Alcorn McBride Inc.

Digital Video Machine
User's Manual

DVM-7400

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Every effort has been made to assure the accuracy of the information contained in this manual, and the reliability of the Alcorn McBride DVM7400 Digital Video Machine hardware and software. Errors can sometimes go undetected, however. If you find one, please bring it to our attention so that we can correct it for others. Alcorn McBride welcomes comments and suggestions on the content and layout of its documentation.

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Table of Contents

Welcome!

Thank you for purchasing The Alcorn McBride Digital Video Machine™ DVM7400. The Digital Video Machine, or DVM for short, is designed to be an ultra reliable video playback source for permanent installations. It can provide hours of superb digital video and audio. We've tried to think of everything you'd need in a stand-alone video player – three types of video outputs, four types of audio outputs, and numerous control interfaces make the DVM incredibly flexible.

The DVM was designed to be a solid-state drop-in replacement for many different brands of DVD players and other types of video players, in a wide variety of applications. With no moving parts, it's far more than a DVD player replacement, offering both standard and optional features that go way beyond what ordinary video playback solutions can offer including SMPTE 259M SDI digital video, RGB-HV or YUV analog video, balanced audio, Dolby Digital bitstream or S/PDIF digital audio, parallel control, built-in real-time scheduling, Ethernet, and many other features. The DVM is the ultimate choice for almost any new video installation.

We hope you enjoy using it as much as we enjoyed designing it. Have fun with your new Digital Video Machine!

We would like to provide you with the latest Firmware updates for your DVM and notify you when additional features become available. Please visit :

http://alcorn.com/library/lists/subscribe.html

to sign up for automatic notifications of Firmware upgrades. You can also visit http://www.alcorn.com/support/firmware.html to check for upgrades.

Standard Features

The Digital Video Machine DVM7400 offers a wide variety of standard features including:

- High resolution MPEG-2 Video at up to 15 Mbps

- Plays from solid state Compact Flash media

- Scheduled playback from built-in Real Time clock

- Operates from 12VDC to 24VDC (power supply included)

- GPS (Global Positioning Satellite) triggering capability

- Composite video output on RCA connector

- Unbalanced Stereo analog audio on RCA connectors

- 720 x 480 (NTSC) or 720 x 576 (PAL) Resolution

- Seamless video transitions

- Stores thousands of individual video files

- Serial RS-232 Control is Pioneer LDP compatible.

- Removable Compact Flash.

- Parallel inputs provide discrete control of 15 files.

Optional Features

You can order your Digital Video Machine with the following optional features:

Model Number	Features
DVM7400/E*	10/100BaseT Ethernet for control and FTP file transfers
DVM7400/A	20Wx2 Speaker level outputs on screw terminals.
DVM7400/B	Balanced analog audio on combo XLR-1/4 inch connectors and S/PDIF or Dolby 5.1 Digital bitstream on RCA connector.
DVM7400/D	SMPTE292M SDI output on BNC connector with Composite or Blackburst sync input on BNC connector and S/PDIF or Dolby 5.1 Digital bitstream on RCA connector.
DVM7400/P	RGBHV or YUV analog on HD15 connector with Composite or Blackburst sync input on BNC connector and S/PDIF or Dolby 5.1 Digital bitstream on RCA connector.
DVM7400/R	RGBHV or YUV analog on HD15 connector.

*Note: The Ethernet option can be combined with any of the other options. (For example, the DVM7400/A/E includes both the Amplifier and Ethernet options)

Technical Support

You can obtain information about specifying, installing, configuring, updating and programming your Alcorn McBride Digital Video Machine from several sources:

For…	Contact…	When?…
Firmware Updates	http://www.alcorn.com/support	Any Time
Knowledge Base	http://www.alcorn.com/kb	Any Time
E-mail Support	support@alcorn.com	Any Time
Fax Support	(407) 296-5801	M-F 9am-5pm (EST)
Telephone Support	(407) 296-5800	M-F 9am-5pm (EST)

Getting Started

Throughout this manual you will find detailed discussions on all the features of the product. But below are a few points to get you going with the Digital Video Machine right out of the box!

Playing a Test Video

Every DVM comes with a Compact Flash card that is preloaded with an Alcorn McBride test clip. The card is already installed in the DVM's Compact Flash socket. To get the DVM to play this test clip, please follow these step-by-step directions.

- Don't plug anything in yet!

- Connect the red and white audio RCA jacks to an amplifier capable of playing line level in signals.

- Set the Volume Control knob to 50%. At 50%, the notch in the volume knob should be facing straight up (12 o'clock).

- Connect a video monitor to the yellow composite video RCA connector.

- Plug in the DVM with the included power supply. The status LED should briefly blink green and then remain off. If this is not the case, refer to the **Troubleshooting Guide** for assistance.

- Press the black test button located on the front-panel beside the status LED.

- Verify you see the status LED turn Green. At this time, you should be seeing video and hearing audio.

NOTE: If you have any trouble identifying any components mentioned is this guide, refer to the diagrams in the **Controls and Indicators** section. Controls and Indicators

Alcorn McBride Digital Video Machine DVM-7400 User's Manual Rev 1.5

Controls and Indicators

The Digital Video Machine provides controls that can accommodate a wide variety of installations. The front panel incorporates a test button, status indicator, and a Compact Flash Socket. The rear panel provides the composite video, unbalanced audio outputs, and control connectors. Depending on which option cards are installed, the rear panel can also contain speaker-level outputs, balanced audio, digital audio, digital video, component video, video sync, or Ethernet.

Test Button ——— Status LED

Compact Flash Socket

Parallel Control Connector

Optional Ethernet Jack (/E option)

A/V Module Option Slot

Power Input

L/R Line-Level Audio Outputs

RS232 Connector

Composite Video Output

Volume Control
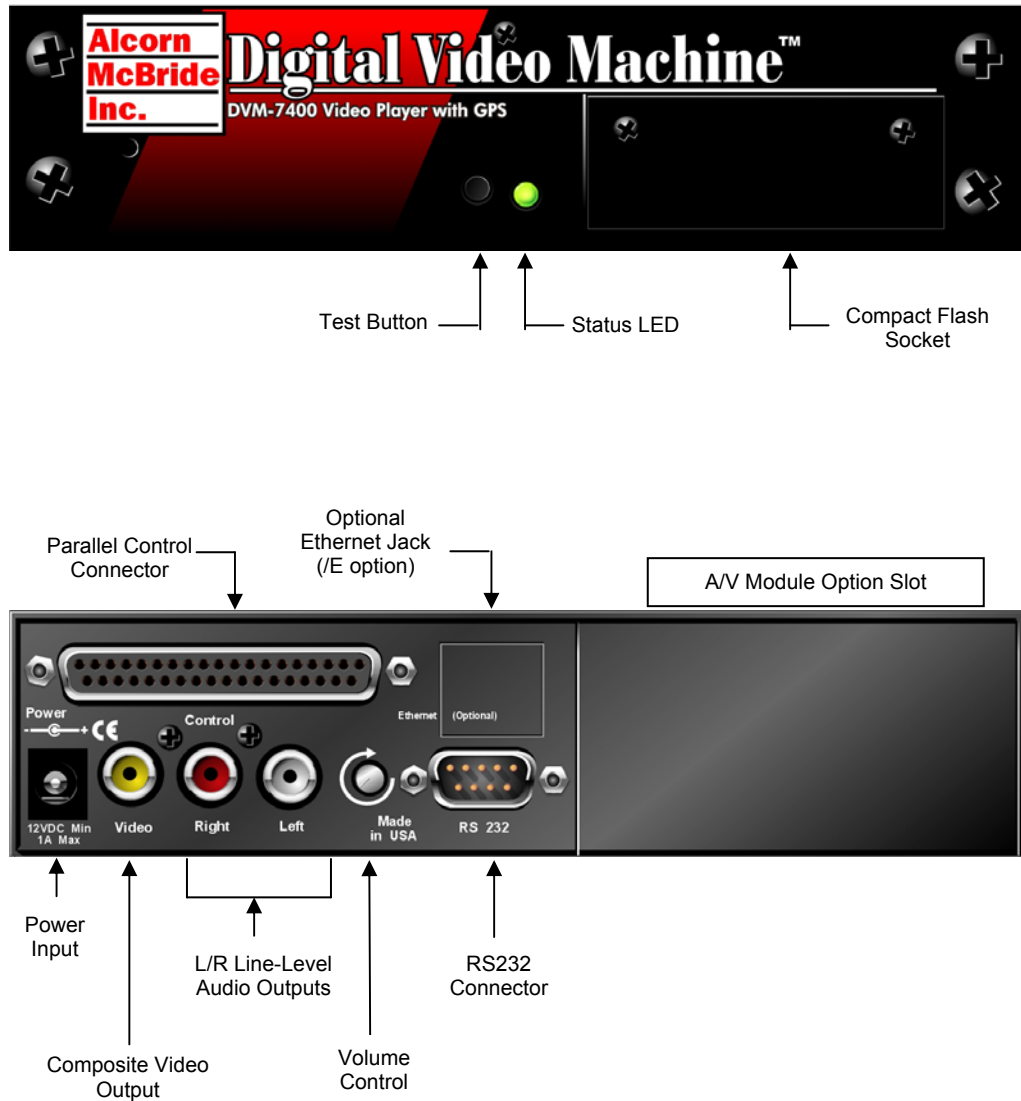
Test Button

The test button will not trigger playlists. It will only trigger videos that are named using the VIDxxxxx.MPG convention.

A push-button is located on the front of the unit. This button is used to "test" play the unit and will play the **lowest number video file** on the media. For example, if the media contained the files **VID00001.MPG** and **VID00002.MPG, VID00001.MPG** would be triggered by the test button.

The test button is also used to format the Compact Flash card. If you hold in the test button while inserting the card, a format operation will take place. While formatting, the Status LED will turn orange. The operation varies in duration based on media size and type. It can take anywhere from 1-60 seconds to format the card. The operation is complete when the status LED turns off.

IMPORTANT: Formatting will result in the loss of all data on the Compact Flash card!

Status LED

A multi-color LED located on the front of the DVM indicates status.

LED Behavior	LED Meaning
Steady green	Playing
Steady orange	Paused, Stilled, Searched, Formatting Media
Steady red	Audio Muted
Flashing red	Fault, No Compact Flash Card
Flashing green	Drive Access or GPS input active
Flashing green/red/orange	Updating OS
Off	Idle

The LED blinks green briefly during initialization.

Configuration DIP Switches

Two sets of Configuration DIP Switches are located on the side of the DVM. One set contains a bank of four switches, while the other has two switches. In this section, ON refers to the DIP switch being in the DOWN position, while OFF means it is in the UP position.

NOTE: On some models, you may be required to flip open the DVM's top panel to access the configuration DIP switches. Also, be sure to configure these switches before mounting the DVM or they may be inaccessible.

Voltage / Contact Closure

The first key in the 4-key bank selects between voltage inputs or contact closures for the discrete controls. More information on these inputs may be found in the section entitled **Rear Panel Connectors**. For contact closure mode, set this key to the ON position.

Voltage   Contacts
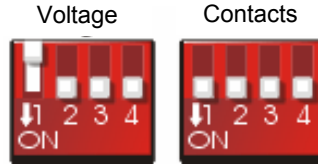
Restore Factory Defaults

Be sure to return this key to the ON position once the defaults have been restored. Failing to do so will result in the DVM restoring the defaults every time it powers on.

Setting the second key in the 4-key bank causes the DVM to reset all stored settings to the factory defaults. These settings include the video configuration, password, network address, and any other non-volatile settings stored on the DVM. Once you switch the key to the OFF position, it only takes a moment to reset the defaults.

Restore Def.   Normal

NTSC / PAL

The third key in the 4-key bank determines whether the DVM's output format is PAL or NTSC. When the key is ON, the DVM will output NTSC. When the key is OFF, the DVM will output PAL.

PAL   NTSC
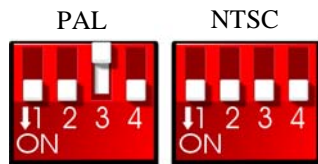
Spare

The fourth key of the 4-key bank is currently unused.

The following two switches are located to the right of the bank of four described above.

Ground Lift

In the event of AC hum, video banding, or other noise caused by potential ground loops the first key on the 2-key DIP switch, may be opened to isolate the DVM's ground from its chassis. To implement a ground lift, turn this switch OFF.

Open   Closed
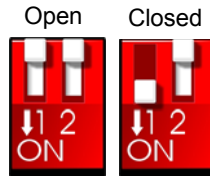
Serial Port Mode

Refer to the GPS section in this manual for details.

For normal serial port control, turn ON the second key on the 4-key DIP switch. To enable GPS mouse operation, turn this switch OFF.

When in GPS mode, the DVM will not respond to Pioneer/AMI commands.

Normal   GPS Mode

Power Connector

The power input is a 2.5x5.5x10mm barrel connector with center pin (+) and the outer rim (-). The Digital Video Machine requires 12.0 VDC to 24.0 VDC at 2 Amp. This is useful for mobile applications where an automotive battery is used to power a Compact Flash Card. An external 100-250 VAC 50/60Hz input universal switching power supply is provided with the unit.

A plastic strain relief can be threaded through slots near the power input jack to secure the barrel connector if the DVM is installed in a high-vibration environment.

DO NOT EXCEED THE SPECIFIED INPUT VOLTAGE RANGE!

Audio/Video Outputs

The audio RCA outputs provide a standard -10dbu unbalanced signal.

Every DVM comes equipped with unbalanced stereo audio as well as composite video outputs. These outputs are provided on RCA jacks that are color-coded.

The composite video type can be set to NTSC or PAL using a DIP-switch on the DVM's side-panel.

Serial Port: DB-9 Connector

A serial cable is provided with each Digital Video Machine.

This input is a standard DB-9 male RS-232C connector. The purpose of this port is to connect to a PC or other control device using a straight-through (**not null-modem**) 9-pin cable. The connector pin assignments are listed in the table below.

Pin	Function
2	TXD (data from DVM)
3	RXD (data to DVM)
5	GND

Volume Control

To increase the volume level, rotate the knob clockwise.

Please refer to the Command Protocol section of this manual for details on changing volume levels remotely.

The volume control is the gray colored knob protruding from the rear of the unit next to the RCA jacks. It controls volume for the audio RCA line level outputs, as well as for the optional speaker or balanced outputs. It does not control the volume on the optional S/PDIF digital audio output.

You can also control the volume via serial control, Ethernet control, or playlists using the Audio Control command. When changing the volume remotely, keep in mind that the setting of the volume control knob is very important. For example, if the knob were set to a level of 75%, 75% would be the maximum volume level that the remote volume control would be able to achieve.

Parallel Port: DB-37 Connector

Be sure to configure the Digital Video Machine for contact closures or voltage inputs <u>before</u> connecting any wires.

This connector provides all of the signals needed to interface to the Digital Video Machine. Files numbered 1 through 15 of the DVM may be played, paused or stopped using eight parallel inputs located on the rear connector. These inputs may be either contact closures such as momentary buttons, or voltage inputs from a controller such as a PLC. The DIP switch located on the side of the unit next to the connector selects between the two input types. More information on these inputs may be found in the section entitled **Parallel Control**.

Two dry-contact relay outputs provide Fault and Playing status (closed when active).

A current-limited (100mA max.) 5VDC output can be used to light external LED indicators, and an extra power supply input exists so that the 37-pin connector can be used to supply power instead of the barrel jack. Any of the ground connections may be used for the return.

1

37

Facing the Discrete Control Port
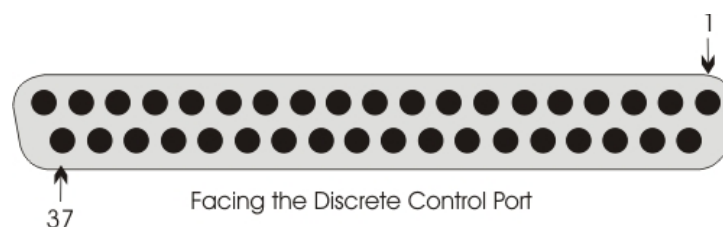
Pin	Function	Pin	Function
1	Resume	20	Ground
2	Still	21	Ground
3	Stop	22	Ground
4	Loop	23	Ground
5	File Select 1	24	Ground
6	File Select 2	25	Ground
7	File Select 4	26	Ground
8	File Select 8	27	Ground
9	Playing Output (contact 1)	28	Playing Output (contact 2)
10	Fault Output (contact 1)	29	Fault Output (contact 2)
11	Resume (voltage input)	30	5 VDC output, 100 mA max.
12	Still (voltage input)	31	Ground
13	Stop (voltage input)	32	Ground
14	Loop (voltage input)	33	Ground
15	File Select 1 (voltage input)	34	Ground
16	File Select 2 (voltage input)	35	Ground
17	File Select 4 (voltage input)	36	Ground
18	File Select 8 (voltage input)	37	Ground
19	Aux Power Supply**		

** This pin is connected directly to the positive (+) barrel tip of the power supply input. When the standard barrel power supply is used, this pin can be used as a power source (for an external device). If the standard supply is not used (and is therefore disconnected), power can be *supplied* to the DVM through pin 19. This is ideal for high vibration environments where a barrel connector is not secure enough to maintain a reliable connection.

Optional Modules

The Digital Video Machine always comes equipped with all of the standard outputs and control interfaces shown at the beginning of the **Controls and Indicators** section. However, the DVM also has a variety of options that can be installed at the factory to increase its capabilities.

Amplifier Option (/A)

Be sure to pay attention to the speaker polarity while making connections.

This version of the Digital Video Machine provides two discrete channels of amplified audio for powering speakers. Each channel is rated at 20 Watts of power at 8Ω. This built-in amplifier features protection that is designed to shutdown the amplifier in the event that the output is overloaded.

IMPORTANT NOTE: Do not bridge the speaker outputs!

Professional Audio Option (/B)

The balanced output level is +4dBu. The S/PDIF output is a standard IEC-958 signal containing either Stereo (2-channel) or Dolby Digital AC3 (5.1 Channel) audio.

When this option is installed, the DVM will supply balanced line-level outputs and a digital audio output. The balanced outputs are provided on combination ¼ inch XLR jacks, and the digital audio output is on an RCA jack.

Professional Video Option (/P)

The S/PDIF output is a standard IEC-958 signal containing either Stereo (2-channel) or Dolby Digital AC3 (5.1 Channel) audio.

When the Digital Video Machine is ordered with the Professional Video option, it will provide a component video output on an HD15 connector.

In addition, this option provides the DVM with the ability to synchronize to an external video sync source using the sync input. The sync output can be used to feed video sync into other devices, such as other DVM's. For more information on the sync features of the DVM, see the **Synchronization** section in this manual.

This option also provides a digital audio RCA jack for outputting S/PDIF Stereo Audio or Dolby Digital 5.1 Surround Sound.

The sync output is NOT a passive connection to the sync input. It actually generates a Composite sync signal.

DIP Switches

*For more information about configuring the DVM for external sync, be sure to read the **Synchronization** section of this manual.*

75Ω Termination

The first switch is used to terminate the sync input connector.

*The colorspace DIP-switch can be overridden with software using remote commands. See the **Command Protocol** section for details.*

Sync Type

The second switch configures the DVM to receive either Blackburst or Composite Sync (C-Sync).

When using RGB colorspace, you have the option to enable or disable Sync-On-Green. This setting can only be changed using remote commands.

RGB/YUV

The third switch selects between RGB and YUV colorspace on the component video output.

HD-15 Pinout

If Sync-On-Green is enabled while in the RGB colorspace mode, the H-Sync and V-Sync signals will be disabled.

RGB Mode Pinout
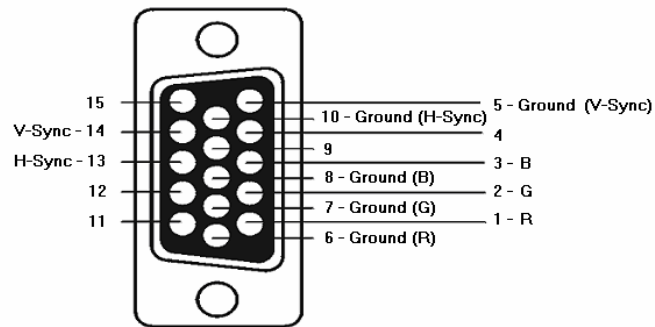
YUV Mode Pinout
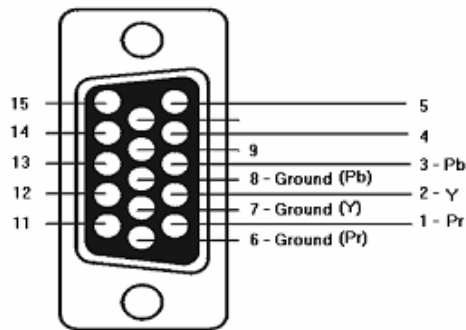
Component Video Option (/R)

When using RGB colorspace, you have the option to enable or disable Sync-On-Green. This setting can be changed using remote commands.

This option provides the DVM-7400 with a component video output on an HD-15 connector. This format can be set to either YUV or RGB using the colorspace command defined in the **Command Protocol**.

The pinout of the HD-15 connector is identical to the HD-15 pinout of the **Professional Video Option**.

Digital Video Option (/D)

The S/PDIF output is a standard IEC-958 signal containing either Stereo (2-channel) or Digital AC3 (5.1 Channel) audio.

A Digital Video Machine equipped with this option provides SMPTE259M digital video on a BNC connector.

In addition, this option provides the DVM with the ability to synchronize to an external video sync source using the sync input. The sync output can be used to feed video sync into other devices (such as other DVM's). For more information on the sync features of the DVM, see the **Synchronization** section in this manual.

This option also provides a digital audio RCA jack for outputting S/PDIF Stereo Audio or Dolby Digital 5.1 Surround Sound.

The sync output is NOT a passive connection to the sync input. It actually generates a Composite sync signal.

DIP Switches

*For more information about configuring the DVM for external sync, be sure to read the **Synchronization** section of this manual.*

75Ω Termination

The first switch is used to terminate the sync input connector.

Sync Type

The second switch configures the DVM to receive either Blackburst or Composite Sync (C-Sync).

Ethernet Module (/E) .

The Digital Video Machine can be ordered with an optional Ethernet Module adding control and file transfer capabilities over a standard Ethernet connection. The Ethernet interface is provided on a standard RJ-45 jack.

Two LED's indicate Ethernet status as shown below. The Green LED should be on whenever an active Ethernet connection is detected, and the Yellow LED flashes whenever Ethernet activity occurs.

Link (Green) ⟶   ⟵ Activity (Yellow)

RJ-45 Jack
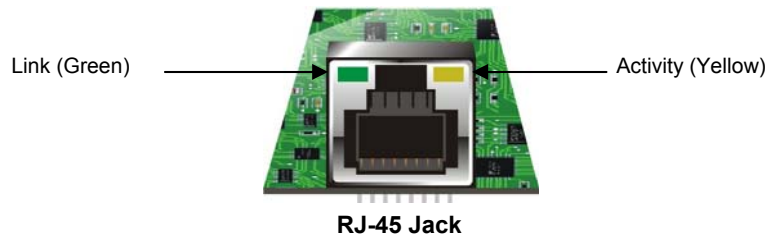
This manual contains sections with more information about Ethernet Control as well as File Transfers using the DVM's FTP interface.

Command Protocol

The Serial., Ethernet., Playlist., Scheduler., and GPS. control interfaces all use the Pioneer./Alcorn McBride Enhanced protocol. This protocol implements nearly all of the Pioneer Laser Disc player command set, but adds commands to access advanced features of the DVM as well. This section discusses the most commonly used commands in detail.

The protocol is ASCII-based. Upper or lower case characters can be used interchangeably. **All commands and responses are terminated with the Carriage Return character. This character is represented by the hexadecimal value 0x0D.**

Addressing Commands

Commands sent to individual units using the address operator (@) will receive a message response, but a wildcard message will not.

Any command can be preceded by <ID>@ where <ID> is the ASCII representation of the unit's Device ID ('0'-'126'). This allows commands to be sent to individual units in a control line of multiple units. The address '127' and '*' act as wildcard ID's; a command sent using '127' or '*' as the ID will cause all units in the control line to execute the command.   The Device ID can be assigned at any time using the Set Device ID command listed in the **Command Protocol** section.

Playback Commands

Select File

Description:	This command causes the DVM to select the specified A/V clip or Playlist. If this is a video clip, the first frame of that clip is displayed. Once this command is sent, the next **Play** command causes the specified file to play from the beginning.
Command Bytes:	**nnnnnSE** or **"<filename>"SE**
Parameters:	**nnnnn** is the ASCII file number between 0-99999. **<filename>** is an ASCII file name surrounded by quotation marks.
Message Response:	**R**
Comments:	This is similar to the "Search to Address" command in chapter addressing mode used in Pioneer Laser Disc protocol. The maximum file number is 99999.
Examples:	Select file 215: **215SE** Select file 4: **4SE** or **"vid00004.mpg"SE** Select file alcorn.mpg: **"alcorn.mpg"SE**

Play

Description:	This command causes the DVM to play the file specified with the **Select File** command. If a clip is stilled or paused, this command resumes playback. If this command is issued while a Playlist is being played, the DVM will advance to the next Playlist entry. This command sends a response when it is executed, and another when the playback is complete.
Command bytes:	**PL**
Message Response:	**R**
Comments:	If the video material ends with a non-black screen, that picture will be displayed until another video file is played.
Example:	Select File 22: **22SE** Play Currently Selected File: **PL**

Play File

Description:	This command is the same as the Play command, except that the file number or name is included in the command. This means that no prior Select File command is required.
Command bytes:	**nnnnnPL** or **"<filename>"PL**
Parameters:	**nnnnn** is the ASCII file number between 0-99999. **<filename>** is an ASCII file name surrounded by quotation marks.
Message Response:	**R**
Comments:	If the video material ends with a non-black screen, that picture will be displayed until another video file is played.
Examples:	Play file 215: **215PL** Play file 4: **4PL** or **"vid00004.mpg"PL** Play file alcorn.mpg: **"alcorn.mpg"PL**

Loop Play

Description:	This command causes the DVM to play the file specified by the **Select File** command and then seamlessly loops back to the beginning. If the file is a Playlist, all of the clips in the Playlist will be played and then the entire Playlist will be restarted.
Command bytes:	**LP**
Message Response:	**R**
Example:	Select File 35: **35SE** Loop Currently Selected File: **LP**

Loop File

Description:
This command is the same as the Loop command, except that the file number or name is included in the command. This means that no prior Select File command is required.

Command bytes:
nnnnnLP or **"<filename>"LP**

Parameters:
nnnnn is the ASCII file number between 0-99999.
<filename> is an ASCII file name surrounded by quotation marks.

Message Response:
R

Examples:
Loop file 215:   **215LP**
Loop file 4:   **4LP or "vid00004.mpg"LP**
Loop file alcorn.mpg: **"alcorn.mpg"LP**

Play Next

Description:
This command causes the specified file to be "queued" for playback at the completion of the current activity. If a file is currently playing, the queued transition to the selected file will be seamless. If a file is currently looping, the seamless transition will occur at the next loop point.

Command bytes:
nnnnnPN or **"<filename>"PN**

Parameters:
nnnnn is the ASCII file number between 0-99999.
<filename> is an ASCII file name surrounded by quotation marks.

Message Response:
R

Example:
Play File 1:   **1PL**
Play File 2 when File 1 is complete: **2PN**

Loop Next

Description:
This command causes the specified file to be "queued" for looping playback at the completion of the current activity. If a file is currently playing, the queued transition to the selected file will be seamless. If a file is currently looping, the seamless transition will occur at the next loop point.

Command bytes:
nnnnnLN or **"<filename>"LN**

Parameters:
nnnnn is the ASCII file number between 0-99999.
<filename> is an ASCII file name surrounded by quotation marks.

Message Response:
R

Example:
Play File 1:   **1PL**
Loop File 2 when File 1 is complete:**2LN**

Still

Description:	This command causes the DVM to still frame. Playback will resume from this position when another Play command is issued. Because the video image is held in a digital buffer, the still frame will be rock solid, and may be held indefinitely without media wear.
Command bytes:	**ST**
Message Response:	**R**
Comments:	If a Select File or Play File command is issued while in Still mode, it will no longer be possible to resume playback from the stilled point.

Pause

Description:	This command functions exactly like the Still command except it causes the video output to display black. When a Play command is received, playback will resume and the video output will be restored.
Command bytes:	**PA**
Message Response:	**R**
Comments:	If a Select File or Play File command is issued while in Pause mode, it will no longer be possible to resume playback from the stilled position.

Stop

Description:	This command causes the DVM to stop video playback. The last frame displayed will remain on screen. If a playlist is in progress, this command will cause the playlist to abort.
Command bytes:	**RJ**
Message Response:	**R**
Comments:	Once a Stop command has been issued, the only way to start video playback again is to issue a Select File or Play File command.

Audio Control

Description:	This command can be used mute and unmute the audio, as well as adjust volume.
Command bytes:	**nAD** or **mmm%AD**
Parameters:	**n** is 0 (Mute) or 1 (Unmute). **mmm** is an ASCII number between 0-100 representing volume level
Message Response:	**R**
Comments:	Whenever the volume level is changed, the DVM remembers this setting even after power is lost. Remember that the volume level set using this command is limited by the level set using the Volume Control knob on the rear-panel of the DVM.
Examples:	Mute Audio: 0AD

Set volume level to 50%:   50%AD

Video Control

Description: This command causes the DVM to mute or unmute the video.

Command bytes: **nVD**

Parameters: **n** is 0 (Black) or 1 (Image).

Message Response: **R**

Active Mode Request

Description: This command causes the DVM to report its Active Operating Mode.

Command bytes: **?P**

Message Response: **Pnn**

Response Data: **nn** is an ASCII number that represents the current playback mode

Response	State
P01	Stopped
P04	Playing
P05	Stilled
P06	Paused

Chapter Request

Description: This command causes the DVM to report its Active Chapter.

Command bytes: **?C**

Message Response: **nnnnn** or **<Filename>**

Response Data: **nnnnn** is a 5-digit ASCII number that represents the active video or playlist
                        <Filename> is the non-numeric video or playlist that is currently active

Examples: Response when vid00001.mpg is active: 00001
                        Response when ply00400.lst is active: 00400
                        Response when alcorn.mpg is active: alcorn.mpg

Frame Request

Description: This command causes the DVM to report the current frame number of the actively
                        playing clip.

Command bytes: **?F**

Message Response: **nnnnnnn**

Response Data: **nnnnn** is a 7-digit ASCII number that represents the frame number

Configuration Commands

Set Colorspace

Description: This command configures the colorspace format for the component video output of the DVM. You can configure this output to use either the RGB or YUV colorspace formats.

Command Bytes: **nVC**

Parameters: **n** is a numeric value that represents the colorspace. **0=RGB**, **1=YUV**

Message Response: **R**

Comments: This command only applies to DVM's with either the **Professional Video(/P)** or **Component Video(/R)** options installed. If you have the Professional Video(/P) option installed, this command will override the colorspace DIP-switch setting. This override will remain in effect until either the DIP-switch value is changed, or another Set Colorspace command is received.

Examples: Set Colorspace to RGB: **0VC**
Set Colorspace to YUV: **1VC**

Set Sync-On-Green

Description: This command configures the type of sync that is used on the component video output when it is operating in the RGB colorspace mode.

Command Bytes: **nSG**

Parameters: **n** is a numeric value that represents the sync on green setting. **0=OFF (RGB-HV)**, **1=ON (RGsB)**

Message Response: **R**

Comments: This command only applies to DVM's with either the **Professional Video(/P)** or **Component Video(/R)** options installed. This command also only applies when the RGB colorspace format is being used. YUV always embeds the sync signal on the 'Y' output.

Examples: Set to RGB-HV: **0SG**
Set to RGsB: **1SG**

Set Brightness

Description: This command configures the Brightness of the DVM's video outputs.

Command Bytes: **nnnBN**

Parameters: **nnn** is a numeric value between 0-100 that represents the Brightness setting. 50 is the default setting.

Message Response: **R**

Set Contrast

Description:	This command configures the Contrast of the DVM's video outputs.
Command Bytes:	**nnnCO**
Parameters:	**nnn** is a numeric value between 0-100 that represents the Contrast setting. 50 is the default setting.
Message Response:	**R**

Set Saturation

Description:	This command configures the Saturation of the DVM's video outputs.
Command Bytes:	**nnnSA**
Parameters:	**nnn** is a numeric value between 0-100 that represents the Saturation setting. 50 is the default setting.
Message Response:	**R**

Set Aspect Ratio

Description:	This command configures the Aspect Ratio of the DVM's video outputs. Normally, the DVM will take the source MPEG video material and stretch it to the size of the video output. This means that no matter what the aspect ratio of your source material is (4:3 or 16:9), it will fill the entire display (whether it's a 4:3 or 16:9 display). This command is used for cases where you don't want this to happen. (ie. Playing 16:9 material on a 4:3 display without stretching the picture vertically)
Command Bytes:	**nAP**
Parameters:	**n** is a numeric value between 0-5 that represents the Aspect Ratio setting. These settings are as follows: 0 = 4:3 Normal 1 = 4:3 Pan-and-Scan 2 = 4:3 Letterbox 3 = 16:9 Normal 4 = 16:9 Letterbox 5 = 16:9 Pan-and-Scan
Message Response:	**R**

Set Test Pattern

Description:	The DVM is capable of generating several built-in test patterns for diagnosing video problems and/or optimizing display settings. This command causes the DVM to display those patterns.
Command Bytes:	**nTP**
Parameters:	**n** is a numeric value between 0-7 that represents the Test Pattern mode. The available modes are as follows: **0** = Test Pattern Off (Normal video output displayed) **1** = ITU Combination Test Signal **2** = Pluge Test Pattern **3** = SMPTE Bars **4** = Step and Pulse Test Pattern **5** = EIA Color Bars **6** = EBU Color Bars **7** = EBU Color Bars (100%)
Message Response:	**R**

Set User Name

Description:	This command sets the user name of the DVM. The user name is used to access the DVM via the FTP interface over the Ethernet connection. The default user name is **admin**.
Command Bytes:	**<username>US**
Parameters:	**<username>** represents a string of ASCII characters that make up the user name.
Comments:	This string of characters is case-sensitive, and must be between 4 and 32 characters in length.
Message Response:	**R**
Examples:	Set user name to "Administrator": **AdministratorUS** Set user name to "Fred": **FredUS**

Set Password

Description:	This command sets the password of the DVM. The password is used to access the DVM via the FTP interface over the Ethernet connection. The default password is **password**.
Command Bytes:	**<password>PW**
Parameters:	**<password>** represents a string of ASCII characters that make up the password
Comments:	This string of characters is case-sensitive, and must be between 4 and 32 characters in length.
Message Response:	**R**
Examples:	Set password to "1234": **1234PW**

Set password to "Stretch": **StretchPW**

Miscellaneous Commands

Format Media

Description:	This command causes the DVM to format the Compact Flash card media that is installed in the Compact Flash socket. **This will erase the contents of the flash card!!!**
Command Bytes:	**FO**
Parameters:	None
Message Response:	**R**
Comments:	The Message Response is received when the format is complete. Cards that are 2GB in size or less are formatted using the FAT16 file system. Cards greater than 2GB in size are formatted using the FAT32 file system.

Set Baud Rate

Description:	This command changes the Baud Rate of the DVM's RS-232 control port.
Command Bytes:	**nBR**
Parameters:	**n** is a numeric value between 0 and 9 that represents the baud rate. These representations are as follows: **0** = 300 baud **1** = 600 baud **2** = 1200 baud **3** = 2400 baud **4** = 4800 baud **5** = 9600 baud (default) **6** = 19200 baud **7** = 38400 baud **8** = 57600 baud **9** = 115200 baud
Message Response:	**R**
Comments:	This setting is temporary, so it will not be retained by the DVM when power is cycled. If you need the DVM to power-up at a different baud rate, you can insert this command into an auto-executing playlist.
Examples:	Set RS-232 port to 2400 baud: **3BR** Set RS-232 port to 19200 baud: **6BR**

Set Device ID

Description: This command is used to configure the Device ID of the DVM. The Device ID is typically used to individually address DVM's that share the same control line.

Command Bytes: **nID**

Parameters: **n** is a numeric value between 0 and 126 that represents the Device ID

Message Response: **R**

Examples: Set the Device ID to 4: **4ID**

Software Reset

Description: This command will reset the DVM, just as if the power were cycled.

Command Bytes: **XX**

Parameters: None

Message Response: None (System will immediately reset without responding)

Send Serial String

Description: This command causes the DVM to send a user-defined serial string out of its RS-232 control port. This can be handy for using the DVM to activate other RS-232 controlled devices (ie. Turning on Displays, Projectors, etc.)

Command Bytes: **<serial string code>SS**

Parameters: **<serial string code>** is a string of coded ASCII characters that tell the DVM how to assemble the actual serial message.

Comments: The serial string code gives you the capability to assemble any kind of serial message, even those containing non-displayable ASCII characters (ie. Carriage Return, Line Feed, etc.). To include alpha-numeric ASCII characters in your serial string, you simply wrap them in quotation marks. To send hexadecimal bytes, you simply precede the Hexadecimal value with the letter **'h'**. To understand exactly how this is done, see the examples below.

Message Response: **R**

Examples: Send the ASCII string "Start": **"Start"SS**
Send the ASCII string "Start" terminated by a CR: **"Start"h0dSS**
Send the hexadecimal characters 0x01 0x02 0x03: **h01h02h03SS**

Set Relay Outputs

Description:	This command allows you to manually control the 2 relay outputs on the DVM's Parallel control connector.
Command Bytes:	**<Code>RL**
Parameters:	**<Code>** is one or more characters that define which relay to control, and what state it should be in. The available codes are:

1P = Turns ON Play Relay
0P = Turns OFF Play Relay
1F = Turns ON Fault Relay
0F = Turns OFF Fault Relay
X = Returns Relays to default Play/Fault operation

Comments:	Once a relay is manually set or cleared, it will no longer resume it's default operation. For example, the Play relay will no longer turn on and off automatically depending on the playback mode. The relays will remain in the commanded state until they are changed manually once again, or until the **X** parameter is used to return them to default operation
Message Response:	**R**

Examples:		
	Turn ON Play Relay	**1PRL**
	Turn OFF Fault Relay:	**0FRL**
	Return Relays to default operation:	**XRL**

Set On-Screen Display (OSD)

Description:	This command causes the DVM to display one of several available On-Screen diagnostic displays. These displays contain a great deal of information that can be used to verify configuration as well as troubleshoot problems.
Command Bytes:	**nOS**
Parameters:	**n** is a number between 0 and 4 that represents the OSD to be displayed. The available OSD screens are as follows:

0 = OSD OFF (Normal Operation)
1 = Display System Configuration Screen
2 = Display Video Information Screen
3 = Display Audio Information Screen
4 = Display Activity Log

Comments:	The OSD screens are translucent, so the video is still visible in the background.
Message Response:	**R**

Examples:		
	Display Activity Log:	**4OS**
	Turn OFF OSD:	**0OS**

Command Error Codes

Any **R** response will be replaced by a message of the form **Enn** (where **nn** represents the error code) if an error occurs. The error codes are listed in the following table.

Error Code	Description	What to Do:
E00	Communication Error	Check your serial settings
E04	Feature Not Available	Have you entered the correct command? Check for avail.
E06	Invalid Argument	The parameters of the command are not formatted correctly
E11	Media Not Present	Is the Compact Flash inserted? Formatted? A recommended brand?
E12	Search Error	Selecting the correct file? Is the file on the card? Is it named correctly?
E99	Fatal System Error	Contact Alcorn Support to diagnose this failure

Command Protocol Summary

The following tables list all of the commands that are supported by the DVM. Additional playlist commands can be found in the Playlist Control section of this manual.

Playback Command List

Description	Command Bytes	Response	Comments
Select File (Number)	nnnnnSE	R	n = File number (0-99999)
Select File (Name)	”<filename>”SE	R	<filename> = filename with extension (ie. Test.mpg)
Play	PL	R	Plays selected file
Loop Play	LP	R	Plays and loops selected file
Play File (Number)	nnnnnPL	R	n = File number (0-99999)
Play File (Name)	”<filename>”PL	R	<filename> = filename with extension (ie. Test.mpg)
Loop File (Number)	nnnnnLP	R	n = File number (0-99999)
Loop File (Name)	”<filename>”LP	R	<filename> = filename with extension (ie. Test.mpg)
Play Next	nnnnnPN	R	n = File number (0-99999)
Loop Next	nnnnnLN	R	n = File number (0-99999)
Still	ST	R	Picture remains
Pause	PA	R	Picture goes black
Stop	RJ	R	Picture remains
Audio Control (Mute)	nAD	R	n=0(Mute), n=1(Unmute)
Audio Control (Volume)	nnn%AD	R	nnn = volume level from 0-100
Video Control	nVD	R	n=0(Black), 1=(Image)
Active Mode Request	?P	P0n	n=1(Stopped), 4(Playing), 5(Stilled), 6(Paused)
Chapter Request	?C	nnnnn <filename>	nnnnn = file number <filename> = ASCII filename
Frame Request	?F	nnnnnnn	nnnnnnn = current video frame of clip being played

Configuration Command List

Video Configuration Commands			
Description	**Command Bytes**	**Response**	**Comments**
Set Colorspace	nVC	R	n=0(RGB), n=1(YUV)
Get Colorspace	VC	n	n=0(RGB), n=1(YUV)
Set Sync-on-Green	nSG	R	n=0(RGB-HV), n=1(RGsB)
Get Sync-on-Green	SG	n	n=0(RGB-HV), n=1(RGsB)
Set Brightness	nnnBN	R	n=Brightness Level (0-100)
Get Brightness	BN	nnn	n=Brightness Level (0-100)
Set Contrast	nnnCO	R	n=Contrast Level (0-100)
Get Contrast	CO	nnn	n=Contrast Level (0-100)
Set Saturation	nnnSA	R	n=Saturation Level (0-100)
Get Saturation	SA	nnn	n=Saturation Level (0-100)
Set Aspect Ratio	nAP	R	n=0 →4:3 Normal n=1 →4:3 PanScan n=2 →4:3 Letterbox n=3 →16:9 Normal n=4 →16:9 Letterbox n=5 →16:9 PanScan
Get Aspect Ratio	AP	b	n = number between 1-5 representing aspect ratio
Set Test Pattern	nTP	R	n=0 → Test Pattern Off n=1 → ITU Combination n=2 → Pluge n=3 → SMPTE Bars n=4 → Step/Pulse n=5 → EIA Color Bars n=6 → EBU Color Bars n=7 → EBU Color Bars

Ethernet Configuration Commands			
Description	**Command Bytes**	**Response**	**Comments**
Set IP Address	xxx.xxx.xxx.xxxIP	R	
Set Subnet Mask	xxx.xxx.xxx.xxxSM	R	
Set Gateway	xxx.xxx.xxx.xxxGW	R	
Get IP Address	IP	xxx.xxx.xxx.xxx	
Get Gateway Address	GW	xxx.xxx.xxx.xxx	
Get Subnet Mask	SM	xxx.xxx.xxx.xxx	
Set FTP User Name	<Username>US	R	<Username> = ASCII user name (up to 32 characters)
Get FTP User Name	US	<Username>	
Set FTP Password	<Password>PW	R	<Password> = ASCII password (up to 32 characters)
Get FTP Password	PW	<Password>	

Scheduler & GPS Commands			
Description	**Command Bytes**	**Response**	**Comments**
Set Time Zone	nTZ	R	n= number of hours behind UTC (ex. Orlando is 5TZ)
Get Time Zone	TZ	n	n= number of hours behind UTC (ex. Orlando is 5TZ)
Set Longitude	nLO	R	n= longitude ex. 26LG, n26LG, -15LG, s15LG
Get Longitude	LO	n	
Set Latitude	nLA	R	n= latitude ex. 26LA, w26LA, -15LA, e15LA
Get Latitude	LA	n	
Set Date	mm/dd/yyyyDA	R	2-digit years are accepted also.
Get Date	DA	mm/dd/yy	
Set Time	hh:mm:ssTI	R	Military time
Get Time	TI	hh:mm:ss	Military time
Set DST Support	nSD	R	n=1(DST On),n=0(DST Off)
Get DST support	SD	n	n=1(DST On),n=0(DST Off)
Set DST Type	nnnDT	R	nnn = USA, UTC, or AUS
Get DST Type	DT	nnn	nnn = USA, UTC, or AUS

Miscellaneous Commands			
Description	**Command Bytes**	**Response**	**Comments**
Format Media	FO	R upon completion	All data on media will be erased!
Set Baud Rate	nBR	R	n = 0 → 300 baud n = 1 → 600 baud n = 2 → 1200 baud n = 3 → 2400 baud n = 4 → 4800 baud n = 5 → 9600 baud(default) n = 6 → 19200 baud n = 7 → 38400 baud n = 8 → 57600 baud n = 9 → 115200 baud
SendString	"string"SS	R	Sends string out serial port.
Set Device ID	nID	R	n = Device ID (0-126)
Get Device ID	ID	n	n = Device ID (0-126)
Get Firmware Version	?V	DVM-7400 Vx.xx	x.xx = Firmware Version
Manual Output Relay Control	nRL	R	n = 1P (turns on Play relay) n = 0P (turns off Play relay) n = 1F (turns on Fault relay) n = 0F (turns off Fault relay) n = X return relays to normal function
Software Reset	XX	--	Same as power-on reset.
On-Screen Display (OSD)	nOS	R	n = 0 → OSD Off n = 1 → System Info Screen n = 2 → Video Info Screen n = 3 → Audio Info Screen n = 4 → Activity Log Screen

Serial Control

The Digital Video Machine can be controlled using the male DB-9 RS-232 connector on the rear panel. If you are interfacing to the DVM with a PC or other type of controller, you will need to use a straight-through DB-9 Female to DB-9 Female serial cable. For your convenience, this cable has been included with your DVM.

This serial interface defaults to 9600 baud, no parity, 8 bits per character, and one stop bit (9600,8,N,1). If you need to use a different baud rate, you can change it using the Baud Rate command listed in the **Command Protocol** section.

All serial commands are ASCII based, and are terminated with a carriage return (hexadecimal value 0x0D). The complete list of supported commands can be found in the **Command Protocol** section as well.

For your convenience, Alcorn McBride distributes an application called **AMI Terminal,** which allows you to control the DVM via RS-232 with the click of a button. This free application can be obtained at http://www.alcorn.com.

Alcorn McBride Digital Video Machine DVM-7400 User's Manual Rev 1.5

Ethernet Control

If your Digital Video Machine is equipped with the optional Ethernet feature, you can control the DVM using a standard Ethernet Protocol called UDP (User Datagram Protocol).

UDP is a very simple Ethernet protocol that allows an Ethernet device to transmit a generic string of data to another Ethernet device. Since UDP is such a broad standard, UDP packets can be generated by a large variety of controllers and PC applications. The UDP packet handles all of the complexities of getting the message where it needs to go in one piece. The good news is that you do not have to understand those complexities. As a matter of fact, you only need to know the following information to send a UDP message.

1. **Destination IP Address –** This needs to be the IP address of the DVM you intend to control. The default IP address of the DVM is **192.168.0.254**.

2. **Destination Port –** This value needs to be the UDP port that the DVM is listening to for UDP commands. This value is always **2638**.

3. **Source Port -** This is the UDP port that your PC or controller will use to send the UDP message. It does not matter what port you choose, as long as it is a valid UDP port. If you have no idea what a valid UDP port is, just use **2638**.

4. **Data –** This is the actual message that you are sending to the DVM. This message needs to be a **Command Protocol** message (ie. 1PL<CR>).

All UDP commands are ASCII based, and are terminated with a carriage return (hexadecimal value 0x0D). The complete list of supported commands can be found in the **Command Protocol** section.

For your convenience, Alcorn McBride distributes an application called **AMI Terminal,** which allows you to control the DVM using UDP with the click of a button. This free application can be obtained at http://www.alcorn.com.

      Alcorn McBride Digital Video Machine DVM-7400 User's Manual Rev 1.5

Playlist Control

Playlists provide a mechanism for the Digital Video Machine to automatically execute commands in a predefined sequence. Playlists often allow the DVM to be used to perform complex functions that would normally require an external controller. Since Playlists can execute any of the commands listed in the **Command Protocol** section, they can perform a variety of functions. These functions could be something as simple as looping a single track, or as complex as user prompted pacing of the playback.

Overview

A playlist zero (PLY00000.LST) will play on power-up.

A Playlist file is nothing more than a list of DVM commands. These commands, which are listed in the **Command Protocol** section, are the same commands that are used by all of the DVM's control interfaces**.** Although any of the supported commands can be used, Playlists usually contain **Play** commands, which cause the DVM to play video clips on the media. When a Playlist is being used, the commands are processed in the order in which they appear in the list. The Playlist is an ASCII text file and can be made using any ASCII text editor (like notepad) or using the Playlist Builder program available from http://www.alcorn.com/support/software.html.

A Playlist can be started by serial or parallel commands, in exactly the same way as an individual MPEG file. For example, the serial command

2PL<CR>

causes Playlist PLY00002.LST on the currently selected drive to start. Discrete File Select Input 2 will also start PLY00002.LST.

If Playlist 0 (PLY00000.LST) exists, it will be automatically executed on power up.

If a Playlist contains a command to play the number or name of another Playlist, execution of the current Playlist will be terminated at that point, and the new Playlist will begin.

Special Playlist Commands

In addition to regular Digital Video Machine commands listed in the **Command Protocol** section, there are a few commands that apply only to Playlists. These single-character commands further modify the behavior of the Playlists. These characters and their functions are listed in the following table:

Char	Meaning
U	Uninterruptible. Causes the Digital Video Machine to ignore the Resume input and serial Play until the playlist becomes interruptible once again.
I	Interruptible. Allows the Resume input or serial Play command to skip to the next track. This is the power-up default.
S	Seamless. Whenever PL commands are located immediately after one another, the playlist will seamlessly transition between the clips. This is the power-up default.
G	Segmented. In this mode, the playlist will not transition between clips seamlessly. There will be a brief delay between clips.
W	Wait. Unit waits until a Resume (Parallel) or a Play (Ethernet or Serial) Command received, then continues to the next command in the playlist.
<	Loop. Tells the playlist to loop upon completion. The only way to stop the playlist from looping is to use the Parallel Stop input or Stop command. The playlist will also stop if another playlist or video is started.
;	Comment. Ignore all characters until the next line.

Commands may be entered into the Playlist in either upper or lower case. All text following a semicolon (;) is interpreted as comments, until the next line in the file. You may put anything you want in comments, including the special command characters normally used in the Playlist.

One thing to be cautious of when making a playlist is creating an unintended endless loop or uninterruptible wait. For example, if a Playlist contains a **'U'** followed by a Loop Play command, it doesn't matter how many more tracks may occur in it, there is no way to get to them! When using the **'U'** command, always include an '**I**' command before the next Loop Play or W, unless this is the desired behavior. Of course, you can always terminate the loop or wait with a stop command, or by selecting a different file.

Playlists may contain references to other Playlists, but as soon as such a reference is encountered the new Playlist begins execution, and the old one is abandoned.

Example Playlists

```
i,1PL,6LP,37PL,415PL,5PL,60PL,<
```

The list can be arranged all on the same line, as shown above, or vertically as shown below.

```
I
1PL     ;You can comment your Playlist file by using
6LP     ;semicolons.  All text after a semicolon is
37PL    ;ignored until the end of the line where a
        ;carriage return is encountered.
5PL
<
```

The first command in the playist is the "**I**" command. This character places the Digital Video Machine into "interruptible" mode, which means that the unit will respond to discrete Select inputs and serial play commands by jumping immediately to the next command in the list. The unit remains in interruptible mode unless a "**U**" character is encountered.

The next command, which is "**1PL**", causes the DVM to play video #1. If the user issues a Play command during the playback of video #1, it will be interrupted and the playlist will move on to the next command.   If a Play command is not received, the DVM will not advance to the next playlist command until video #1 has played to completion.

When video #1 has finished playing, the "**6LP**" command is executed. This command causes the DVM to loop video #6 continuously. This file will continue looping indefinitely until the user issues a Play command or activates the Play input.

If advanced by the user, video #37 plays followed by video #5. Once video #5 finishes, the "**<**" character causes the playlist to loop back to the beginning. This means that video #1 will start playing once again.

Using Playlist Builder

For convenience, Alcorn McBride provides a free Windows application for making playlists using a graphical interface. This program is called Playlist Builder, and it can be downloaded from the software section the Alcorn McBride website at **http://www.alcorn.com**.

Here is a step-by-step guide to get started making playlists with Playlist Builder.

1. Open the Playlist Builder application

2. Select the DVM-7400 in the list of supported devices and click OK.
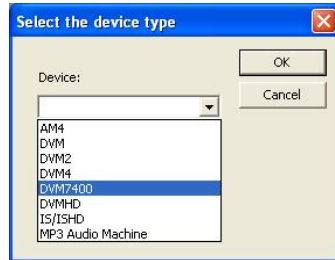
3. Select the event you wish to insert into the playlist. Since "Play Clip" is the event used to play a video, we will use it for this example.

4. Using the arrows in the 'parameters' box, you can select which type of Play command you wish to use. For example, "By Number" would allow you to enter a clip number. "By File" would allow you to enter the actual file name. If you are using the compact flash card that shipped inside your DVM, select 'By Number' and enter the number '1' in the field.
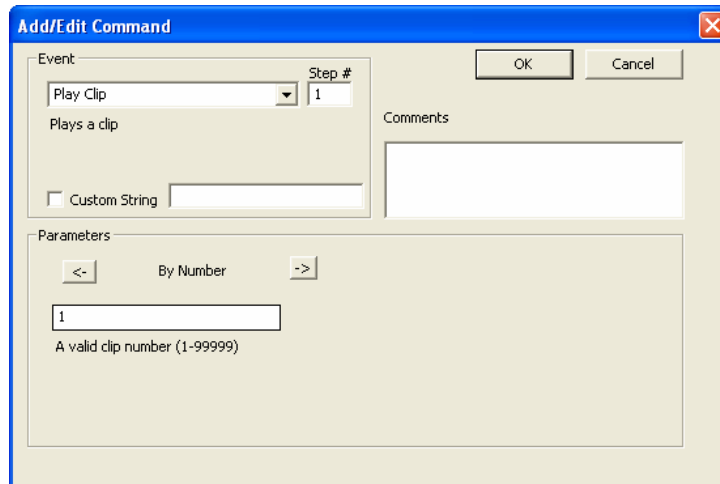
5. Click OK to add the event to the playlist
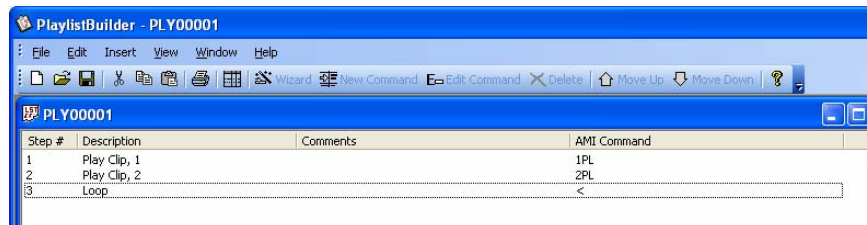
6. Add as many commands as you like! Once you are done, you can save the playlist file and transfer it to your DVM!

Scheduler Control

If you plan on using the Scheduler, you should verify that the DVM's time and date are set correctly.

The Digital Video Machine has a built-in real-time clock, which can be used to trigger events based on time and/or date. For example, the DVM could play a video at 3:00PM on January 15th 2009.

The DVM accomplishes this type of task using a feature called the **Scheduler**. Using a user-defined schedule file, the Scheduler can execute any event listed in the **Command Protocol** section of this manual. These scheduled events are accurate down to the minute, and can be programmed to execute only once, or repeat periodically (ie. repeat every Monday, or every January 1st, etc.).

The Digital Video Machine obtains any schedule information from a file on the Compact Flash card named **schedule.scl**. This file is created using either a text editor (ie. Notepad) or a free Alcorn McBride application called **Schedule Builder**. The remainder of this section contains information on how to make this schedule file using either method.

Schedule File Format

The **schedule.scl** file itself is nothing more than a formatted ASCII text file. In this file, each line contains a DVM command as well as data fields that specify when that command should be executed. This section covers these fields and how they are used to schedule command execution.

Field Summary

Here is a list of the fields that can be used within a scheduled event. Below this table, there are several examples that show how these fields can be used to change the behavior of a scheduled event.

Delimiter	Field
T:	Starting time (hh:mm) (military time – leading zeros for hours required)
D:	Starting date (mm/dd/yy or mm/dd/yyyy . You can use periods, slashes, or dashes to separate dates)
I:	Ending time (hh:mm) (military time)
A:	Ending date (mm/dd/yy or mm/dd/yyyy . You can use periods, slashes, or dashes to separate dates)
E:	Event – This field always contains the COMMAND event
1:	Parameter 1 – This always contains the DVM command wrapped in quotes.
R:	Repeat Number: repeat after this number of periods has expired
P:	Repeat Period: Time to wait between executions, used with Repeat Number and Set when necessary
S:	Repeat Set: special case usage described below
;	Although not a field, this marks a comment

Example 1

```
T:13:46 D:01/1/2010 E:COMMAND 1:"1PL"
```

This is the simplest possible example because it contains the minimum number of fields needed to execute a scheduled event. Notice that the example occupies only one line of text, and that each field is separated by a space. In order, this is exactly what each field means.

Start Time(T): 1:46pm in the afternoon (**13:46** military)

Start Date(D): January 1st 2010

Event(E): COMMAND – Specifies that parameter 1 contains a DVM command

Parameter 1(1): The command string "1PL" will cause the DVM to play file #1.

Example 2

```
T:14:46 D:01/1/2010 E:COMMAND 1:"RJ" ;Stop Playback
```

Two things have changed in this example.

Start Time(T): 2:46pm in the afternoon (**14:46** military)

Start Date(D): January 1st 2010. (same as Example 1)

Event(E): COMMAND (same as Example 1)

Parameter 1(1): The command string "RJ" will cause the DVM to stop playback.

Using Example #1 and Example #2 together in a schedule file will cause file #1 to begin playback at 1:46PM on January 1st, 2010 and stop playback at 2:46PM the same day.

One other thing that is special about this event is that the comment "**Stop Playback**" has been added at the end of the line using a semicolon(;). **Anything found after a semicolon is ignored by the scheduler.** You can even place a comment on its own line, if you like.

Example 3

```
T:14:46 D:01/1/2010 R:30 P:minute A:1/3/2010 I:3:00 E:COMMAND 1:"1PL"
```

We've now added:

Repeat Number(R): 30

Repeat Period(P): minute

Ending Time(I): 3am in the morning (**3:00** military)

Ending Date(A): January 3rd 2010

The **Repeat Number** acts as a multiplier of the **Repeat Period**. They should be read in conjunction like this: **"Repeat this event every 30 minutes".**

The **Ending Time** and **Ending Date** fields specify the time and date that the repeating will stop. In this example, the DVM will play file #1 on 1/1/2010 at exactly 2:46PM. It will then play the file again 30 minutes later (3:16PM) and will continue to repeat until 3:00AM on 1/3/2010.

Example 4

```
T:1:00 D:11-28-02 R:4 P:Thursday S:November E:COMMAND 1:"1PL"
```

The only thing that is new with this example is the **Set** field:

Repeat Set(S): November

A **set** defines a certain range of valid repeat periods. For this example, only the Thursdays in November are eligible for this event. When a **Set** is used in an event, the **Repeat Number** takes on a different meaning. Instead of being a multiplier of the **Repeat Period**, **it and the Repeat Period become an <u>index</u> of the set.** These three fields should be read in conjunction like this: **"Repeat this event every 4th Thursday in November."**

Fields in Detail

There is a summary table in the **Scheduled Events** section that lists all the fields for your reference. Since the Command Event, and event Parameter fields have been discussed, we'll discuss the rest of the fields here.

T: Start Time

The Start Time is the hour and minute your event becomes active. For most cases being active simply means gets executed. You can specify it in military or standard time where 00:00 is midnight, 23:59 or 11:59pm is last minute of the day something can be scheduled. You can also specify **sunrise** or **sunset**. In order to take advantage of sunrise/sunset calculations in the DVM, you need to determine you longitude, latitude, and time zone. All three of these settings can be configured remotely using the **Command Protocol** of the DVM.

Example:
T:13:30
T:Sunrise
T:Sunset

D: Start Date

The Start Date is the month, day, and year your event becomes active. For most cases being active simple means gets executed. You specify it in a variety of ways. You can use periods, slashes, or dashes to separate the fields of the dates. Dates from the year 2000 to the year 2099 are supported. Leap years are handled automatically.

Examples:
D:01.01.2001
D:01/01/2001
D:01-1-2001

I: End Time

The End Time is the hour and minute your event stops being active. See the T: Start Time section for syntax.

Examples:
I:1:30
I:Sunset
I:Sunrise

A: End Date

The End Date is the month, day, and year your event stops being active. See the D: Start Date section for syntax.

Examples:
D:01.01.2001
D:01/01/2001
D:01-1-2001

R: Repeat Number

The Repeat Number acts differently depending on what other fields it is used with:

- With no Repeat Set field present.

- With a Repeat Set field present:

1. With no Repeat Set field present:

This is the most common usage of the Repeat Number. It acts as a <u>multiplier</u> of the Repeat Period. They should be read in conjunction like this: **"Repeat this event every <repeat number> <repeat period>".** Ex."Repeat this event every <u>30 minutes</u>".

The repeat number can be anywhere from 1 to over 4 billion. You can specify repeating a number of minutes, which is why this is so huge. Realistically though, you would specify repeating in years, if it got that large. Whatever combination you choose between Repeat Number and Repeat Period should not multiply out to be greater than a century.

Example:
R:1   ;do it every period
R:117   ;do it every 117 periods

2. With a Repeat Set field present: The Repeat Number and the Repeat Period become an <u>index</u> of the set. These three fields should be read in conjunction like this: **"Repeat this event every <repeat number> <repeat period> in <set>."**
Ex."Repeat this event every 4th Thursday in November."

Although there are many possibilities, we can use an example of holidays to explain what using a set can do for you. Over the period of a year, you may want to schedule events for some holidays. Unfortunately, not all holidays land on the same date every year. By defining a set, along with the repeat number and repeat period, you can choose the first Monday of the month, or whatever you like. Sets can be specific or general.

Example:
R:2 P:Sunday S:May E:Command 1:"1PL" ;Every 2nd Sunday in May Play video #1

R:1 P:Day S:Month E:Command 1:"2PL" ;Every 1st day of every month play video #2
R:2 P:Day S:Month E:Command 1:"4PL" ;Every 2nd day of every month play video #4
R:3 P:Day S:Month E:Command 1:"5PL" ;Every 3rd day of every month play video #5.
….

P: Repeat Period

The Repeat Period defines how long to wait. It is multiplied or indexed according to the presence of a Repeat Set field. (See the Repeat Set and Repeat Number sections for details)

Periods can be one of the following:
Sunrise, Sunset
Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

Minute
Hour
Day
Year

Notes: Month is not a valid period. If you want to make a monthly schedule, use a combination of repeat number, period and set to do so.   See the example in the Repeat Number section for details. You can also specify **sunrise** or **sunset**. In order to take advantage of sunrise/sunset calculations in the DVM, you need to determine you longitude, latitude, and time zone. All three of these settings can be configured remotely using the **Command Protocol** of the DVM.

Examples:
R:sunday
R:year
R:sunset

I: Repeat Set

Using the Repeat Set field changes the way Repeat Number and Repeat Period operate. Together they act as an index into the Repeat Set. Please read the Repeat Number section above, for a detailed explanation of the different behaviors they take on when the Repeat Set field is present.

For example, in order to create a monthly schedule, you can specify the Repeat Set as **month**.

Sets can be one of the following:
Month
January, February, March, April, May, June, July, August, September, October, November, and December

Examples:

R:5 P:day S:month	;repeat 5th day of every month
R:2 P:monday S:month	;repeat 2nd Monday of every month
R:4 P:Thursday S:November	;repeat 4th Thursday in November

Restrictions

Since the Scheduler is very flexible, it is easier to explain what it cannot do, than to explain what it can.

1. Whatever combination you choose between Repeat Number and Repeat Period should not multiply out to be greater than a century. For example, don't repeat an event every 102 years.

2. One event executes per minute. If you want to execute more than one event, you should launch a playlist with the schedule event. Playlists can execute an unlimited number of commands once they are triggered.

Schedule Builder

For convenience, Alcorn McBride provides a free Windows application for making schedules using a graphical interface. This program is called Schedule Builder, and it can be downloaded from the software section the Alcorn McBride website at **http://www.alcorn.com**.

Here is a step-by-step guide to get started making schedules with Schedule Builder.

1. Open the Schedule Builder application

2. Select the DVM-7400 in the list of supported devices and click OK.
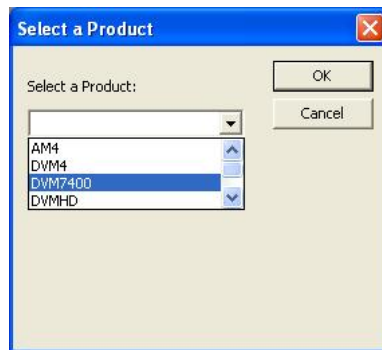
3. The Add/Edit Event window will appear automatically. This is where you select the event you wish to insert into the schedule. Since "Play Clip" is the event used to play a video, we will use it for this example.

4. Using the arrows in the 'parameters' box, you can select which type of Play command you wish to use. For example, "By Number" would allow you to enter a clip number. "By File" would allow you to enter the actual file name. If you are using the compact flash card that shipped inside your DVM, select 'By Number' and enter the number '1' in the field.
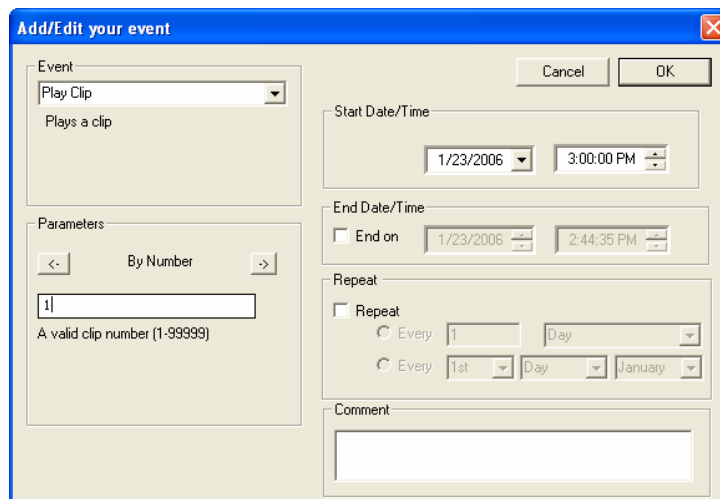
5. Select the time and date you wish to execute the command in the Start Date/Time section on the right side of this screen.

6. If you only want the command to be executed once, just click OK. However, if you want the command to be repeated (say every hour or every day) you can specify that in the repeat box on the right side of the screen. For the sake of this example, we are going to repeat this command every hour.

7. Click OK and the event will be added to the schedule.

7. In this screen, you are free to Add/Edit/Delete Scheduled events as needed.

8. Once you are finished creating the schedule, all you need to do is **Save** the schedule file as **schedule.scl** and copy it to the Digital Video Machine's Compact Flash card.

Alcorn McBride Digital Video Machine DVM-7400 User's Manual Rev 1.5

GPS Control

Overview

The Digital Video Machine can automatically trigger videos whenever it enters into a predetermined geographical area. With this feature you can easily design a "No Operator-Intervention Required" A/V system on a tour bus or tram that automatically plays pre-recorded spiels or videos whenever it enters a specified area.

Enable the GPS mode of operation by turning DIP switch #2 of the 2-key DIP switch block OFF (UP).

In GPS Mode, the DVM will not accept normal serial commands.

The DVM accepts a standard NMEA-0183 data stream at default 4800 baud. You can change the baud rate using the BR command in your GPS playlist.

The DVM accomplishes this by reading a data stream from a GPS (Geographical Position Satellite) sensor. This sensor is often in the form of a "GPS Mouse" or pod that outputs a serial data stream containing Longitude and Latitude data obtained from orbiting GPS satellites, and normally connects up to a serial or USB port on a laptop computer running mapping or direction-finding software. In the case of the DVM, the sensor connects up to the 9-pin serial port.

The Longitude and Latitude data supplied by the GPS sensor is compared to geographical points stored in a GPS playlist. Each entry in a GPS playlist contains a command supported by the DVM's **Command Protocol** as well as GPS coordinates that are associated with that command. When a GPS sensor is connected to the DVM and a GPS Playlist is active, the incoming coordinates are compared to those listed in the GPS Playlist. When a match is found, the command is executed.

GPS Playlists can be easily created using a Alcorn McBride's free Windows application called **GPS Builder**.

GPS Builder

What is GPS Builder?

GPS Builder is a graphical tool used to create GPS Playlists for the Digital Video Machine. To accomplish this, GPS Builder has some features that make this process a snap:

If you need to change the DVM baud rate to match the GPS input, you can use an autoexec playlist that contains a "BR" command followed by a "1PL" command (where your GPS playlist is PLY00001.GPS)

- **Direct Support for GPS Input** – GPS Builder automatically detects any NMEA 0183 GPS input source. What this means is that you can connect any GPS sensor to your Laptop, and get real-time geographical information within the GPS Builder application itself. This includes information such as Latitude, Longitude, Speed, Heading, etc.

- **Real-Time Capturing of GPS Points** – When a GPS sensor is connected to your PC, GPS Builder can capture GPS points with the click of a button. This makes programming your GPS trigger points a piece of cake. All you have to do is drive the actual route using a laptop, and record each trigger point as you pass through them. Later, you can fill in the commands that you want to associate with each point.

- **Online Map Support** – GPS Builder interfaces directly with an online map database. This database allows you to click on a location to obtain its longitude and latitude. This information can then be entered into your GPS Playlist. This feature allows users to program GPS Playlists without traveling the actual route.

- **DVM Integration** – This application contains a complete list of built-in commands for the DVM. There is no need to enter them manually, and all command parameters (ie. File Name, etc.) are described in plain English.
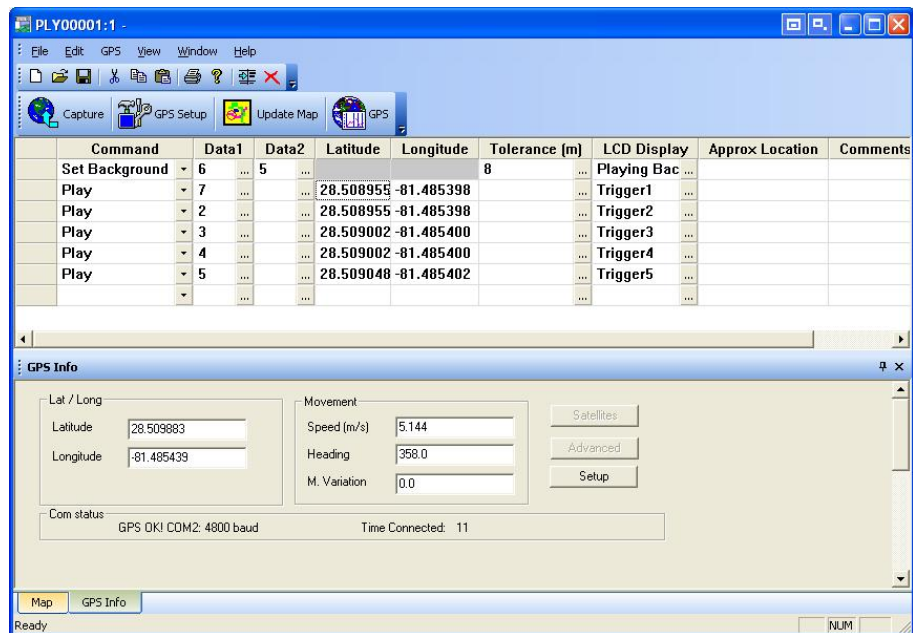
Main Spreadsheet

The program uses a spreadsheet layout with horizontal rows that represent specific tasks for the DVM to execute, and vertical columns that contain the various parameters associated with the particular task. Clicking the small buttons to the right of each cell will provide further help with that cell's contents. The following explains each column in detail.

Command

The Command column contains the command to be executed at a particular Longitude and Latitude (if specified). A pull-down menu of available commands is provided. Often, this command is a Play command because you normally want to play a particular video at a specified location. Other commands such a Set Relay ON/OFF are available as well.

Data Columns

The Data columns are used to supply additional data for commands that require it. For example, a Play command would require data to specify which file to play.

Latitude and Longitude

The Latitude and Longitude fields specify the coordinates the command will be executed. These fields can be entered manually, or they can be inserted automatically using the Capture feature of GPS Builder.

Tolerance

Longitude and Latitude data provided by the GPS sensor is updated at one-second intervals (this is a function of all GPS sensors). As a result, it is extremely unlikely that the exact coordinates entered in the Latitude and Longitude fields will be encountered.

The Tolerance field is used to define the size of a circular GPS 'Zone' around the specified coordinates. The size of this zone can vary greatly depending on the speed at which the vehicle is traveling as well as how far the vehicle can possibly stray from the center of the zone (ie. a vehicle traveling on multi-lane highway may not always be in the same lane). Clicking on the button located in this field will reveal a helpful utility for setting the Tolerance based on the size of the zone or speed of travel.
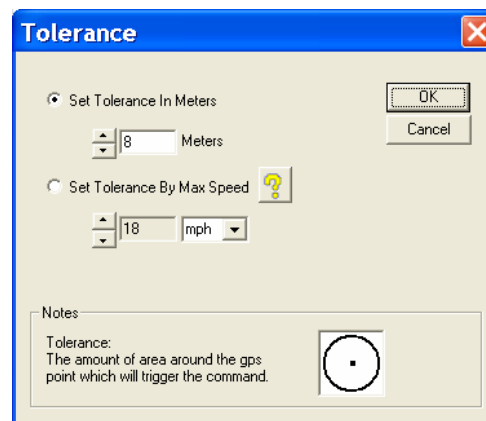

Tolerance can be changed at any time in the playlist. For example, you might want to tighten tolerance for a trigger that occurs while the vehicle is moving slower (or stopped), and need to open it up for when the vehicle is traveling faster. When setting the tolerance, just keep in mind that GPS coordinates are only updated once per second. This update must happen at least once inside the zone for the GPS trigger to occur.

Comments

Both the Approx Location and Comments field are solely for the purpose of describing the location and function of each GPS point. They are not used by the DVM.

Map Display

If an Internet connection is present, you can view the location of your GPS point on a map. Click on the map tab at the bottom of your screen. Select the GPS point you wish to view on the map my clicking its row in the spreadsheet. Once you click on the "Update Map" button located at the top of the screen, you should see a red circle indicating the exact location of the selected point.
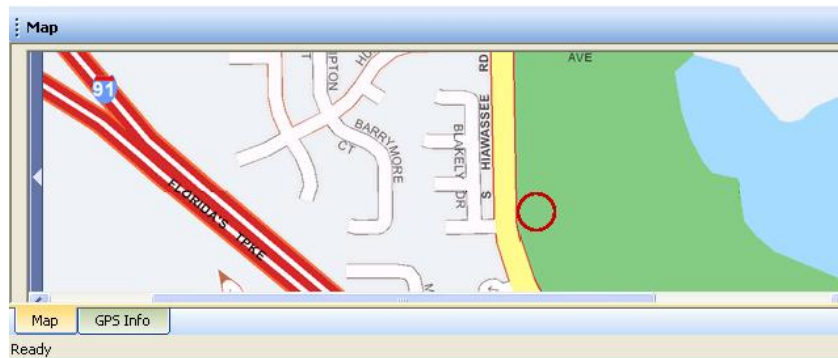
Aside from displaying coordinated, the Map Display is also useful for entering coordinates. If you click a specific location on the map, the Latitude and Longitude of that location will appear below the map. These coordinates can then be copied and pasted into the spreadsheet.

GPS Device Setup

GPS Builder typically detects when a GPS receiver is connected to your PC. However, if this is not the case, click on the 'GPS Setup' button located at the top of the screen. This screen allows you to specify the COM port and baud rate of the GPS device.
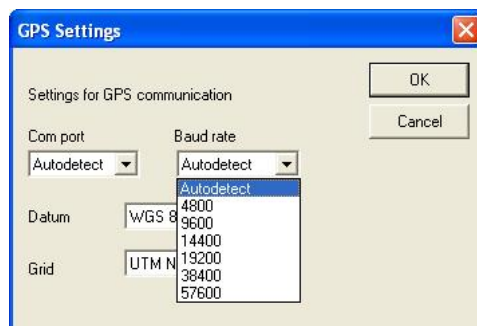
Connecting a GPS Sensor to a PC

In order for GPS Builder to detect latitude and longitude, a GPS sensor must be connected to a serial port. Below is a connection diagram for the GPS Kit that can be purchased as an accessory with your Digital Video Machine.
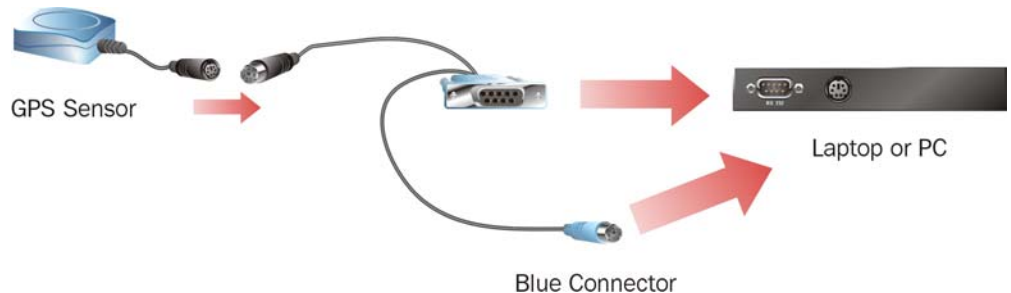
This diagram shows what is currently the most common GPS cable interface for PC. This interface uses a standard RS-232 connector to send GPS strings to your PC's serial port. The Blue PS/2 port is only used to supply power to the GPS Sensor. There are also USB adapters that use the PC's USB port for both power and communication. Contact Alcorn McBride to get the latest information about what types of GPS interfaces are available.

Creating a GPS Playlist

Enter subsequent commands on the following rows until you've completed your "tour." Each command can be any of the commands listed in the pull-down menu available in the Commands column.

If you want this GPS Playlist to launch automatically when the DVM powers up, name the file "PLY00000.GPS".

This is a step-by-step guide on how to use GPS Builder to make a playlist for the Digital Video Machine. Basically what we're going to do is make a "boilerplate" GPS playlist by filling in some DVM commands. Afterwards, we will enter GPS coordinates for these commands.

1. Click on the little "down" arrow in the first cell in the **Command** column. Select a command. This is usually a Play command because this is the command that is used to play videos or launch playlists.

2. Specify the video or playlist number in the Data1 column.

3. Select an initial Tolerance by clicking on the "**…**" inside the Tolerance cell. This number will normally depend on how fast the vehicle is traveling for the first trigger.

4. Once all of the commands have been entered, save your GPS Playlist by clicking on File…Save As…

5. Connect the GPS sensor (sometimes called a GPS Mouse) to your laptop. GPS Builder will begin detecting the GPS input stream and will display "GPS OK!" once detection has occurred. When the GPS sensor successfully locks onto the satellite signal, Longitude and Latitude values will begin to update in the windows on the left. **Note: No Longitude or Latitude information will appear until the sensor locks onto a satellite signal. For some GPS sensors, this may take a few minutes.**

6. You're now ready to begin entering GPS trigger points. Get in your vehicle! Place the GPS sensor on the roof (or other mounting location recommended by the GPS sensor manufacturer). Click on the first entry in your GPS playlist. Drive to the first desired trigger point and hit the Space Bar when you reach it. GPS Builder will record the coordinate and advance to the next line. After this point all you need to do is hit the Space Bar each time you want to log another coordinate.

7. Drive to the next trigger point and hit the Space Bar again. GPS Builder will record the next coordinate. Keep doing this until all of your coordinates have been entered.

8. Click on File…Save…to save your file. Make a backup!

9. Copy the playlist to the Compact Flash card you're going to use in the DVM, along with all of the videos referenced in the playlist.

Proceed to the next section to learn how to use this playlist in your DVM.

Configuring the DVM for GPS Operation

Now that you have your playlist file with the GPS coordinates, you can use it in the DVM. Here's how.

First, make sure that the DVM GPS Mode DIP switch is in the OFF (UP) position. It's DIP Switch #2 on the 2-key DIP switch block.

Connect the Alcorn McBride GPS harness (comes with the DVM GPS kit) to the DB-37 port and the RS-232 port of the DVM.

Connect the GPS sensor to the mini DIN connector of the GPS harness.

The DVM is compatible with any serial GPS sensor which outputs a NMEA-0183 data stream at default 4800 baud. You can change the baud rate using the BR command in your GPS playlist.

The DVM will steadily blink the Green LED whenever an active GPS input is detected.

Unless you are launching a GPS Playlist by other means (ie. Playlist, Ethernet, etc.), make sure that your GPS playlist is named "PLY00000.GPS".

The diagram below shows the proper connection using the Alcorn McBride GPS Kit.

DAM4 Rear

Blue Connector

Null Adapter
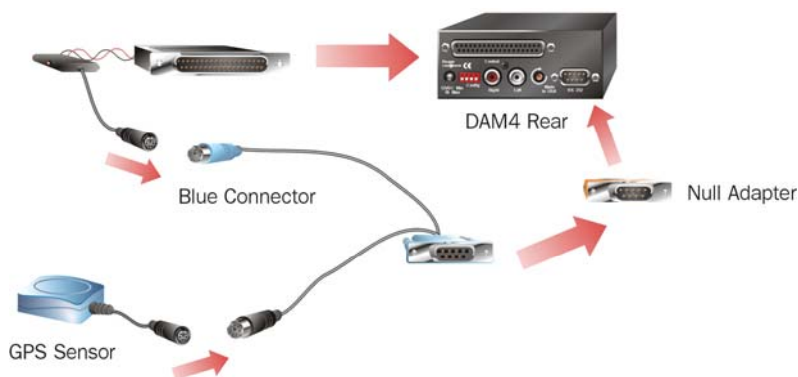
GPS Sensor

Place the GPS sensor on top of the vehicle or other position that the GPS sensor manufacturer recommends.

Connect the DVM A/V outputs to the onboard Audio and Video systems.

Install the Compact Flash card that contains the playlist you prepared in the previous section. Make sure that it also contains all of the videos referenced in the playlist.

Connect 12VDC power to the last remaining connector on the GPS harness. The DVM GPS kit includes a cigarette lighter adapter. The DVM should power on and the LED should start flashing once per second. When the LED is flashing red, this means that the   has not yet locked on to a satellite. When the LED is flashing green, the GPS sensor has locked on to several GPS satellites, and you are ready to roll!

Now as you drive around to the programmed Longitude and Latitude points your videos will automatically trigger.

Overlapping GPS Routes

GPS Playlists are executed in a Random fashion. In other words, the order in which GPS Commands are listed within the GPS Playlist is of no importance. That means that you can go through the first trigger in the GPS playlist, and then skip to the fifth trigger for example. There is no need to go in any specific order.

There is only one catch to this mode of operation. What if you want to have the DVM play a different video the second or third time passing through the same point? For example, say you want to play an "Arrival" video when passing through a point in one direction, and then play a "Departure" video when passing the same point in the opposite direction.

Here's how to do implement this: Make two different GPS playlists; one for the first direction and a second for the other direction. Each playlist contains an entry with the same "Arrival-Departure" point, but each has a different video file associated with it.

The last GPS coordinate in the first playlist is a Play command with the file number corresponding to the second playlist number. Similarly, the second playlist has a last GPS coordinate with a file number corresponding to the first playlist number. When these points are passed the DVM switches to the new playlist and abandons the old one.

You can do this for as many different messages as you want for the same point. You just need to decide where you want to switch to the next playlist. Note also that you do not need to play a video at the point where the new playlist takes over. All you need to do is call up the new playlist, at which time it will take over and start looking for GPS matches before playing a video.

Alcorn McBride Digital Video Machine DVM-7400 User's Manual Rev 1.5

Parallel Control

Parallel Inputs

Be sure to configure the Parallel Input mode DIP-switch before connecting any wires.

The Digital Video Machine can be controlled using either contact closures or voltage inputs on the female DB-37 Control Connector. DIP-switch number 1 on the 4-key DIP-switch bank selects between the two input types. Voltage inputs are rated for 24 VDC. The table below describes the function of each input.

Function	Voltage Input Pins	Contact Closure Pins	Description
Resume	11(+),1(-)	1,20	Resumes playing if paused or stilled. Also, serves as an "advance to next entry" command when machine is running a Playlist (after a Wait, or to jump out of a Loop, or to advance to next file in an Interruptible list.)
Still	12(+),2(-)	2,21	Stills the clip currently playing.
Stop	13(+),3(-)	3,22	Stops the file currently playing. If the file is a **Playlist**, it is aborted.
Loop	14(+),4(-)	4,23	Causes the selected file to loop indefinitely from beginning to end. If the file is a **Playlist**, all tracks will be played and then the file will loop. The state of this input is examined at the *start* of each file.
File Play 1	15(+),5(-)	5,24	Binary-encoded input plays files 1-15.
File Play 2	16(+),6(-)	6,25	Binary-encoded input plays files 1-15.
File Play 4	17(+),7(-)	7,26	Binary-encoded input plays files 1-15.
File Play 8	18(+),8(-)	8,27	Binary-encoded input plays files 1-15.

The binary file play inputs are used to play the first 15 files. These inputs may be contact closures or voltages, depending upon the input select DIP switch described in the Configuration DIP switch section of this manual. The inputs are change-sensitive; that is, when a change is detected, the new file will be played. It is therefore important that the four bits change at the same time (<50ms from each other to be exact).

If the same file number is selected repeatedly it will normally interrupt itself and begin again. The only exception to this rule is when a Playlist is currently running and is in an Uninterruptible state. In this situation, the file input will be completely ignored (see the **Playlist** section for more information).

The table below shows the binary combinations possible, and what file they play:

8	4	2	1	File
Off	Off	Off	Off	None
Off	Off	Off	On	1
Off	Off	On	Off	2
Off	Off	On	On	3
Off	On	Off	Off	4
Off	On	Off	On	5
Off	On	On	Off	6
Off	On	On	On	7
On	Off	Off	Off	8
On	Off	Off	On	9
On	Off	On	Off	10
On	Off	On	On	11
On	On	Off	Off	12
On	On	Off	On	13
On	On	On	Off	14
On	On	On	On	15

For example, connecting pins 8 and 27 together with the Voltage / Contact Closure DIP switch set in the contact closure position will cause file 8 to play.

The loop input is read at the start of the file.

The file will be looped if the loop command is asserted when the file is played. If the file is a **Playlist**, all tracks will be played and then the **Playlist** will loop.

The simplest possible configuration is to connect four buttons to the unit's four file select lines. These buttons will play files 1, 2, 4 and 8. (The missing file numbers need not exist.) Sixteen buttons may be connected without an external controller, by using a diode matrix. One side of each button is connected to a wire that goes to signal ground. The other sides of the buttons are connected through signal diodes, such as a 1N914 or 1N4148, to the file select inputs.
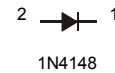
Using a terminal block to hold the diodes makes the wiring neater.

For example, the following circuit allows switches to select files 1 to 15:

DB37 Contact Closure Diode Network Diagram for 15 Clips
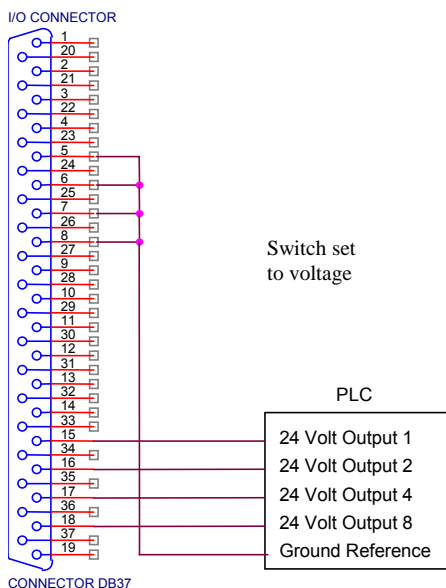

SYMBOLS:

SWITCH

1N4148
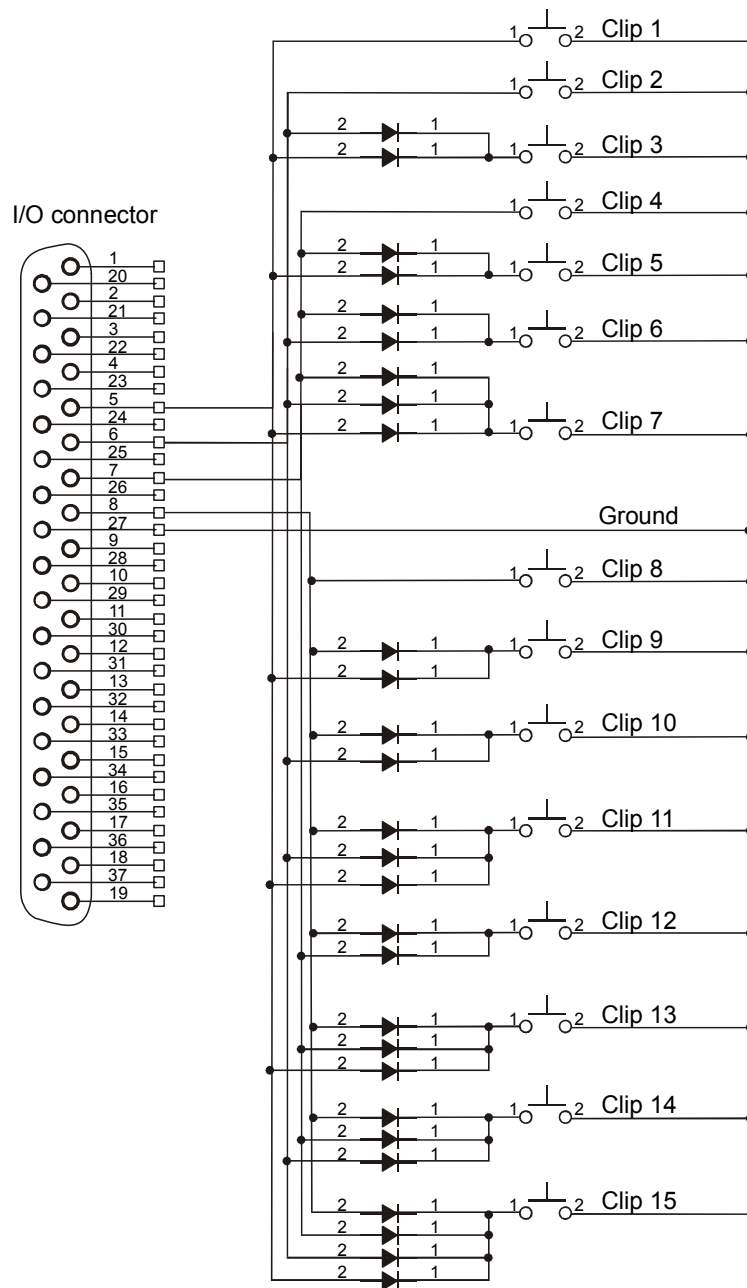
Note:

The 37pin connector on the diagram is inverted from what you see when looking at the back of our product. This is so that you can see what it will look like when making a cable assembly. Remember to have the I/O setting to Contact Closure.

You may use this as a guide for building a diode network, but it is only a reference. We are not responsible for any obvious errors in the diagram. Use logic to verify your setup is correct. If you find errors with this diagram, please notify Alcorn McBride. You can help us help other customers with the same question.

If you don't want to wire this circuit yourself, we have a cheap, discrete control breakout-board that lets you directly select all 15 files and the control contacts like Play, Stop, etc… without touching a diode or your soldering iron. Look for the **Input Expander** at www.alcorn.com for details.

Voltage inputs, such as from a PLC, could be wired this way:

I/O CONNECTOR

CONNECTOR DB37

Switch set
to voltage

PLC

24 Volt Output 1
24 Volt Output 2
24 Volt Output 4
24 Volt Output 8
Ground Reference

Diodes are not needed, since the PLC can actuate any combination of lines desired.

Parallel Outputs

Two status outputs are provided. They are dry contact closures rated at 24 VDC and 0.9 amp max. Their function is described below.

Function	Pins	Description
Playing	9,28	Closed when the unit is playing.
Fault	10,29	Closed when the unit detects a fault condition.

You can also control these outputs with serial "Relay" commands. One practical application of this is to embed the "Relay" commands in a playlist along with "Play" commands. This way you can close or open a relay when a video plays or stops.

Please refer to the **Command Protocol** section for details on how the "Relay" command works, and to the **Playlist** section for an example playlist demonstrating the use of the "Relay" command.

File Types and Storage

The Digital Video Machine plays MPEG-2 video files. These files must have a ".MPG" extension. Please refer to the **Required File Name Formats** section of this manual for details on file naming conventions.

What Is An MPG File?

MPG is short for MPEG, which stands for Motion Picture Experts Group, the organization that codified the audio/video compression scheme used in the DVM.

The DVM plays MPG files that contain digital video encoded in high-resolution by an algorithm known as MPEG-2.

Many encoding systems produce MPEG-2 files, but not all MPEG-2 files may be played on the DVM. Many MPEG-2 files are designed for playback in a small window on a PC, or for transfer over the internet. These files are generally of very low resolution at slow frame rates.

The DVM is designed to accept MPEG-2 files encoded at a resolution of 720 x 480 (NTSC) or 720 x 576 (PAL).

The DVM can play MPEG-2 files encoded at bit rates up to 15.0 Megabits per second. Since higher bit rates equate to better picture quality, we encourage you to encode your video at the highest bit rate supported.

How Do I Make an MPG File?

The most important step in creating video for your application is to perform the highest quality MPEG-2 encoding of your source material.

Encoding professional-quality MPEG material is more of an art than a science. The person encoding the material must be experienced and the hardware well-chosen, so users deciding whether or not to encode their material themselves should put a lot of thought into what would best suit their needs.

The quality of encoded video depends upon the quality of the source video, the encoding system used, and the skill of the operator.

Although encoding your own video can be cost effective, only an experienced individual can create the highest-quality, error-free MPEG. Video material encoded without regard to bit errors will include them and may cause glitches in the presentation, so it is important to have the necessary tools to analyze the encoded bitstreams and make adjustments if necessary.

A good alternative to hiring an on-staff MPEG expert (or becoming one yourself) is to hire an experienced post-production house to encode and format your video for you. All you have to do is to provide a Digital Betacam or D-1 master and they do the rest! Prior Alcorn customers have had good results using the services listed on the Alcorn McBride website at www.alcorn.com, but there are many others available.

MPEG-2 Formats

The MPEG-2 Program Stream

The DVM only supports files up to 2GB in size. See File System Limitations section for more information.

The DVM only plays MPEG-2 Program Streams. This stream is a Variable or Constant bitrate stream containing both audio and video information. In order to achieve playback of video only, you must encode an elementary stream of silent audio that will be combined with your elementary video stream to create a program stream.   A program stream is not the same as a DVD VOB file. The DVM does not play VOB files.

What is a Variable Bitrate?

Unlike MPEG-1, which uses a constant bitrate, MPEG-2 supports variable bitrate program streams. This means that the encoding process scales the bitrate up and down depending on quality needs. A scene with a tremendous amount of movement requires more bits than a much more still scene.

Program Stream:

Multiplexed Bit Rate:	15.0 Mbits/s max

The stream should be authored according to ISO 13818-1 Format

MPEG-2 Video:

Picture Format	SIF-NTSC: 240 lines by 352 pixels
	SIF-PAL: 288 lines by 352 pixels
	HalfD1-NTSC: 480 lines by 352 pixels
	HalfD1-PAL: 576 lines by 352 pixels
	CCIR-NTSC: 480 lines by 704(or 720) pixels
	CCIR-PAL: 576 lines by 704(or 720) pixels
Chroma Format	4:2:0

MPEG-1 Audio (Layer I or II):

Sample Rate:	44.1 KHz or 48KHz
Emphasis:	Off
Mode:	Stereo

Dolby Digital 5.1 Surround Sound

The DVM supports output of Dolby Digital 5.1 Surround Sound bitstreams as well as standard 2 channel MPEG audio. The DVM will automatically detect which type of stream is present in the MPEG file, and output the audio accordingly.

NOTE: The DVM will NOT down-mix AC3 audio streams. Whenever a Dolby Digital bitstream is present in an MPEG clip, the analog audio outputs of the DVM are disabled.

DVM Hardware Requirements

The DVM7400/P, DVM7400/D, and the DVM7400/B are capable of outputting a Dolby Digital 5.1 Surround Sound encoded bitstream on the digital audio output on the rear of the option module. To decode the bitstream you will need an external Dolby Digital decoder.

Compact Flash Media

The Digital Video Machine can use almost any ATA compatible Compact Flash media. There are some manufacturers of ATA Compact Flash that Alcorn McBride has identified to be more compatible than others. For a complete list of preferred manufacturers, please visit the Knowledge Base on the Alcorn McBride website at http://www.alcorn.com/kb/index.html.

Formatting the Compact Flash

Note: Formatting the Compact Flash will result in a loss of all data. Make sure you to backup any data beforehand!

You should always format a new Compact Flash card in the DVM before using it. The card that comes with your DVM has already been formatted and contains a sample MPEG file so it is not necessary to reformat it. If you have enough space on the card, it is best to keep the sample video (rename it if necessary) so you can use it as a reference. If you don't have enough room for the sample video and your video, you can copy the sample video off to your PC hard drive to keep it, then delete it from the Compact Flash card.

The easiest way to format the Compact Flash is to power on the DVM, hold down the test button, and then insert the Compact Flash card into the unit. You can release the test button when the LED turns orange. When the LED flashes green and then remains off, the format is complete. This operation varies in duration based on media size and type. It can take anywhere from 1-60 seconds to format the card

There is also a remote command that can be used to format the card. When using the command, the LED will turn orange, flash green, and then turn off when the format is complete.

Please refer to the **Command Protocol** section for specific details about the format command.

Transferring Files to the DVM

You can copy the files to the Compact Flash card externally, using a USB or other type of adapter for your desktop or laptop computer. If you have the Ethernet option installed, you can also transfer files using the DVM's FTP interface.

Copying Files Directly Using a PC

Here is a step-by-step procedure for copying files from your PC to the Compact Flash card using a Compact Flash adaptor on your PC:

- You will need a PC with a Compact flash socket of some kind. This is typically done using USB Compact Flash card readers, which are available at most electronics stores. You can also purchase Compact Flash to PCMCIA converters that will allow you insert the card into laptops or PC's with PCMCIA sockets.

- Format the Compact Flash Card in the DVM by following the procedure explained earlier.

- Remove the card from the DVM (Power off the unit. Remove the front panel's metal plate, and look inside and push the square ejector button to get it out.) If you need to get a larger capacity card, look online or at your local electronics store for starters.

- Insert the Compact Flash card into the PC's card reader, and look for the drive letter Windows has assigned to your Compact Flash Card drive. The computer sees it as an extra drive, like "F:" for this example.

- Copy and Paste your media files to the Compact Flash card using 'My Computer' or Windows Explorer.

- When you are finished copying files to the flash card, Double-Click on the 'Safely Remove Hardware' icon on the right side of the windows taskbar. Select the Compact Flash card reader from the list, and click the 'Stop' button. Do not remove the card until Windows says that you may do so safely. ***Removing the card too soon may corrupt the contents of the flash card.***

- Remove the card from your PC, and place it in the Digital Video Machine. Turn on the unit, and wait for the green LED to go out. Press the test button to play the lowest numbered file. If it plays, you did everything correctly. If not, check the trouble shooting section for potential problems.

Copying Files Using an FTP Connection

Note: This procedure applies only if your DVM is equipped with the optional Ethernet .Module (i.e. DVM7400/E, DVM7400/A/E, DVM7400/P/E, DVM7400/B/E, DVM7400/D/E).

Use a straight-thru Ethernet cable to connect to a network hub or switch.

Use a crossover (Null) Ethernet cable for a direct connection to a PC.

Refer to the Command Protocol section in this manual for the list of commands needed to configure the Ethernet connection.

AMI Terminal is a Windows application used to control Alcorn McBride equipment. It is available at www.alcorn.com.

You can use Windows FTP client programs such as CuteFTP if desired.

- Connect the DVM to an Ethernet network, or directly to a PC with an Ethernet jack and power-up the DVM.

- Use a serial terminal program or AMI Terminal to program the DVM to an unused IP address on your network. If plugged directly into a PC (not on a network) you can use the default IP address of 192.168.0.254 (assuming that it has not been previously changed from the factory default).

- Also program a username and password using serial commands. You can use the username (admin) and password (password) if they have not been changed from the factory default.

- If this is the first time transferring files to the DVM, format the Compact Flash card in the DVM by following the procedure outlined previously.

- On the PC open a DOS shell and go to the directory containing the files you want to transfer to the DVM.

- Begin an FTP session by typing FTP 192.168.0.254 at the command prompt (without the quotes, with the IP address replaced by the DVM's IP address).

- You should get a connection to the DVM and it should ask for a username.

- Type the username. It should then ask you for a password.

- Type the password. You should get a welcome message.

- Type "ls" (without quotes). You should get a directory listing if files exist on the media.

- Type "bin" to get the interface into binary mode.

- Type "ha" so that progress hash marks will appear during file transfer.

- Type "put *filename*" where *filename* is the name of the file you want to transfer to the DVM.

- You should see the hash marks go across the screen indicating that data is being transferred to the DVM.

- Once the transfer completes you can repeat the above process for as many files as the Compact Flash will hold.

- Type "quit" to end the FTP session.

- At this point the DVM will check to see if a new schedule file was transferred and load it if found.

Required File Name Formats

File names are represented in simple DOS 8.3 format. In other words, an eight character name, a period, and then a three-character extension. There are two ways to name your video files.

VID00003.MPG is an example of a numbered file name. With this naming convention, you can use the parallel inputs to access files.

The first method consists of a name made up of eight characters specifying the type (VID for video file, PLY for Playlist), and the number of the file (5 digits from 00000 to 00511).

The three-character extension is used to tell the Digital Video Machine the data format of the file, either MPG or LST representing a video file or a playlist.

To avoid confusion, don't duplicate file numbers.

File numbers are used to identify which file is to be played in response to Select File serial commands or rear panel file selection parallel inputs. File numbers contained on a drive should be unique, regardless of the file type. In other words, you shouldn't have PLY00002.LST and VID00002.MPG on the same drive. The two files should have different numbers. If more than one file has the same number, the first file found in the directory will be used.

Autoexec files are invaluable in stand-alone applications.

File #0 is an autoexec file. A file numbered 0 is automatically executed on power up. For example, Playlist PLY00000.LST will start as soon as the Digital Video Machine is turned on. If the loop input is strapped on, or if the Playlist is designed to repeat, playback will continue indefinitely.

CLIP.MPG is an example of a named file name. With this method, only serial or Ethernet. control can be used to trigger the file.

The second file naming method is simply a name up to eight characters long, with a three-character MPG, LST, SCL , or GPS extension.

Any type of file may be stored in the Digital Video Machine, but only those listed in the table may be played.

Although any file name may be copied to the Digital Video Machine's media, only **MPG, LST** (playlist, **SCL** (for schedules) files, or **GPS** (for GPS playlists) are actually used by the DVM. Other file types are essentially ignored. This allows archiving of ANY information on the drive: CAD drawings, spreadsheets, documentation, etc. Some example file names:

File Name	Description
VID00000.MPG	Track number 0 MPG Video file
PLY00002.LST	Playlist Number 2
ALCORN.MPG	File Name "ALCORN.MPG" Video file
SHOW1.LST	Playlist Name "SHOW1"
SCHEDULE.SCL	The file used for real-time clock scheduled play.
PLY00000.GPS	GPS Playlist Number 0 (autoexec).

File System Limitations – 2GB File Size

If the File Splitter software is no longer available, please obtain the latest manual from the Alcorn McBride website, or contact technical support for the latest recommended method for splitting files.

The Digital Video Machine uses a special implementation of the FAT32 file system. This file system is widely used, and will allow your flash cards to be accessible from any Windows based PC or MAC computer.

Although the supported *volume* size of Compact Flash cards is much larger, the maximum *file* size supported by the FAT32 implementation in the reproducers is 2GB. Your Windows PC will allow you to copy a larger file (up to 4GB) to the flash card, but the reproducer will not be able to access this file. This will result in a fault condition (Red flashing LED) if you attempt to play the file.

If your application requires a longer playback time than a 2GB limitation will allow, the best solution is 'split' the file into several segments using a file-splitting program. One suggestion is a software package called File Splitter, which can be downloaded at http://www.filesplitter.org/. Using this method, a large file can be separated into several segments which a reproducer can treat as a single coherent video file. Here's how it works.

Let's say that you have encoded a 5GB video file (Program Stream) that you want to play in the DVM. First, you will need to use a utility (like File Splitter) to divide this file into several chunks smaller than 2GB. To be safe, you could divide the file into 1GB chunks. When the splitting process is complete, you should have 5 files. Rename those files like this:

*The split-file playback feature requires firmware **V1.64 or newer** to work.*

VID00001.MPG

VID00001.001

VID00001.002

VID00001.003

VID00001.004

Keep in mind that VID00001.MPG is the first segment, VID00001.001 is the second segment, and so on. When you are finished renaming the files, copy them to the DVM's Compact Flash card.

At this point, all you have to do is treat VID00001.MPG as you normally would. For example, if you send a command to Play File #1, the reproducer will automatically play through all of the file chunks without you having to do anything special. You can also send a command to Loop File #1, and the entire file will loop from start to finish just as you would expect.

Alcorn McBride Digital Video Machine DVM-7400 User's Manual Rev 1.5

Synchronization

If you intend to use the DVM for an application that requires video sync, be sure to order your DVM equipped with the Professional Video(/P) or Digital Video(/D) Option.

One of the most powerful features of the Digital Video Machine is its ability to synchronize to an external video source. This ability makes the DVM a perfect solution for the following type of applications:

- **Synchronized playback on multiple displays** – Any application that entails side-by-side displays, edge-blended projectors, or 3D projection require perfect frame synchronization between multiple video sources. Without it, each display would be playing a different portion of the video at different times, ruining the desired effect.

- **Tightly Synchronized Shows** – Since the DVM can slave to an external video clock; it has the ability to keep perfect time with other devices that are slaved to the video clock as well. Some examples of these devices might be other video players, audio players, SMPTE Generators, or Show Controllers.

- **Broadcast Applications** – For reasons that are beyond the scope of this manual, broadcasters typically require all of their video equipment to be slaved to an external sync source.

Configuring the DVM for External Sync

Sync Mode

The DVM generates C-Sync and Sync Out connector. This means that if you are connecting the Sync Output of one DVM to the Sync Input of another, the receiving DVM needs to be configured for C-Sync.

The yellow LED located next to the sync connectors only illuminates when a sync signal is detected. This indicates that the DVM is using that sync signal to generate video.

The Digital Video Machine is designed to accept either of the two most widely used types of sync; Composite sync and Blackburst sync. Once you determine what type of sync source you intend to use, you must set the Sync Mode DIP-Switch to the corresponding type. If you are using Composite sync (typically referred to as C-Sync), the Sync Mode DIP-switch must be in the DOWN position. Therefore, setting the DIP-switch to the UP position would configure the DVM for Blackburst sync. Setting this switch is necessary for the DVM to interpret the sync signal reliably.

75Ω Termination

It is always good practice to terminate every active sync line with 75Ω. This means that the 75Ω DIP-switch should always be DOWN whenever the DVM is receiving sync directly from a sync generator, video distribution amplifier, or another DVM. The only occasion where you would want to disconnect the 75Ω termination is when you are 'splitting' a sync line. An example of this would be daisy-chaining a single sync line to multiple DVM's using BNC T-Connectors. In this scenario, you would only want to terminate the last DVM in the chain.

Video Format

The last important step in configuring a Digital Video Machine to receive external sync is verifying that the video format of the DVM matches that of the incoming sync signal. For example, you do not want to feed a PAL sync signal into a DVM configured for NTSC. If you were to do so, the DVM would reject the sync signal and generate its own instead. The DVM would indicate this by turning OFF the yellow LED. The DVM's video format can be changed at any time using the configuration DIP switches located on the side of the machine.

Synchronizing Multiple DVM's

The most common application of Digital Video Machines equipped with the External Sync option is synchronizing multiple machines. When implemented properly, this capability allows several DVM's to maintain perfect frame synchronization with one another. This is a critical requirement for applications that involve:

- Adjacent Displays intended to form a larger image (Video Wall)

- Edge-blended projectors (same concept)

- 3-D Theatres (require separate video sources for the left and right eye)

In order to accomplish perfect frame synchronization between DVM's, two requirements must be fulfilled. First, **all DVM's must be locked to the same video sync source**. This is the only way to guarantee that they will display each frame at exactly the same moment. It is also the only way to keep the machines from 'drifting', which results from them playing at slightly different speeds. The second requirement is that **all DVM's must be told to play at exactly the right moment, and at exactly the same time**. To be more specific, this moment is just after a new video frame is encountered. Telling the DVM's to play at this precise moment ensures that they all have time to process the 'Play' command and make preparations to begin playback when the next video frame is encountered. Issuing the Play command too close to the end of a frame will likely result in the players starting at slightly different times. This is because some players might process the 'Play' command in time for the next video frame, while others might still be processing the 'Play' command (forcing them to wait until the next frame). The result of this is that each video has the potential to be out of sync by +/-1 video frame. For the majority of synchronized applications, that is an unacceptable margin of error.

The following sections contain information on how to meet these requirements and achieve perfect frame synchronization between multiple DVM's.

Sharing Video Sync Between DVM's

The Digital Video Machine has been conveniently designed to daisy-chain with other DVM's so that they may share a common sync source without the need for a 3rd party sync generator. Here's how it's done:

1. First, verify that each DVM is configured to receive C-Sync and that each one also has the 75Ω termination enabled.

2. Pick a DVM to be a Master clock source. It really doesn't matter which one you pick, but it would probably be a good idea to pick one at the 'beginning' of your chain. (For example, if your DVM's are stacked or rack-mounted vertically, the top machine would be a good choice)

3. Using a standard BNC cable, connect the sync Output of the Master DVM to the sync Input of the 2nd DVM in the chain. If both machines are powered on, you should see the yellow LED on the back of the 2nd DVM illuminate when you connect the cable.

4. If you have more than two machines, continue by connecting the Output of the 2nd DVM to the Input 3rd DVM.

5. Continue this process until you reach the last DVM in the chain.

6. Check your work by verifying that the yellow LED is illuminated on every machine except the Master.

If you've successfully completed these steps, you're ready to move on to the next section about triggering these DVM's to play in sync.

Triggering Synchronized DVM's Simultaneously

If you remember the discussion at the beginning of the **Synchronizing Multiple DVM's** section, you'll recall that there are two requirements for playing synchronous video. We've already taken care of the first requirement in the **Sharing Video Sync Between DVM's** section, so now it's time to take care of the second part; telling the DVM's to play simultaneously at the correct moment.

Accomplishing this requires a control system with enough RS-232 control ports to interface to each DVM as well as the ability to accept an external video sync source. It just so happens that Alcorn McBride specializes in designing and manufacturing these types of controllers. All of our Show Controllers have different features that allows them to support different applications. To determine which controller is best for your application, be sure to check out our website at http://www.alcorn.com and/or contact an Alcorn McBride representative.

When you are ready to install the controller, you should connect its C-Sync input to the same sync source you are using for your DVM's. If your DVM's are daisy-chained, the best place to make this connection would be the sync Output of the last DVM in the chain. Once you have done that, you just need to connect the RS-232 cables to the serial ports on the controller.

The only remaining work is to write a script, or program, using a Windows application called WinScript. This script is what is eventually transferred to the controller to tell it what to do and when. Although writing scripts for our show controllers is beyond the scope of this manual, there is an example script called *SYNC2UNITS.AMW* included with WinScript that implements synchronized playback between 2 video players. This is a great place pickup the basics without the need to create a script from scratch.

Power Up Operation

When power is first applied to the Digital Video Machine, it briefly blinks the Status LED green. It then checks to see if a new firmware file exists, or if a track or Playlist should be played, according to the following priority:

- Check the Compact Flash card for an OS.NEW file. If found, the firmware is updated and the file is renamed to OS.SAV.

- Launch schedule (schedule.scl)

- Launch GPS Playlist #0 (PLY00000.GPS)

- Launch Playlist #0 or Video #0 (Playlist gets priority)

Updating Firmware

You can download the latest firmware upgrades for your DVM7400 Digital Video Machine from http://www.alcorn.com

Follow these directions to update the DVM's firmware:

- Establish a serial connection with the DVM using PC and AMI Terminal.   Use the **Version** button to retrieve the current firmware version back from the unit. Compare that to the version number listed on the website. If you need an upgrade, continue.

- Download and extract the zipped firmware update file to your PC from the Alcorn McBride website.

- Copy the **OS.NEW** file to your Compact Flash Card. Use the **Transferring Files to the DVM** section if you need help doing this**.**

- Load the Compact Flash Card into the DVM

- Power on the DVM

- The status LED will display the following colors during the update process
    1. Solid Green – Verifying **OS.NEW** file
    2. Solid Red – Erasing Flash Memory
    3. Solid Orange – Programming Flash Memory

- Wait for LED to go out completely.

- You're done. Use the **Version** command to verify that the DVM's firmware has actually been updated to match the version on the website.

Ethernet Step by Step

This Application Note will show you how to connect your DVM7400/E, AM4/E or V16Pro to a network. Some basics of Ethernet networking are covered, and an example of using the DVM7400/E in a network is provided.

Network Architecture

Ethernet is a high-speed serial communication standard that involves both hardware and software. The hardware maintains the electrical integrity of all the connections and the software maintains the communication channels by addressing the correct connection throughout the entire network. From a user point of view, the process of connecting a device to a network is simple. In this application note, two examples will be examined. The first is the simple point-to-point connection of two devices without additional network hardware. This example is the similar to using RS232 ports and a serial cable. The second example is a general local network in which more than two devices will be connected.

Point-to-Point Example

Here we have a PC that connects directly to another device. When connecting directly from a notebook or PC to a device you will need a crossover Ethernet cable. This cable eliminates the need for a hub, switch, or router to make a point to point connection. When connecting through a hub, switch, or router, a patch cable is used. There will be more on this later.

```
┌────────┐              ┌────────┐
│   PC   │──────────────│ Device │
└────────┘              └────────┘
```

Point to Point

Multipoint Network Example

The second example will use additional hardware to form the beginnings of a network. You will be able to connect as many devices as you have ports available on the switch. By connecting additional hubs, switches and router to available ports, the network can grow as needed.

```
┌────────┐   ┌──────────┐   ┌──────────┐
│   PC   │   │ Device 1 │   │ Device 2 │
└────────┘   └──────────┘   └──────────┘
      │            │              │
      └──────┐     │    ││││  ││││
         ┌───┴─────┴──────────────┐
         │     Ethernet Switch    │
         └────────────────────────┘
```
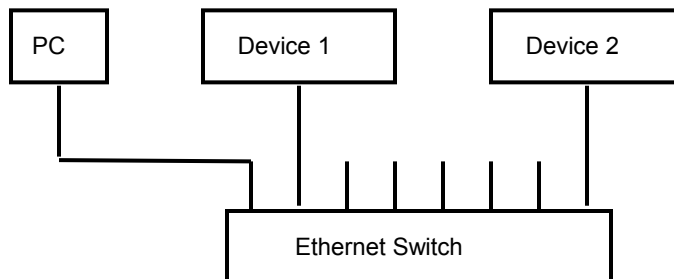
Small Local Network

Hardware

Ethernet hardware typically uses an eight-wire (four pair) cable that makes a point-to-point electrical connection. When connected to a switch, an Ethernet device is able to communicate with many other devices using the same connection. Do not let that idea bother you because setting up a small network to control your show will be easier than you think.

Network Equipment

Now a few words on what the difference is between systems using the network to communicate and devices that make up the network. Devices (PCs, controllers, DVM7400/E, AM4/E, V16Pro and such) are connected to the network so that they may pass information to each other. In the first example, the network was a simple point-to-point connection. This is different from a RS232 connection in the fact that Ethernet requires addressing and controls that go far beyond a simple dedicated serial connection.

Devices such as hubs, switches and routers make up the network itself. The purpose of the network is to permit as many devices possible to be connected together. Just think of how your PC may be connected to the one down the hall or even to mine way over here or remain connected to mine if I go half way around the world. When many PCs, show controllers and other network devices all sending data back and forth, there must be a post office to deliver the mail, so to speak. All these devices work together to get the mail delivered.

So why do we need hubs, switches, and routers to create an Ethernet network? There are different reasons to use each of these devices so let's go over the basic functions of each one of them. Although small control networks are fast and easy to implement, the nature of non-dedicated connections can be hard to manage. As your network grows, it's sometimes a good idea to maintain a map of the connections.

Hubs

Hubs have become scarce in modern networks, often being replaced by higher-performing switches or routers. Hubs copy all traffic to all ports at the same time. You may however, still find a hub in an existing network or need one for simple network troubleshooting.

Switches

These devices are similar to hubs except that switches send data only to the port connected to the device with the corresponding Ethernet address. Much more traffic can be supported when using switches. If we use the post office example, you send a card to a friend and it goes only to your friend or if you send multiple cards they will all go only to the addressed locations and nowhere else. The Ethernet switch will support as many separate interconnects as it has ports. Another function of the switch is the ability to store addresses and remember the ports used to make the connection. This is valuable because it increases the efficiency of the data transfer. Ethernet switches are best for show control networks.

Routers

These devices are more complex in that they offer a connection between networks (such as your home network to the Internet). If you are planning to control or program your show via a remote Internet, you will need a router. Please be aware that you may also need an Internet Service Provider (ISP) and network administrator to maintain the security of your systems.

Addresses and Routing

IP Addressing

If we think about the network connections, it is necessary to understand how the devices connected know where they are and how they find each other. The method most commonly used for Ethernet networks is the Internet Protocol (IP). IP uses addresses assigned to devices in the same way your home address is used by postmen to know what mail is to go to your house. In the Ethernet network, the IP address is divided into groups like a home address is divided up for easy reading.

For example, your name, house number, street, city, state and zip code are all needed to get a letter delivered to your house. The IP address is also divided into groups but in number form. IP addresses are in four groups of three numbers separated by periods (dots). The default IP address for many IP based products is 192.168.0.254 (192 dot 168 dot 0 dot 254), where each number can be in the range of 0-254. Every port on the network must have a unique IP address just as in the address for your mail. If we think of the IP address as a mailing address for your home, the first number could be the state = 192, the second could be the city = 168, the street = 0 and the house number = 254. We all know how much computers love numbers so we have number addresses for network identification.

Subnet Mask

In order make the connections as fast as possible, there is a parameter that filters the network and is called the Subnet Mask. The subnet mask parameter is another set of numbers such as 255.255.255.0. In the simplest terms, this parameter will limit the network by allowing the IP addresses to be connected that have the same fields as those in the subnet mask having the 255. So the IP address, in our case 192.168.0.254 (port A), will be able to communicate with all other devices that have 192.168.0.(0-255) as their IP address. If the subnet mask is 255.255.0.0, the device could communicate with other devices in the range 192.168.(0-255).(0-255). IP addresses that end in 0 are special, as are any value of 255; these are not used for simple networking. The smaller the subnet mask-number the larger the subnet will be. You may never need to change this parameter unless you need to communicate with more than 254 devices.

Gateway

The Gateway parameter is another way to isolate very large networks. The gateway address is the IP address of a router or similar device that is connected to more than one network. It allows a computer on one network to ask for the address of a device on another network.

Connecting the Hardware

We can now configure the machines on our network as shown in the diagram that was introduced at the start of this section. Let's first build the simplest network, the point-to-point network. The point-to-point network will have a PC connected to a device such as a DVM7400/E, AM4/E or V16Pro or any other IP based device. Again, this is like using the RS232 port to talk to a device connected to the PC with a serial cable. Each device must have an IP address assigned. Pick an address that you will remember for the PC's IP address. It is best to keep the IP addresses of your devices separate from those of the equipment that is making up network. For example, put network devices like routers, servers and gateways that need an IP address down low in the address range (i.e 192.168.1.1 through 192.168.1.99) and devices to control such as the PC, in the high address (i.e

192.168.1.100 through 192.168.1.199). As you build a bigger and bigger network make a network IP map or list, as this will save you lots of time when tracking down issues. We can now set the PC Ethernet port parameters.

Network Example 1 (Point-to-Point)

The point-to-point connection is the simplest network configuration. That being, your PC connected to another device like the DVM7400/E, AM4/E or V16Pro. Because we are connecting directly to another device and not to network connection equipment (i.e. hub, switch or a router) we must use the RED crossover cable that was included with your unit.

Note: The crossover cable is used with this simple connection setup called a point-to-point connection. You may find this cable connecting devices to network equipment a router or switch that has a cable auto detect feature, but not all-networking equipment will support this.

Locate the Ethernet port on your PC and connect one end of the red crossover cable to that port. Next, locate the Ethernet port on the device you want to talk too and connect the other end of the cable to that port. If this is the only connection you wish to make then proceed to PC configuration.

Network Example 2 (Multipoint Connections)

A PC will be used to control multiple devices in this example. This network will require an Ethernet switch because we will be connecting more than two devices to the network.

The PC is connected to any port of the switch with a patch cable. A patch cable is a straight-through cable (any color but RED) as opposed to a crossover cable (RED). The ease of connecting additional devices to the network or moving them will make for some interesting tangles and confusion later on that may need to be sorted out later.

PC Configuration

For this example Windows XP is used, if another OS is being used the parameters are the same but the way to get them into the system will be different.

Open the "Control Panel" and find the icon "Network Connections" and open that window. If the network ICON is present in the tray in the lower right side of your screen then you can right click it to open the options menu. This ICON looks like to computer monitors together. You may have several network connections here so look for the one that refers to your local area connection that is not wireless, 1394 or a modem. You will need to identify the connection that controls the Ethernet port on your PC that will in turn be connected to the DVM7400/E, AM4/E or V16Pro. This will take some understanding of your PC configuration.

Next, right click on the icon that control your Ethernet port and go to Properties menu item and click to open that window. Then click on the Internet Protocol (TCP/IP) menu item them click the properties button.

- Click the "Use the following IP address" radio button.

- Enter the IP address for your PC's IP address of 192.168.0.100 or what ever address you want to use.

- Enter the subnet mask of 255.255.255.0 if it is not already filled in.

- Skip the Gateway IP address or fill in the address as shown below.

- Nothing else is needed.

- You computer must be rebooted to change the IP parameters.

You can follow the map below if you prefer.
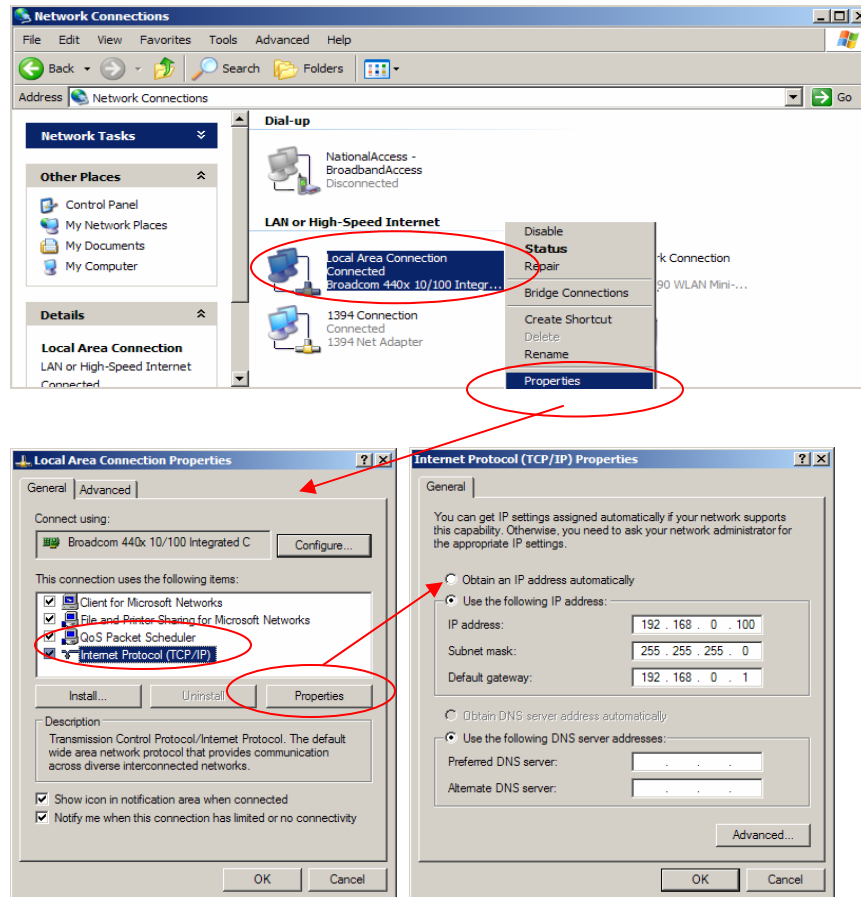
Device Configuration

The configuration of the Alcorn devices should be setup by default to 192.168.0.254. That is all of them will have the same address so they must be reconfigured. If changes are needed or if parameters need to be verified, then go thru the following steps to understand how to configure the port parameters. The default parameters are:

IP address:	192.168.000.254
Subnet Mask:	255.255.255.000
Gateway:	192.168.000.001

Setting Device IP Addresses

The default IP address of most Alcorn McBride equipment is 192.168.0.254. This may need to be changed to work in your network. In this example, we will set all the other units on the network according to the configuration requirements. i.e. DVM7400/E-1 is 192.168.0.101, AM4/E is 192.168.0.102 and so on. Remember to make an address map.

Connect to the serial port of the first device (DVM7400/E in this example) and open the AMITerm software. (You can download this program from www.alcorn.com.) Click on the Network tab and under the Configuration Box click the Set button. Next go to the IP field and edit the last number changing it to 101. Click the IP button and observe the message in the box at the bottom left of the AMITerm window. The receive response must be R<0D> to verify the new address was understood. See the diagram below for the locations and function of

the items just described. The DVM7400 will need to be power cycled to complete the configuration.

Repeat these steps for all the devices you wish to connect to the network. Be sure all devices have a unique IP address or your network will not work. The port connections do not matter and can be changed at any time with out having to readdress any of the devices.
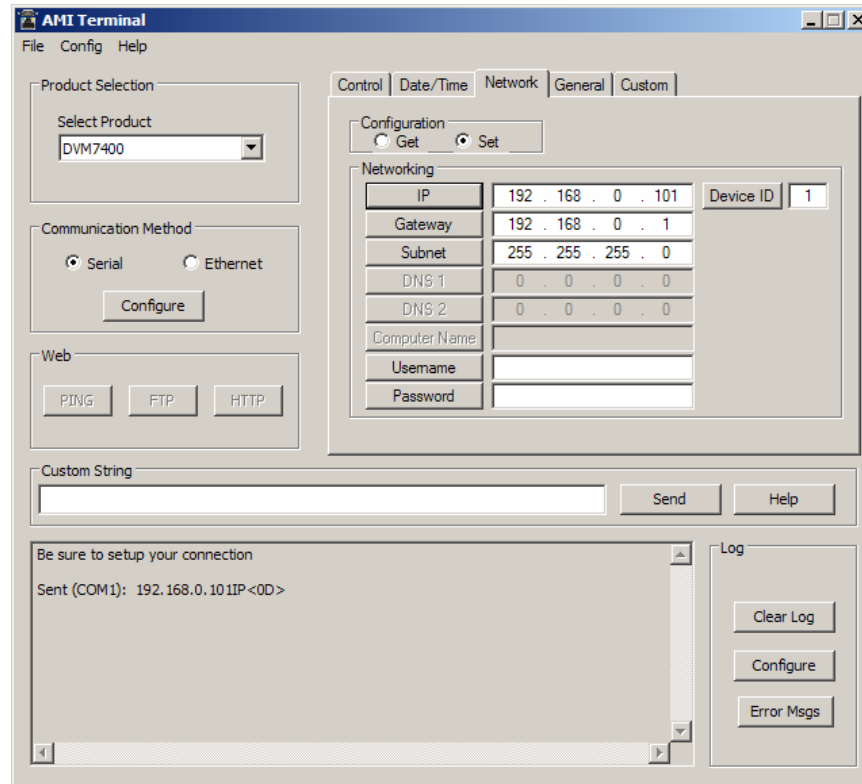
Now that the hardware is setup, the next step is to begin to communicate with all the devices you have added. Use AMIterm to test the port connections by selecting the Ethernet button under the "Communication Method" window show above. Then request the version of the software by going to the "General" tab and click on the "Version" button. The command will be displayed at the bottom of the AMITerm window and the connected device will respond with the message in the same window. At this point the network is complete and you need only address the unit to complete the connection.

Alcorn McBride Digital Video Machine DVM-7400 User's

Troubleshooting Guide / FAQ

If you don't find an answer to your question here, have a look at our Knowledge Base at http://www.alcorn.com/kb/index.html. We're always updating it with new answers and useful information!

Q: I have several files on my Digital Video Machine. When I try to play one of them, a different file plays.

A: *All file names and numbers should be unique. You should not have, for instance, two files named VID00005.MPG, or have a file named VID00003.MPG, along with a PLY00003.LST. The Compact Flash could also be fragmented, in which case you need to format it in the DVM and re-copy the files.*

Q: I have created a playlist using Windows, but the DVM reports an error when I try to play it. What's going on?

A: *Windows sometimes uses its own filename extensions, or adds extensions that are hidden when viewed in Windows Explorer. Make sure that Windows Explorer is configured to show file extensions, and make sure that file does not have two extensions (i.e. ply00010.lst.txt).*

Q: Can I control the Digital Video Machine with your show controller?

A: *Yes. There is a protocol file specifically designed to operate the Digital Video Machine. If it is not already bundled in your version of WinScript, check the protocols section located in our Library at http://www.alcorn.com.*

Q: What brands of Compact Flash Cards do you recommend? Where do I get one?

A: *We don't have a brand we endorse, but we know cards from SanDisk work in the DVM. You can typically get them from a local camera shop, computer supply store, or online. They need to be ATA compatible. Also check our Knowledge Base at http://www.alcorn.com/kb/index.html. Once there, type in Compact Flash to see if we have added anymore supported brands to our list.*

Q: I copied MPEG files to a flash card, but when I press the test button the LED flashes red. Why isn't it playing my MPEG file?

A: *The DVM-7400 test button plays the lowest numbered video file on the flash card. Do the files you've copied follow the DVM numbering convention (vidxxxxx.mpg)? Have you encoded the MPEG2 files according to the information in this manual?*

Q: I am trying to play a high bit-rate MPEG2 file, but the DVM seems to have trouble playing it. The video is playing slow and I am seeing distortion or 'blocking'. What am I doing wrong?

A: The DVM is capable of playing MPEG2 clips with a maximum bitrate of 15mbps, however the Compact Flash card must be fast enough to do this. Try using a newer compact flash card, or a compact flash card that is rated for higher transfer speeds. If you are unable to do so, try lowering the bit-rate of your MPEG encoding.

Q: I am trying to play an MPEG file on the DVM. I hear audio, but the video output just looks like a bunch of random colors and blocks. What's happening?

A: The MPEG2 file that you are playing is most likely encoded with a 4:2:2 chroma format. The DVM only supports a chroma format of 4:2:0. Change this setting in your encoder, and re-encode the video with the correct format.

Q: Do you have a basic checklist I can go by in order to figure out what's wrong?

A: Here's a checklist we have compiled of typical things you can check to make sure all the bases are covered:

- *Is the unit plugged in? (bear with us)*

- *Does the unit have a Compact Flash card in it at all? (remove the front metal plate & check)*

- *Is the Compact Flash card pressed in all the way?*

- *Validate you've used the A/V cables somewhere else successfully. Verify your display works, etc…*

- *If you are using a serial cable, is it straight through (as opposed to a null modem)?*

- *Are your MPEG files MPEG2 Program Streams?*

- *Are your file name formats valid? See the **File Names** section to be sure.*

- *Take every other piece of control equipment away from the unit, making it stand-alone until you get it running. Try to make it operates now either with contact closures (paper clips will work) or serial commands from a laptop or PC.*

- *If the unit does not respond to serial messages typed by hand or from another system:*

  - *Have you validated you are communicating through the serial port correctly? Chosen the right PC comm. port? Using 9600, 8,N,1? If you want to validate the comm. port is right, use a paperclip to short together pins 2 and 3 on your computer's serial port cable. It should echo back to you the keys you type from a terminal emulator like Hyperterminal.*

  - *Are you using the correct commands listed in the **Command Protocol** Section? Can you get a version number from the box by using a terminal emulator, or AMI Terminal?*

- *Is the Compact Flash Card damaged? Do you have a second Compact Flash card you can temporarily use to make sure the Compact Flash Card isn't just damaged? Go through the file*

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copying process with the new Compact Flash Card, and try to play the file.

- *Is the unit damaged? If you can put another Digital Video Machine in the circuit, you can rule out the possibilities of a damaged unit.* ***Remember to use the same Compact Flash card.***

Mechanical Information

Mechanical Dimensions
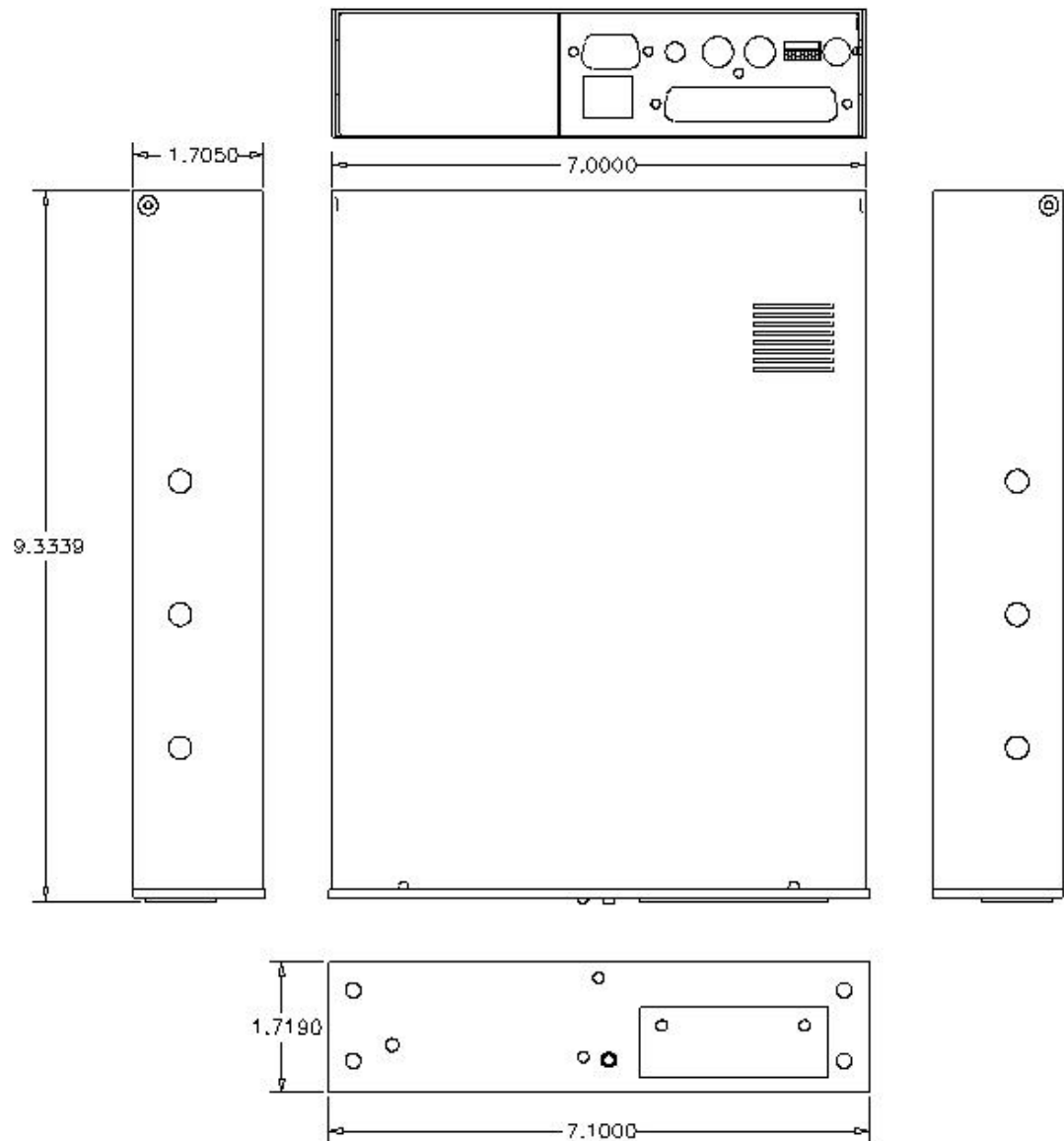
Surface Mounting

Surface Mount Kit, Part Number 230-100979

Qty	Part Number	Description
2	306-100711	Mounting Flange
6	500-000566	Screw, 6-32 x 3/8, Pan Head, Black Ox, SS
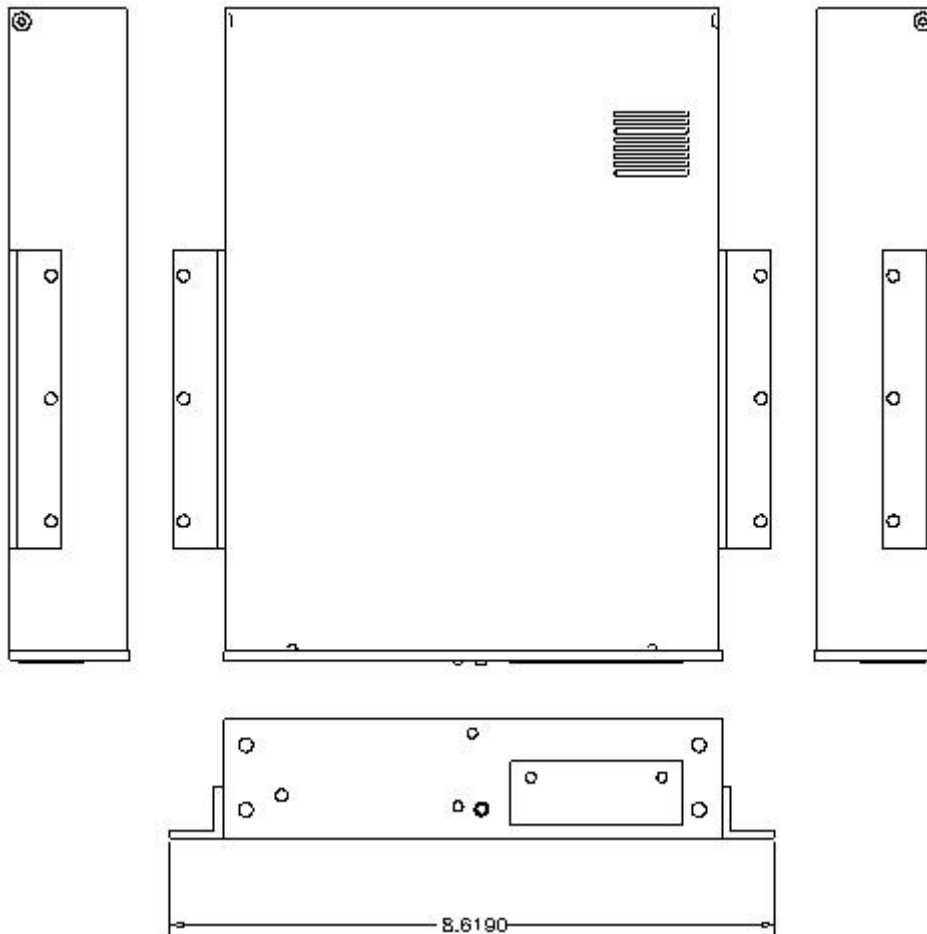
Rack Mounting

You can mount one or two DVM7400 Digital Video Machines in a 1U rack mount space.

Rack Mount Kit, 1 Unit, Part Number 302-101062
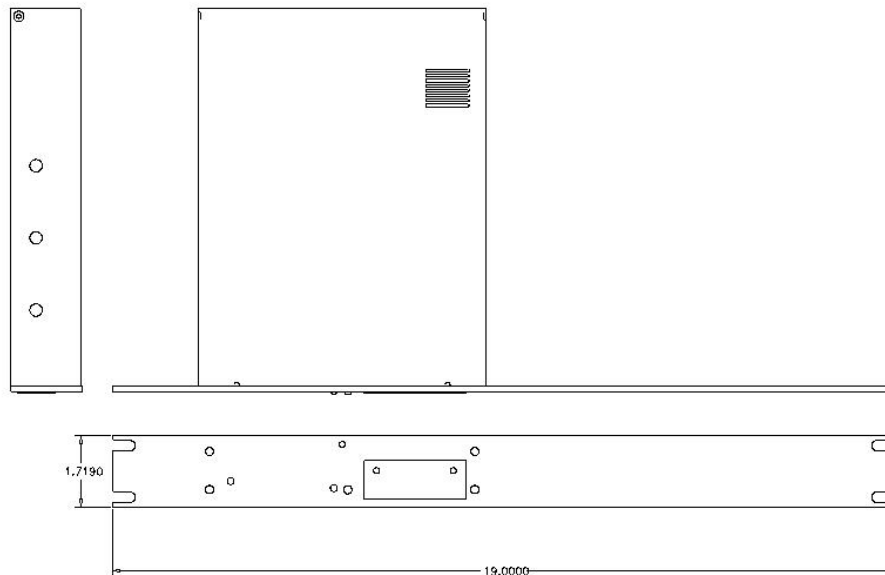
Rack Mount Kit, 2 Unit, Part Number 302-101060

Alcorn McBride Digital Video Machine DVM-7400 User's Manual Rev 1.5
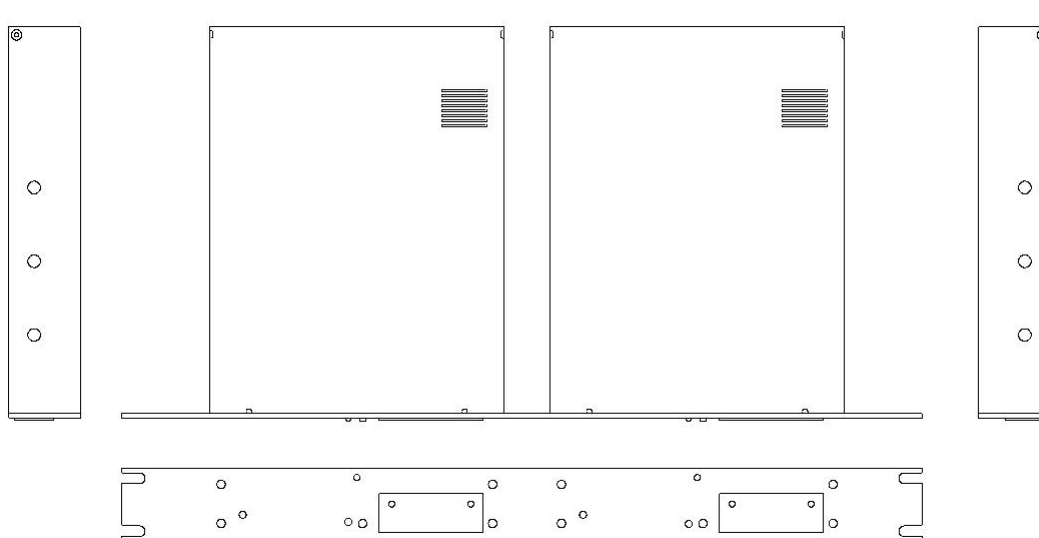
Specifications

Video

720 x 480 (NTSC), 720 x 576 (PAL) resolution
704 x 480 (NTSC), 704 x 576 (PAL) resolution
Up to 15.0 Mbits/sec (including audio)
25 fps (PAL), 29.97 fps (NTSC)
4:2:0

Audio

DAC Resolution:	16 bits
Deviation from Linear phase:	+/-0.5dB
Total Harmonic Distortion:	0.003%
Dynamic Range (A-weighted):	94dB
Inter-channel Isolation:	90dB
Inter-channel Gain Mismatch:	0.1dB
Frequency Response:	10 to 20 KHz +/- 0.1 dB
Maximum Phase Non-Linearity:	5 degrees
Line Out Level:	Unbalanced, 2V P-P max into 20K
Balanced Output (optional)	+4dBu
Amplifier Output (optional)	20WRMS x 2 8ohms each (@10% THD)

Playback Time

Approximately 13 minutes per gigabyte at 10Mbps encoded bitrate.
Approximately 9 minutes per gigabyte at 15Mbps encoded bitrate.

Search/Trigger Response Time

Search time: Depends on encoding (ranges from 100-400 milliseconds)
Trigger Time: less than one video frame when Search is performed in advance

Power

12 VDC to 25.0 VDC at 2 Amp max with installed Compact Flash Card.
Connector: 2.5 mm I. D., 5.5 mm O. D., 10 mm shaft length.
Adapter for 100/250 Volts 50/60 Hz provided (CE, UL, CSA)

Switches and Indicators

Front panel test button.
Front panel bi-color LED.
Side panel DIP switches for ground lift, PAL/NTSC, Password, input type, GPS mode.
Rear panel volume control
Optional:
Rear panel Sync Detect LED (Yellow)
Rear panel DIP switches for 75Ω, Sync Input Type, and RGB/YUV selection
Rear panel green SDI status LED

Connectors

Rear Panel DB-9M serial I/O connector.
Rear Panel DB-37F parallel and serial I/O connector.
Rear Panel RCA type Phono connectors, video, left and right audio.
Rear Panel Barrel connector (2.5 mm x 5.5 mm x 10 mm) for power.
Optional:
Rear Panel Screw Terminal Speaker Connectors (20Watts/8ohms)
Rear Panel XLR-1/4 inch Combo Connectors for Balanced Audio
Rear Panel RCA connector for S/PDIF Digital Audio
Rear Panel RJ45 jack for Ethernet connection.
Rear Panel BNC for SMPTE-259M SDI Digital Video
Rear Panel BNC for Composite/Blackburst Sync input
Rear Panel HD-15F for RGBHV/YUV Analog Video

Ethernet (optional) .

10/100BaseT
FTP, ARP, UDP protocols

Physical

9.3339" x 7.0000" x 1.7190" (DxWxH)
4 lbs
0°C (32°F) to 38°C (100°F), free air circulation.
0-90% relative humidity, non-condensing
20 g max Vibration (with removable Compact Flash Card)

Part Numbers

DVM7400 Digital Video Machine with 100/250Volts 50/60 Hz, 3A switcher ,
Part Number 230-100978.00
Flush Mounting Bracket Kit, Part Number 320-100375
Rack Mounting Bracket Kit, 1 Unit, Part Number 302-101062
Rack Mounting Bracket Kit, 2 Unit, Part Number 302-101060
Mating Connector and Housing for DB-37F, Solder Cup, Part Number 320-100376
Compact Flash Card Media – contact factory

Index