# Gray Interfaces

## DMX*Dart*

# Users Manual

August 2000.

# Table of Contents

# Table of Contents

# Table of Contents

# About DMX Dart

The Gray Interfaces DMX *Dart* is a fully featured DMX test tool that incorporates DMX reception and transmission tools, as well as a set of functions completely dedicated to moving lights.  Complete cue recording and playback features are also provided so that the DMX *Dart* can be used as a miniature standalone controller or as an inline backup DMX source. The DMX *Dart*'s features, as well as its intuitive handheld design make it the ideal tool for theatre, concert touring, and themed entertainment users.

## What can it do?
A few of the things that you can use your DMX *Dart* to do!
- Handheld lamp check
- Verify console output
- Control dimmers directly
- Test DMX cables
- View DMX levels as %, hex or decimal values
- Synchronize a DMX signal to an oscilloscope
- Control moving lights individually or in groups
- Test "in wall" DMX wiring
- "Tweak" DMX output parameters
- Print out reports (with optional printer)
- Analyze incoming DMX signals
- Act as a  DMX "Flicker finder"

# DMX*Dart* Physical Arrangement

## The front panel

1     Keypad
2     Backlit LCD Display
3     Joystick
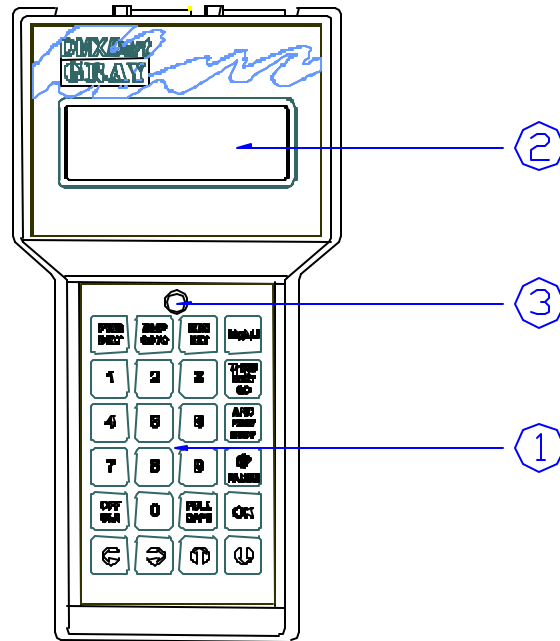


## The top panel
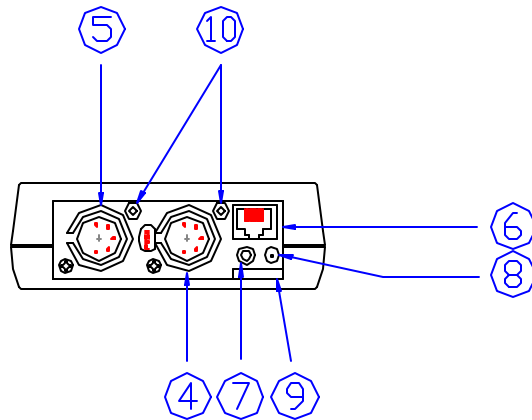


4     DMX 512 output (5 Pin female XLR type connector)
5     DMX 512 input (5 Pin male XLR type connector)
6     RS 232 PC serial port (RJ45 receptacle)
7     DC power Input / Scope Sync output (1/8" mini phone receptacle)
8     IR transmitter
9     Future Dart*Flash* slot
10    Encoder panel mounts

## The rear panel
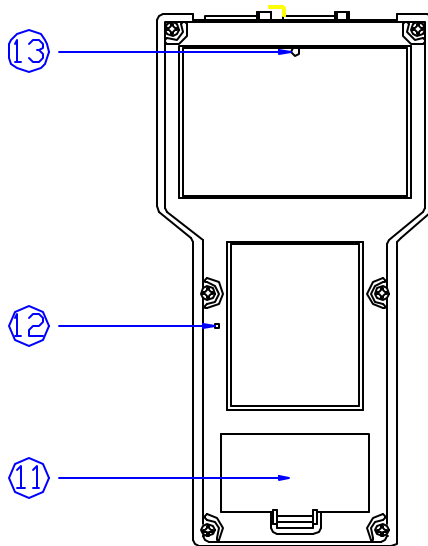


11    Battery compartment
12    Reset switch
13    Belt clip mounting hole

**Included Accessories:**

- Soft carry case 7702
- Belt clip kit
- PC adapter kit with RJ11 – RJ45 cable, and RJ11 to DB9 adapter
- 9 Volt AC adapter

**Optional Accessories:**

7704         DMX *Dart* moving Light Encoder Panel
             Ericom Powerterm Software

# Quick Start

Turning on the DMX *Dart* is as simple as pressing any of the 4 top row keys on the keypad. When one of these keys is pressed, the DMX *Dart* will power up in the mode that it was in when it was turned off.

---

*NOTE: The DMXDart may transmit DMX immediately upon power up. Please insure that all equipment (such as moving lights) is safe prior to starting*

---

The **PWR/BKLT** key provides access to the DMX *Dart*'s power management features, as well as operation of the LCD display. Pressing the **PWR/BKLT** key accesses the top-level power functions menu. This menu appears like this:

```
MENU-continue
OFF-  power down
BKLT-backlight
view angle , more
```

From this display, pressing the **MENU** key returns to the previous menu. Pressing the **OFF** key turns the unit off, and pressing the **PWR/BKLT** key toggles the LCD backlight on and off.

---

*NOTE:*
*The backlight is set to automatically turn off after 2 minutes of inactivity.*

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*NOTE:*
*While this is the only menu that allows the operator to power down the DMXDart it can be accessed directly at any time by pressing the PWR/BKLT key.*

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## Navigating the menus

The **MENU** key, located in the top right corner of the keypad, is the key that allows for the navigation through the DMX *Dart*'s menu system. At any time during operation of the DMX *Dart*, the pressing the **MENU** key will exit a function and display the associated function menu. Pressing **MENU** key while in a menu screen will advance to the next page of the current menu.

To choose a function, press the number key that corresponds with the number displayed beside the desired function. This will call the function, and jump directly to the function screen. Repeated presses of the **MENU** key from within a function submenu will rotate through the associated function menu, returning to the function display.

# QUICK START

## Controlling Dimmers

From the main menu select screen choose 1 to load **Main Menu 1**. From Main Menu 1, select **2 - Transmit DMX512**. The DMX 512 transmit function is now displayed:

```
Transmit DMX512
Data Entry
CH???              @??%
```

From this screen, standard level setting commands can be used to transmit DMX dimmer levels.  Enter **1 THRU 40 @ 30 OK.**  DMX channels 1 through 40 are now being transmitted at 30%. Subsequent commands will pile on levels to previous entries on a last take precedence basis while in data entry mode.

Enter **41 AND 75 @ 15 OK.** DMX channels 41 and 75 are now being transmitted at 15%, while channels 1 through 40 are held at 30%.

To blackout or turn all dimmers off, enter **1 THRU 512 @ OFF OK.**

# DMX*Dart* Operation

## Menus

The DMX*Dart*'s operating software is a menu-based system that provides quick access to all of the unit's functions.  The system consists of 2 main menus, one for DMX transmit functions and one for DMX receive functions.  From each of the main menus, functions are chosen by pressing the number corresponding to the item desired.  To swap main menus, choose the 'main menu select ' option from either of the main menus. This will display the main menu selection screen:

```
Main Menu Select
1-Transmit Functions
2-Receive Functions
1 or 2 select
```

Pressing the 1 key from this menu loads main menu 1, and the 2 key loads main menu 2.

## Navigating the menus

The **MENU** key, located in the top right corner of the keypad, is the key that allows for the navigation through the DMX*Dart*'s menu system.  At any time during operation of the DMX*Dart*, the pressing the **MENU** key will exit a function and display the associated function menu. Pressing **MENU** key while in a menu screen will advance to the next page of the current menu.

To choose a function, press the number key that corresponds with the number displayed beside the desired function.  This will call the function, and jump directly to the function screen.  To set up the parameters of any function, or to access function options, press **MENU** from the function display.  This will access the function's submenu. Repeated presses of the **MENU** key from within a function submenu will rotate through the associated function menu, returning to the function display.

# Function Summary

## Menu 1

### 1 - About Dart
Displays information about the DMXDart software, including software version, and the software serial number.

### 2 - Transmit DMX512

Command line setting of DMX levels.  Controls conventional DMX equipment. Transmits variable DMX 'flavors' for testing DMX reception equipment.

### 3 - Moving Light Tx
Dedicated control of moving lights, complete with fixture library, and attributes. Encoders and integrated pointing device provide direct access to attributes.

### 4 - Cue Mode
Playback of cues in standard DMX or moving light mode.  Also contains backup mode for operation inline with a DMX console.

### 5 - Misc Tools
Cable tester, real time clock, and DMX*Dart* self-test functions.

### 6 - Main Menu Select
Allows for the swapping of main menus between receive and transmit functions.

## Menu 2

### 1-About DART
Displays information about the DMX*Dart* software, including software version, and the software serial number.

### 2-Receive DMX512
Analyzes incoming DMX signal for signal integrity, as well as displays all incoming DMX data by channel.  User configurable extended features include alternate start codes, DMX termination, and pass-through regeneration.

### 3-DMX512 Monitor
Extends the Receive DMX functionality by displaying all signal parameters and full 512 bytes of DMX data on a single display via connection to a PC.

### 4-IDS Talkback
Monitors and translates messages sent by products supporting DMX talkback on pair 2 of the DMX cable.

### 5-Main Menu Select
Allows for the swapping of main menus between receive and transmit functions.

## Getting Started

Turning on the DMX*Dart* is as simple as pressing any of the 4 top row keys on the keypad. When one of these keys is pressed, the DMX*Dart* will power up in the mode that it was in when it was turned off.

> *NOTE: The DMXDart may transmit DMX immediately upon power up. Please insure that all equipment (such as moving lights) is safe prior to starting*

## Joystick

The DMX*Dart* features an integrated pointing device located at the center of the front panel. This device will respond to very small pressures applied to the entire outside diameter, as well as straight downward. While it is the first instinct for the user to press hard to create large changes in the on-screen values, it is actually more effective to press lightly. Operating the pointing device very gently will give the best results when operating moving lights, or manipulating values within other menus.

If you are having difficulty with the joystick, try the following exercise:

Go to **Main Menu 1**. Choose **5 - Misc Tools**, and then **3 - Misc. Self Test**. Finally press **1 – Keypad Joystick**.

You should see something like this:

```
Keypad/Joystick
Keypad:
X: +001  Y: +003   Z: +000
press menu to exit
```

The part of the display that we are interested in for this exercise, are the X & Y readouts. These show how much 'action' your joystick pressure is generating. Give it a try using very little pressure. Observe just how little pressure it takes to get a response. A little practice in this display should be all it takes to improve your joystick technique.

# Transmitting DMX

The DMX*Dart* supports 2 modes of transmitting DMX data, each having a different application when testing a lighting system.  The first mode is Data Entry mode, which is more commonly referred to as command line level setting.  In this mode DMX levels are set using standard command line language through the whole 512 channel DMX stream, and 512 channel 'looks' are established by "piling on" levels. Channel levels are held at their last set level until they are changed.  The second mode is Channel Test, which allows for the sequential testing of single channels, while leaving all others off.   A single channel is brought to a level using the standard command line, then the NEXT and PREV keys are used to increment or decrement the channel number being tested.  As the channel is changed, the previously active channel is taken to 0.

## Changing the DMX transmit mode

From the DMX transmit Function display press the **MENU** key. The Transmit DMX Menu will be displayed:

```
Transmit DMX512
1-Main Menu
2-Ch test / Normal
3-Cue Mode
```

Press **2 - Ch Test/Normal** to change the transmit mode.  This will be displayed:

```
Transmit DMX512
CH Test/normal mode
Mode:  Norm
                ^
```

Pressing the up or down arrow keys changes the mode.  Press the ℧ key.  The display will look like this:

```
 Transmit DMX512
CH Test/Normal
Mode:  Test   T: 0. 0
```

Press the ➲ key and enter **10**.  This will set the channel test to a 1.0-second fade time. Press **MENU** then **OK.**  This returns the Transmit DMX function display, changed for channel test mode.

```
Transmit DMX512
Ch Test
CH ???        @ ??%
         ^
```

Enter **1 @ 75 OK**.  DMX channel 1 is now being transmitted at 75%.  Channels 2 through 512 are off. Press **NEXT.**  DMX channel 2 is now being transmitted at 75%, Channels 1 and 3 through 512 are off. Press **PREV.** DMX channel 1 is now being transmitted at 75%.  Channels 2 through 512 are off.

The **Next** and **Prev**ious keys can be used to sequentially check dimmers and fixtures through all 512 DMX channels.

Data entry can also be used to check single DMX channels non-sequentially. Enter **200 @ 90 OK.** DMX channel 200 is now being transmitted at 90%, 1 through 199 and 201 through 512 are off.

Enter: **6 @ 80 OK.**  Channel 6 is now at 80%, and all other dimmers are off.

# Advanced DMX512 Transmit Options

## Transmit Setup

From the Main Menu, press **2-Transmit DMX512**.  This puts the DMX*Dart* output online.  Press **Menu** again to enter the Transmit DMX512 Menu.  **Select 4-Tx Setup** for the Transmit Setup.   This menu offers 5 options for customizing the DMX512 Transmit function:

## 1 - %/Dec

Changes to display of DMX levels between percentage (00 to FL) or decimal (00 to 255).  Use the ◍ and ◐ buttons to change the levels display mode, then press **MENU** to return to the Setup menu. When in DMX Transmit mode, levels will display with a % when in percentage mode, or without the % when in decimal mode. Changing the way that levels display, also changes they way they are entered from the keypad. Percentage display means levels can be entered from the keypad using values from 00 to 100 (FL).  Decimal display requires levels with values from 00 to 255. The ◍ and ◐ keys can be used to change levels, regardless of the display mode selected.

---

> NOTE: Changing the way that levels display, also changes they way levels are entered from the keypad.

## 2 – Hex

This function adds the hexadecimal value of the level selected to the levels display. When this method of display is selected, the hexadecimal level is shown to the right of the (% or D) level display, next to the level information.  The letter H follows the hexadecimal level.

```
Transmit DMX512
Accepted
CH 001    @    16%  29H
                     ^
```

Use the ⊙ and ⊙ buttons to turn the hexadecimal display mode on or off, then press **MENU** to return to the Setup menu.

## 3 – Bump

Use this function to set the level and fade time parameters for the **BMP** (Bump) key operation. Use the ⊙ and ⊙ or the keypad buttons to set the level you want to bump to when the BMP button is pressed, then press ⊃ to move to the fade time parameter (T:). Use the ⊙ and ⊙ buttons or the keypad to set the fade time you want to use for the bump function.  Any fade time from 0.0 to 9.9 seconds can be set.  Press **MENU** to return to the Setup menu.

## 4 – Power Up

When DMX transmit mode is selected, the DMX*Dart* will output the DMX levels present in last state that DMX transmit was in before it was powered down.  A Power Up fade time can be assigned to give the user an opportunity to either pause the fade or take the DMXDart offline if the output state going live is not what is desired.

Use the ⊙ and ⊙ or the keypad buttons to set the fade time you want, from 1 to 99 seconds. Press **MENU** to return to the Setup menu.

> NOTE: *As a precaution, the minimum power up fade time is limited to 1 second.*

## 5 – Parameters

**1 – Type Setup**: This selection allows you to configure the characteristics of the DMX output signal. Sets the "flavor" of the DMX signal: A, B, C, or U.  A through C are factory defaults, and U is a user programmable type for "tweaking" the DMX output. This can be especially useful in determining why a device that is considered to be DMX does not respond to a particular console

(More required… DAVE ??)

**2 – Sync Setup**: Turns on the Scope Sync port, and sets up the portion of the signal to sync to. (See Rx Sync Test for further information)
**3 – Data Loss Test**: Intentionally transmits poor DMX signal, manipulated by the user. Inserts 100ms to 2 s of "dead time" into the signal at a specified point. Tests DMX reception equipment for its reaction to poor data.

# Printing DMX Data

*Note:*
*Printing requires the optional Hewlett Packard 82240B Thermal Infrared printer.*

From the Transmit DMX512 submenu, press **5 – Print DMX Data** to enter the print screen.

```
Transmit DMX512
Print Data
* Hexval   CH: 001-050
^
```

From this display, all of the print options are set.  For example, to print the decimal value of channels 1 to 400 press ➲ to move the cursor (^) to below the format setting (currently Hexval):

```
Transmit DMX512
Print Mode Select
* Hexval   CH: 001-050
^
```

Press ∩ to change the format to "Decimal". Press ⊃ to move the cursor to the beginning channel value:

```
Transmit DMX512
Print Range Select
* Decimal   CH: 001-050
                    ^
```

Enter the lowest channel to be printed, in this case **1**. Press ⊃ to move the cursor to the highest channel value, and enter **400.** Press ⊂ twice to move the cursor below the asterisk (*), position the printer in a direct line with the top panel of the DMX*Dart*, and press **OK**.  The display will show:

```
Transmit DMX512
Printing: anykey-stop
* Decimal   CH: 001-050
^
```

To stop the print press any key, otherwise the full range specified, in this case from channel 1 to 400, will print. To exit the Print DMX display, press **MENU** or ⊂.


# Moving Light Control

An advanced feature of the DMX*Dart* is its ability to control a wide variety of moving lights.  The DMX*Dart* contains a complete fixture library of approximately 189 fixtures, and incorporates a joystick and optional encoders for direct access to moving light attributes.

To enter Moving Light Control **(ML-Tx)** mode select Main Menu 1 from the Main Menu Select display.  Press **3 - Moving Light TX.**

The Moving Light transmit function display will load.  During the load something like this will be displayed:

```
Moving Light TX
Technobeam (full)
Encoders setup ok!
```

*Note:*
*If the optional Encoder Wing is not connected, the DMXDart will automatically disable encoder operation.  To enable the Encoders, simply plug the Encoder Wing cable into the DMXDart and reload the Moving Light TX function.*

# *DMXDart Operation*

After the function loads the display will change to something like this.

```
Pan  Coarse           Grp
PanH  PanL  TiltH  TiltL
000   000    000    000
^                      C
```

This display is the Moving Light display, showing the first 4 attributes of the selected moving light.  This is the display where moving light control takes place.

## Moving Light Setup

In Moving Light mode, the DMX*Dart* controls up to 512 DMX channels, and each channel controls one attribute of a moving light.  Before using the DMX*Dart* to control moving lights, it must be set up for the specific number and type of moving lights that are to be controlled.

> *Note:*
> *Only 1 type of moving light may be controlled at a given time.*

There are three aspects to DMX*Dart* moving light configuration:
- Moving light model
- Address (address offset)
- Group offset
- Total number of moving lights

Different models of moving lights assign their attributes in a different order.  In addition, many models have attributes (color, gobo, strobe, etc.) that are not found on other fixtures.  To accommodate these differences, the DMX*Dart* has to know which model of moving light is being addressed so that it can map the attributes correctly.  You will need to know the exact model of the moving lights you need to control.  *See appendix "A" for a listing of moving lights.*

The DMX*Dart* needs the correct DMX address for the moving lights to ensure that the luminaire is controlled correctly.  Since most rigs have the moving lights addressed in sequence, DMX*Dart* follows this convention when configuring the address range.  You will need to provide the address of the lowest addressed fixture in your rig before you can control any moving lights.

To simplify the moving light addressing process, the DMX*Dart* is capable of offsetting each moving light's start address by a user programmable number of channels (Group Offset). For example, if a moving light has 18 attributes, you could separate each light's start address by 20 channels.  This will make it easier to set the fixture addresses in the rig.  Fixtures can be DMX addressed as 1…21…41…61 as opposed to 1…19…37…55.

When actually controlling individual moving lights, they are called up as fixture numbers.  Fixture number 1 will be patched by the DMX*Dart* to the fixture who's DMX address was set in the DMX offset.  Fixture 2 will be patched to the address calculated by using the Group Offset and the DMX Offset, and so on.  This patching process continues for the total number fixtures you have under your control.

To enter the setup menu from the Moving Light TX display press **MENU** then **4-Setup** to enter the moving light setup submenu.  Press **1 - Parameters** to enter the ML Parameters submenu.

## Moving Light Model

To select the type of moving light being controlled, press **1 –ML# Select**.  You should see something like this:

```
ML# Select
Technobeam (full)
Select ML:078  Att=18
                ^
```

The DMX*Dart* fixture library assigns a unique number to each model of moving light.  To choose the model of moving light you wish to control, you have to select its corresponding fixture number.  To make this easy, The DMX*Dart* displays both the fixture number and the fixture model name on the moving light selection display.

The cursor will appear under the moving light number.  From this location a moving light can be selected via direct digital entry or by using the ⋂ and ⋃ keys.  As the moving light numbers are scrolled through, the model and the number of attributes that fixture utilizes are displayed.

Once the desired moving light has been selected, Press **MENU** to return to the ML Parameters submenu.

# *DMXDart Operation*

## DMX Address (DMX Offset)

> *NOTE:*
> *Incorrect addressing can result in unpredictable moving light response to control.*

From the ML Parameters menu, press **2- DMX Offset** to enter the DMX Offset display:

```
DMX offset

DMX offset 001
                ^
```

Enter the DMX start address for the moving light with the lowest start address using the number keys or the up and down arrows.

Press **MENU** to save and exit to the ML Parameters submenu.

## Group Offset

> *Note:*
> *The group offset cannot be less than the number of attributes within the moving light.*

To change the group offset,

From the ML Parameters submenu, press **3 - Group Offset**

```
Group Offset

Group Offset:  020
                 ^
```

Enter the desired group offset using the number keys or the ဂ and ဎ keys. Press **MENU** to save and exit to the ML Parameters submenu.

## Total Number of Moving Lights

From the ML Parameters submenu press **MENU** to access page 2 of the submenu. Press **4 - # of lights/group**

```
# of  lights/group
Technobeam (full)
# lights/group: 020
                   ^
```

Enter the total number of moving lights being controlled (to a maximum of 512 DMX channels) using the number keys (followed by **OK**) or the up and down arrow keys. Press **MENU** to save and exit to the ML Parameters submenu. Press **Menu** 4 times to return to the ML TX function display.

# Controlling Moving Lights

The DMX*Dart* can control a single moving light within the group, as well as the entire group.

When changing from single mode to group in Moving Light TX, the DMX*Dart*, regardless of what is being transmitted, synchronizes the attributes of all of the moving lights in the system. Attributes are moved to the last values set in Group Mode. Each time the mode is switched from Group to Single, the DMX*Dart* saves the last levels transmitted to the whole group of fixtures.

When Group Mode is re-selected, the DMX*Dart* reminds the user that the last group data will be restored, reverting all of the channels that were changed in single mode.

There is currently no method of re-entering group mode without restoring the levels.

> *Operational Tip:*
> *Set all group options first: set color and gobo information for all fixtures in Group Mode prior to setting each individual fixture's position, focus etc.*

## *DMXDart Operation*

From the Moving Light TX function display, press **2 - SGL / Grp** to enter the setup display:

```
SGL/GRP setup
Mode Select
Mode:  group
            ^
```

Use the ⋂ and ⋃ arrows to change from Group to Single mode.  Press **OK.**   The display will change to:

```
SGL/GRP setup
Sgl # within group
Mode:  single:  012
                  ^
```

Press ⟳ to move to the fixture number and use the ⋂ and ⋃ keys or direct numeric entry to select the desired fixture number.  Press **MENU** to complete the selection and return to the Moving Light TX function display.

The top right corner of the display will show whether a single moving light or the entire group of moving lights is being controlled.  If group operation has been selected, "grp" will be shown.  If a single fixture is being controlled, the number of the fixture will be displayed.

Once the correct moving light has been selected (in this case ML# 78 – HES Technobeam) attributes can be directly controlled using the  ⋂ and  ⋃ keys, encoders, or direct digital entry.  The joystick is automatically assigned to the pan and tilt attributes.

To select an attribute, use the ⟲ and ⟳ keys to move the cursor (^) beneath the desired attribute.  To quickly scroll through pages of attributes, simply press the NEXT and PREV keys.  Once the desired attribute has been selected, values may be manipulated using the number keys (followed by **OK**) or ⋃ and ⋂ keys. Regardless of the attribute menu being displayed, the joystick will always operate the pan and tilt attributes.

## Pan / Tilt Shortcut

The Pan / Tilt Shortcut gives instant visibility and control of the three most commonly used moving light attributes; pan, tilt and intensity.   This display can be accessed by simply pressing the @ key from the moving light control display. When Pan / Tilt mode is active, a P/T will appear in the upper left corner.

```
P/T                     Grp
PanH  PanL  TiltH  TiltL
000    000    000    000
^                        C
```

This shortcut menu gives instant access to the optional Encoder Panel for pan and tilt.  In P/T Mode the Bump key flashes the fixture to full while the key is depressed.

Another use of the Pan / Tilt Shortcut is to change the fixture being controlled in "single" mode.  While the P/T display is active, pressing **NEXT** and **PREV** steps the live fixture number, speeding up the programming process.

To exit the pan/tilt shortcut, press @ again.

## Bringing Fixtures "Home"

To speed up programming of moving lights, the fixture library contains a set of default parameter values that put the fixture into a "home" position.  Home is typically 50/50 pan and tilt, no color, no pattern, 50% focus, iris and shutter open, intensity at 0%, and all control parameters at "safe".  This gives a "clean slate" to begin setting up looks.

The DMX*Dart* will home either a single fixture or a group, depending on which mode you were last in.  From Moving Light Tx, select **6 – Home**. DMX*Dart* will display a reminder if the home function is going to be performed on the entire group of fixtures.  Press **OK** to accept.

## Controlling Dimmers while in Moving Light Mode

The moving light TX submenu allows for the setting of DMX levels outside of those channels used for moving lights. To set levels from the Moving Light Tx function screen press **MENU** to enter the Moving Light Tx submenu. Press **3 - DMX512** to switch to Tx mode. Enter DMX levels using the standard command syntax, as outlined in the DMX512 Tx section of this manual. To return to the Moving Light control display, press **MENU**, then **1 – Return to M/L Tx**

---

*NOTE:*
*This is a special mode of DMX512 transmit that allows fast switching between DMX direct control and Moving Light control. The DMX 512 transmit options can still be set up while operating in this mode.*

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# Cue Mode

At the time of this manual's publication, the cue mode remains under development. Watch the Gray Interfaces website for updates. Features to include:

- 100+ Cues with memory backup
- Fully programmable fade and wait times, as well as linking of cues.
- Standard cue operation syntax.
- RTC Mode
- Backup Mode
- Moving Light Mode ( With 16 bit support)

# Miscellaneous Tools

The Misc Tools section contains 3 useful tools.

- DMX cable tester
- Set the DMX*Dart*'s internal real-time clock.
- DMX*Dart* Self Test

## Testing Cables

The DMX*Dart* is able to test DMX data cables using 3 different methods:

- **Double ended continuity testing** – checks the cable for shorts, opens, and incorrect connections

# DMXDart Operation

- **Double ended data loss testing** – checks a cable for its' data transmission stability by connecting both ends to the DMXDart's DMX input and output and transmitting 250Kbps data over it.
- **Single ended loopback data loss testing** – same as double ended data loss testing, but it allows for testing of permanently installed cable through the use of a loopback connector.

**Double ended continuity testing**
From Main Menu Select, choose **1- Transmit Functions**.
Select **5 - Misc Tools**
Press **1 - Cable Test**.

The double ended continuity test will be displayed:

```
Cable Test    CM CF
1-N 2-N 3-N 4-N 5-N
Err Err Err Err Err
^v mode,    menu-exit
```

Connect one end of a DMX cable to the DMX*Dart*'s input and the other to the DMX*Dart*'s output.  The display will change automatically as the real time test is performed:

```
Cable Test     CM CF
1-1 2-2 3-3 4-4 5-5
Ok   Ok   Ok   Ok   Ok
mode,      menu-exit
```

Incorrect connections, shorts, and opens will be displayed as an Err on the third line of the display.

**Double-ended data test**
Pressing the Ʊ and Ʊ arrow keys switches the cable test mode.
Press the Ʊ key.  The display will change to:

```
Cable test 00000
Double-end data
(2-3) OK      (4-5)OK
    mode, clr-reset
```

During this test the DMX*Dart* counts packets of data that have been transmitted and received.  If the DMX*Dart* detects data corruption on either of the pairs, an Err! Will appear beside the problem pair. (2-3) Denotes pins 2 and 3 of the DMX cable, or pair #1, and (4-5) pins 4 and 5 – pair #2.
The error message is held until **CLR** is pressed to reset the test.

# *DMXDart Operation*

**Single Ended Data Test**

Pressing the ↻ again switches the DMX *Dart* mode.

```
Cable test 00000
Single-end loop
(TxJ)NoRx    (RxJ)NoRx
   mode, clr-reset
```

*Note:*
*TxJ Denotes the cable connected to the DMX output (Female) connector, and RxJ the cable connected to the input (male) connector.*

Connect one end of a DMX cable to one of the DMX connectors on the DMX *Dart*. Connect a loopback XLR connector to the other end. The DMX *Dart* should count data packets and display an OK message beside the connection being used. As with the double-ended data test, errors are held until the **CLR** key is pressed, allowing very rapidly occurring errors to be displayed.

*TIP:*
*To create a DMX loopback connector, use a 5-pin XLR style cable connector and connect pin 2 to pin 4 and pin 3 to pin 5. This connects the transmit pair ( pins 2 and 3) with the receive ( talkback) pair ( pins 4 and 5) using the correct signal polarity. Pin 1 (Ground) is not tested using this method.*

## Onboard Clock

The DMX *Dart* contains a real time clock (RTC) capable of displaying the day and time.

*Note:*
*This clock governs all fade operations within the DMX*Dart*, and can be turned off, subsequently disabling all fade functions within the unit.*

To set the clock, enter **2- RTC Setup** from the Misc Tools menu. The following will be displayed:

```
RTC Setup
Time: Mon 16:48.57
Control: On
^
```

Press ↻ to select a parameter, then ➲ and the ↻ and ↺ keys to modify the value. Once the value has been changed, press ↻ to return to the parameter field. Repeat for each parameter that you wish to modify.

# *DMXDart Operation*

The 'Control' parameter should be left at "on" to allow for the fade time routines, as well as future real time clock functions to operate correctly.

To exit the RTC Setup press **MENU**.

## Self Test

The Self-Test function runs diagnostic routines on 3 key areas of the DMX*Dart*'s hardware. Self Test is provided as a troubleshooting tool in the event of suspected DMX*Dart* malfunction. The areas tested are:

- Keypad and Joystick
- Optional encoder panel
- Printer

The keypad/Joystick, and encoder panel tests give real time feedback as the hardware is manipulated, pointing out any hardware failures if they have occurred. The printer test sends a test message to the printer, testing the IR ports, as well as the printer. If a failure is discovered, please contact Gray Interfaces technical support.

# DMX Receive Functions

The DMX*Dart* contains a complete set of tools for analyzing incoming DMX512 data. These tools can be tailored to suit the needs of a given testing situation by displaying DMX data, signal characteristics, or IDS talkback information. The DMX*Dart* will also act as a trigger for an oscilloscope to provide quick viewing of the signal's electrical characteristics when an oscilloscope is used.

From Main Menu #2, press **2 - Receive DMX**

```
Receive DMX512
No RX!
001  002  003  004  005
00%  00%  00%  00%  00%
```

Once a lighting console, or any DMX 512 transmitting device is connected to the 5 pin XLR male connector on the unit's top panel, and DMX levels are sent, the display changes in real time to reflect those levels:

```
Receive DMX512
PS: 512    PR: 041  SC: 000
001  002  003  004  005
20%  00%  50%  00%  00%
```

---

Pressing **NEXT** displays the next 5 DMX dimmer levels:

```
Receive DMX512
PS: 512    PR: 041  SC: 000
006  007  008  009  010
20%  00%  00%  00%  00%
```

Press **PREV** and **NEXT** to display the desired block of 5 dimmer levels.

The Receive DMX512 function display will show the current status of the DMX signal it is receiving in the form of the 3 items on line 2 of the display.

Key components of the Receive DMX512 display are:
- PS is the data packet size, in bytes (dimmers)
- PR is the data rate in packets per second of the incoming data
- SC is the current start code being displayed
- TRM, if displayed, indicates that DMX line termination is ON

From the receive DMX512 display pressing **MENU** displays the Receive DMX512 submenu.  This submenu offers options to further analyze the incoming signal, change the testing parameters, and alter the functionality of the DMX Thru connector.

## Receive DMX Analyzer

This function performs a complete analysis of the incoming signal's characteristics, and can report average, minimum, and maximum values for each portion of the data stream.  To access the DMX Receive Analyzer, **select 2 – Rx Anaylzer** from the Receive DMX512 menu.

```
Receive DMX512
Break
BRK Nom
^
```

Pressing the Ϙ or Ϭ arrow keys changes the signal parameter being analyzed.  The second line of the display gives the complete name of the signal parameter chosen.  Once the parameter has been chosen, pressing ➲ starts the real time analysis.

```
Receive DMX512   00010
Packets per second
PPS Nom      44.11
      ^
```

## *DMXDart Operation*

The packet counter (top right of the display) begins to count the DMX data packets received. To cycle the display between the minimum, nominal (average) and maximum values, press the ➲ key to move the cursor below the value being received.  Then press the ⋂ or ⋃ to change to the desired parameter.

The parameters that can be analyzed are:

> BRK – Break Length
> MAB – Mark after break
> MBF – Mark Between Frames
> MBP – Mark between packets
> BTB – Break to Break
> FPP – frames per packet
> PPS – packets per second.

If the parameter being analyzed is outside of the recommended specification for USITT DMX512-1990, an error message will be displayed beside the abnormal value.

---

*TIP:*
*For more information on DMX characteristics, please refer to United States Institute for Theatre Technology DMX512/1990 Digital Data Transmission Standard for Dimmers and Controllers.  This publication is available for purchase at http://www.usitt.org*

---

## Receive DMX Setup

Within Rx Setup, 3 parameters can be adjusted to tailor the way DMX receive functions display and operate.

- **Start Code Select** – View data for a single, user defined, start code
- **Termination** – Turn on DMX termination when the DMXDart is the last DMX receiving device in a daisy chain.
- **Thru-trans control** – Set the output port (DMX thru) off, as a direct pass through, or transmit a regeneration of the incoming signal.  When regenerating the signal, the DMX "flavor" can be chosen, effectively acting as a DMX to DMX converter.

## Flicker Finder

The Flicker Finder is a long-term test designed to detect fluctuating levels (corrupt data) within a static DMX512 signal.   The test compares a snapshot, or individual packet of DMX512 levels against every incoming packet, and displays inconsistencies.  To test a DMX transmission device for "flickers", go to DMX transmit mode (Main Menu 1) and set a static look of DMX Levels such as **1-512 @ 50.**

Next, go to Main Menu 2, select **2- Receive DMX**. Press **Menu** and select **4 – Flicker Finder**.

```
Flicker Finder
1- Snapshot   4- Test
2- Clear Log 5- Print
3- View       6-Setup
```

Connect the DMX source to be tested to the DMX input of the DMX*Dart*. Snapshot the levels by pressing **1** on the DMX*Dart*, then **OK**. The unit will prompt for confirmation of the snapshot (SURE??). Press **OK** a second time to confirm.

---
***Note:***
*DMX must be present for Flicker finder to run. If no DMX is present, you will be returned to the Snapshot?? screen.*

---

Once the snapshot has been taken, the Flicker Finder menu will reappear. To perform the test, insure that the levels coming from the device have not been inadvertently changed, and press **4 – Test** to begin the test.

The Flicker Finder will continually analyze the incoming signal until the user stops it. Each flicker or error found is logged and the first and last dimmer, as well as the number of dimmers displaying errors will be shown:

```
Flicker Finder
First:???     Last:???
Test:00010   #Dim???
       ^
```

To stop the testing, press **OK**. The Flicker Finder Menu will reappear. To view the log, press **3 - View**, then **1 - Log**. Use the ↥ and ↧keys to scroll through the errors. If Timestamps is selected from the View Select, the time of day for each flicker found can be seen. The flicker log can also be printed using the optional printer and selecting option **5 – Print.** The print option prints the entire log by pressing **OK**.

---
*Note:*
*Print functions require a  Hewlett Packard 82240B Thermal Infrared printer.*

---

## Printing Received DMX Data

From the Receive DMX512 submenu, the incoming DMX data stream can be printed using the Print Rx Data option.

From the Receive DMX512 submenu, press **5 – Print Rx Data**.

```
Receive DMX512
Print Data
* Hexval   CH:001-050
^
```

From this display, all of the print options are set. For example, to print the decimal value of channels 1 to 400 press ➲ to move the cursor (^) to below the format setting ( currently Hexval):

```
Receive DMX512
Print Mode Select
* Hexval   CH:001-050
    ^
```

Press ↻ to change the format to "Decimal". Press ➲ to move the cursor to the beginning channel value:

```
Receive DMX512
Print Range Select
* Decimal   CH:001-050
                  ^
```

Enter the lowest channel to be printed. In this case channel **1**. Press ➲ to move the cursor to the highest channel value, and enter **400**

Press ➲ twice to move the cursor below the asterisk (*), position the printer in a direct line with the top panel of the DMX*Dart*, and press **OK**. The display will show:

```
Receive DMX512
Printing:anykey-stop
* Decimal   CH:001-050
^
```

To stop the print press any key, otherwise the full range of channels 1 through 400 will print. To exit the print RX Data display, press **MENU**.

## Oscilloscope Sync

The DMXDart provides oscilloscope users with a handy tool that will help synchronize an oscilloscope's display with characteristics of the incoming DMX data stream. The Rx Sync test transmits a high-speed pulse from the 1/8" TRS jack on the top panel of the DMX*Dart*. Using this feature requires an adapter cable (not included) to connect to the trigger input or alternate channel of an oscilloscope. The pin-out is as follows:

> Tip = Ground
> Ring= Sync
> Sleeve=Power supply input

The sync pulse is a 1uS wide 4V peak pulse that is output whenever the given signal parameter is present.

---

**Note:**

*An oscilloscope faster than 16MHz is required for an accurate look at the DMX signal.*

---

To sync a scope to the incoming signal, connect the scope's trigger input and ground to the scope sync adapter. Connect the scope's primary probe to the RX+ or − (pin 1 or 2 on the DMX input) and the reference to the shield of the incoming cable. Enter the RX sync test function by selecting **6 – Rx Sync Test Mode** from the Receive DMX512 submenu:

```
Rx Sync Test Mode
Disabled
Sync:    Off
            ^
```

Use the ↻ and ↺ keys to choose the portion of the signal to synchronize to. The available characteristics are:

- Break,
- Start Code
- Any frame of data (1 to 512)

The sync port provides technicians with a means to obtain a quick and easy look at the electrical characteristics of the incoming signal.

## DMX 512 Monitor

AT THE TIME OF THIS MANUAL'S PUBLICATION, THIS FEATURE IS STILL UNDER DEVELOPMENT. DMX MONITOR WILL PROVIDE A REAL-TIME DISPLAY OF 512 DIMMER LEVELS, AND DMX SIGNAL CHARACTERISTICS VIA SERIAL CONNECTION TO A PC RUNNING ERICOM POWERTERM™ 32 SOFTWARE.

## IDS Talkback

The IDS talkback function accepts status data from dimmers, color scrollers, and other IDS-capable equipment over pair 2 of the DMX cable.  When active this display shows "raw data" from any devices communicating over the alternate pair:

```
IDS Talkback:  Control
Generic ID: 000 R:
G: 001   B: 001:
     ^                <Tx
```

From this display, dimmer levels can be set, and status messages returned can be viewed.  To set dimmer levels, press ⌁ to go to the DMX-512 Tx (transmit) display.  Levels can be set using the usual command line entry, or via channel test mode.  Returning to talkback is achieved by pressing **MENU 1**.  Any incoming status messages will be displayed.

Please consult the equipment's manufacturer for IDS "plain English" data translations.

# Internal Utilities

The DMX*Dart* contains a menu designed specifically for internal utility functions – functions that do not relate to the analysis of DMX equipment. This menu is called the BOOT menu.  To enter the boot menu, first turn the DMXDart off.

While holding the 4 key, press **PWR**.  This will load the boot menu:

```
Boot VerA.23
1-About Dart
2-Main Menu Select
3-PC Communications
```

This menu performs all of the functions with regards to operating software installation and backup.

# *DMXDart Operation*

## Power Management and Backlight

The **PWR/BKLT** key provides access to the DMX*Dart*'s power management features, as well as operation of the LCD backlight.  Pressing the **PWR/BKLT** key accesses the top-level power functions menu.

```
MENU-continue
OFF-  power down
BKLT-backlight
view angle, more
```

From this display, pressing the **MENU** key returns to the previous menu. Pressing the OFF key turns the unit off, and pressing the **PWR/BKLT** key toggles the LCD backlight on and off.

---
*NOTE:*
*The backlight is set to automatically turn off after 2 minutes of inactivity.*

---

---
*NOTE:*
*This is the only menu that allows the operator to power down the DMXDart.  This menu can be accessed directly at any time by pressing the PWR/BKLT key.*

---

The **PWR/BKLT** key also provides access to the DMX*Dart*'s power management software.  The DMX*Dart* has been designed to achieve the highest possible operating time using a standard 9-volt battery. The power management software tracks battery life, and calculates the time remaining.  DMX*Dart*'s power consumption monitoring can also be used as a DMX troubleshooting tool. Excessive power consumption during DMX transmit functions can be an indication of cable problems.

From the power management screen, pressing ⊃ to access the Battery Status display:

```
Battery Status
V=9.0 I=058mA C=100%
Run Time: 008hr 55min
MENU-exit      <more>
```

This display provides the following real-time information about the unit's battery:

|  |  |
|---|---|
| V | Battery Voltage |
| I | Current draw in milliamps |
| C | Battery capacity remaining |
| Run Time | Approximate available battery life |

By monitoring the battery status display, problems present in cabling or DMX reception equipment may be discovered.   The DMX*Dart*'s power draw is typically between 28 and 80mA, depending on a number of operational factors. Seeing a current draw outside of this range indicates a problem somewhere in the signal path and may prompt the use of another of the DMX*Dart*'s DMX analysis tools.

**Changing the Battery**

The DMX*Dart*'s run time and capacity are based on the typical current capacity of a standard 9V Alkaline battery (approximately 540mAHr). Each time the DMX*Dart*'s battery is changed, this capacity must be reset to insure the most precise calculations for these values.  The DMXDart will automatically detect a battery change and reset the capacity.  You will be prompted to confirm a battery change when one occurs.

```
Initial MAHR: 0540
Current MAHR: 0100
SET, FULL -- reset
MENU-exit     Back<
```

It is possible to change the initial capacity if a non-standard battery is being used. This is done by using the up and down arrows to manipulate the value.  Please consult your battery's manufacturer for the correct capacity information.

To exit the power management displays, press **MENU**.  This will return to the previously used function menu.


# Software Updates

DMXDart software updates are available from the Gray Interfaces website (http://www.gray-interfaces.com) as they become available.  Software updates will generally add features or enhancements, improve usability or fix bugs.

## Connecting to a PC

To install the update, the DMX*Dart* is connected to your PC using the supplied serial cable.  PC communications for the purpose of software updates are set up from the PC Communication option within the boot menu. The DMX*Dart* employs a high-speed serial interface that can be configured to communicate using any standard baud rate and settings.  Choosing **1 – PC Comm Setup** from the PC Communications option sets up the port. The typical settings for software updates are:

Format: 8N2 (8 data bits, no parity, 2 stop bits)
Baud: 115.2Kbps

Choosing **2 – PC comm test**, and pressing **OK** can test the connection. A message will be sent to the PC, and will be displayed on the terminal screen of any standard communication software, such as Hyperterminal. If the message does not appear correctly, ensure that the communications settings of both the PC and the DMX*Dart* are identical. If the settings are the same and problems still exist, try changing the values until the test is successful. For further assistance, contact Gray Interfaces Technical support.

### Installing Software Upgrades

To update the operating software, choose **4 – Update From PC** form the Boot menu. This will display the update screen. Follow the instructions provided with the operating software package to download the software files to the DMX*Dart*.

The software files will load, and will be scanned for corruption. If the software is free of errors, the DMX*Dart* will be ready to operate using the new software. To restart the DMX*Dart*, select **7-Restart**. The DMXDart will start with the new software.

## DartFlash

At present, the DMX*Dart* supports the use of a 128KB serial flash module for software backup. Supplies of this module have become unreliable. Watch the Gray Interfaces website for developments.

## Technical Support

For technical support contact:

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T2G 1W4

Phone: +1 (403) 243-8110
Fax: +1(403)287-1281
E-mail: support@gray-interfaces.com
Internet: http://www.gray-interfaces.com

# Appendix A – Moving Light Library

**Amptown**

001: Amptown Posi-Fan
002: Amptown PML Mk2
003: Amptown Washlite Hal
004: Amptown Washlite-HP
005: Amptown Wash-Shutter

**Clay Paky**

006: Superscan Zoom
007: Superscan Zoom Ext
008: Goldenscan HPE
009: Goldenscan 3
010: Goldenscan 2
011: Stagescan
012: Stage Light 300
013: Stage Color 300
014: Stage Color 575
015: Stage Color 1000
016: Stage Color 1200
017: Stage Zoom 1200
018: Goldenscan 3x
019: Super MRG
020: Superscan
021: Minihpe
022: Combicolor

**Coemar**

030: CF1200HE
031: Nat 1200
032: Nat 2500
033: Samurai

**High End Systems**

040: Cyberlight
041: Intellabeam 700HX
042: Studio Color
043: Trackspot
044: Technobeam (full)
045: Technobeam (reduced)
046: Studio Spot 250
047: Studio Color 250

048: EC-1
049: Studio Spot
050: Studio Spot 575 CMY
051: Cyber M2 Litho
052: Technibeam Hi
053: Technoray
054: Technopro
055: Intellabeam 13 Ch
056: Dataflash

**Irideon (ETC)**

065: Irideon AR5 Hi8Ch
066: Irideon AR500

**Martin Professional**

075: Roboscan 218
076: Roboscan Pro 218 M1
077: Roboscan Pro 218 M2
078: Roboscan Pro 218 M3
079: Roboscan 518
080: Roboscan Pro 518 M1
081: Roboscan Pro 518 M2
082: Roboscan Pro 518 M3
083: Roboscan Pro 812 M1
084: Roboscan Pro 812 M2
085: Roboscan Pro 812 –5C
086: Robo Pro1220 CMYR M2
087: Robo Pro1220 CMYR M3
088: Robo Pro1220 CMYR M4
089: Robo Pro 1220 XR M3
090: Robo 1220 RPR M2
091: Robocolour Pro 400
092: Robocolour Pro 4
093: Pal 1200 M1
094: Pal 1200 M2
095: Pal 1200 M3
096: Mac 600 M1-8 wo spd
097: Mac 600 M2 - 16 wo spd
098: Mac 600 M3 – 8 w spd
099: Mac 600 M4 – 16 w spd
100: Mac 500 M1-8 wo spd
101: Mac 500 M2 - 16 wo spd
102: Mac 500 M3 – 8 w spd

103: Mac 500 M4 – 16 w spd
104: Mac 1200 M1-8 wo spd
105: Mac 1200 M2 - 16 wo spd
106: Mac 1200 M3 – 8 w spd
107: Mac 1200 M4 – 16 w spd
108: Robo Pro 918 M1 - 8 wo spd
109: Robo Pro 918 M2 – 16 wo spd
110: Robo Pro 918 M4 – 16 w spd
111: Robo 918 M2
112: FxPal 1200 M2

## Pani

120: Pani AMD15 + Shutter
121: Pani Projector & Sld

## Sagitter

125: Sagitter Infinity
126: Sagitter Prince
127: Sagitter Digiflash

## Strand Lighting

130: PALS Pirouette
131: PALS Pirouette 16
132: PALS Pirouette Color
133: PALS Pirouette 16C
134: Hyperbeam 1288 CMYR M3
135: Hyperbeam 1200 XR M3
136: Hyperbeam 200
137: Colourbeam 200
138: Cadenza PC PALS
139: Cadenza 17/32 PALS

## Vari*Lite

140: VLM M1
141: VLM M2-8BE
142: VLM M3-16B
143: VL5 M1-8BR

144: VL5 M2-8BE
145: VL5 M3-16R
146: VL5 M4-16E
147: VL5 M5-8B
148: VL5 M6-16B
149: VL6 M1 –8R
150: VL6 M2-8E
151: VL6 M3-16R
152: VL6 M4-16E
153: VL6 M5-8B
154: VL6 M6-16B
155: VL7 –16 M6
156: VL5 M3
157: VL6 M3
158: VL7 5.0 M7
159: VL7 5.0 M8
160: VLM M1
161: VLM M2
162: VLM M3

## Other Manufacturers

175: Dimmer
176: Non Dimmable
177: Scroller
178: Scroller Dim
179: CMY Fader
180: CMY Fader / Dimmer
181: Strobe Dimmer
182: American DJ
183: Color Fader 300
184: Digital Beam Light
185: LT Komplett
186: Summa HTI
187: Statos Hires
188: Giant 16 Ch
189: Starlite MK5

# Appendix B: Connector Pinouts

## DMX512 – 5 Pin XLR Male

| Pin | Function |
|-----|----------|
| 1 | Ground |
| 2 | Data Tx- |
| 3 | Data Tx+ |
| 4 | Data Rx- |
| 5 | Data Rx+ |

Power / Sync – 1/8 " TRS

| Tip | Ground |
|-----|--------|
| Ring | Sync |
| Sleeve | Power |

## RS232 PC Comm / Encoder expansion port – RJ 45 Female, 8 pin

| 1 | Encoder 1 |
|---|-----------|
| 2 | Encoder 2 |
| 3 | Encoder 3 |
| 4 | Ground |
| 5 | Ground |
| 6 | RS232 CTS |
| 7 | RS232 TXD |
| 8 | RS232 RXD |

## DMX Loopback Test Connector

Using a single male or female 5-pin XLR inline connector, connect as follows:

| Pin | Connected to Pin |
|-----|------------------|
| 1 | NC |
| 2 | 4 |
| 3 | 5 |

# Appendix C – Troubleshooting

Before contacting Gray Interfaces Technical Support, please use the following checklist to troubleshoot DMXDart Operation Problems:

Problem:
*Unit not responding to Keypad commands*
Possible Solutions:

1) Disconnect Encoder wing and repeat keypress
2) Manipulate Pointing device ( Lightly!) then repeat keypress.
3) Using a paperclip or piece of wire, press RESET on rear of unit.

Problem:
*Pan/tilt movement is very slow using joystick*

Possible Solutions:

1) Check Lower Right corner of display for "F" . "F" denotes fine movement, and is switched by pressing directly down on the pointing device
2) After switching the coarse/fine mode, operate the pointing device by pressing VERY LIGHTLY on the unit. The IPD is much more effective if operated from the side, rather than the top of the device. Pressing hard on the device may impede the device's function, or cause permanent damage to the unit.

Problem:
Coarse / Fine selection not available
Possible Solutions:

1) IPD Range set to OFF in ML-Tx Setup submenu. Turn range ON to activate FINE mode availability.