The VDE026 also has a FPGA that can be updated.

This procedure requires the use of a laptop or other computer that runs a terminal emulation program such as Microsoft HyperTerminal™. This terminal emulation program must support the YMODEM file transfer protocol.

This procedure assumes that you have already received a file or files from Delta Information Systems, Inc. to perform the upgrade, and that files are saved on the same computer that is running HyperTerminal. It is recommended that the files be saved on the Desktop for easy access during this procedure.

## 1.1 ELECTRICAL INTERFACE

The Control and Status port uses a standard RS-232/RS-422 asynchronous serial interface having the characteristics listed below:

- Signal Levels: RS-232
- Baud Rate: 9600 baud
- Data Bits: 8
- Start Bits: 1
- Stop Bits: 1
- Parity: None

There is no hardware or software flow control.

The interface uses the following signals found on the Remote 9-pin D connector (J7) on the front panel of the card:

| RS-232 INTERFACE PIN ASSIGNMENT | | | |
|---|---|---|---|
| PIN | SIGNAL | DESCRIPTION | DIRECTION |
| 2 | SD | Send Data | Output |
| 3 | RD | Receive Data | Input |
| 5 | GND | Signal Ground | Ground |



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## 2 PROCEDURE

The following procedure should be followed in order to update the software or firmware in the CDE026 MPEG2 / H.264 Decoder card.

**NOTE: IF THE CARD SOFTWARE IS BEING UPGRADED FROM VERSION 1.43 TO VERSION 1.44, FOLLOW THE UPGRADE SEQUENCE DESCRIBED IN SECTION 3.**

### 2.1 INITIALIZATION

After unit power up and initialization, a welcome message is output to the control interface. If the control interface is in Verbose mode, the following welcome message is output:

```
<cr><lf>
VDE026 DECODER<cr><lf>
Copyright Delta Digital Video<cr><lf>
A division of Delta Information Systems, Inc.<cr><lf>
<cr><lf>
OK>
```

In Quiet mode, only the prompt is sent:

```
<cr><lf>
OK>
```

### 2.2 DOWNLOAD COMMAND

In response to the prompt, enter the Download Command (DLD).

```
OK>DLD<cr>
```

The unit is now in the download mode.

### 2.3 SELECT MODE

In response to the Download Command, the unit issues the following prompt:

```
Select Mode 3=CTRL APP, 5=FPGA, 6=DEC MPEG2 APP, 7=DEC H264 APP,
8=DEC BOOTLOADER:
```

Mode 3 is used for loading the Controller DSP software. Modes 6, 7 and 8 are used for loading different parts of the Decoder DSP software. DSP software files all have a .out extension. Mode 5 is used for loading the Card Firmware. Card Firmware files have a .bit extension. Please make sure you select the proper download mode. Failure to do so will render the unit inoperable, and will necessitate returning it to the factory for reprogramming.

A Controller DSP software file will have a filename like:

Vde026_ctrl_Vxxx_r.out

A Decoder DSP software file for MPEG2 will have a filename like:

Vde026_dec_mpg2_Vxxx_r.out



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A Decoder DSP software file for H264 will have a filename like:

Vde026_dec_h264_Vxxx_r.out

A Decoder DSP software file for the Bootloader will have a filename like:

Bootloader3_Vde026dec-d.out

A Card Fimware file will have a filename like:

Vde026top_xxxx.bit

The x characters in the filenames above will change from file to file as they indicate the software or firmware version.

After entering a selection, the unit confirms your selection. For example, after selecting Mode 3, you will see:

```
<cr><lf>
You have selected: Controller Application
<cr><lf>
```

If an invalid selection was made, the unit would respond with:

```
<cr><lf>
You have selected: Illegal value, power down unit.
<cr><lf>
```

In this case, you must power down the unit and start over.

## 2.4 SELECT DOWNLOAD SPEED

After the mode is selected, the unit will prompt for the download speed. The default control port speed is 9600 baud which may be too slow for downloading a large software or firmware file. For this reason, y=the user has the option to change the interface speed.

The unit issues the following prompt:

```
Select Download speed 0=9600, 1=19200<cr><lf>
2=38400, 3=57600, 4=115200:
```

After entering a selection, the unit confirms your selection as follows:

```
<cr><lf>
You have selected: 115200 Baud
<cr><lf>
```

If an invalid selection was made, the unit will respond with the following:

```
<cr><lf>
You have selected: Illegal selection, using 9600 baud.
<cr><lf>
```



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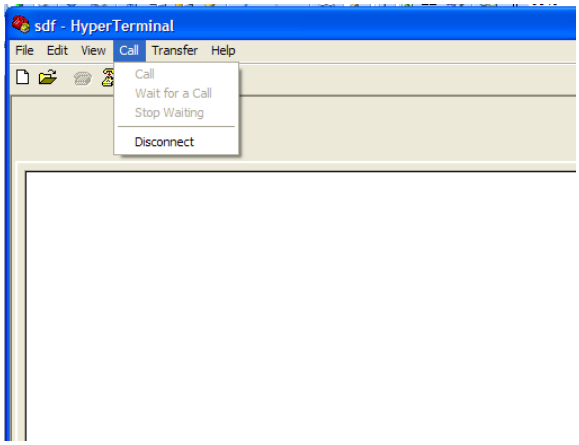
And the download process will continue.

## 2.5 CHANGE HYPERTERMINAL SPEED

The unit will now prompt you to change the HyperTerminal program speed with the following prompt:

```
Change to the selected data rate and <cr><lf>
download the file using the YMODEM protocol. <cr><lf>
```

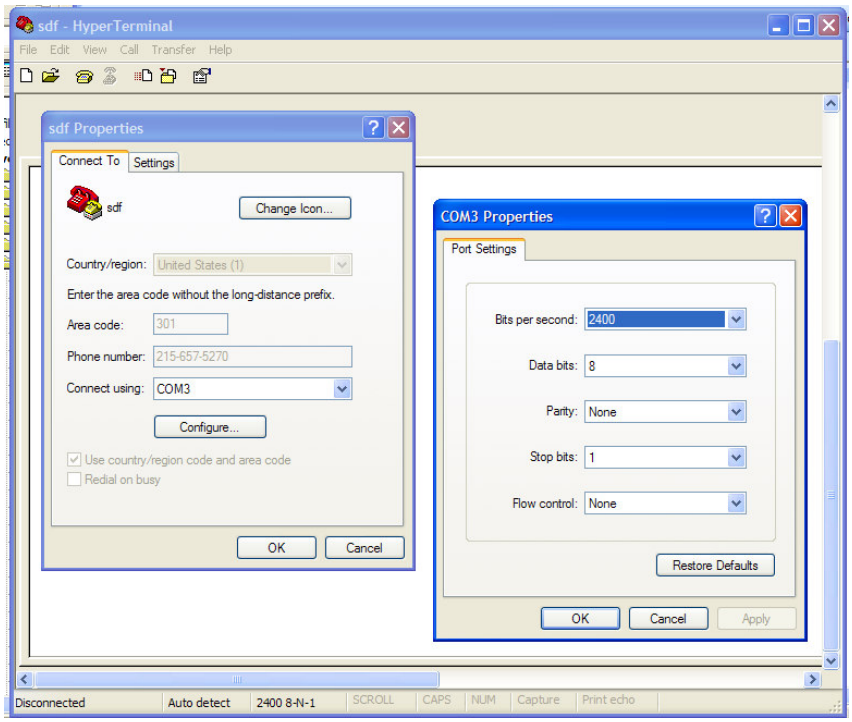
At this point, you should change the HyperTerminal settings. To do this, you must first disconnect the HyperTerminal session. This can be done by selecting **Call** and then **Disconnect**.



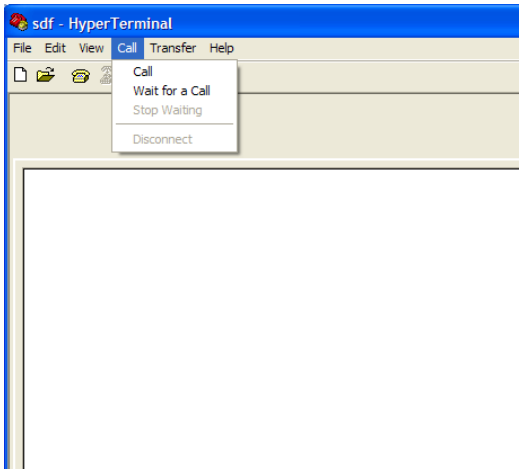

You can then change the settings by selecting **File**, then **Properties**, then **Configure**. Then change the **Bits per Second** to match the speed selected in Step 2.4.



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You must then reconnect the HyperTerminal session. This can be done by selecting **Call** and then **Call.**




If you have selected the proper speed, you will begin to see the letter C printing about once every 5 seconds. This is an indication that the unit is ready to receive the file.

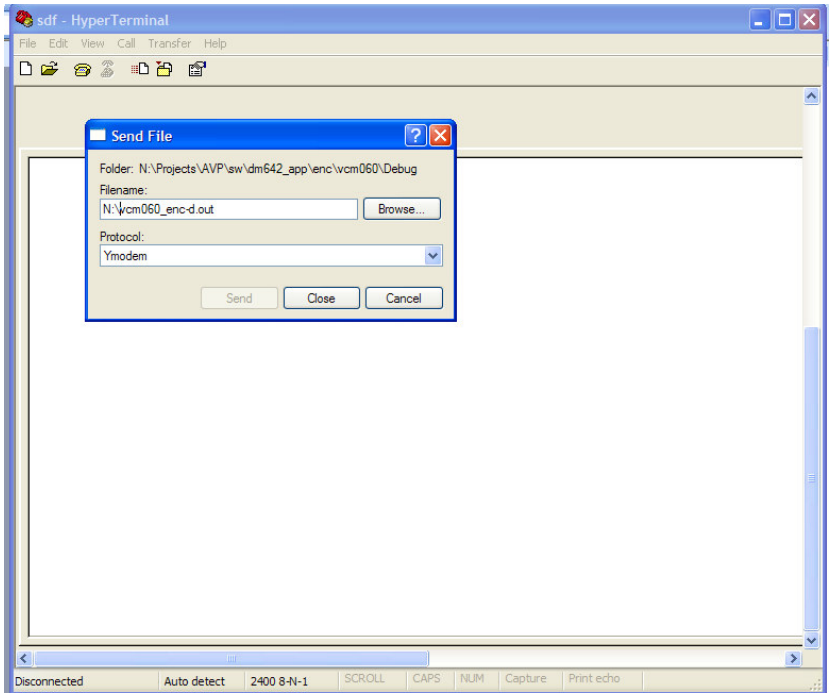
## 2.6 BEGIN FILE TRANSFER

You should now begin the HyperTerminal file transfer process. Typically, this can be found by selecting **Transfer**, then **Send File**. You must then enter the **Filename** to be downloaded. The **Browse** button will allow you to easily find this file in the location that you saved it in on your computer. You must specify the full path, filename, and extension for the file to be downloaded.



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After selecting the file name, you must then select the download protocol. Select YMODEM from the **Protocol** drop down list. Finally, select **Send** to begin transferring the file.




A progress screen will be shown indicating the file size, the amount of data to be transmitted and any errors or retransmissions.

The YMODEM protocol should assure error free transmission of the file.

## 2.7 FLASH MEMORY PROGRAMMING

After file transfer completes, the unit will automatically begin the process of programming the flash memory with the downloaded file. The unit will display the following message:

```
<cr><lf>
File received. Starting Flash update... <cr><lf>
WARNING: Do not remove power until update complete. <cr><lf>
```

At this point, if power is removed from the unit, it will be left in an inoperable state and will need to be returned to the factory for reprogramming.

The unit continues to display progress massages:

```
Scanning flash memory ... <cr><lf>
Erasing flash memory ... <cr><lf>
Parsing COFF file ... <cr><lf>
Heap size: xxxxxx <cr><lf>
Writing flash memory ... <cr><lf>
```



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When this is complete, the unit will print either:

```
Embedded software flash loaded ! <cr><lf>
```

Or

```
Embedded firmware flash loaded ! <cr><lf>
```

Depending on which data was downloaded, and finally:

```
Flash update Finished. <cr><lf>
Please cycle power on unit for update to take effect. <cr><lf>
```

At this point, the download process is complete, and the user must turn off power and then turn on power for the new software to take effect. This process will also reload the factory defaults, so any special configuration will need to be reloaded.

Be sure to change the Hyperterminal baud rate setting back to 9600 or the Control and Status port will not work when the card reboots.

If at anytime during this process, the unit experiences a problem, it will print out an error message. If this occurs, it is likely that the unit will be inoperable, and will need to be returned to the factory for reprogramming.

## 3 SPECIAL PROCEDURE FOR UPDATING SOFTWARE FROM VERSION 1.43 TO VERSION 1.44

The following procedure should be followed in order to update the software in the VDE026 MPEG2/H.264 Decoder card from Version 1.43 to Version 1.44. The firmware does not need to be updated during this upgrade. Because of changes to the interface between the Controller DSP and the Decoder DSP, the steps in this procedure must be followed in order or the card will not function properly and will have to be returned to Delta for reprogramming.

### 3.1 UPDATE DECODER DSP MPEG2 APPLICATION

Follow the instructions in Steps 2.1 and 2.2.

In response to the Download Command, the unit issues the following prompt, which is different than the response described in Step 2.3:

```
Select Mode 3=MPEG2 APP, 4=H264 APP, 5=FPGA, 6=DEC MPEG2 APP,
7=DEC H264 APP:
```

Select **Mode 6** to upgrade the Decoder DSP MPEG2 application. Follow the instructions in Steps 2.4 and 2.5. When starting the file transfer in Step 2.6, transfer the file called vde026_dec_mpg2_V144_r.out. Once the flash update has completed as described in Step 2.7, change the HyperTerminal speed back to 9600 and reboot the card.

### 3.2 UPDATE CONTROLLER DSP APPLICATION

Follow the instructions in Steps 2.1 and 2.2.



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In response to the Download Command, the unit issues the following prompt, which is different than the response described in Step 2.3:

```
Select Mode 3=MPEG2 APP, 4=H264 APP, 5=FPGA, 6=DEC MPEG2 APP,
7=DEC H264 APP:
```

Select **Mode 3** to upgrade the Controller DSP application (Mode 3 updates the Controller DSP application, even though it is labeled MPEG2 APP in the prompt). Follow the instructions in Steps 2.4 and 2.5. When starting the file transfer in Step 2.6, transfer the file called vde026_ctrl_V144_d.out. Once the flash update has completed as described in Step 2.7, change the HyperTerminal speed back to 9600 and reboot the card.

### 3.3 UPDATE DECODER DSP BOOTLOADER

Follow the instructions in Steps 2.1 and 2.2.

In response to the Download Command, the unit should now issue the same prompt described in Step 2.3.

Select **Mode 8** to Upgrade the Decoder DSP bootloader. Follow the instructions in Steps 2.4 and 2.5. When starting the file transfer in Step 2.6, transfer the file called bootloader3_vde026dec_v2-d.out. Once the flash update has completed as described in Step 2.7, change the HyperTerminal speed back to 9600 and reboot the card.

### 3.4 UPDATE DECODER DSP H.264 APPLICATION

Follow the instructions in Steps 2.1 and 2.2.

In response to the Download Command, the unit will issue the prompt described in Step 2.3.

Select **Mode 7** to Upgrade the Decoder DSP bootloader. Follow the instructions in Steps 2.4 and 2.5. When starting the file transfer in Step 2.6, transfer the file called vde026_dec_h264_V144_r.out. Once the flash update has completed as described in Step 2.7, change the HyperTerminal speed back to 9600 and reboot the card.

### 3.5 REFLASH APPLICATIONS

Due to a bug in Version 1.43 of the Controller DSP and Decoder DSP applications, the flash checksum is not calculated correctly during the upgrades above. So once Version 1.44 of the software is flashed in, the Controller DSP application, Decoder DSP MPEG2 application, and Decoder DSP H264 application must be updated again in order to display a valid checksum for each software component. To upgrade, follow the instructions in Steps 2.1 to 2.7 for the following files:



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1. Mode 3 with the vde026_ctrl_V144_d.out file
2. Mode 6 with the vde026_dec_mpg2_V144_r.out file
3. Mode 7 with the vde026_dec_h264_V144_r.out file

### 3.6 UPDATE CARD MAC ADDRESS

After updating the Controller DSP from Version 1.43 to Version 1.44, the card settings will revert back to the factory defaults. This includes the MAC address of the card. The default MAC address of the card is 0x00:0x0F:0x5B:0x00:0x90:0x00. The first three bytes of the address are the Vendor ID for Delta Information Systems, Inc. The 0x90 byte is the same for all VDE026 cards. The last byte of the MAC address is the hexadecimal representation of the serial number of the card. For example, if the serial number of the card is SN101, the MAC address should be set to 0x00:0x0F:0x5B:0x00:0x90:0x65. To set the MAC address of this card, use the DMA command:

```
OK>DMA=5B009065<cr>
```

The DMA command must be passed the last 4 bytes of the desired MAC address. The first two bytes of the MAC address are fixed to 0x00:0x0F. The MAC address update will take effect when the card is rebooted.

NOTE: Updating the MAC address is only necessary when updating the Controller DSP from Version 1.43 to 1.44. In Version 1.44 and above, the MAC address is not changed when the card reverts back to the factory defaults.



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