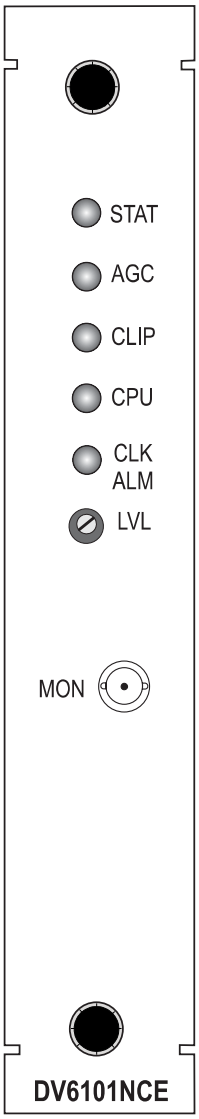
# High Performance NTSC IF Encoder and Decoder

## Procedures Manual

**1114628 Rev B**

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# Procedures Manual
# for
# High Performance NTSC IF Encoder and Decoder

ARTEL

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# *High Performance NTSC IF Encoder and Decoder*

Artel Document Number: 1114628, Revision B



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## Revision History

| REVISION | DATE | DESCRIPTION |
|---|---|---|
| A | 7/00 | Initial Release |
| B | 2/02 | Trademark Update |

## Related Documentation

Listed below is the title and part number of manuals related to this one. Copies of these publications can be ordered by contacting your Sales Respresentative.

| Title/Description | Part Number |
|---|---|
| DV6000 Digital Video Transmission System Installation and Operation | 060681-001 |
| DV6300 Single Channel Transport System Installation and Operation Manual | 060620-001 |
| DV6000 DAP Control Software User's Manual | DVDAP-0195M |
| DV6400 Tributary Access and Interface Gateway Installation and Operation Manual | 1045657 |
| Osworx Commander Operator's Guide | 1025530 |

# Contents

# INTRODUCTION

This manual contains a complete description as well as provisioning, installation and operation procedures for the High Performance NTSC IF Encoders and Decoders, DV6101NCE and DV6102NCD. These plug-in encoder and decoder modules are used in DV6000, DV6300, and DV6400 digital video transport systems. These modules interface Intermediate Frequency (IF) electronic signals with a digital, fiber optic transport system.

This manual contains the following sections:

- Introduction - Gives information about the manual.
- Section 1 - Description. Describes user interfaces (controls, indicators, adjustments, and connections) and functions for both the encoder and decoder modules.
- Section 2 - Procedures. Detailed instructions for the user to set options on the various encoders and decoders, install them in a shelf, and adjust them in a working system.
- Section 3 - Technical Specifications.

# SECTION 1 DESCRIPTION

## HIGH PERFORMANCE NTSC IF ENCODER AND DECODER (DV6101NCE AND DV6102NCD)

**NOTE:** In DV6000 equipment shelves, the NTSC IF cards require -PSB series power supply modules, and series 2 or later controller cards (MUX2, DEMUX2, DAP2) for proper operation.

### Encoders

The DV6101NCE High Performance NTSC IF Encoders, shown in Figure 1, are digital encoders with 10-bit resolution. The High Performance NTSC IF Encoders are standard-size single equipment slot plug-in cards that slide into any empty encoder slot in a DV-family equipment shelf.

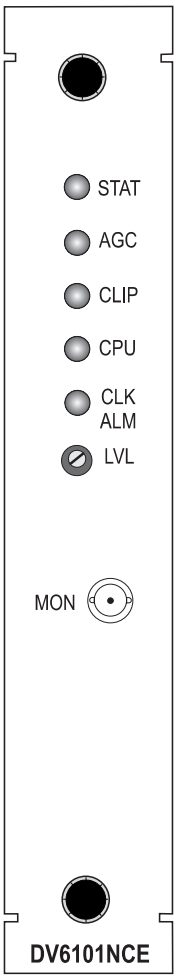


**Figure 1. Front Panel of High Performance NTSC IF Encoder Plug-In Card (DV6101NCE)**

The encoder cards accept IF input signals at the main video input. On all DV6000-related equipment shelves or units, the main video input is a 75 Ohm BNC connector labeled "Video Input" on the rear panel (this can be a composite video/audio signal, or video only). The signal is filtered and processed, then converted to a digital signal for laser transmission. Table 1 describes the front panel features of the encoder.

**Table 1. Connector/Switch/Indicator Functions for the DV6101NCE**

| TYPE | NAME OF INDICATOR/ CONTROL | FUNCTION DESCRIPTION |
|---|---|---|
| LED | STAT | *Glow*s GREEN to indicate that the IF signal is above the user-settable minimum threshold level.<br>OFF to indicate IF signal is below threshold (user-settable, +24 dBmV default). |
| LED | AGC | *Glows* GREEN when the module's AGC circuitry is active.<br>OFF to indicate the AGC is disabled. |
| LED | CLIP | *Glows* AMBER to indicate that the input signal to the A/D conversion circuit exceeds its dynamic window. That is, the input signal level is too high.<br>OFF to indicate normal operation. |
| LED | CPU | *Blinks* RED to indicate a fault in the CPU or signal processing circuitry.<br>*Glows* GREEN to indicate normal operation.<br>*Blinks* GREEN during firmware download, alternating with ALM/CLK LED.*<br>OFF to indicate CPU failure. |
| LED | CLK ALM | *Glows* RED at power up *for about 10 seconds* during automatic AGC setup, ***if AGC option is enabled***. No actual clock alarm will register during this period.<br>*Glows* RED if the A/D converter clock is lost or the card has been disabled.<br>*Blinks* RED if the PLL circuitry is out of lock.<br>*Glows* GREEN during normal operation.<br>*Blinks* GREEN during a firmware download, alternating with the CPU LED.* |
| ADJ POT | LVL | This adjustable attentuator controls the level of the incoming IF signal by ±21 dB. |
| BNC Connector | MON | This connector accesses the input signal on the board after manual or automatic gain adjustment, but before signal processing and A/D conversion. This is a 75 Ohm output. |

***NOTE**: During a firmware download the CLK ALM and CPU LEDs will alternately blink green, and turn off. When the firmware download is complete, the card will reset, causing all LEDs to blink off, then return to normal.

The encoder modules accept IF analog signals in the standard NTSC passband, with 43.875 MHz center frequency, in these categories:

- Analog NTSC IF video only (carrier at 45.75 MHz)
- Analog NTSC IF video and 1 analog audio carrier at 41.25 MHz
- 64-QAM and 256-QAM modulated IF signals with center frequency at 44 MHz
- 8-VSB modulated IF signals

See Figure 2 for a representation of the High Performance NTSC IF modules' passband characteristics.

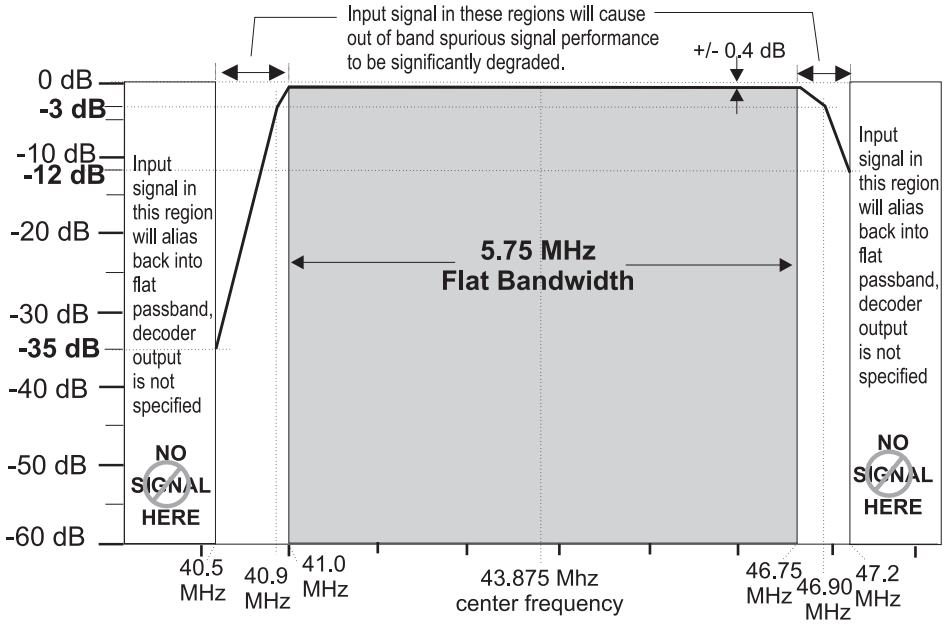


**Figure 2. High Performance NTSC IF Encoder Input Passband Characteristics**

**Jumpers** - There are several options that the user can set on the surface of the encoder module's circuit card. See Section 2, Procedures, paragraph A, for illustrated procedures to set these options.

***Firmware PAGE jumper*** - The **PAGE/PAGE B** jumper toggles the set of firmware in use from one storage "page" to the other. Firmware on the card is stored in two locations, or pages. At manufacture, the two pages contain identical firmware. If corrupted or otherwise non-usable firmware is loaded on the card, the jumper can be moved to cause the card to run from the other set of firmware.

***Input Impedance Jumpers*** - The paired **75/50** ohm jumpers can be used to choose the input impedance (75 ohms is the default). ***These two jumpers must each have the same setting.***

***SMART-NETT (Software) Override Jumper*** - The **SN/OE** jumper is set by default to the SN position, allowing SMART-NETT (or other network monitoring and control software) to control (enable/disable) the module. In the OE (OverridE) position, the module cannot be disabled by software.

***AGC DIP Switches*** - The UPward switch position on the **DIP Switch** enables, or turns *ON* an option; the DOWNward switch position (default) disables, or turns *OFF* an option. #1 enables and disables the card's Automatic Gain Control (AGC). When AGC is enabled, the type of input format must be set. #2 controls analog IF input AGC mode, #3 controls QAM 64 IF input AGC mode, #4 controls QAM 256 IF input AGC mode, and #5 controls 8VSB IF input AGC mode. If AGC is enabled and an input format is not set *ON*, or if more than one input format is set *ON*, the highest priority format will be used. The formats' priority follows the order of their DIP switch position numbering, so that #2, analog IF, takes the highest priority, and # 5, 8 VSB IF, takes the lowest priority.

**NOTE:** If the Automatic Gain Control (AGC) is enabled, when the card is powered up, the card firmware will automatically set the level of the input signal to fill the A/D input window without clipping to maximize A/D conversion accuracy. During this setup time, the signal and accompanying noise will be amplified temporarily above a clipping level, for about 10 seconds. (If audio is monitored, this can be quite loud.) Also, the CLK ALM LED will *glow* RED, and the alarm is disabled during this setup time.

## Decoders

The DV6102NCD High Performance NTSC IF Decoder, shown in Figure 3, accepts digital input with 10-bit resolution through the DV system from a DV6101NCE, and decodes it to produce analog signals at intermediate frequency (41.0 to 46.75 MHz). The output from the NTSC IF Decoder reproduces the input to its paired encoder, and is available at the main VIDEO OUTPUT BNC at the rear of the unit which houses the decoder. A second IF signal with a fixed output level of –3.8 dBm is availabe at the rear 'loop-through' BNC connector.

The High Performance NTSC IF Decoder is a plug-in card that slides into any empty decoder slot in a DV equipment shelf. Table 2 lists the features of each front panel indicator and control. See Figure 3.

**Jumpers** - There are several options that can be manually changed on the surface of the decoder module's circuit card. See Section 2, Procedures, paragraph A, for illustrated procedures to set these options.

***Firmware PAGE jumper*** - The **PAGE/PAGE B** jumper toggles the set of firmware in use from one storage "page" to the other. Firmware on the card is stored in two locations, or pages. At manufacture, the two pages contain identical firmware. If corrupted or otherwise unusable firmware is loaded on the card, the jumper can be moved to cause the card to run from the other set of firmware.

***SMART-NETT (Software) Override Jumper*** - The **SN/OE** jumper is set by default to the SN position, allowing SMART-NETT (or other network monitoring and control software) to control (enable/disable) the module. In the OE (OverridE) position, the module cannot be disabled by software.

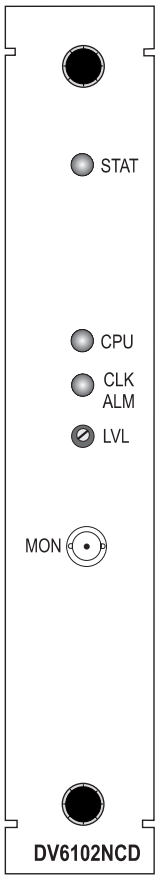


**Figure 3. Front Panel of High Performance NTSC IF Decoder (DV6102NCD)**

**Table 2. Connector/Switch/Indicator Functions for the DV6102NCD Decoder**

| TYPE | NAME OF INDICATOR/ CONTROL | FUNCTION DESCRIPTION |
|---|---|---|
| LED | STAT | *Glows* GREEN to indicate IF output is above user-settable low-limit threshold. (+30 dBmV is the default low-limit threshold.)<br>OFF to indicate the output is below the low-limit threshold. |
| LED | CPU | *Blinks* RED to indicate a detected fault in the CPU or signal processing circuitry.<br>*Glows* GREEN to indicate normal CPU operation.<br>*Blinks* GREEN during firmware download, alternating with CLK/ALM LED.*<br>OFF to indicate CPU failure. |
| LED | CLK ALM | *Glows* RED to indicate the input clock is lost, or the card is disabled by software.<br>*Blinks* RED to indicate the Phase Lock Loop (PLL) is not in a locked state.<br>*Glows* GREEN to show normal operation.<br>*Blinks* GREEN during a firmware download, alternating with CPU LED.* |
| ADJUSTMENT POT | LVL | When the encoder A/D window is filled, this adjustable attenuator can be used to set the level of the IF output signal between 30 and 45 dB. |
| BNC CONNECTOR | MON | This 75 Ohm connector accesses the output IF signal from the front panel, after conversion and signal processing . |

***NOTE:** During a firmware download the CLK ALM and CPU LEDs will alternately blink green, and turn off. When the firmware download is complete, the card will reset, causing all LEDs to blink off, then return to normal.

# SECTION 2 PROCEDURES

## A. PROVISIONING THE ENCODER AND DECODER MODULES - SETTING BOARD SURFACE OPTIONS

**CAUTION:** *Electronic modules can be damaged by static electrical discharge. Before handling modules, wear an anti-static discharge wrist strap to prevent damage to electronic components. Place modules in anti-static packing material when transporting or storing. When working on modules, always place them on an approved anti-static mat that is electrically grounded.*

### High Performance IF Encoder (DV6101NCE) Module

1. Board surface jumpers on the DV6101NCE allow the user to choose 50 or 75 ohm input impedance, enable or disable the software ON/OFF control, and choose the firmware "page" in case of a firmware problem. A board surface DIP switch is also provided to enable or disable Automatic Gain Control (AGC), and set the input format for the AGC. Refer to Figure 4, and Tables 3 and 4 for complete information to set each option.

**NOTE:** If the Automatic Gain Control (AGC) is enabled, when the card is powered up, the card firmware will automatically set the level of the input signal to fill the A/D input window without clipping to maximize A/D conversion accuracy. During this setup time, the signal and accompanying noise will be amplified temporarily above a clipping level, for about 10 seconds. (If audio is monitored, this can be quite loud.) Also, the CLK ALM LED will *glow* RED, and the alarm is disabled during this setup time.

**NOTE:** Consult site-plan documents regarding the provisioning of individual encoder and decoder cards. Often, all of the encoders that will be housed in the same shelf will be set up in the same way.

2. Set all options necessary for the card application. Record card settings for future reference.

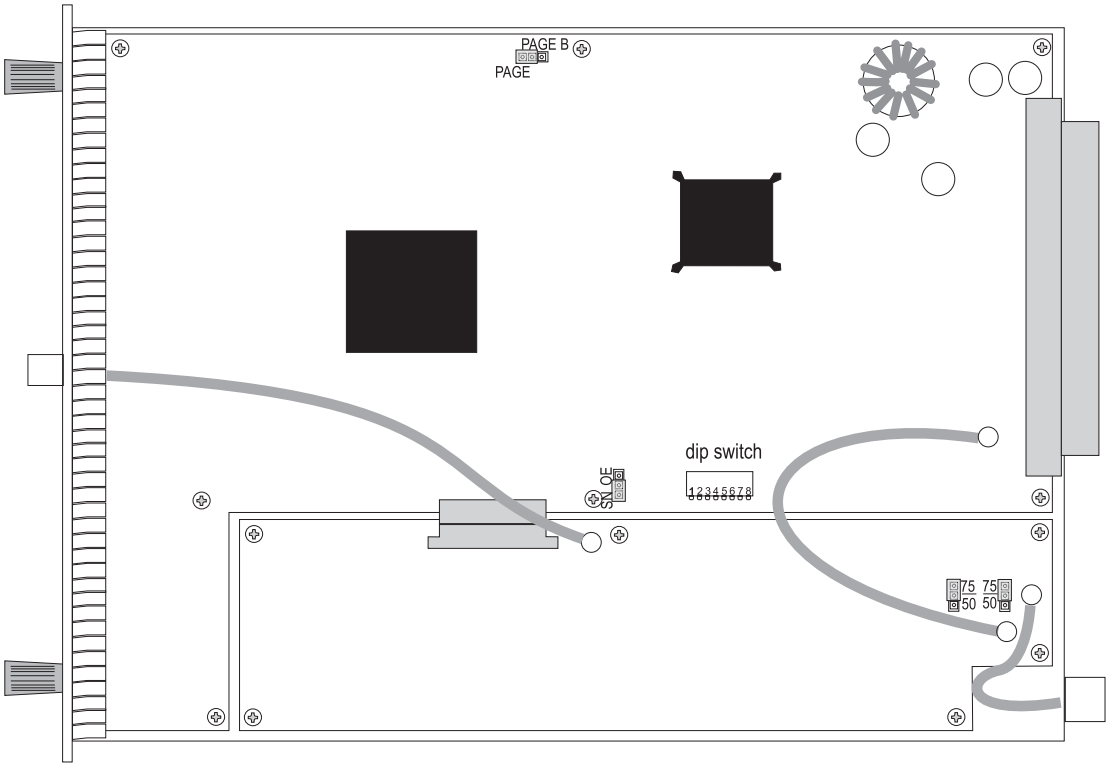


**Figure 4. Selectable Option Hardware for the DV6101NCE**

**Table 3. Selectable Options for the DV6101NCE Encoders**

| TYPE | NAME OF INDICATOR/ CONTROL | FUNCTION DESCRIPTION |
|---|---|---|
| 3-Pin Header | PAGE/ PAGE B | The jumper connects either set of two pins on the header (pins 1 and 2, or pins 2 and 3) to choose one or the other alternate "page" of firmware. Changing the jumper position toggles the **firmware "pages"** being used by the board. |
| 3-Pin Header | SN/OE | When the jumper is installed to connect the 2 pins at the SN end of the header (default) **software** can be used to **enable/disable** the card. When the jumper is installed to connect the 2 pins at the OE end of the header, software can NOT enable/disable the card. |
| 3-Pin Header Pair | 75/50 | When the jumpers are installed at the ends of the headers marked 75 (default), the module's **input impedance** will be 75 ohms. When installed at the ends marked 50, input impedance will be 50 ohms. **Both headers must be set the same.** |
| 8-position DIP Switch<br><br>*see Table below | #1 thru #5 | These DIP switch positions control the **AGC options**. The **UP**ward switch position enables, or turns ***ON*** an option; the **DOWN**ward switch position (default) disables, or turns ***OFF*** an option. Position #1enables and disables the card's AGC. When AGC is enabled, the type of input format must be set. Position #2 controls analog IF input AGC mode, #3 controls QAM 64 IF input AGC mode, #4 controls QAM 256 IF input AGC mode, and #5 controls 8VSB IF input AGC mode. If AGC is enabled and a format is not set ***ON***, or if more than one input format is set ***ON***, the highest priority format will be used. The formats' priority follows the order of their DIP switch position numbering, so that #2, analog IF, takes the highest priority, and # 5, 8 VSB IF, takes the lowest priority. This information is also presented in Table 501-12 below. |

**NOTE:** If the Automatic Gain Control (AGC) is enabled, when the card is powered up, the card firmware will automatically set the level of the input signal to fill the A/D input window without clipping to maximize A/D conversion accuracy. During this setup time, the signal and accompanying noise will be amplified temporarily above a clipping level, for about 10 seconds. (If audio is monitored, this can be quite loud.) Also, the CLK ALM LED will *glow* RED, and the alarm is disabled during this setup time.

**Table 4. DIP Switch Definition**

| POSITION # | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 |
|---|---|---|---|---|---|---|---|---|
| **OPTION** | AGC | analog | QAM64 | QAM256 | 8 VSB | - | - | - |
| **PRIORITY RATING** | | 1 | 2 | 3 | 4 | | | |
| **UP** | ON | ON | ON | ON | ON | | | |
| **DOWN** | OFF(def.) | OFF | OFF | OFF | OFF | | | |

## High Performance IF Decoder (DV6102NCD) Module

3. Board surface jumpers on the DV6102NCD allow the user to enable or disable the software ON/OFF control, and choose the firmware page in case of a firmware problem. Refer to Figure 5, and Table 5.

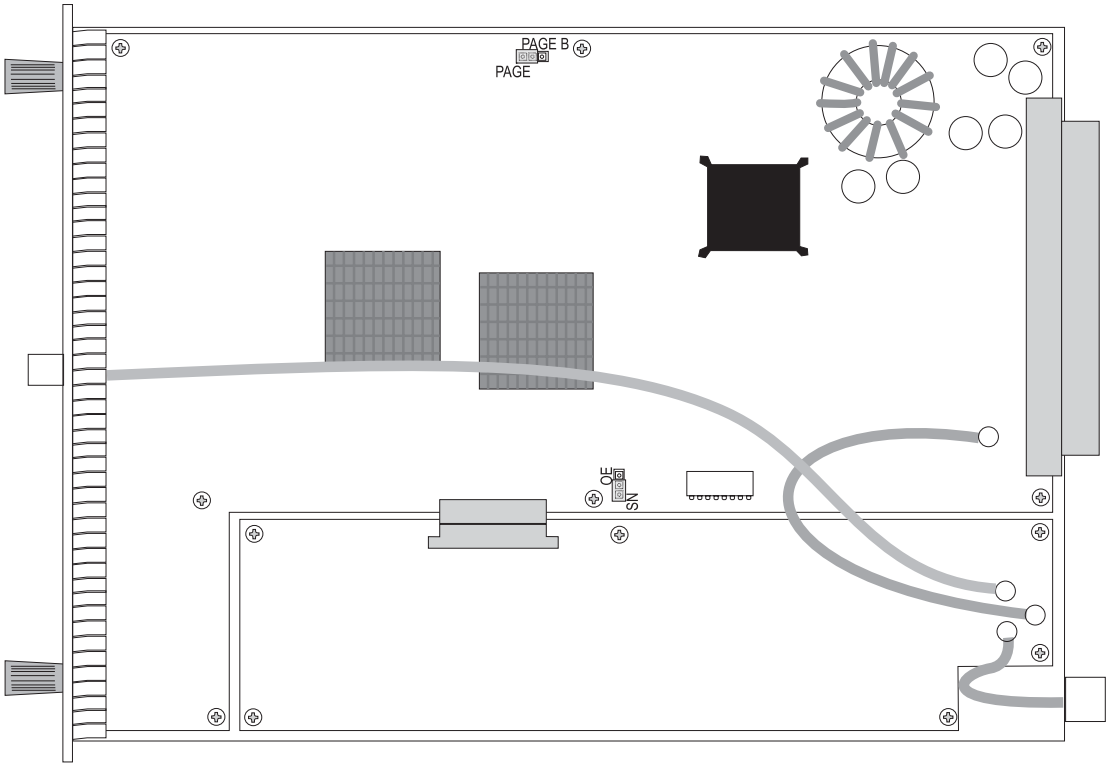


**Figure 5. Selectable Option Hardware for the DV6102NCD**

**Table 5. Selectable Options for the DV6102NCD Decoders**

| TYPE | NAME OF INDICATOR/ CONTROL | FUNCTION DESCRIPTION |
|---|---|---|
| 3-Pin Header | PAGE/ PAGE B | The jumper connects either set of two pins on the header (pins 1and 2, or pins 2 and 3) to choose one or the other alternate “page” of firmware. Changing the jumper position toggles the firmware “pages” being used by the board. |
| 3-Pin Header | SN/OE | When the jumper is installed to connect the 2 pins at the SN end of the header (default), software can be used to enable/disable the card. When the jumper is installed to connect the 2 pins at the OE end of the header, software can NOT enable/disable the card. |

## B. INSERT MODULES INTO EQUIPMENT SHELF

**CAUTION:** *Electronic modules can be damaged by static electrical discharge. Before handling modules, wear an anti-static discharge wrist strap to prevent damage to electronic components. Place modules in anti-static packing material when transporting or storing. When working on modules, always place them on an approved anti-static mat that is electrically grounded.*

1. Refer to site-plan documents to identify the slots into which modules will be installed.

**NOTES:** Encoder and Decoder modules can safely be inserted into any shelf, or removed, with power supply(ies) either on or off (**hot swapped**).

- Make sure you have set any on-board jumpers to **provision options before installing** encoder or decoder modules.

- **If the Automatic Gain Control (AGC) is enabled,** when the card is powered up, the card firmware will automatically set the level of the input signal to fill the A/D input window without clipping to maximize A/D conversion accuracy. During this setup time, the signal and accompanying noise will be amplified temporarily above a clipping level, for about 10 seconds. (If audio is monitored, this can be quite loud.) Also, the CLK ALM LED will *glow* RED, and the alarm is disabled during this setup time.

- In DV6000 systems, channels can be provisioned with software to "Add" or "Drop" any Encoder or Decoder channel, respectively, to or from any of the **time slots** in the fiber optic data stream. However, in the default configuration, modules provide a 1 to 1 relationship between the encoder card slot location, the transport channel in the fiber optic data stream, and the decoder slot location. In a simple end-to-end system, the signal from the encoder in slot 1 in the "transmit" shelf will be demultiplexed to the decoder at slot 1 at the "receive" shelf, and the signal from the encoder in slot 2 will be demultiplexed to the decoder in slot 2, etc., as shown in Figure 6.

- If you are installing a new encoder or decoder module in a running shelf, or doing loopback testing, remember that the **channel configuration** will remain the same unless it is reset, and that it **cannot be reset for that channel if the designated equipment slot is empty**. If the channel needs to be reset, it may be wise to disable that channel before removal of the old module, until after the new module is installed. Use the appropriate craft software to change the channel configuration.

2. Encoder/decoder modules are all retained in the equipment slot by an external captive screw and an internal latch which clinches the module into the equipment slot as the captive screw is tightened. These modules may be installed using these steps.

   a. Carefully remove the module to be installed from its antistatic packaging.
   b. Turn the internal latch to the side so that it will not impede insertion of the module. Observe the position of the latch by looking at the top or bottom edge of the module while turning the captive screw.
   c. Slide the module into its equipment slot until the rear board edge connectors contact the motherboard connectors in the shelf backplane.

d. Firmly press the module fully into its slot in the equipment shelf until its connector mates with the connector in the shelf slot.

e. Tighten the captive screw until snug. The latch will turn simultaneously with the captive screw until it is in position, and then tighten down. Do not over tighten.

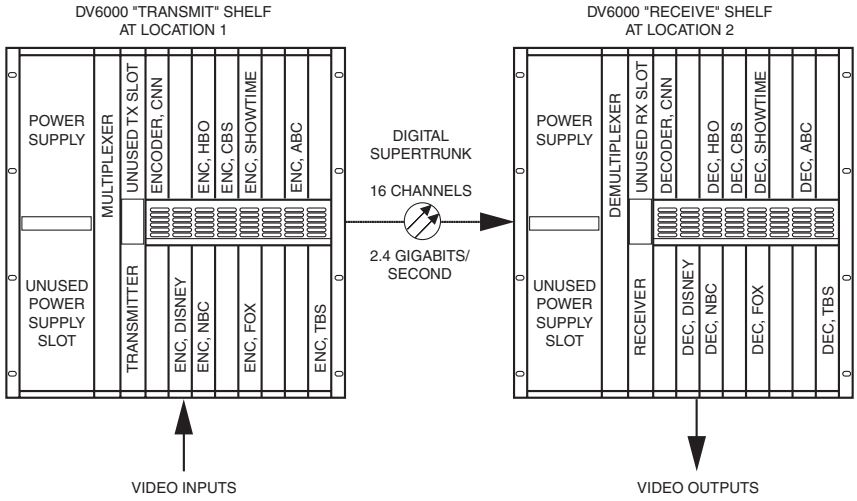


**Figure 6. Flow of Signals from Encoder Slots at Transmit Site to Corresponding Decoder Slots at Receive Site**

## C. CONNECT CHANNEL INPUT/OUTPUT CABLES

**Summary**: Input and output signal cables attach to the back panel of equipment shelves directly behind the slot location of the associated card (connectors are numbered to match card slots). This procedure covers the installation of cables for the IF modules.

**CAUTION:** *Electronic modules can be damaged by static electrical discharge. Before handling modules, wear an anti-static discharge wrist strap to prevent damage to electronic components. Place modules in anti-static packing material when transporting or storing. When working on modules, always place them on an approved anti-static mat that is electrically grounded.*

1. Refer to site planning records to determine the routing of each signal cable.

2. Attach the video cable for each module to its VIDEO INPUT/OUTPUT connector at the backpanel of the unit (see Figure 7). Each connector is associated with the module in the slot in front of it, and connectors and equipment slots are correspondingly numbered.

3. Place caps on all unused BNC connectors. Use non-conductive caps. (Caps that do not ground the center conductor.)

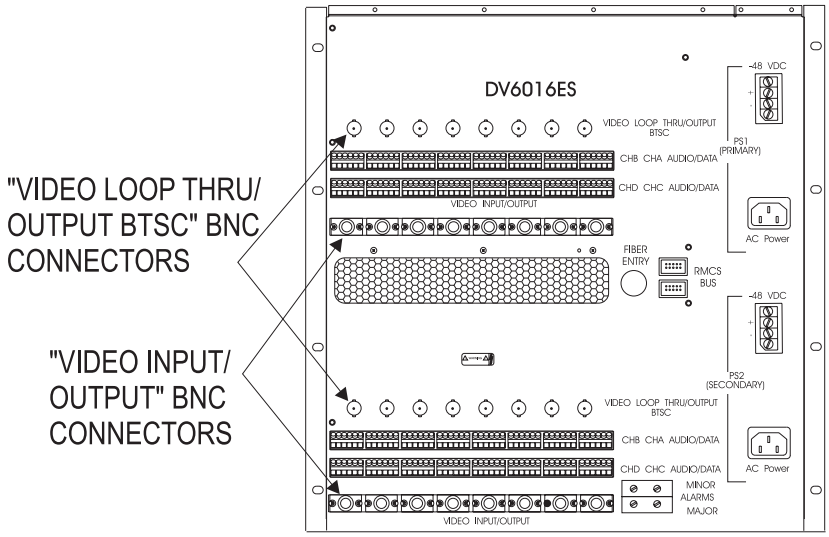


**Figure 7. Location of Electronic Signal Input/Output Connectors on the rear of the DV6016ES Equipment Shelf**

***other units have similarly arranged and labelled connectors**

## D. CHECK AND ADJUST LEVELS FOR IF ENCODERS AND DECODERS

**Summary:** The following procedure includes instructions for manually adjusting High Performance NTSC Intermediate Frequency (IF) encoders (that are not set to use the Automatic Gain Control [AGC] option) and decoders for optimal performance in a functioning system. In this procedure, the variable attenuator is used to set the input to the right level to "fill" the analog-to-digital window without clipping. This optimizes signal-to-noise performance.

You can use the following tools and equipment for testing and adjustment:

- Power Meter **OR** Spectrum Analyzer (HP8591 or equivalent recommended)
- IF Signal Source, supplying signal format to be transported in the system

**CAUTION:** *Electronic modules can be damaged by static electrical discharge. Before handling modules, wear an anti-static discharge wrist strap to prevent damage to electronic components. Place modules in anti-static packing material when transporting or storing. When working on modules, always place them on an approved anti-static mat that is electrically grounded.*

1. Generate a test signal, using the signal format to be transported in the system. If possible at the time of setup, use the actual signal input that will be transported in the system.

2. Connect the IF signal cable to the "VIDEO INPUT/OUTPUT" connector on the backpanel of the DV6016ES shelf at the slot location of the IF encoder module (see Figure 7).

**At the DV6101NCE encoder** - ***Analog NTSC source*** - The signal applied to the encoder must be at an intermediate frequency (IF) with the video carrier at 45.75 MHz and, if composite, the audio carrier at 41.25 MHz. The video carrier input level must be between +24 dBmv and +45 dBmv in a 75 ohm impedance system, or between -23.0 and -2.0 dBm in a 50 ohm system, with the audio subcarrier at 13 dB below the video carrier.

*8 VSB, QAM64, and QAM256 source.*

The QAM 64, QAM 256, or 8 VSB IF signal applied to the encoder must be between -23 and -5 dBm with 50 ohm impedance, or between -24.8 and -6.8 dBm with 75 ohm impedance. See Figure 8 for assistance in measuring the level of QAM and 8VSB signals with a spectrum analyzer.

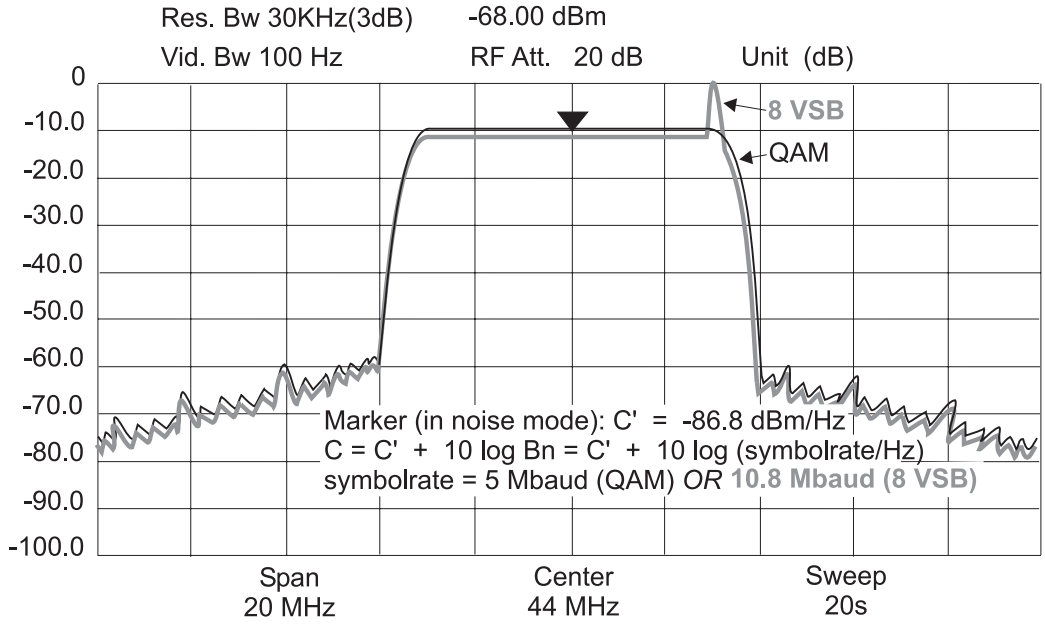


**Figure 8. Measuring QAM and 8VSB Signal Levels with a Spectrum Analyzer**

**Table 6. Typical QAM 64 Readings for the High Performance IF Modules**

Typical values measured at 50 Ω impedance for a **QAM64** 5.06 Mbaud signal

| C' - Sig. marker | C' - Mon sig. marker | 10 LOGBn | SNR | C - Sig. lvl. | C - monitor lvl. |
|---|---|---|---|---|---|
| *High Performance IF Encoder - Maximum Input* | | | | | |
| -72.04 dBm/Hz | -66.0 dBm/Hz | 67.04 | 34.0 | -5.0 dBm | -5.0 dBm |
| *High Performance IF Decoder Output with the max. encoder input above* | | | | | |
| -72.04 dBm/Hz | -72.04 dBm/Hz | 67.04 | 34.1 | -5.0 dBm | -5.0 dBm |
| *High Performance IF Encoder - Minimum Input* | | | | | |
| -90.04 dBm/Hz | -66.0 dBm/Hz | 67.04 | 34.0 | -23 dBm | -23 dBm |
| *High Performance IF Decoder Output with the min. encoder input above* | | | | | |
| -90.04 dBm/Hz | -90.04 dBm/Hz | 67.04 | 33.7 | -23 dBm | -23 dBm |

**Table 7. Typical Readings for QAM256 IF on the High Performance IF Modules**

Typical values measured at 50Ω impedance for a **QAM256** 5.3 Mbaud signal

| C' - Sig. marker | C' - Mon sig. marker | 10 LOGBn | SNR | C - Sig. lvl. | C - monitor lvl. |
|---|---|---|---|---|---|
| *High Performance IF Encoder - Maximum Input* | | | | | |
| -72.24 dBm/Hz | -66.2 dBm/Hz | 67.24 | 34.1 | -5.0 dBm | -5.0 dBm |
| *High Performance IF Decoder Output with the max. encoder input above* | | | | | |
| -72.24 dBm/Hz | -72.24 dBm/Hz | 67.24 | 34.2 | -5.0 dBm | -5.0 dBm |
| *High Performance IF Encoder - Minimum Input* | | | | | |
| -90.24 dBm/Hz | -66.3 dBm/Hz | 67.24 | 33.4 | -23 dBm | -23 dBm |
| *High Performance IF Decoder Output with the min. encoder input above* | | | | | |
| -90.24 dBm/Hz | -90.24 dBm/Hz | 67.24 | 33.4 | -23 dBm | -23 dBm |

**Table 8. Typical Readings for 8 VSB IF on the High Performance IF Modules**

Typical values measured at 50Ω impedance for an **8 VSB** 10.76224 Mbaud signal

| C' - Sig. marker | C' - Mon sig. marker | 10 LOGBn | SNR | C - Sig. lvl. | C - monitor. lvl. |
|---|---|---|---|---|---|
| *High Performance IF Encoder - Maximum Input* | | | | | |
| -75.32 dBm/Hz | -71.4 dBm/Hz | 70.32 | 34.0 | -5.0 dBm | -5.0 dBm |
| *High Performance IF Decoder Output with the max. encoder input above* | | | | | |
| -75.32 dBm/Hz | -75.32 dBm/Hz | 70.32 | 34.1 | -5.0 dBm | -5.0 dBm |
| *High Performance IF Encoder - Minimum Input* | | | | | |
| -93.32 dBm/Hz | -71.4 dBm/Hz | 70.32 | 34.0 | -23 dBm | -23 dBm |
| *High Performance IF Decoder Output with the min. encoder input above* | | | | | |
| -93.32 dBm/Hz | -93.32 dBm/Hz | 70.32 | 33.7 | -23 dBm | -23 dBm |

3.Observe the front panel of the encoder module. When the signal is detected by the **DV6101NCE** encoder, the "STAT" LED on the front panel will light green if the signal is above the programmed minimum threshold.

4. Connect a spectrum analyzer to the front panel IF monitor port and observe the signal. On the DV6101NCE, the signal at the monitor port is the input signal after manual or automatic gain adjustment, but before signal processing and A/D conversion.

5. Turn the adjustment pot (LVL) clockwise until the amber CLIP LED lights. Then, slowly rotate the pot counterclockwise just until the CLIP LED goes out. Record the signal level.

**NOTE:** This manual adjustment cannot be made, and is not needed, on encoders that are set up to use the Automatic Gain Control (AGC) option.

**At the IF Decoder**

1. Ensure that an IF output 75 Ohm coaxial cable is attached to the backpanel VIDEO INPUT / OUTPUT connector at the appropriate slot location.

2. Check that the status LEDs on the in-shelf controller and receiver card(s) are green to ensure that the fiber optic link interface is operating properly.

3. Check that the status LED (STAT) on the IF decoder card is green, showing that it is receiving a translated IF signal from the upstream encoder.

4. Connect a power meter to the front panel IF MON port, and measure the signal power level. If a power meter is not available, connect a spectrum analyzer to the front panel IF MON port, and measure the power level. See Figure 8 for an explanation of how to measure QAM and 8 VSB signal power levels with a spectrum analyzer. See Table 6 for typical readings for QAM 64 IF on the High Performance IF cards. See Table 7 for typical readings for QAM 256 IF on the High Performance IF cards, and Table 8 for typical readings for 8VSB IF on the High Performance IF cards. The signal at the front panel monitor port is identical to the output at the rear of the shelf.

5. While watching the reading on the power meter, or the display on the spectrum analyzer, rotate the **LVL** adjustment pot on the decoder front panel until the amplitude of the video carrier on the spectrum analyzer display is at the desired output level. This will produce the desired IF video output level at the VIDEO INPUT / OUTPUT connector.
   **Typically, this should be:**

   **For analog NTSC:** +30 to +45 dBmV (at 75 ohm impedance) *at the front panel monitor,* indicating an identical output at the back of the shelf .

   **For 8 VSB:** -24.8 dBm to -3.8 dBm (at 75 ohm impedance) carrier *at the front panel monitor,* indicating an identical output at the back of the shelf .

   **For <u>QAM Signals</u>:** -24.8 dBm to -3.8 dBm (at 75 ohm impedance) *at the front panel monitor,* indicating an identical output at the back of the shelf .

## E. PERFORM LOOP BACK TESTING

**Summary**: This procedure tests the operation of encoder/decoder cards in a single DV6000 shelf. In this test, multiple encoder cards' outputs can be routed to a decoder card of the same type to test the function of the encoders. Or the output from an encoder card can be routed to multiple decoder cards, to test the function of the decoders.

1. Be sure the power supply in the equipment shelf is on.

**CAUTION:** *Electronic modules can be damaged by static electrical discharge. Before handling modules, wear an anti-static discharge wrist strap to prevent damage to electronic components. Place modules in anti-static packing material when transporting or storing. When working on modules, always place them on an approved anti-static mat that is electrically grounded.*

**NOTE:** In the DV6000 equipment shelf, the channels can only be looped back for testing with a second-generation controller card (MX2, DX2, or DAP2) installed in the shelf.

2. **"Transmit" Shelf -** In a DV6000 shelf with an "MX2" multiplexer, put a decoder card into any open slot in the shelf; the MX2 firmware will detect the decoder's location. **In any other DV-family shelves, see the control software manual for information on setting up loopbacks.**
**"Receive" Shelf -** With a "DX2" demultiplexer, put an encoder card into any open slot in the shelf; the DX2 firmware will detect the encoder's location. **In any other DV-family shelves, see the control software manual for information on setting up loopbacks.**
**DAP Shelf -** Cards can be put in any slot, but loopback can be set up by software only. **See the control software manual for information on setting up loopbacks.**

**NOTE:** The decoder and encoder cards used must be compatible.

3. Connect the input connector of a video test set to the "Video Input/Output BNC" connector for the slot where the decoder was inserted into the shelf. See Figure 9.

4. Turn on the video test-set and set it to detect the presence of the signal being sent.

5. Turn on the video generator and set it to produce a video test signal.

6. **"Transmit" Shelf** - Insert the encoder card to be tested into any encoder/decoder slot other than the one in which the decoder was inserted in step 2.
**"Receive Shelf"** - Insert the decoder card to be tested into any encoder/decoder slot other than the one in which the encoder was inserted in step 2.
**DAP Shelf -** Cards can be in any slot, but loopback can be set up by software only.

**NOTE:** This test is typically performed in a populated shelf. Ordinarily, the technician simply replaces one of the resident cards with a complementary card (encoder replaced by decoder; decoder replaced by encoder.) Then all resident cards are tested separately.

7. With a multiplexer or demultiplexer card, set the LCL LBK rotary switch (on the front panel of the mux or demux card) to the slot number of the card to be tested (See Figure 9.). **Switch position "0" corresponds to equipment slot #1.** With a DAP card, setup for loopback testing must be done through software - either local craft interface, or network monitoring/control.

8. Connect the output of the signal source to the “Video Input/Output BNC” connector for the encoder card (See Figure 9. ). The “Video Input/Output BNC” connectors are located on the backpanel of the shelf.

9. Check for the presence of decoded video signal with the spectrum analyzer. If the signal is present, consider the card being tested to be verified, and go to step 11. If no signal is present, check the following items to be ensure the validity of this test. Confirm that:

   - the test signal is live,
   - that the connections between the signal generator and the equipment shelf’s BNC connector are secure,
   - that the connections between the video test set and the equipment shelf BNC connector are secure,
   - that the encoder and decoder cards are properly seated in their connection to the equipment shelf sockets,
   - that the multiplexer/demultiplexer/DAP card has been properly seated in its connection to the equipment shelf socket, and
   - that the Local Loopback switch on the multiplexer/demultiplexer card has been set to the correct slot position for the card under test.

10. If all items listed in step 9 have been verified, and there is still no signal present, consider the card under test to be faulty. Replace the card.

11. If additional cards are to be tested, repeat steps 6 through 11.

12. The slot initially chosen for the testing card in step 2 may have originally been occupied by a resident card during normal operation of the shelf. Reposition cards, if necessary, to test the displaced card.

13. Remove the testing card from its slot.

14. Install all encoder/decoder cards into the slots designated for them in the site-plan documentation.

15. Turn off the power and disconnect the signal source and the spectrum analyzer.

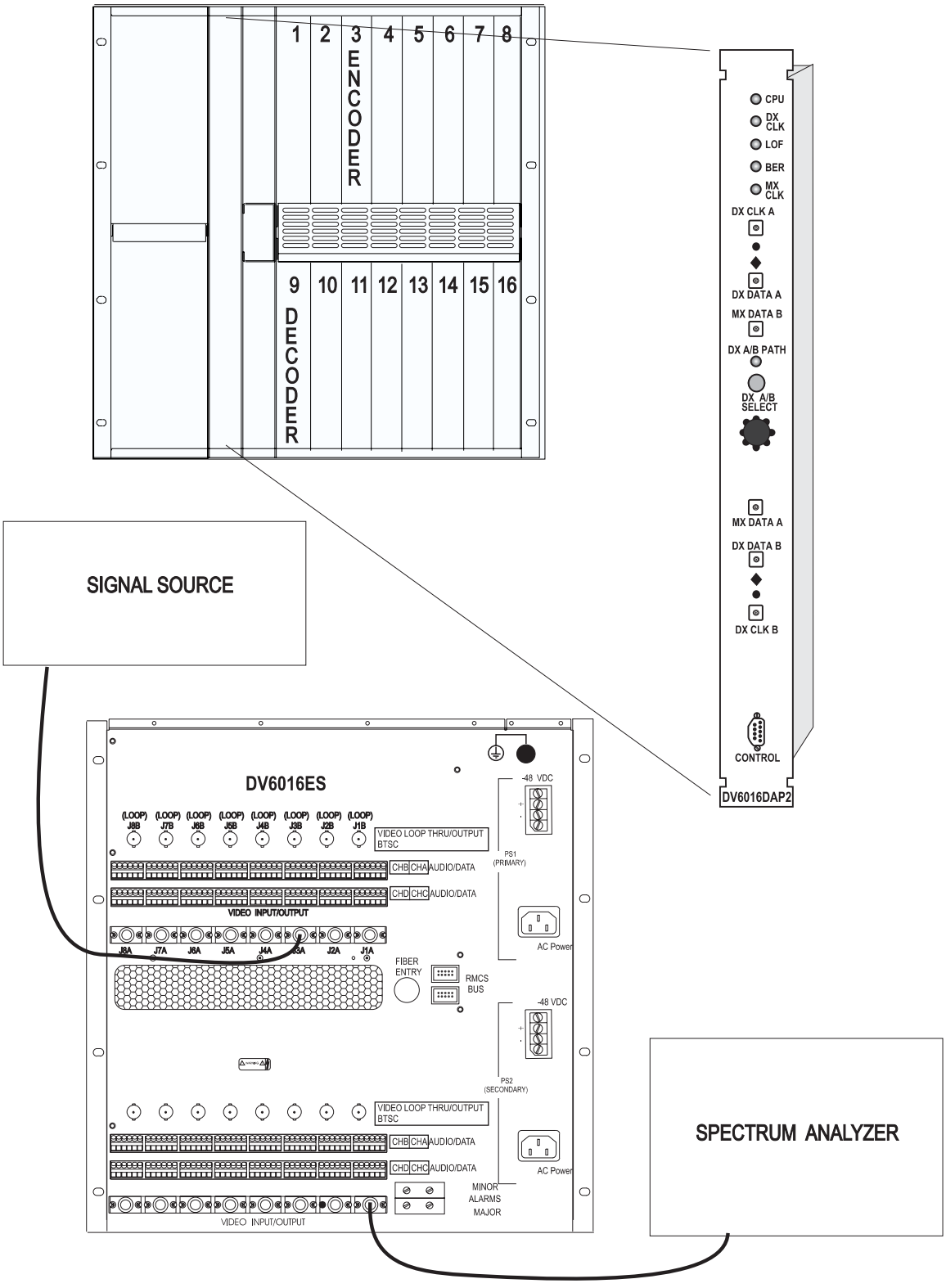


**Figure 9. Equipment Set-Up for Encoder Loop back Testing in DV6000 Transmit Shelves**

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# SECTION 3 TECHNICAL SPECIFICATIONS

The following table contains performance specifications for High Performance NTSC IF Video Transport. Specifications are subject to change without notice.

### High Performance IF Video Transport Specifications

| END-TO-END PERFORMANCE | |
|---|---|
| **PARAMETER** | **SPECIFICATION** |
| Passband | 41.00 to 46.75 MHz at ± 0.4dB |
| Bandwidth | ( -3dB) 40.90 to 46.90 MHz |
| Group Delay Ripple : | 20ns p-p max |
| Phase Noise : | ≤ -71 dBc/Hz, @ 100Hz Offset |
| | ≤ -91 dBc/Hz, @ 1KHz Offset |
| | ≤ -98 dBc/Hz, @ 10Khz Offset |
| | ≤ -110 dBc/Hz, @ 100KHz Offset |
| | ≤ -117 dBc/Hz, @ 1 MHz Offset |
| In-Band/Out of Band Spurious | -60 dBc |
| **Digital** | |
| Digital Input IF Signal Power Level | -23.0 dBm to –5.0 dBm @ 50ohm |
| | -24.8 dBm to –6.8 dBm @ 75ohm |
| Digital Output IF Signal Power Level | -24.75 dBm to –3.8 dBm (75 ohm termination) |
| 64 QAM EVM Contribution | 1.8% max |
| 256 QAM EVM Contribution | 2% max |
| 8 VSB EVM Contribution | 2.5% max |
| **Analog** | |
| Analog Input IF Signal Power Level | +24dBmV to +45 dBmV |
| Analog Output IF Signal Power Level | +30 dBmV to +45 dBmV |
| CNR<br>*w/ noise floor measured at 1.25 MHz offset from single 45.75MHz unmodulated carrier input to encoder at min. input level with 5.75Mhz bandwidth | 56 dB min @ 40 – 45 dBmV input/output<br>54 dB min @ 35 – 40 dBmV input/output<br>52 dB min @ 24 – 35 dBmV input/output |
| Video SNR | 59 dB min. |
| Chroma/Luma Gain Inequality | 100 ± 3% max. |
| Chroma/Luma Delay Inequality | +15ns max |
| **Physical** | |
| Dimensions | 1.19” W x 7.75” H x 9.14” D (One DV6000 slot ) |
| Weight | < 4 lbs |
| Power | < 14.5 Watts |
| Operating Temperature | 10°C to 50°C |
| Storage Temperature | -40°C to +70°C |
| Humidity | 10% to 90%, non-condensing |