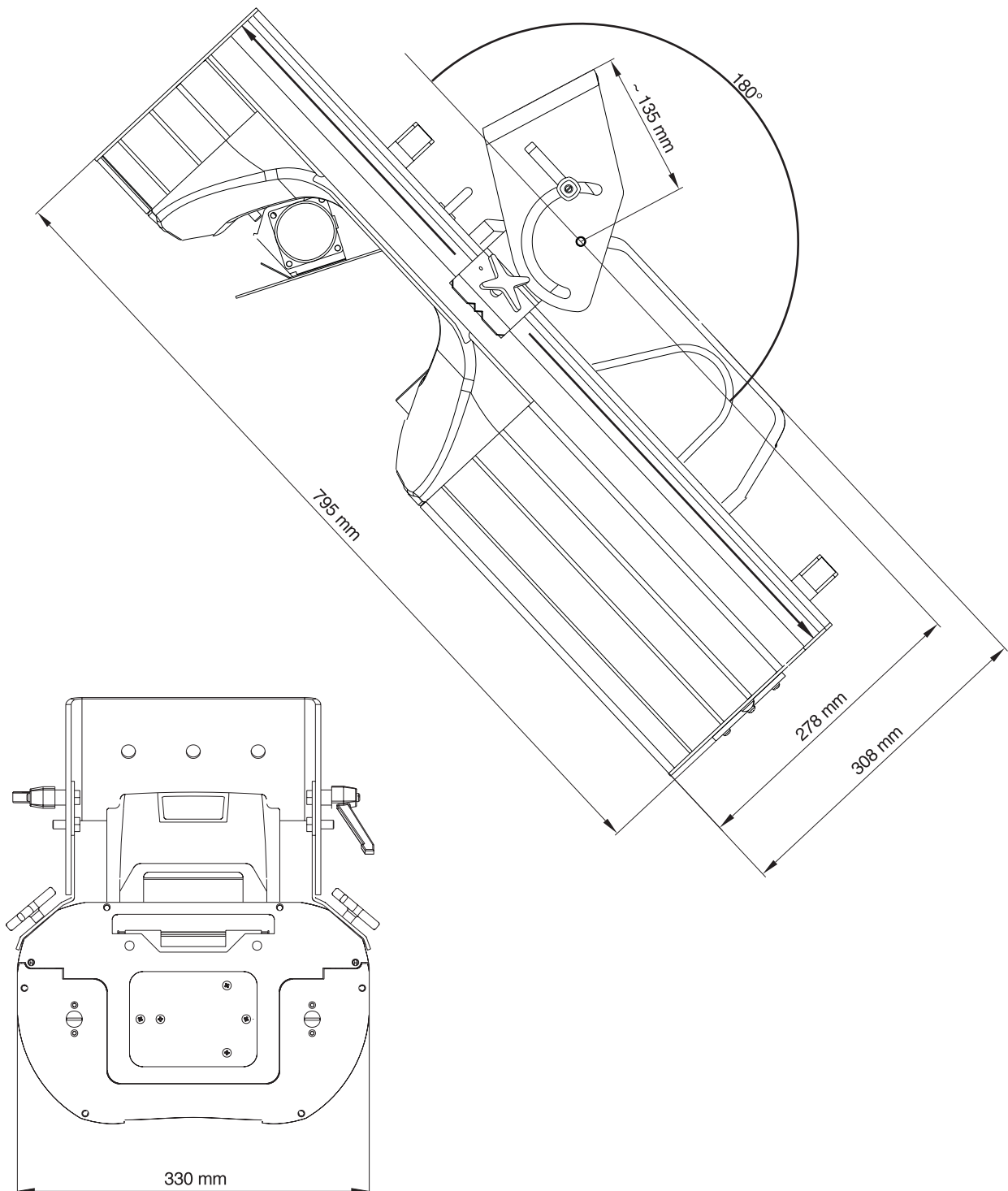


# RoboScan Pro 918

user manual



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## section 1

# INTRODUCTION

Thank you for selecting the Martin RoboScan Pro 918. This scanner, with its highly efficient optical and thermal design, provides quiet operation and crisp, bright output in a compact, easy-to-handle package.

This manual covers all models of the RoboScan Pro 918 and describes the features found in CPU software version 1.3. The latest Pro 918 service and support information is available from the Martin Professional web site at <http://www.martin.dk>.

## SAFETY PRECAUTIONS

**The RoboScan Pro 918 is for professional use only.** It presents potential risks due to electrical shock, heat and ultra-violet radiation burns, lamp explosion, falls, high-intensity light, and fire. A thorough understanding of the dangers, genuine concern for safety, and attention to detail are required to prevent accidents. **Read this manual before powering or installing the fixture, follow the safety precautions listed below and observe the warnings in this manual and printed on the fixture, and always double check the safety conditions.** If you have questions about how to operate the Pro 918, please contact your Martin dealer for assistance.

- Always disconnect the fixture from AC power before:
  - Changing the transformer or ballast settings
  - Installing or removing the lamp
  - Checking or replacing fuses
  - Removing any cover or part
- Allow the fixture to cool for 15 minutes before replacing the lamp.
- Keep all combustible materials (for example fabric, wood, paper) at least 0.5 meters (20 inches) away from the fixture. Keep flammable materials well away from the fixture.
- For protection against dangerous electric shock, always ground (earth) the fixture electrically. Use only a source of AC power that complies with local building and electrical codes. Do not expose the fixture to rain or moisture.
- Ensure that the air flow through fans and vents is free and unobstructed.
- When suspending the fixture above ground level, verify that the structure can hold at least 10 times the weight of all installed devices and secure the fixture with an approved safety cable. Block access below the work area whenever installing or removing the fixture.
- Refer any service operation not described in this manual to a qualified technician.
- The covers get very hot under normal operation: to avoid burns, locate the fixture where it cannot be accidentally touched or bumped, and allow the fixture to cool before servicing.
- Do not illuminate surfaces within 1 meter of the fixture.
- Never place filters or other materials over the lens or mirror.
- Do not operate the fixture if the ambient temperature ( $T_a$ ) exceeds  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ).
- Do not look directly into the light from a close distance.
- Never operate the fixture without all lenses and covers installed: an unshielded lamp can explode without warning and emits dangerous UV radiation that can cause burns and eye damage.
- Do not modify the fixture or install other than genuine Martin accessories and upgrade kits.

## section 2

# SETUP

This section describes the steps required to prepare the RoboScan Pro 918 for operation.

## UNPACKING

The RoboScan Pro 918 package includes:

- 1 5-meter, 3-pin shielded XLR control cable
- 1 3-meter, 3-wire IEC power cable (EU version only)
- 1 user manual
- 9 extra rotating gobos
- 1 spare rotating-gobo spring

The packing materials are carefully designed to protect the fixture during shipment - always use them or a custom flight case to transport the fixture.

## INSTALLING OR CHANGING THE LAMP

The RoboScan Pro 918 is designed to work with the Philips MSR-575/2, Philips MSD-575, or the Osram HSR-575/2 discharge lamp. *Installing any other lamp may damage the fixture.* The lamp holder is pre-adjusted at the factory; precise alignment may be necessary due to slight variations between lamps. The procedure is described on page 21.

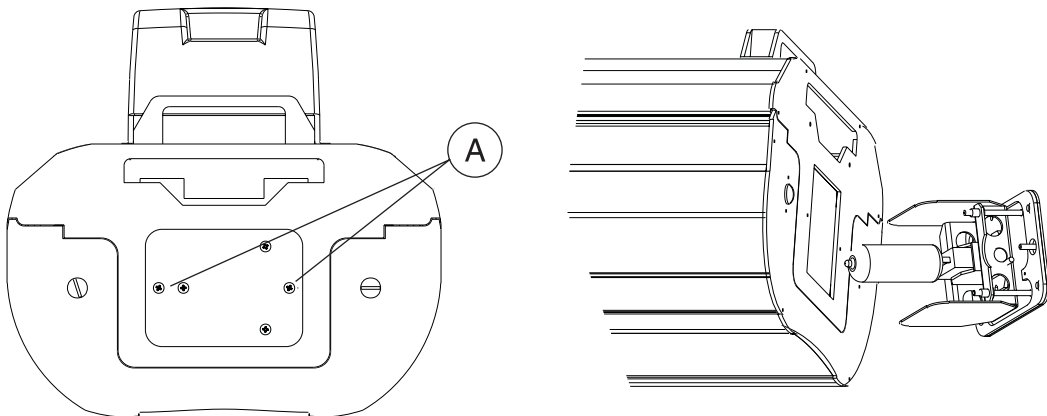
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### WARNING!

Disconnect the fixture from AC power before proceeding. Always wear safety goggles to protect your eyes and allow a hot lamp to cool for at least 15 minutes before removing it from the fixture.

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1. The RoboScan Pro 918 must be cool and isolated from AC power. Remove the 2 screws (A) securing the lamp assembly to the back plate. Gently pull out the assembly.



2. If changing the lamp, remove the old lamp from the socket.
3. Holding the new lamp by its ceramic base (do not touch the glass), insert it firmly and squarely into the lamp socket. Clean the glass bulb with the cloth supplied with the lamp, particularly if your fingers touch the glass. A clean, lint-free cloth wetted with alcohol may also be used.
4. Reinsert the lamp assembly and replace the screws.
5. Before turning the lamp on, reset the RLAH and RLST counters. See "Readouts" on page 11.

## POWERING THE FIXTURE

### WARNING!

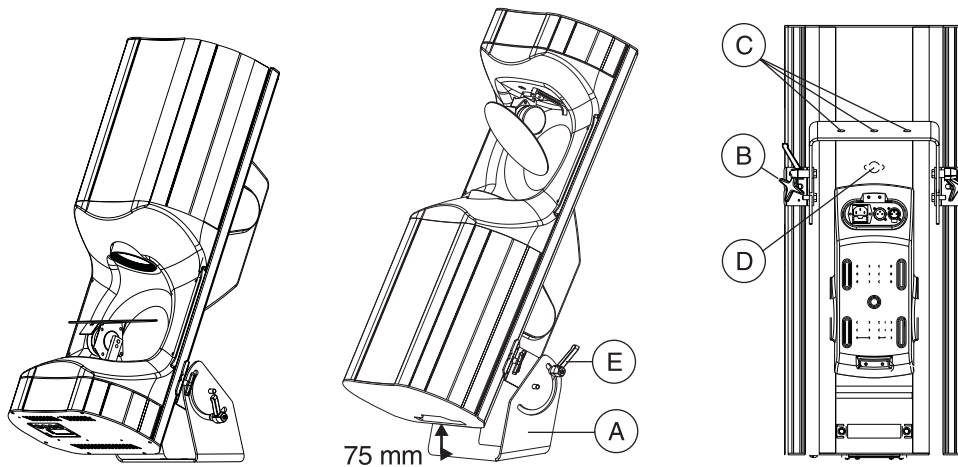
For protection from dangerous electric shock, the fixture must be grounded (earthed). The AC mains supply shall be fitted with a fuse or circuit breaker and ground-fault protection.

1. Verify that the voltage and frequency settings match the local AC supply. These settings are printed on the serial number label next to the control panel. If the settings do not match the supply, then the ballast and transformer must be rewired as described under "Changing voltage and frequency settings" on page 18.
2. You may need to install a cord cap that fits your supply on the power cable. Following the manufacturer's instructions, connect the wires as shown below. Note: The table shows some possible pin identification schemes; if the pins are not clearly identified, or if you have any doubts about proper installation, consult a qualified electrician.

| Wire (EU)    | Wire (US) | Pin     | Marking | Screw (US)      |
|--------------|-----------|---------|---------|-----------------|
| brown        | black     | live    | "L"     | yellow or brass |
| blue         | white     | neutral | "N"     | silver          |
| yellow/green | green     | ground  | ⏏       | green           |

3. Verify that the supply cable is undamaged and rated for the current requirements of all connected devices. Do not connect the Pro 918 to a dimmer system: doing so will damage the fixture.

## INSTALLATION



### Using the mounting bracket as a floor stand

### WARNING

When standing the fixture with the lamp end down, the end panel must be a minimum of 75 mm (3 in) above the floor to provide adequate circulation.

1. If standing the fixture with the mirror end up, loosen the mounting bracket and align the pointer with the last index line: the bracket shall not be placed any farther from the end. Tighten the clamps securely. Loosen the swivel locks and set the angle to the extreme position, marked as "-". Tighten both swivel locks.
2. If standing the fixture with the mirror down, slide the mounting bracket to the mirror end and set the pointer near the last index line; the exact position is not critical. Tighten the clamps securely. Loosen the swivel locks and set the angle in between the 60° and 75° marks. Tighten both swivel locks.
3. Stand the fixture on a stable platform away from publicly trafficked areas. Verify that the fixture is stable; adjust the bracket if necessary.

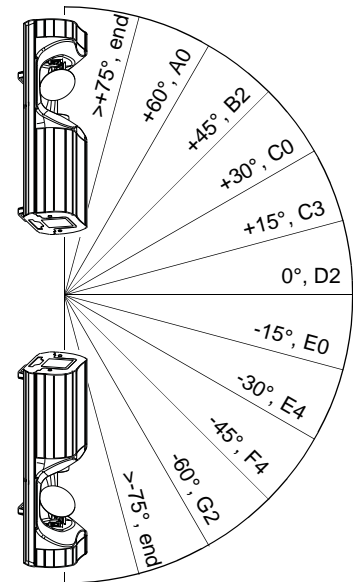
## Rigging

The mounting bracket allows the Pro 918 to be rigged at any angle. The figure below shows the index position of the balance point at different angles. Balancing the fixture makes it more stable and easier to work with, but it can be hung out of balance if necessary.

### WARNING!

Attach an approved safety cable to the eye hook.

1. Loosen the clamps (B) on each side of the mounting bracket, slide the bracket to the approximate position, and partially tighten the clamps.
2. Loosen the swivel locks (E) and tilt the bracket to the desired angle. Partially tighten the locks.
3. Bolt rigging clamps that can bear at least 10 times the weight of the fixture to the mounting bracket. 1 clamp may be bolted to the center hole or 2 clamps may be bolted to the 2 outside holes (C). See page 30 for clamps available from Martin.
4. Verify that the structure can bear at least 10 times the weight of all installed fixtures, clamps, cables, auxiliary equipment, etc.
5. Block access below the work area. Working from a stable platform, place the fixture on the rigging.
6. Install a safety wire that can bear at least 10 times the weight of the fixture. Use the eye hook (D) to fasten the safety wire to the fixture. *Never use the carrying handles or mounting bracket for secondary attachment.*
7. Tighten the rigging clamp(s) securely to the structure.
8. Fine-tune the position and the fully tighten the slide clamps and swivel locks.



## CONNECTING THE SERIAL LINK

The default pin-out is compatible with DMX-512.

The Pro 918's 3-pin data sockets are configured for DMX controllers, i.e., pin 1 to shield, pin 2 to cold (-) and pin 3 to hot (+). As many devices have 5-pin connectors or 3-pin connectors with reversed polarity on pins 2 and 3, adaptor cables may be required.

| 3-pin to 3-pin<br>Phase-Reversing<br>Cable | 3-pin to 5-pin<br>Phase-Reversing<br>Cable                               | 5-pin to 3-pin<br>Phase-Reversing<br>Cable | 5-pin to 3-pin<br>Straight<br>Cable      | 3-pin to 5-pin<br>Straight<br>Cable                                      |
|--|--|--|--|--|
| Connections<br>Male    Female              | Connections<br>Male    Female  | Connections<br>Male    Female              | Connections<br>Male    Female            | Connections<br>Male    Female  |
| <pre> 1 ——— 1 2 ——— 2 3 ——— 3 </pre>       | <pre> 1 ——— 1 2 ——— 2 3 ——— 3                 4                 5 </pre> | <pre> 1 ——— 1 2 ——— 2 3 ——— 3 4 5 </pre>   | <pre> 1 ——— 1 2 ——— 2 3 ——— 3 4 5 </pre> | <pre> 1 ——— 1 2 ——— 2 3 ——— 3                 4                 5 </pre> |
| P/N 11820006                               | P/N 11820002   | P/N 11820003                               | P/N 11820005                             | P/N 11820004   |

1. Connect the controller's data output to the RoboScan Pro 918's data input. For a
  - DMX controller with 5-pin output: use a cable with 5-pin male and 3-pin female connectors such as P/N 11820005. Pins 4 and 5 are not used.
  - DMX controller with 3-pin output: use a normal cable with 3-pin male and female connectors.
  - Martin RS-485 Protocol controller: use a phase-reversing cable, such as P/N 11820006, with 3-pin male and female connectors, or reconfigure the data sockets as described on page 19.

2. Continue the link: connect the output of the fixture closest to the controller to the input of the next fixture. Use a phase-reversing cable when connecting a DMX-standard (pin 3 +) device to a Martin-standard (pin 3 -) device.
3. Insert a male 120  $\Omega$  XLR termination plug in the output of the last fixture on the link.

### **Tips for building a serial link**

- Use shielded twisted-pair cable designed for RS-485 devices: standard microphone cable cannot transmit DMX data reliably over long runs. For links up to 300 meters (1000 ft.) long, you can use 24 AWG, low capacitance, 85-150 ohm characteristic impedance, shielded cable with 1 or more twisted pairs. For runs up to 500 meters (1640 ft.) use 22 AWG cable. Use an amplifier if the serial link exceeds 500 meters.
- Never use a “Y” connector to split the link. To split the serial link into branches use a splitter such as the Martin 4-Channel Opto-Isolated RS-485 Splitter/Amplifier.
- Do not overload the link. Up to 32 devices may be connected on a serial link.
- Terminate the link by installing a termination plug in the output socket of the last fixture on the link. The termination plug, which is simply a male XLR connector with a 120 ohm, 0.25 watt resistor soldered between pins 2 and 3, “soaks up” the control signal so it does not reflect back down the link and cause interference. If a splitter is used, terminate each branch of the link.

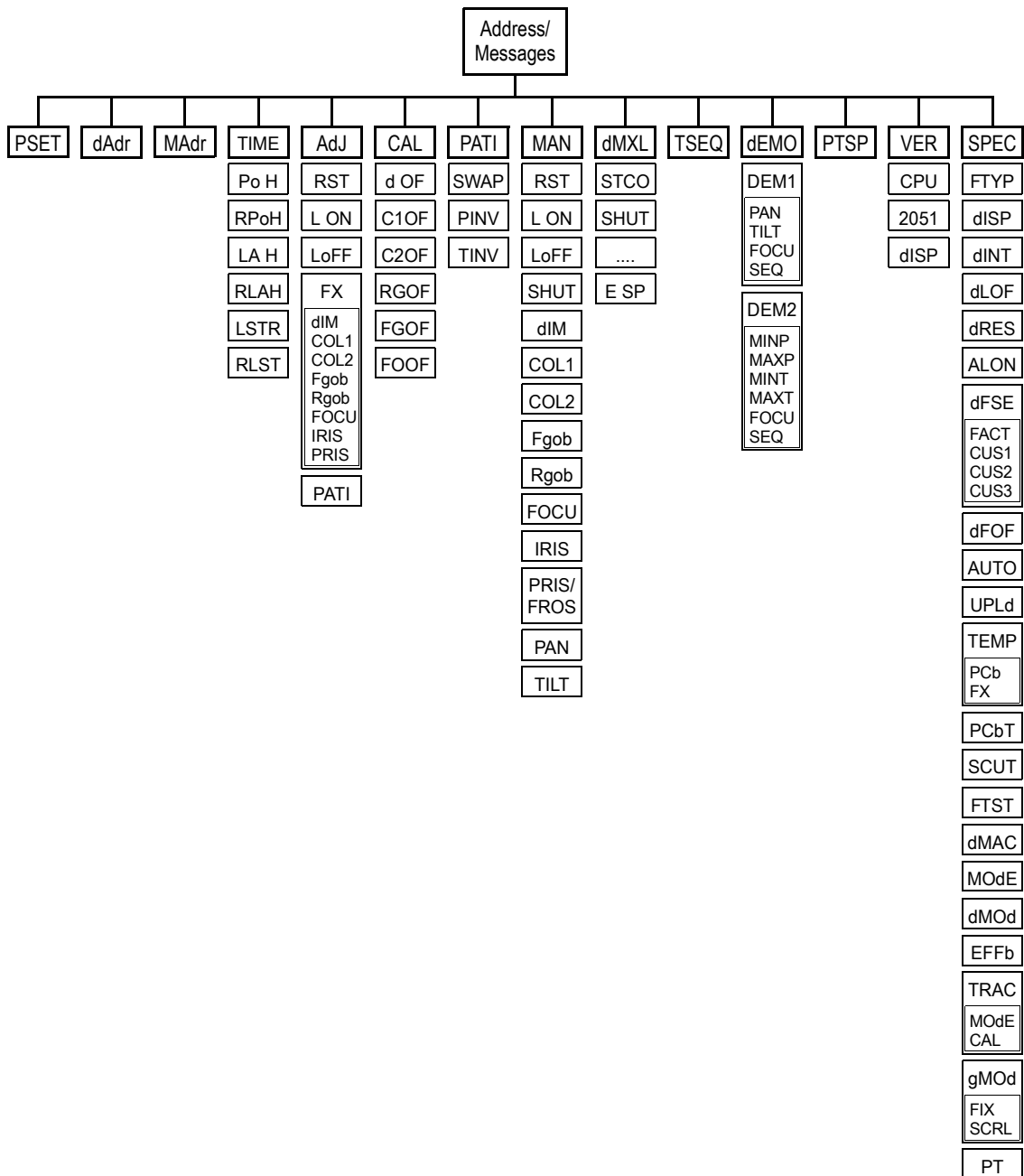


# section 3 CONTROL PANEL

The 4-digit LED control panel allows you to set the address and personalities, read lamp hours and other information, calibrate effects, control the fixture manually, and run stand-alone tests and demo programs. Most of these functions may be performed remotely via the serial link with the MPBB1 Uploader

The display can be flipped for easy reading by pressing the [↑] and [↓] keys simultaneously. The intensity is adjustable and the display can be set to go out 2 minutes after the last key-press.

The DMX or Martin address, depending on the protocol setting, and any error messages are displayed when the RoboScan Pro 918 is turned on. To enter the menu, press [MENU]. Use the [↑] and [↓] keys to move within the menu. To select a function or submenu, press [ENTER]. To escape a function or menu, press [MENU].



## PERSONALITY SETTINGS

| Personality                  | Path               | Options     | Effect (Default settings shaded.)  |
|------------------------------|--------------------|-------------|--|
| Pan/tilt speed               | PTSP               | FAST        | Optimize mirror movement for speed.*   |
|                              |                    | <b>SLOW</b> | <b>Optimize mirror movement for smoothness.*</b>   |
| Pan/tilt swap                | PATI / SWAP        | ON          | Map DMX pan control to tilt channel and vice versa.  |
|                              |                    | <b>OFF</b>  | <b>Normal pan and tilt control.</b>  |
| Pan inverse                  | PATI / PINV        | ON          | Reverse DMX pan control, right → left.   |
|                              |                    | <b>OFF</b>  | <b>Normal pan control, left → right.</b>   |
| Tilt inverse                 | PATI / TINV        | ON          | Reverse DMX tilt control, down → up.   |
|                              |                    | <b>OFF</b>  | <b>Normal tilt control, up → down</b>  |
| Tracking algorithm           | SPEC / TRAC / MODE | <b>MOD1</b> | <b>Absolute delta value algorithm (for most controllers)</b>   |
|                              |                    | MOD2        | Real delta value algorithm   |
| Tracking samples             | SPEC / TRAC / CAL  | 1 - 10      | Tracking mode sample level - default is 6. Higher levels give smoother movement but slower acceleration. |
| Fixture type                 | SPEC / FTYP        | <b>PRIS</b> | <b>Operate with rotating prism.</b>  |
|                              |                    | FROS        | Operate with optional variable frost.  |
| Display On/Off               | SPEC / DISP        | <b>ON</b>   | <b>Display stays on.</b>   |
|                              |                    | OFF         | Display goes out 2 minutes after last key press.   |
| Display intensity            | SPEC / dINT        | 10 - 100    | Adjust display intensity.  |
| DMX lamp off                 | SPEC / dLOF        | ON          | Enable DMX lamp off command.   |
|                              |                    | <b>OFF</b>  | <b>Disable DMX lamp off command.*</b>  |
| DMX reset                    | SPEC / dRES        | ON          | Enable DMX reset command.  |
|                              |                    | <b>OFF</b>  | <b>Disable DMX reset command.*</b>   |
| Automatic lamp on            | SPEC / ALON        | ON          | Lamp strikes automatically within 90 seconds of power on.  |
|                              |                    | <b>OFF</b>  | <b>Strike lamp from controller.</b>  |
| Automatic protocol detection | SPEC / AUTO        | ON          | Enable automatic protocol detection.   |
|                              |                    | <b>OFF</b>  | <b>Disable automatic protocol detection.</b>   |
| Shortcuts                    | SPEC / SCUT        | <b>ON</b>   | <b>Color wheels and fixed-gobo wheel turn the shortest direction.*</b>                                   |
|                              |                    | OFF         | Wheels turn same direction.*   |
| DMX macros                   | SPEC / dMAC        | <b>ON</b>   | <b>Enable DMX-selectable macros and pulsating effects.</b>   |
|                              |                    | OFF         | Disable DMX-selectable macros and pulsating effects  |
| Fixed gobo mode              | SPEC / gMOD        | <b>FIX</b>  | <b>Static gobo wheel steps between full positions</b>  |
|                              |                    | SCRL        | Static gobo wheel scrolls continuously   |
| Studio mode                  | SPEC / MODE        | <b>NORM</b> | <b>Optimize effects for speed.</b>   |
|                              |                    | STUD        | Optimize effects for silence.  |
| Dimmer mode                  | SPEC / dMOD        | <b>NORM</b> | <b>Normal dimming curve.</b>   |
|                              |                    | TUNG        | Simulated tungsten dimming curve.  |
| Effects feedback             | SPEC / EFFb        | <b>ON</b>   | <b>Enable feedback on color wheels, fixed-gobo wheel, and rotating-gobo index.</b>                       |
|                              |                    | OFF         | Disable feedback on color wheels, fixed-gobo wheel, and rotating-gobo index.                             |
| Tilt motor select            | SPEC / PT          | NEW         | For units after S/N 402908-0000 (selected automatically).  |
|                              |                    | OLD         | For units before S/N 402908-0000 (selected automatically).   |

\* Setting may be overridden via DMX. See protocol for details.

## PROTOCOL AND ADDRESS SELECTION

The RoboScan Pro 918 has 4 DMX operating modes, or protocols, and a Martin mode. These are described in more detail on page 14.

Each fixture must be assigned its own channels to receive instructions from the controller. The address, also known as the start channel, is the first channel used. Addresses are independent of the physical order on the link: they may be set in any convenient order. Two Pro 918s may share the same address; however, they will receive the same instructions and independent control will not be possible.

| Mode                | Martin | DMX 1    | DMX 2  | DMX 3                  | DMX 4  |
|---------------------|--------|----------|--------|------------------------|--------|
| Control             | Vector | Tracking |        | Tracking and/or Vector |        |
| Pan/tilt resolution | 16 bit | 8 bit    | 16 bit | 8 bit                  | 16 bit |
| Channels required   | 2      | 12       | 14     | 14                     | 16     |

1. Apply power to the RoboScan Pro 918. Press the [MENU] key and then press [↑] or [↓] until the display shows `PSET`. Press [ENTER].
2. Press [↑] or [↓] until the desired protocol appears on the display. Press [ENTER] to confirm.
3. Press [↑] or [↓] until the display shows `dAdr` (to set a DMX address) or `MAdr` (to set a Martin address). Press [ENTER] to confirm.
4. Press [↑] or [↓] to select a DMX address from 1 to 512 or a Martin address from 1 to 31. Press [ENTER] to confirm.
5. Press [MENU] to return to the main menu. Depending on the protocol selected, the DMX or Martin address is displayed.

## READOUTS

### Usage readouts (TIME)

Read the total number of power-on hours (POH), power-on hours since last reset (RPOH), total lamp hours (LAH), lamp hours since last reset (RLAH), total number of lamp strikes (LSTR), and the number of lamp strikes since last reset (RLST).

The resettable counters may be used to track overall usage and lamp life. To reset to zero, display the readout and then press [↑] for 5 seconds.

### DMX value readouts (dMXL)

Read the DMX start code (STCO) and DMX values received for each effect. This is an easy way to check if the fixture is receiving the expected commands. This feature is not applicable in Martin mode.

### Software version readouts (VER)

Read the version number of the CPU software (CPU), 2051 microprocessor (2051), and display module software (DISP). The CPU software version is also displayed for a moment at power up.

### Temperature readouts (SPEC/TEMP)

Read temperature at the main printed circuit board (PCB) and in the effects section (FX) in Celsius. Temperatures below 25° C are shown as -25; temperatures above 100° C are shown as +100.

The temperature sensors are calibrated at the factory and adjustment should not be necessary. The following procedure calibrates the sensors if they give no or faulty readings.

1. Allow the unit to cool to room temperature (powered off for at least 4 hours).
2. Measure the room temperature in Celsius. (To convert F° to C°, subtract 32° and then multiply by 0.555.)
3. Power up the unit and allow it to reset.
4. Press the [MENU] and [↓] keys at the same time and hold them for 3 seconds until "25" shows in the display.
5. Press the [↑] and [↓] keys until the display shows the temperature measured.
6. Press [ENTER] to save the setting.

## MANUAL CONTROL

### Manual control (MAN)

The manual control menu permits you to do the following without a controller:

- reset the fixture (RST)
- turn the lamp on and off (L ON, L OFF)
- open, close, and strobe the shutter at 3 speeds (SHUT)
- control the dimmer (DIM)
- move the color wheels to each position and scroll them at 3 speeds (COL1, COL2)
- move the fixed-gobo wheel to each position (Fgob)
- move the rotating-gobo wheel to each position and rotate the gobos at 3 speeds (Rgob)
- control the focus (FOCU)
- control the iris (IRIS)
- insert and rotate the prism (PRIS) at 3 speeds, or, if a frost filter is installed, vary the frost (FROS)
- control pan and tilt (PAN, TILT)

### Adjustment (ADJ)

The adjustment menu provides manual control for making mechanical adjustments. These should be performed by a qualified technician. The menu allows you to reset the fixture (RST), turn on and off the lamp (L ON, L OFF), control all effects (FX), and move the mirror to the home and extreme positions (PATI). The FX submenu allows you to:

- open, close, and strobe the dimmer/shutter (DIM)
- move the color and gobo wheels through their positions (COL1, COL2, Fgob, Rgob)
- move the focus lens to its extreme positions (FOCU)
- open and close the iris (IRIS)
- insert and rotate the prism (PRIS)

## STAND-ALONE SEQUENCES

### Demonstration programs (demo)

This menu offers 2 preprogrammed demonstrations. Demo 1 shows each effect individually and in combination with others. Pan and tilt are static. Demo 2 pans and tilts within a defined area and shows various effect combinations.

Before running demo 1, set the pan/tilt position (PAN, TILT) to a good location for viewing the effects and then focus (FOCU) the beam. Select SEQ to run the demo. Demo 2 is similar but instead of defining a home position, you define an area such as a screen or wall by setting the minimum and maximum pan and tilt positions (MINP, MAXP, MINT, MAXT). Focus the beam in the center of the area.

### Test sequences

**Test sequence (TSEQ):** Run a general test of all effects.

**Printed circuit board test (SPEC/PCBT):** This menu provides 4 tests of the circuit board for service use: T1, T2, T3, and LED.

**Factory test (SPEC/FTST):** This menu provides an effects test (ETST), a movement test (MTST), and a sensor test (STST) used for quality control. The sensor test includes programs for testing sensors on the color and gobo wheels (COL1, COL2, Rgob, and Fgob).

## UTILITIES

### Calibration (CAL)

The calibration menu allows you to adjust the effects to achieve total uniformity between fixtures: it is not a substitute for mechanical adjustment. Select dimmer/shutter (DOF), color wheels (C1OF, C2OF), rotating-gobo wheel (RGOF), focus (FOOF), or fixed-gobo wheel (FGOF) and adjust the effect's offset with the arrow keys. Offsets are adjustable from 1 to 255 for all effects except the fixed-gobo wheel, which is adjustable from 127 to 129. Press [ENTER] to save the calibration.

### **Reset default offsets (SPEC/dFOF)**

Reset all calibrations to their factory defaults. Select `dFOF` and press [ENTER] when `SURE` is displayed, or press [MENU] to escape.

### **Reset default personality settings (SPEC/dFSE/FACT)**

Return all personality settings (not calibrations) to their factory defaults. Select `FACT` and press [ENTER] when `LOAD` is displayed.

### **Custom configurations (SPEC/dFSE/CUS1, CUS2, CUS3)**

Save and load 3 sets of custom configurations. To save a custom configuration, adjust the settings as desired, go to `CUS1`, `CUS2`, or `CUS3` and press [ENTER] when `SAVE` is displayed. To load a custom setting, select it and press [ENTER] when `LOAD` is displayed.

### **Upload mode (UPLd)**

Upload mode prepares the RoboScan Pro 918 to receive control software. It is normally engaged automatically when using a Martin uploader. In certain circumstances, however, you may have to set upload mode manually as described under “Updating software” on page 19.

## section 4 OPERATION

This section describes the RoboScan Pro 918's controllable effects and the options for customizing them for your application. Selecting options from the menu is described in the previous section.

### MARTIN RS-485 CONTROL

The Pro 918 may be controlled with the Martin 3032 controller with version 2.04 or later software. While the Pro 918 is not officially implemented in version 2.04, it may be set up and operated as a MAC 500.

For the fixture to respond, the protocol setting (PSET) must be set to Martin (MART) or automatic protocol detection (SPEC/AUTO) must be enabled. If automatic protocol detection is enabled, send one dummy command before sending real commands.

### DMX-512 CONTROL

The Pro 918 has 4 DMX control modes with different channel requirements and characteristics. Mode selection will depend on the controller and your programming preferences.

#### Tracking control

Tracking is available in all 4 DMX modes. With tracking control, the controller calculates the positions along the path between an effect's starting point and its ending point. It uses the fade time to calculate the change (delta) of each update or refresh, which the fixture "tracks." For smooth movement with any fade time, the Pro 918 has a filter algorithm that looks at several position updates (samples), and calculates the ideal speed.

This algorithm is adjustable to compensate for controllers that calculate position changes unevenly. In most cases the default settings work well.

If movement is not satisfactory there are 2 parameters that can be adjusted. The first is the calculation method used and is selected under SPEC/TRAC/MODE.MOD1, the default, calculates speed based on the absolute value of the change in DMX; it is the best choice with controllers that calculate intermediate positions that are close to the line of travel. MOD2 uses the real value of the DMX delta to calculate speed and is better if the intermediate positions stray significantly from the line of travel.

The second parameter is the number of position updates used to calculate speed. The level is adjustable between 1 and 10 under SPEC/TRAC/CAL. Increasing the number of samples increases the distance over which speed is calculated, making movement smoother but less responsive to sudden changes.

The ideal settings for both parameters will vary from controller to controller: experiment for best results. The real value algorithm (MOD2) is recommended when using the Pro 918 with the Martin Lighting Director system.

#### Vector control

With vector control, available in DMX modes 3 and 4, the fixture is given just 1 position - the end position - and a speed, which is set on a separate channel. *For smooth movement, the fade time must be set to 0.* With controllers that do not have programmable fade times, vector control provides a way to set speed. Because the end point and speed are known from the beginning, vector control results in smooth movement regardless of the fade time or the controller's processing power.

The speed channels allow vector control to be turned off, resulting in tracking control. In addition, they offer a "black-out speed," described below, and overrides of the PTSP (pan/tilt speed) and SCUT (shortcuts) personality settings.

#### 8-bit versus 16-bit pan/tilt resolution

With 8-bit pan/tilt resolution, the pan and tilt are divided into 256 equal increments. Finer position control and smoother movement is provided in the 16-bit modes, which divide the full pan range into 6400 increments and the full tilt range into 1280 increments.

### STAND-ALONE CONTROL

The Pro 918 has test and demonstration sequences that can be run from the control panel. See page 12 for details.

## CONTROLLABLE EFFECTS

All mechanical effects are reset to a “home” position when the fixture is powered up. They can also be reset via DMX if necessary. Accidental resets can be prevented by turning DMX Reset (SPEC / dRES) off.

An on-the-fly position correction system automatically corrects the position of the color wheels, fixed-gobo wheel, and rotating gobos. This feature can be disabled by turning Effects Feedback (SPEC / EFFb) off.

The Studio Mode setting (SPEC / MOdE) allows operation to be optimized for speed (NORM) or quietness (STUD).

### Lamp

With the default setting, the lamp remains off until a “lamp on” command is sent from the controller. Note: A strong surge of electric current is drawn for an instant when striking a discharge lamp. Striking many lamps at once may cause a voltage drop large enough to prevent lamps from striking or trip the main circuit breaker. If sending “lamp on” commands to multiple fixtures, program a sequence that strikes lamps one at a time at 5 second intervals.

The Pro 918 automatically strikes the lamp within 90 seconds of being powered on if the Automatic Lamp On (SPEC / ALON) setting is turned on. A delay determined by the address staggers lamp strikes to prevent excessive current draw.

Lamp power can be turned off from the controller. *Be careful:* it is not possible to strike the lamp within 8 minutes of having switched it off. Accidental lamp off commands can be prevented by turning DMX Lamp Off (SPEC / dLOF) to off.

### Pan and tilt

The mirror pans 180° and tilts 72°. Movement may be optimized for speed by setting the pan/tilt speed (PTSP) personality to FAST, or for smoothness by setting it to SLOW. The setting may be overridden on the speed channel in vector mode. Setting the movement speed to “blackout” in vector mode causes the shutter to black out the light while the mirror is moving.

The pan and tilt channels (DMX) can be inverted and/or swapped using the pan/tilt (PATI) menu.

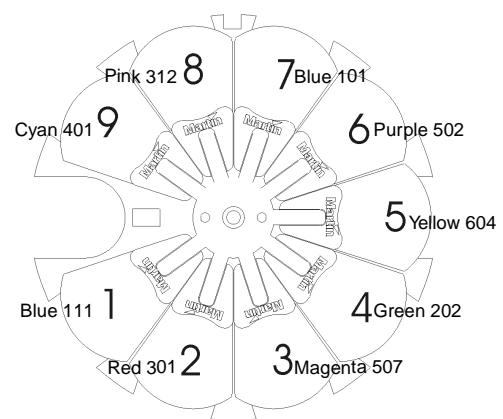
### Color wheels

The Pro 918 has 2 9-position-plus-open color wheels, yielding a total of 100 possible combinations. In the standard configuration the wheels combine in 67 useful ways that can be called on 1 DMX channel. The filters on color wheel 1 are easily replaceable, allowing you to configure the color wheel to suit your taste. See page 21 for details.

Both wheels can be scrolled, allowing for split color effects, snapped to fixed positions, and continuously rotated in both directions at different speeds. The 67 colors can be called randomly on DMX channel 4.

The shortcuts (SPEC / SCUT) setting determines whether the wheels take the shortest path to the next position or turn in one direction only. The setting may be overridden on the speed channel in vector mode.

Setting the color speed to “blackout” in vector mode causes the shutter to black out the light while the wheels are moving.



Color wheel 1

### Focus

The beam may be focused from 2 meters (6.5 feet) to infinity. Depending on model, the beam angle is 17° or 23.5°.

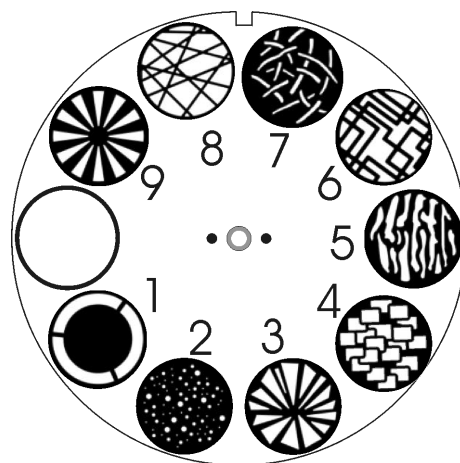
### Iris

The iris closes from full open down to 10 percent. There are 6 variable/random pulsating iris effects callable on channel 9. These can be disabled by switching DMX Macros (SPEC / dMAC) off.

## Fixed (static) gobos

The fixed-gobo wheel provides 9 metal gobos plus an open position. It has 2 operating modes. In “fixed” mode (`SPEC / gMod / FIX`), the wheel steps between fixed positions and shakes at variable speeds. In “scroll” mode (`SPEC / gMod / SCRL`), the wheel scrolls continuously, shakes at 1 speed, and rotates at variable speed.

Setting the fixed-gobo speed to “blackout” in vector mode causes the shutter to black out the light while the wheel turns from one position to another. The Shortcuts (`SPEC / SCUT`) setting determines whether the gobo wheel takes the shortest path to the next position or turns in one direction only. The setting may be overridden on the speed channel in vector mode.

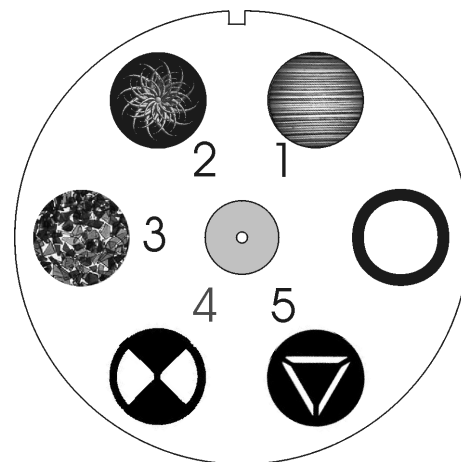


Fixed gobos

## Rotating gobos

The Pro 918 has 5 rotating gobo positions. Gobos may be rotated in both directions at varying speeds or indexed to any position. The function and gobo are selected on channel 5 and the velocity or index position are selected on channel 6. Setting the rotating-gobo speed to “blackout” in vector mode causes the shutter to black out the light while the wheel turns from one position to another and, if indexing is selected, while the gobo rotates between positions.

To change the gobos, see “Changing rotating gobos” on page 20.



Rotating gobos

## Rotating prism / variable frost

The 3-facet prism can rotate in both directions at varying speeds. There are 8 preprogrammed macros that combine the prism with rotating gobos on channel 10. These can be disabled by switching DMX Macros (`SPEC / dMAC`) off. Setting the prism speed to “blackout” in vector mode causes the shutter to black out the light while the prism moves in and out.

An optional frost filter may be installed in place of the rotating prism to provide a variable frost effect. If the frost filter is installed, the fixture type personality (`SPEC / FTYP`) must be set to “FROS” to enable the frost variation of the protocol.

## Dimmer / shutter

The mechanical dimmer/shutter system provides smooth, high-resolution 100 percent dimming, “instant” open and blackout, random and variable strobe effects up to 23 Hz, and random and variable pulses in which the dimmer snaps open and slowly dims or snaps closed and slowly opens. The pulse and random strobe effects can be disabled by switching DMX Macros (`SPEC / dMAC`) off.

The Dimmer Mode (`SPEC / dMod`) setting allows you to select between linear or simulated tungsten fade curves. The fade time must be 0 to simulate tungsten dimming.



## section 5 BASIC SERVICE AND MAINTENANCE

The RoboScan Pro 918 operates under challenging conditions presented by heat, humidity, dust, and touring. It requires regular cleaning and lubrication to keep performing at its peak. The maintenance schedule will depend heavily on the application and should be discussed with your Martin technician. This section describes basic maintenance. Refer any service procedure not described here to a qualified technician.

### IMPORTANT!

Excessive dust, grease, and smoke fluid buildup degrades performance and causes overheating and damage to the fixture that is not covered by the warranty. If you do not feel completely competent to perform the service, consult qualified service personnel.

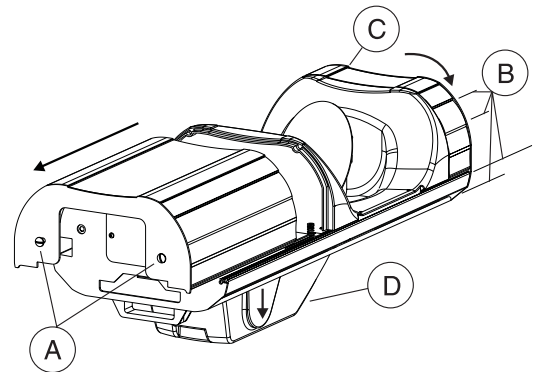
## ACCESSING PARTS

### WARNING!

Disconnect the fixture from AC power before removing any cover.

#### Effects section

1. Disconnect the fixture from AC power.
2. Turn the locking pins (A) on the back plate 1/2 turn.
3. Pull the cover back and off.
4. To replace the cover, position the rails on the cover in the grooves and slide the cover forward. Push the locking pins (A) all the way in to lock.



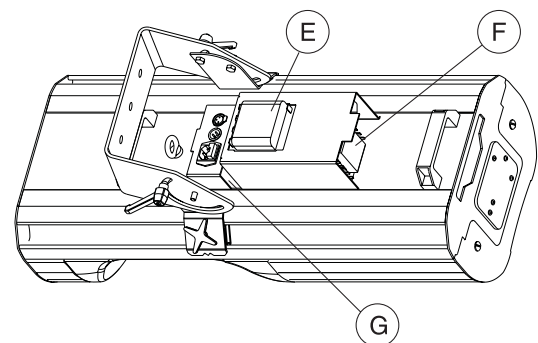
#### Printed circuit board

1. Disconnect the fixture from AC power.
2. Remove the 4 screws (B) from the front cover plate (C) with one hand on the section to prevent it from falling. Gently tilt the plate away from the body to access the printed circuit board. Removing the wires is not necessary for most service procedures.
3. Thread the screws carefully when replacing the cover. Aluminum threads are easily stripped if screws are overtightened or cross-threaded.

#### Ballast, transformer, and mains filter fuse

The ballast (E), transformer (F), and mains filter circuit board (G) are accessed by removing the cover (D) from the top of the RoboScan Pro 918.

1. Disconnect the fixture from AC power.
2. Remove the 4 screws from the plastic ballast/transformer cover (D) and lift it off.



## CHANGING VOLTAGE AND FREQUENCY SETTINGS

Operating at the wrong setting can result in poor output, greatly reduced lamp life, overheating and fixture damage.

### EU version

| Local AC Supply |           | Transformer |          | Magnetic Ballast |          |
|-----------------|-----------|-------------|----------|------------------|----------|
| Frequency       | Voltage   | Setting     | Terminal | Setting          | Terminal |
| 50 Hz           | 200-210 V | 210 V       | 4        | 200 V / 50 Hz    | 7        |
| 50 Hz           | 210-220 V |             |          | 230 V / 50 Hz    | 10       |
| 50 Hz           | 220-235 V | 230 V       | 6        | 245 V / 50 Hz    | 12       |
| 50 Hz           | 235-240 V |             |          |                  |          |
| 50 Hz           | 240-260 V | 250 V       | 8        |                  |          |
| 60 HZ           | 200-217 V | 210 V       | 4        | 208 V / 60 Hz    | 4        |
| 60 HZ           | 217-240 V | 230 V       | 6        | 227 V / 60 Hz    | 7        |

1. Make sure the fixture is isolated from AC power. Access the transformer and ballast as described above.
2. On the transformer (F), move the BROWN wire to the terminal listed for your voltage. The terminal numbers are printed in front of the connection tabs.
3. On the ballast (E), move the BROWN wire to the terminal listed for your voltage and frequency.
4. Replace the cover.

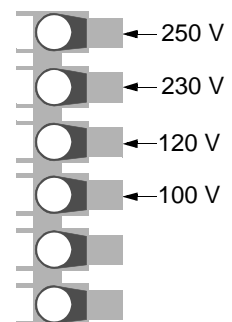
### US version

#### IMPORTANT!

Fixtures wired for 100 or 120 volt operation shall have a 10 ampere main fuse (P/N 05020025). Replace this with a 6.3 ampere fuse (P/N 05020020) if rewiring for 230 or 250 volt operation.

| Local AC Supply |             | Transformer |          | Ballast       |          |
|-----------------|-------------|-------------|----------|---------------|----------|
| Frequency       | Voltage     | Setting     | Terminal | Setting       | Terminal |
| 60 Hz           | 98 - 105 V  | 100 V       | red      | 227 V / 60 Hz | 7        |
|                 | 118 - 126 V | 120 V       | orange   | 227 V / 60 Hz |          |
|                 | 220 - 240 V | 230 V       | yellow   | 227 V / 60 Hz |          |
|                 | 240 - 260 V | 250 V       | green    | 227 V / 60 Hz |          |
| 50 HZ           | 99 - 105 V  | 100 V       | red      | 230 V / 50 Hz | 10       |
|                 | 118 - 126 V | 120 V       | orange   | 230 V / 50 Hz |          |
|                 | 220 - 240 V | 230 V       | yellow   | 230 V / 50 Hz |          |
|                 | 240 - 260 V | 250 V       | green    | 230 V / 50 Hz |          |

1. Make sure the RoboScan Pro 918 is isolated from AC power. Access the transformer and ballast as described above.
2. Find the correct transformer setting for your AC supply in the table above. The colors refer to the wires that enter the connection block at the bottom. The figure to right shows the transformer connection block as seen from the top. On the transformer (F), move the BROWN wire to the correct terminal.
3. On the ballast (E), move the BROWN wire to terminal 7 (60 Hz), or terminal 10 (50 Hz). The other terminals are not used because the ballast is fed 230 volts from the transformer.
4. Replace the cover.



US version transformer connections

## REPLACING FUSES

The RoboScan Pro 918 has 5 fuses. The main fuse is located in the power inlet and may be replaced without opening the fixture. Note: The main fuse may need to be replaced with one of another value when rewiring the fixture for operation at a different AC voltage. The fuses for each of the 3 low-voltage power supplies are located on the printed circuit board. If one of the circuit board LEDs does not light, one of these fuses may be blown. To replace:

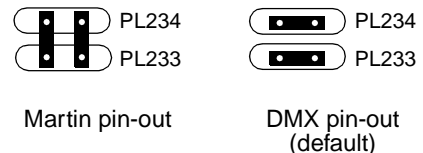
1. Access the printed circuit board as described above.
2. Locate and replace the defective fuse with a time-delay fuse of the same rating. Fuse locations are shown on the PCB layout diagram and their values are listed in the specifications.

The fifth fuse is located on the mains filter and power protection circuit board, located between the ballast and the AC power inlet. If this fuse is blown there will be no power to the transformer and the fixture will appear dead, but there will still be mains voltage on the ballast. To replace the fuse:

1. Make sure the RoboScan Pro 918 is isolated from AC power. Access the mains filter circuit board fuse as described above.
2. Remove the fuse with tweezers or a similar tool. **Replace only with a special fast-acting fuse of the same rating (P/N 05021010).**
3. Replace the ballast/transformer cover.

## CHANGING THE XLR PIN-OUT

This procedure reverses the signal polarity of pins 2 and 3 on the XLR connectors so that the fixture can be connected directly to Martin RS-485 protocol devices. Optionally, a phase-reversing cable may be used.



1. Access the printed circuit board as described above.
2. Position the jumpers on PL 233 and PL 234 for the desired XLR pin-out as shown.

## UPDATING SOFTWARE

The latest software for the RoboScan Pro 918 is available from your Martin dealer and the Martin Professional web site. Please read the update notes bundled with the software. Update software is uploaded to the RoboScan Pro 918 using a Martin uploader such as the MBPPI.

### Normal upload

Connect the uploader to the fixture just like a controller. Under normal conditions, software can be installed from a remote location - there is no need to set the RoboScan Pro 918 to boot mode. Please refer to the uploader manual for further instructions.

### Boot mode upload

If the data is corrupted during transmission, a check-sum error (CSER) will occur and after 15 seconds the fixture will automatically switch to boot mode (UPLd) and be ready for a boot-mode upload as described below and in the uploader manual.

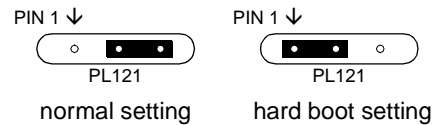
If a software upload to the RoboScan Pro 918 is interrupted, the fixture must be powered off for at least 10 seconds before a new upload can be attempted. When powered on, a check-sum error will occur and it will automatically go into boot mode, ready for a second upload attempt. Select boot mode upload on the uploader.

If there is no functional software in memory, the fixture must be set to boot mode manually before starting the upload. If the control panel works, select UPLd from the SPEC menu and confirm when SURE is displayed by pressing [ENTER].

If the control panel does not work, boot mode can be engaged by moving jumper PL121 on the main circuit board to pins 1 and 2 as follows.

1. Access the printed circuit board as described above.

2. Move jumper PL121 to pins 1 and 2 (hard boot setting) as shown. See also the circuit board layout diagram on page 29.
3. Apply power to the RoboScan Pro 918 and proceed with the upload as described in the uploader manual.
4. After the upload, disconnect the fixture from AC power, move the jumper back to the normal setting, and replace the circuit board section.



## CUSTOM GOBOS

For best focus, custom gobos for the RoboScan Pro 918 should be made with the artwork reversed on the coated side. See page 30 for gobo specifications.

Chrome-coated glass gobos are not recommended: they absorb more heat than enhanced aluminum gobos and are likely to break or oxidize. The lifetime of chrome gobos is extremely short in the Pro 918; but, if used, their lifetime can be extended somewhat by inserting the gobos with the coated side towards the lamp.

## CHANGING ROTATING GOBOS

### Without tools

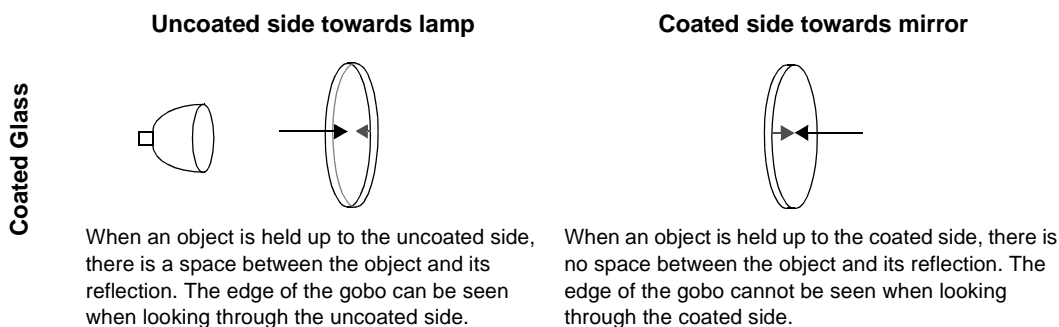
1. Remove the effects section cover.
2. Turn the gobo wheel so you can reach the desired gobo. Turn the color wheel until the open position is over the gobo.
3. Push the gobo and retaining spring out of the back of the holder. Avoid letting the spring and gobo fall into the effects compartment.
4. Insert the new gobo. See below for proper orientation.
5. Insert the retaining spring with the bend facing out, away from the gobo. Working through the open position in the color wheel, push the gobo and spring all the way down into the gobo holder.

### With needlenose pliers

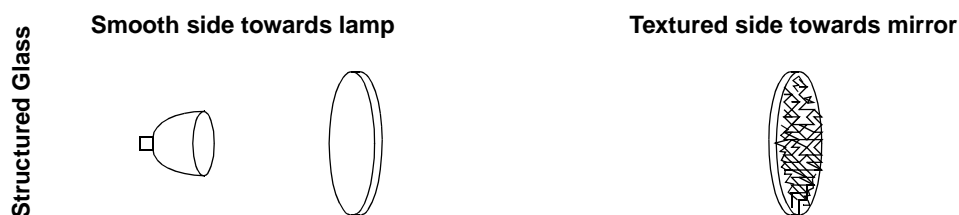
1. Remove the effects section cover as described above.
2. Turn the gobo wheel until the easiest access to the desired gobo position is obtained. Turn the color wheel until the open position is over the gobo position.
3. Turn the gobo holder until you can see the tab on the holder retaining spring.
4. Grip the tab on the retaining spring with a pair of small (needlenose) pliers. Place your index finger over the spring to prevent it from falling into the fixture. Open the spring and remove it from the gobo holder.
5. Remove the gobo holder from the bearing by pulling it forwards towards the mirror.
6. Push the gobo and gobo retaining spring out of the holder.
7. Insert the new gobo. See below for proper gobo orientation.
8. Insert the retaining spring with the bend facing out, away from the gobo. Push the gobo and spring all the way down into the gobo holder.
9. Replace the gobo holder in the bearing. Do not force the holder into the bearing: it will go in easily if it is installed straight.
10. Grip the retaining ring by the tab with the pliers. Place your thumb on the back of the gobo holder to press it all the way down in the bearing and use your index finger to hold the other end of the spring on the holder. Open the spring and place it in the groove.

## Gobo orientation

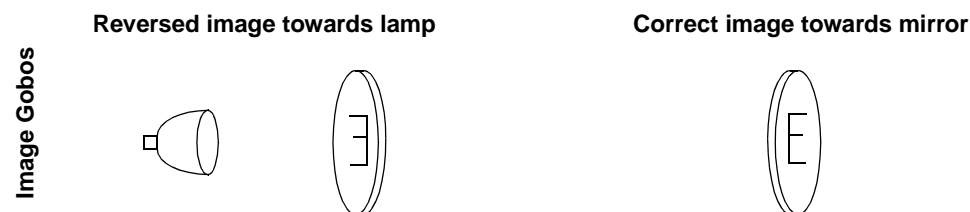
When installing coated glass gobos, the coated side should face out towards the mirror for best focus. Glass gobos may be inserted with the coated side towards the lamp if required for proper projection.



Textured glass gobos must be installed with the smooth side facing the lamp.



Text and image gobos, for correct projection, must be installed with the image facing the mirror.



## CHANGING COLOR FILTERS

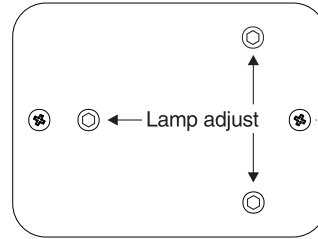
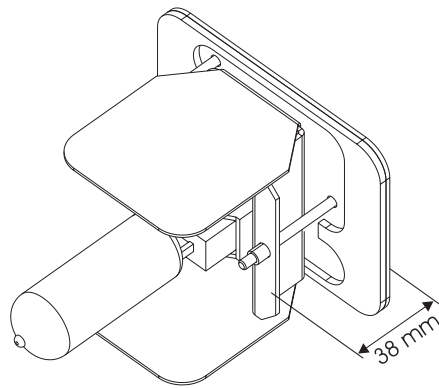
1. Remove the effects section cover as described above.
2. Manually turn color wheel 1 so the desired filter is accessible.
3. Using a soft cloth or gloves, gently tilt the outside edge of the filter towards the mirror and remove.
4. To place a filter in the wheel, insert the plastic holder between the spring clip - with the protruding tab facing the lamp - until it snaps into place.

## LAMP REPLACEMENT

Discharge lamps operate under high pressure. As the lamp ages, the glass envelope becomes more fragile. To reduce the risk of the lamp exploding, which may cause damage to the fixture, do not exceed the rated average life by more than 25 percent. The procedure for installing the lamp is described on page 5. After installing the lamp, reset the lamp usage counters as described under "Readouts" on page 11.

## OPTIMIZING LAMP ALIGNMENT

1. Disconnect the fixture from AC power and allow to cool.
2. Make a preliminary adjustment: remove the lamp assembly and turn the 3 lamp adjustment screws with a 3 mm Allen wrench to position the lamp socket plate a distance of 38 mm (1.5", outside measurement) from the access plate as shown below.
3. Replace the lamp assembly.
4. Apply power to the fixture and allow it to reset.



5. Using either a controller or the control panel, strike the lamp and focus the light on a flat surface.
6. Center the hot-spot (the brightest part of the beam) using the 3 adjustment screws. Turn one screw at a time to drag the hot-spot diagonally across the projected image. If you cannot detect a hot-spot, adjust the lamp until the light is even.
7. To reduce a hot-spot, pull the lamp in by turning all three screws clockwise 1/4-turn at a time until the light is evenly distributed.
8. If the light is brighter around the edge than it is in the center, or if light output is low, the lamp is too far back in the reflector. "Push" the lamp out by turning the screws counterclockwise 1/4-turn at a time until the light is bright and evenly distributed.

## CLEANING

### Optical components

Be very careful when cleaning the optical components. The colored surface on the dichroic filters is achieved by means of special multi-layer coatings and even small scratches may be visible. Residues from cleaning fluids can bake onto components and ruin them.

1. Allow the components to cool completely.
2. Wash dirty lenses and filters with isopropyl alcohol. A generous amount of regular glass cleaner may also be used, but no residues may remain.
3. Rinse with distilled water. Mixing the water with a small amount of wetting agent such as Kodak Photoflo will help prevent streaking and spotting.
4. Dry with a clean, soft and lint-free cloth or blow dry with compressed air.

### Fans

To ensure proper cooling of the fixture, it is important that the fans are free of dust. Vacuum or gently wipe the fans clean if they are dirty.

## LUBRICATION

The focus mechanism slides on 2 metal pins that must be lubricated periodically. Check the focus mechanism whenever the fixture is open for service and lubricate the slides if movement is rough. Lubricate the rotating-gobo bearings if movement is rough on slow rotation or if they become noisy.

1. Fill a syringe with Martin P/N 37302003, "Silicone oil, 500 ml," or P/N 37302004, "Silicone oil, 200 ml, in applicator bottle."
2. Apply a few drops of oil to both slides. The oil will be distributed by the action of the focus mechanism. Be careful not to get oil on other parts.
3. Apply a few drops of oil to each rotating-gobo bearing from the lamp side of the wheel. Remove excess lubricant and be careful not to get oil on other parts.

# appendix a

## DMX PROTOCOL

| DMX Channel   |          |  |      | Start code = 0                             |         |   |
|---|----------|--|------|--|---------|---|
| DMX1  | DMX2     | DMX3                                       | DMX4 | Value                                      | Percent | Function                                      |
|   |          |  |      | <b>Shutter, Strobe, Reset, Lamp On/Off</b> |         |   |
| <p>Note: If the DMX reset (dRES) and/or DMX lamp off (dLOF) commands are turned off in the menu, they can be enabled by setting color wheel 1 to cyan 401(144-148) and color wheel 2 red 308 (157-160).</p> |          |  |      | 0 - 19                                     | 0 - 7   | Shutter closed                                |
|   |          |  |      | 20 - 49                                    | 8 - 19  | Shutter open                                  |
|   |          |  |      | 50 - 72                                    | 20 - 28 | Strobe, fast→slow                             |
|   |          |  |      | 73 - 79                                    | 29 - 31 | Shutter open                                  |
|   |          |  |      | 80 - 99                                    | 31 - 39 | Opening pulse, fast →slow                     |
|   |          |  |      | 100 - 119                                  | 39 - 47 | Closing pulse, fast →slow                     |
|   |          |  |      | 120 - 127                                  | 47 - 50 | Shutter open                                  |
|   |          |  |      | 128 - 147                                  | 50 - 58 | Random strobe, fast                           |
|   |          |  |      | 148 - 167                                  | 58 - 65 | Random strobe, medium                         |
|   |          |  |      | 168 - 187                                  | 66 - 73 | Random strobe, slow                           |
|   |          |  |      | 188 - 190                                  | 74 - 75 | Shutter open                                  |
|   |          |  |      | 191 - 193                                  | 75 - 76 | Random opening pulse, fast                    |
|   |          |  |      | 194 - 196                                  | 76 - 77 | Random opening pulse, slow                    |
|   |          |  |      | 197 - 199                                  | 77 - 78 | Random closing pulse, fast                    |
|   |          |  |      | 200 - 202                                  | 78 - 79 | Random closing pulse, slow                    |
|   |          |  |      | 203 - 207                                  | 80 - 81 | Shutter open                                  |
|   |          |  |      | 208 - 217                                  | 82 - 85 | Reset fixture, see note                       |
|   |          |  |      | 218 - 227                                  | 85 - 89 | Shutter open                                  |
|   |          |  |      | 228 - 237                                  | 89 - 93 | Lamp power on                                 |
|   |          |  |      | 238 - 247                                  | 93 - 97 | Shutter open                                  |
| 248 - 255   | 97 - 100 | Lamp power off: time > 5 seconds, see note |      |  |         |   |
| 2   |          |  |      | 0 - 255                                    | 0 - 100 | <b>Dimmer</b><br>Closed → open                |
|   |          |  |      | <b>COLOR 1</b>                             |         |   |
| <p style="text-align: center;">3</p>  |          |  |      | 0 - 16                                     | 0 - 6   | <b>Continuous scroll</b><br>White → Blue 111  |
|   |          |  |      | 16 - 32                                    | 6 - 13  | Blue 111 → Red 301                            |
|   |          |  |      | 32 - 48                                    | 13 - 19 | Red 301 → Magenta 507                         |
|   |          |  |      | 48 - 64                                    | 19 - 25 | Magenta 507 → Green 202                       |
|   |          |  |      | 64 - 80                                    | 25 - 31 | Green 202 →Yellow 604                         |
|   |          |  |      | 80 - 96                                    | 31 - 38 | Yellow 604 → Purple 502                       |
|   |          |  |      | 96 - 112                                   | 38 - 44 | Purple 502 → Blue 101                         |
|   |          |  |      | 112 -128                                   | 44 - 50 | Blue 101 → Pink 312                           |
|   |          |  |      | 128 - 144                                  | 50 - 56 | Pink 312 → Cyan 401                           |
|   |          |  |      | 145 - 148                                  | 57 - 58 | <b>Fixed color positions</b><br>Cyan 401      |
|   |          |  |      | 149 - 152                                  | 58 - 60 | Pink 312                                      |
|   |          |  |      | 153 - 156                                  | 60 - 61 | Blue 101                                      |
|   |          |  |      | 157 - 160                                  | 62 - 63 | Purple 502                                    |
|   |          |  |      | 161 - 164                                  | 63 - 64 | Yellow 604                                    |
|   |          |  |      | 165 - 168                                  | 65 - 66 | Green 202                                     |
|   |          |  |      | 169 - 172                                  | 66 - 67 | Magenta 507                                   |
|   |          |  |      | 173 - 176                                  | 68 - 69 | Red 301                                       |
|   |          |  |      | 177 - 180                                  | 69 - 71 | Blue 111                                      |
|   |          |  |      | 181 - 184                                  | 71 - 72 | White   |
|   |          |  |      | 185 - 215                                  | 73 - 84 | <b>Continuous rotation</b><br>CW, fast → slow |
| 216 - 245   | 85 - 96  | CCW, slow → fast                           |      |  |         |   |
| 246 - 255   | 96 - 100 | Enable alternate color functions.          |      |  |         |   |

| DMX Channel |      |      |      | Start code = 0  |          |   |
|-------------|------|------|------|---|----------|---|
| DMX1        | DMX2 | DMX3 | DMX4 | Value   | Percent  | Function  |
|             |      |      |      | <b>COLOR 2: Normal Functions</b>  |          |   |
|             |      |      |      | <b>Continuous scroll</b>  |          |   |
|             |      |      |      | 0 - 16  | 0 - 6    | White → CTC 3200-4100   |
|             |      |      |      | 16 - 32   | 6 - 13   | CTC 3200-4100 → CTC 3200-5600   |
|             |      |      |      | 32 - 48   | 13 - 19  | CTC 3200-5600 → Blue 104  |
|             |      |      |      | 48 - 64   | 19 - 25  | Blue 104 → Blue 108   |
|             |      |      |      | 64 - 80   | 25 - 31  | Blue 108 → Green 206  |
|             |      |      |      | 80 - 96   | 31 - 38  | Green 206 → Red 308   |
|             |      |      |      | 96 - 112  | 38 - 44  | Red 308 → Yellow 603  |
|             |      |      |      | 112 - 128   | 44 - 50  | Yellow 603 → CTC 5500-2900  |
|             |      |      |      | 128 - 144   | 50 - 56  | CTC 5500-2900 → CTC 5500-4200   |
|             |      |      |      | <b>Fixed color positions</b>  |          |   |
|             |      |      |      | 145 - 148   | 57 - 58  | CTC 5500-4200   |
|             |      |      |      | 149 - 152   | 58 - 60  | CTC 5500-2900   |
|             |      |      |      | 153 - 156   | 60 - 61  | Yellow 603  |
|             |      |      |      | 157 - 160   | 62 - 63  | Red 308   |
|             |      |      |      | 161 - 164   | 63 - 64  | Green 206   |
|             |      |      |      | 165 - 168   | 65 - 66  | Blue 108  |
|             |      |      |      | 169 - 172   | 66 - 67  | Blue 104  |
|             |      |      |      | 173 - 176   | 68 - 69  | CTC 3200-5600   |
|             |      |      |      | 177 - 180   | 69 - 71  | CTC 3200-4100   |
|             |      |      |      | 181 - 184   | 71 - 72  | White   |
|             |      |      |      | <b>Continuous rotation</b>  |          |   |
|             |      |      |      | 185 - 215   | 73 - 84  | CW, fast → slow   |
|             |      |      |      | 216 - 245   | 85 - 96  | CCW, slow → fast  |
|             |      |      |      | <b>Random color</b>   |          |   |
|             |      |      |      | 246 - 248   | 96 - 97  | Fast  |
|             |      |      |      | 249 - 251   | 98 - 98  | Medium  |
|             |      |      |      | 252 - 255   | 99 - 100 | Slow  |
|             |      |      |      | <b>Alternate Functions (Channel 3 set from 246 to 255.)</b>                     |          |   |
|             |      |      |      | 0 - 255   | 0 - 100  | 67 different colors in following order:<br>white, purple, pink, magenta, red, orange, yellow, green,<br>cyan, blue, black |
|             |      |      |      | <b>Rotating Gobo Selection</b>  |          |   |
|             |      |      |      | 0 - 55  | 0 - 22   | Open gobo   |
|             |      |      |      | <b>Indexing - set position on channel 6</b>                                     |          |   |
|             |      |      |      | 56 - 75   | 22 - 29  | Gobo 1  |
|             |      |      |      | 76 - 95   | 30 - 37  | Gobo 2  |
|             |      |      |      | 96 - 115  | 38 - 45  | Gobo 3  |
|             |      |      |      | 116 - 135   | 45 - 53  | Gobo 4  |
|             |      |      |      | 136 - 155   | 53 - 61  | Gobo 5  |
|             |      |      |      | <b>Continuous rotation - set velocity on channel 6</b>                          |          |   |
|             |      |      |      | 156 - 175   | 61 - 69  | Gobo 5  |
|             |      |      |      | 176 - 195   | 69 - 76  | Gobo 4  |
|             |      |      |      | 196 - 215   | 77 - 84  | Gobo 3  |
|             |      |      |      | 216 - 235   | 85 - 92  | Gobo 2  |
|             |      |      |      | 236 - 255   | 93 - 100 | Gobo 1  |
|             |      |      |      | <b>Rotating Gobo Index and Rotation</b><br>(Select mode and gobo on channel 5.) |          |   |
|             |      |      |      | <b>Indexing</b>   |          |   |
|             |      |      |      | 0 - 126   | 0 - 49   | Index CCW from default  |
|             |      |      |      | 127   | 50       | Default index   |
|             |      |      |      | 128 - 255   | 50 - 100 | Index CW from default   |
|             |      |      |      | <b>Continuous rotation</b>  |          |   |
|             |      |      |      | 0 - 2   | 0 - 1    | Static  |
|             |      |      |      | 3 - 127   | 1 - 50   | CW, slow → fast   |
|             |      |      |      | 128 - 252   | 50 - 98  | CCW, fast → slow  |
|             |      |      |      | 253 - 255   | 99 - 100 | Static  |



| DMX Channel                |          |                  |      | Start code = 0                 |          |                            |
|----------------------------|----------|------------------|------|--------------------------------|----------|----------------------------|
| DMX1                       | DMX2     | DMX3             | DMX4 | Value                          | Percent  | Function                   |
| 7<br><b>gMOD = FIX</b>     |          |                  |      | <b>Fixed Gobos</b>             |          |                            |
|                            |          |                  |      | <b>Fixed gobo positions</b>    |          |                            |
|                            |          |                  |      | 0 - 9                          | 0 - 4    | Open gobo                  |
|                            |          |                  |      | 10 - 19                        | 4 - 8    | Gobo 1                     |
|                            |          |                  |      | 20 - 29                        | 8 - 11   | Gobo 2                     |
|                            |          |                  |      | 30 - 39                        | 12 - 15  | Gobo 3                     |
|                            |          |                  |      | 40 - 49                        | 16 - 19  | Gobo 4                     |
|                            |          |                  |      | 50 - 59                        | 20 - 23  | Gobo 5                     |
|                            |          |                  |      | 60 - 69                        | 24 - 27  | Gobo 6                     |
|                            |          |                  |      | 70 - 79                        | 27 - 31  | Gobo 7                     |
|                            |          |                  |      | 80 - 89                        | 31 - 35  | Gobo 8                     |
|                            |          |                  |      | 90 - 102                       | 35 - 40  | Gobo 9                     |
|                            |          |                  |      | <b>Gobo shake, fast → slow</b> |          |                            |
|                            |          |                  |      | 103 - 119                      | 40 - 47  | Gobo 9                     |
|                            |          |                  |      | 120 - 136                      | 47 - 53  | Gobo 8                     |
|                            |          |                  |      | 137 - 153                      | 54 - 60  | Gobo 7                     |
|                            |          |                  |      | 154 - 170                      | 60 - 67  | Gobo 6                     |
|                            |          |                  |      | 171 - 187                      | 67 - 73  | Gobo 5                     |
|                            |          |                  |      | 188 - 204                      | 74 - 80  | Gobo 4                     |
|                            |          |                  |      | 205 - 221                      | 80 - 87  | Gobo 3                     |
| 222 - 238                  | 87 - 93  | Gobo 2           |      |                                |          |                            |
| 239 - 255                  | 94 - 100 | Gobo 1           |      |                                |          |                            |
| 7<br><b>gMOD = SCRL</b>    |          |                  |      | <b>Fixed Gobos</b>             |          |                            |
|                            |          |                  |      | Continuous scroll              |          |                            |
|                            |          |                  |      | Full positions:                |          |                            |
|                            |          |                  |      | 0                              | 0        | Open                       |
|                            |          |                  |      | 20                             | 8        | Gobo 1                     |
|                            |          |                  |      | 40                             | 16       | Gobo 2                     |
|                            |          |                  |      | 60                             | 24       | Gobo 3                     |
|                            |          |                  |      | 80                             | 31       | Gobo 4                     |
|                            |          |                  |      | 100                            | 39       | Gobo 5                     |
|                            |          |                  |      | 120                            | 47       | Gobo 6                     |
|                            |          |                  |      | 140                            | 55       | Gobo 7                     |
|                            |          |                  |      | 160                            | 63       | Gobo 8                     |
|                            |          |                  |      | 180                            | 70       | Gobo 9                     |
|                            |          |                  |      | <b>Gobo shake</b>              |          |                            |
|                            |          |                  |      | 181 - 183                      | 71 - 72  | Gobo 9 shake               |
|                            |          |                  |      | 184 - 186                      | 72 - 73  | Gobo 8 shake               |
|                            |          |                  |      | 187 - 189                      | 73 - 74  | Gobo 7 shake               |
|                            |          |                  |      | 190 - 192                      | 74 - 75  | Gobo 6 shake               |
|                            |          |                  |      | 193 - 195                      | 75 - 76  | Gobo 5 shake               |
|                            |          |                  |      | 196 - 198                      | 77 - 78  | Gobo 4 shake               |
| 199 - 201                  | 78 - 79  | Gobo 3 shake     |      |                                |          |                            |
| 202 - 204                  | 79 - 80  | Gobo 2 shake     |      |                                |          |                            |
| 205 - 207                  | 80 - 81  | Gobo 1 shake     |      |                                |          |                            |
| <b>Continuous rotation</b> |          |                  |      |                                |          |                            |
| 208 - 231                  | 82 - 91  | CW, fast → slow  |      |                                |          |                            |
| 232 - 255                  | 92 - 100 | CCW, slow → fast |      |                                |          |                            |
| 8                          |          |                  |      | <b>Focus</b>                   |          |                            |
|                            |          |                  |      | Infinity → 2 meters            |          |                            |
| 9                          |          |                  |      | <b>Iris</b>                    |          |                            |
|                            |          |                  |      | 0 - 199                        | 0 - 78   | Open → close               |
|                            |          |                  |      | 200 - 215                      | 78 - 84  | Close                      |
|                            |          |                  |      | 216 - 229                      | 85 - 90  | Opening pulse, fast → slow |
|                            |          |                  |      | 230 - 243                      | 90 - 95  | Closing pulse, fast → slow |
|                            |          |                  |      | 244 - 246                      | 96 - 96  | Random opening pulse, fast |
|                            |          |                  |      | 247 - 249                      | 97 - 98  | Random opening pulse, slow |
|                            |          |                  |      | 250 - 252                      | 98 - 99  | Random closing pulse, fast |
|                            |          |                  |      | 253 - 255                      | 99 - 100 | Random closing pulse, slow |

| DMX Channel                            |          |  |      | Start code = 0   |          |  |
|--|----------|--|------|--|----------|--|
| DMX1                                   | DMX2     | DMX3   | DMX4 | Value  | Percent  | Function   |
| 10<br>Fixture type = prism (default)   |          |  |      | 0 - 19   | 0 - 7    | <b>Prism</b><br>Prism out                                      |
|  |          |  |      | 20 - 79  | 8 - 31   | Prism in, CCW rotation, fast → slow                            |
|  |          |  |      | 80 - 89  | 31 - 35  | Prism in, no rotation  |
|  |          |  |      | 90 - 149   | 35 - 58  | Prism in, CW rotation, slow → fast                             |
|  |          |  |      | 150 - 215  | 59 - 84  | Prism out  |
|  |          |  |      | <b>Rotating prism and gobo macros</b>                  |          |  |
|  |          |  |      | 216 - 220  | 84 - 86  | Macro 1  |
|  |          |  |      | 221 - 225  | 87 - 88  | Macro 2  |
|  |          |  |      | 226 - 230  | 89 - 90  | Macro 3  |
|  |          |  |      | 231 - 235  | 91 - 92  | Macro 4  |
| 10<br>Fixture type = frost (optional)  |          |  |      | 0 - 255  | 0 - 100  | <b>Variable Frost</b><br>No frost → full frost                 |
| 11                                     |          |  |      | 0 - 255  | 0 - 100  | <b>Pan Coarse (16-bit MSB)</b><br>Left → right (128 = neutral) |
| -                                      | 12       | -  | 12   | 0 - 255  | 0 - 100  | <b>Pan Fine (16-bit LSB )</b><br>Left → right                  |
| 12                                     | 13       | 12   | 13   | 0 - 255  | 0 - 100  | <b>Tilt Coarse (16-bit MSB)</b><br>Up → down (128 = neutral)   |
| -                                      | 14       | -  | 14   | 0 - 255  | 0 - 100  | <b>Tilt Fine (16-bit LSB )</b><br>Up → down                    |
| - - 13 15                              |          |  |      | 0 - 2  | 0 - 1    | <b>Pan/Tilt Speed</b><br>Tracking mode                         |
|  |          |  |      | 3 - 245  | 1 - 96   | Fast → slow  |
|  |          |  |      | 246 - 248  | 96 - 97  | Tracking at slow speed, overrides PTSP FAST                    |
|  |          |  |      | 249 - 251  | 98 - 98  | Tracking at fast speed, overrides PTSP SLOW                    |
|  |          |  |      | 252 - 255  | 99 - 100 | Blackout while moving  |
| - - 14 16                              |          |  |      | <b>Effects Speed</b>                                   |          |  |
|  |          |  |      | <b>Dimmer, iris, focus and gobo indexing</b>           |          |  |
|  |          |  |      | 0 - 2  | 0 - 1    | Tracking mode  |
|  |          |  |      | 3 - 245  | 1 - 96   | Fast → slow  |
|  |          |  |      | 246 - 248  | 96 - 97  | Tracking with shortcuts disabled, overrides SCUT ON            |
|  |          |  |      | 249 - 251  | 98 - 98  | Tracking with shortcuts enabled, overrides SCUT OFF            |
|  |          |  |      | 252 - 255  | 99 - 100 | Maximum speed  |
|  |          |  |      | <b>Color 1, color 2, and fixed gobo if gMod = SCRL</b> |          |  |
|  |          |  |      | 0 - 2  | 0 - 1    | Tracking mode  |
|  |          |  |      | 3 - 245  | 1 - 96   | Speed, fast → slow   |
|  |          |  |      | 246 - 248  | 96 - 97  | Tracking with shortcuts disabled, overrides SCUT ON            |
|  |          |  |      | 249 - 251  | 98 - 98  | Tracking with shortcuts enabled, overrides SCUT OFF            |
|  |          |  |      | 252 - 255  | 99 - 100 | Blackout while moving  |
|  |          |  |      | <b>Fixed gobo if gMod = FIX</b>                        |          |  |
|  |          |  |      | 0 - 245  | 0 - 96   | Normal (as set on effect channel), no blackout                 |
| 246 - 248                              | 96 - 97  | Normal, shortcuts disabled, overrides SCUT ON  |      |  |          |  |
| 249 - 251                              | 98 - 98  | Normal, shortcuts enabled, overrides SCUT OFF  |      |  |          |  |
| 252 - 255                              | 99 - 100 | Blackout while moving                          |      |  |          |  |
| <b>Rotating gobo and prism</b>         |          |  |      |  |          |  |
| 0 - 251                                | 0 - 98   | Normal (as set on effect channel), no blackout |      |  |          |  |
| 252 - 255                              | 99 - 100 | Blackout while moving                          |      |  |          |  |
| <b>Gobo shake speed if gMod = SCRL</b> |          |  |      |  |          |  |
| 0 - 2                                  | 0 - 1    | Fast   |      |  |          |  |
| 3 - 245                                | 1 - 96   | Speed, fast → slow                             |      |  |          |  |
| 246 - 255                              | 96 - 100 | Fast   |      |  |          |  |

appendix b

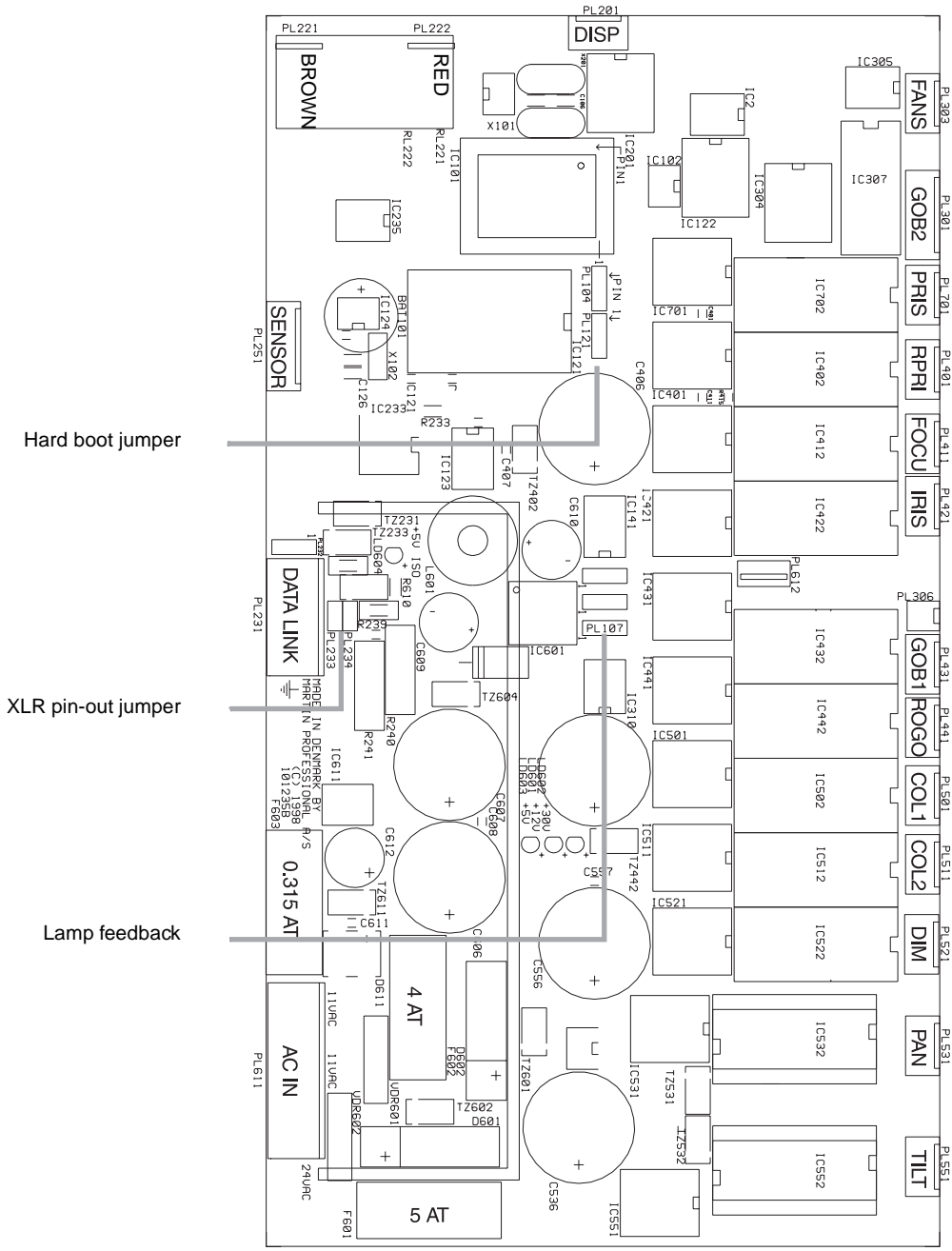
# ERROR MESSAGES

| Display readout   | Appears if...   | What to do   |
|---|---|--|
| LERR (Lamp error)   | ... the lamp doesn't ignite within 10 minutes of receiving the 'Lamp ON' command. Likely reasons are a missing or defective lamp, or insufficient AC voltage.   | <ul style="list-style-type: none"> <li>• Check the lamp</li> <li>• Check that the voltage and frequency settings match the local supply.</li> </ul>  |
| MERR (Memory error)   | ...the EEPROM memory cannot be read.  | <ul style="list-style-type: none"> <li>• Contact Martin service personnel for assistance.</li> </ul>   |
| CSER (Check-sum error)  | ...a software upload is unsuccessful.   | <ul style="list-style-type: none"> <li>• Reload software, see page 19.</li> </ul>  |
| ****  | ... there is no communication between the control panel and motherboard. This read-out appears briefly when switching on the fixture.   | <ul style="list-style-type: none"> <li>• Check fuses and replace accordingly.</li> <li>• Check that cable between control panel and motherboard is connected properly.</li> <li>• Reinstall software.</li> </ul> |
| ShER (Short error)  | ... the fixture detects the lamp is ON but no 'Lamp ON' command has been received. This can occur if the lamp relay is stuck or if the lamp feedback circuit fails. The fixture may be operated but remote lamp on/off may be effected. | <ul style="list-style-type: none"> <li>• Contact Martin service personnel for assistance.</li> </ul>   |
| Hot (Hot lamp)  | ... you attempt to strike the lamp within 8 minutes after having switched it off. The fixture will store the 'Lamp ON' instruction and strike the lamp once the 8 minute period has elapsed.  | <ul style="list-style-type: none"> <li>• Wait until the lamp strikes.</li> </ul>   |
| PTER (PCB temp. error)<br>FTER (FX temperature error)   | ...there is a malfunction in the PCB or effects section temperature sensing circuit.  | <ul style="list-style-type: none"> <li>• Contact Martin service personnel for assistance.</li> </ul>   |
| C1ER (Color wheel 1 time-out)<br>C2ER (Color wheel 2 time-out)<br>FgER (Fixed gobo time-out)<br>RgER (Rot. gobo time-out) | ...the magnetic-indexing circuit malfunctions (e.g. sensor defective or magnet missing), or if the effect and/or magnetic sensor requires mechanical adjustment. After the time-out, the effect in question stops in a random position. | <ul style="list-style-type: none"> <li>• Contact Martin service personnel for assistance.</li> </ul>   |

appendix c  
**TROUBLESHOOTING**

| Problem   | Probable cause(s)  | Remedy   |
|---|--|--|
| One or more of the fixtures is completely dead.   | No power to fixture.   | Check that power is on and cables are plugged in.  |
|   | Primary fuse blown.  | See “Changing voltage and frequency settings” on page 18.  |
|   | Secondary fuse(s) blown.   |  |
|   | Filter/power protection fuse blown.  |  |
| Fixtures reset correctly but all respond erratically or not at all to the controller.                 | The controller is disconnected from the data link.   | Connect controller.  |
|   | XLR pin-out of the controller does not match pin-out of the first fixture on the link (i.e. signal is reversed). | Install a phase-reversing cable between the controller and the first fixture on the link.  |
| Fixtures reset correctly but some respond erratically or not at all to the controller.                | Bad data link connection   | Inspect connections and cables. Correct poor connections. Repair or replace damaged cables.  |
|   | Data link not terminated with 120 Ω termination plug.  | Insert termination plug in output jack of the last fixture on the link.  |
|   | Incorrect addressing of the fixtures.  | Check fixture address and protocol settings.   |
|   | One of the fixtures is defective and disturbs data transmission on the link.                                     | Bypass one fixture at a time until normal operation is regained. Do this by unplugging the XLR in and out connectors and connecting them directly together. Have the fixture serviced by a qualified technician. |
|   | XLR pin-out on fixtures does not match (pins 2 and 3 reversed).  | Install a phase-reversing cable between the fixtures or swap pins 2 and 3 in the fixture that behaves erratically.   |
| Magnetically indexed effect resets correctly but wanders after fixture reaches operating temperature. | Effect wheel or magnetic sensor requires mechanical adjustment.  | Disable effects feedback (page 10). Contact Martin technician for assistance.  |
| No light and “LERR” error message displayed.  | The ballast and transformer settings do not match local AC voltage and frequency.                                | Disconnect fixture. Check ballast and transformer settings and correct if necessary.   |
|   | Lamp blown   | Disconnect fixture and replace lamp.   |
|   | Lamp not installed   | Disconnect fixture and install lamp.   |
| Lamp cuts out intermittently.   | Fixture is too hot.  | Allow fixture to cool.<br>Reduce ambient room temperature.<br>Recalibrate temperature sensors.   |
|   | The ballast and transformer settings do not match local AC voltage and frequency.                                | Disconnect fixture. Check ballast and transformer settings and correct if necessary.   |

# appendix d CIRCUIT BOARD LAYOUT



# appendix e SPECIFICATIONS

## Physical

- Dimensions without mounting bracket (LxWxH):..... 795 x 330 x 308 mm (31.3 x 13.0 x 12.1 in)
- Weight, EU version.....32.5 kg (71.5 lbs)
- Weight, US version.....36.5 kg (80.5 lbs)

## Electrical, EU version

- Voltage taps (ballast) ..... 200/230/245 V @ 50 Hz; 208/227 V @ 60 Hz
- Power and current.....695 W, 3.8 A @ 230 V / 50 Hz
- Power factor (PF)..... 0.79

## Electrical, US version

- Voltage taps (transformer) .....100/120/230/250 V @ 50/60 Hz
- Power and current.....790 W, 8 A @ 120 V / 50 Hz
- Power factor (PF)..... 0.79 @ 50 Hz, > 0.79 @ 60 Hz

## Fuses

- Main fuse, fixture wired at 200 V or higher .....6.3 A / 250 V time delay, P/N 05020020
- Main fuse, fixture wired at 100 or 120 V (US version only).....10 A / 250 V time delay, P/N 05020025
- Fuse F601 .....5.0 A / 250 V time delay, P/N 05020018
- Fuse F602 .....4.0 A / 250 V time delay, P/N 05020016
- Fuse F603 .....0.315 A / 250 V time delay, P/N 05020004
- AC filter and power protection fuse ..... 2.0 A / 250 V special fast-acting, P/N 05021010

## Photometric performance

- Light output ..... 8500 lm
- Center intensity, 17° version..... 234,000 cd
- Center intensity, 23.5° version..... 127,000 cd

## Rotating gobos

- Outside diameter..... 27.8 +/- 0.2 mm
- Maximum image diameter..... 23 mm
- Maximum thickness ..... 4 mm
- Recommended custom glass gobo thickness: ..... 1.1 mm
- Recommended custom glass gobo coating:..... dichroic or enhanced aluminum
- Recommended custom gobo glass: ..... high temperature, Borofloat or better

## Thermal

- Maximum ambient temperature ..... 40° C (104° F)
- Surface temperature under normal conditions..... 80° C (176° F)

## Accessories and selected spare parts

- Osram HSR-575/2 (575 W, 85 lm/W, 1000 h avg. life, 6000K)..... P/N 97010200
- Philips MSD-575 (575 W, 75 lm/W, 2000 h avg. life, 5700K) ..... P/N 97010202
- Philips MSR-575/2 (575 W, 85 lm/W, 1000 h avg. life, 6100K) ..... P/N 97010201
- Single unit flight case ..... P/N 91505006
- Double unit flight case ..... P/N 91505007
- Half-coupler clamp..... P/N 91602005
- G clamp ..... P/N 91602003
- MPBB1 Uploader ..... P/N 90758410
- 4 Channel Opto-Isolated RS-485 Splitter/Amplifier ..... P/N 90758060
- Retention spring for rotating-gobo holder..... P/N 17760040
- Frost filter for MAC 500/RS 918, assembled..... P/N 91611003
- Rotating-gobo holder..... P/N 17320090
- Retention spring for rotating gobo ..... P/N 17760210



Start code = 0  
Implemented from CPU software version 1.0

# RoboScan Pro 918 DMX Protocol



| MODE  | 1          | 2        | 3       | 4           | 50        | 75         | 100        | 125        | 150      | 175            | 200                                 | 225 | 250                 |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|---|------------|----------|---------|-------------|-----------|------------|------------|------------|----------|----------------|-------------------------------------|-----|---------------------|-----|-----|-----|-----|-----|-----|------|------|------------|-------------|---------|--------|---------|--------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>LAMP</b><br><b>CH 1</b>  | closed     | open     | 49      | 50          | ←         | 72         | N          | 80         | ←        | 99             | 100                                 | ←   | 119                 | 128 | 147 | 148 | med | 167 | 168 | slow | 187  | open pulse | close pulse | RESET * | OPEN * | LAMP ON | OPEN * | LAMP OFF* |     |     |     |     |     |     |     |     |
|   | 0          | 19       | 20      | 49          | 50        | ←          | 72         | N          | 80       | ←              | 99                                  | 100 | ←                   | 119 | 128 | 147 | 148 | med | 167 | 168  | slow | 187        | N           | F       | S      | F       | S      | N         | 208 | 217 | 218 | 227 | 228 | 237 | 238 | 247 |
| <b>LAMP</b><br><b>CH 2</b>  | closed     |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>COLOR</b><br><b>CH 3</b>   | position 1 | 2        | 3       | 4           | 5         | 6          | 7          | 8          | 9        | STEPPED SCROLL | CONTINUOUS ROTATION                 |     |                     |     |     |     |     |     |     |      |      | CH 4       |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | white      | blue 111 | red 301 | magenta 507 | green 202 | yellow 604 | purple 502 | blue 101   | pink 312 | cyan 401       | * 8   7   6   5   4   3   2   1   0 |     |                     |     |     |     |     |     |     |      |      |            | ALT         |         |        |         |        |           |     |     |     |     |     |     |     |     |
| 0   | 16         | 32       | 48      | 64          | 80        | 96         | 112        | 128        | 144      | 145            | 149                                 | 153 | 157                 | 161 | 165 | 169 | 173 | 177 | 181 | 185  | ←    | 215        | 216         | →       | 245    | 246     | 255    |           |     |     |     |     |     |     |     |     |
| <b>COLOR</b><br><b>CH 4</b>   | white      | ctc+     | ctc++   | blue 104    | blue 108  | green 206  | red 308    | yellow 603 | ctc--    | ctc-           | STEPPED SCROLL                      |     | CONTINUOUS ROTATION |     |     |     |     |     |     |      |      |            |             | RND     |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          | 16       | 32      | 48          | 64        | 80         | 96         | 112        | 128      | 144            | 145                                 | 149 | 153                 | 157 | 161 | 165 | 169 | 173 | 177 | 181  | 185  | ←          | 215         | 216     | →      | 245     | 246    | 255       |     |     |     |     |     |     |     |     |
| Alternate function (enable on ch. 3) 67 colors: white, purple, pink, magenta, red, orange, yellow, green, cyan, blue, black |            |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>G</b>  | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>B</b>  | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>O</b>  | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>S</b>  | default    |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>S</b>  | optional   |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>E</b>  | 8          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>E</b>  | 9          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>E</b>  | default    |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>E</b>  | 10         |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>E</b>  | optional   |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>P</b>  | 11         |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>T</b>  | 12         |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>T</b>  | 13         |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>T</b>  | 14         |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>S</b>  | 13         |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
| <b>S</b>  | 14         |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |
|   | 0          |          |         |             |           |            |            |            |          |                |                                     |     |                     |     |     |     |     |     |     |      |      |            |             |         |        |         |        |           |     |     |     |     |     |     |     |     |

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