ETCNET2 VIDEO NODE

User Manual

Version 2.1.2

DECLARATION OF CONFORMITY

We, ETC, Europe Limited

Unit 5, Victoria Industrial Estate, London W3 6UU United Kingdom

declare under sole responsibility that the products

Product name:	DMX Node & Video Node
Product type/model:	DNODE & VNODE
Lot:	n/a
Batch / Serial number:	n/a
Item numbers:	One each of DNODE rack mount and wall mount versions and one VNODE (3 units total)

CE

to which this declaration relates is in conformity with the following standards:

EN60950:1992 Safety of Information Technology Equipment.

following the provisions of EU LV Directive(s) 73/23/EEC

EN55103-1:1996 Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission. Using EN55022:1994 Amendments A1:1995 & A2:1997 (C.I.S.P.R. 22, 1993). Environment E2

EN55103-2:1996 Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use.; Part 2: Immunity. Including: EN 61000-4-2 (1995) EN 61000-4-3 (1996) ; EN 61000-4-4 (1995) ; EN 61000-4-5 (1995) ; EN 61000-4-6 (1996) ; EN 61000-4-11 (1994) ; EN 55103-2:1996 Annex A & EN 55103-2:1996 Annex B. Environment E2

EN 61000-3-2:1996 Part 3: Limits – Section 2: Limits for harmonic current emissions (equipment input current < = 16 Amps per phase).

EN 61000-3-3:1996 Part 3: Limits – Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current < = 16 Amps. Incorporating EN 61000-3-2/A12 Amendment Number 12 (January 1996)

following the provisions of EU EMC Directive(s) 89/336/EEC and 92/31/EEC

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(Name of authorised person)

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(signature of authorised person)

Contents

Preface

The operating features of the ETCNet2 Video Node (Video Node) depend upon both your lighting controller and the network protocol you are using.

1. When using the Video Node in a network with systems in the Expression® family, system software must be version 3.1 or later. Communication will be under the Net1 protocol (defined below).
2. When using the Video Node in a network with an Obsession® system, system software must be version 4.4.2 or later. Communication between Obsession and the Video Node will be in accordance with the Net2 protocol (defined below).
3. Some features of the Video Node are different under the Net1 and Net2 protocols. Where they pertain to one but not the other, either **[Net1]** or **[Net2]** is included with the text for clarification.

Introduction

The ETCNet2™ Video Node is a network interface device that allows information-sharing with a lighting controller along a single cable. For example, information normally viewed on console monitors can be transmitted through the network to the Video Node for remote viewing. A keyboard, an external switch closure or a Remote Focus Unit (RFU) can each have the same effect when connected to the Video Node as if connected directly to the console.[1]

The Video Node can operate either on ETC's original network protocol, ETCNet (Net1)or on ETC's newest network protocol, ETCNet2 (Net2). When used with Expression-family systems, the Video Node operates under Net1. When used with Obsession systems running v.4.4 system software, the Video Node operates under the Net2. The Video Node has output ports for two video monitors, an input port for an alphanumeric keyboard and a port that supports an RFU.

The Video Node is available in a standard 1-unit high package that fits in a 19" rack. It also comes equipped with hardware to mount it to the top or the underside of a horizontal surface. The same hardware also can be used to mount the Node vertically. Node power is provided by an external power supply that fits into a mountable cradle. The power supply and cradle are supplied with the Node.

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1. *External switches may be connected to the Remote Macro port and control macros programmed in Expression-family controllers (not Obsession). The Remote Macro port is not yet supported in Video Node software.*

Locate your Node

Each Node has an individual address called a MAC address that is stored permanently in the device's memory. The MAC address uniquely identifies a device in a network of similar devices.

Nodes are shipped with a label identifying the MAC address on the case. For your convenience, we included a chart at the rear of this manual where you can record the MAC addresses, physical locations and names of network devices in your system. Names may be assigned to network devices using the Network Configuration Editor. For information about that computer application, see *Network Configuration Editor, page 9*.

Installation

Install the Video Node by mounting it in the way that works best for your circumstances. Then connect the power, Ethernet and data cables. When mounting, please observe the following precautions:

- When rack-mounting the Video Node, ensure that the rack remains mechanically stable.
- Take care when mounting the Video Node in the vicinity of other heat-generating equipment. Ambient temperature should be in the range of 0°–40°C (32°–104°F). Where specified in the mounting procedure, use the rubber bumpers supplied with the rack-mounted Video Node to ensure good ventilation.

Mounting options

The following options for mounting the rack-mount Video Node are explained under separate headings in this section.

- Free-standing (see below)
- In a 19" rack (see *Rack mounting, page 3*)
- On a horizontal surface (*On a horizontal or vertical surface, page 4*)
- Along a vertical surface (*On a horizontal or vertical surface, page 4*)
- Beneath a horizontal surface (*Beneath a horizontal surface, page 4*)

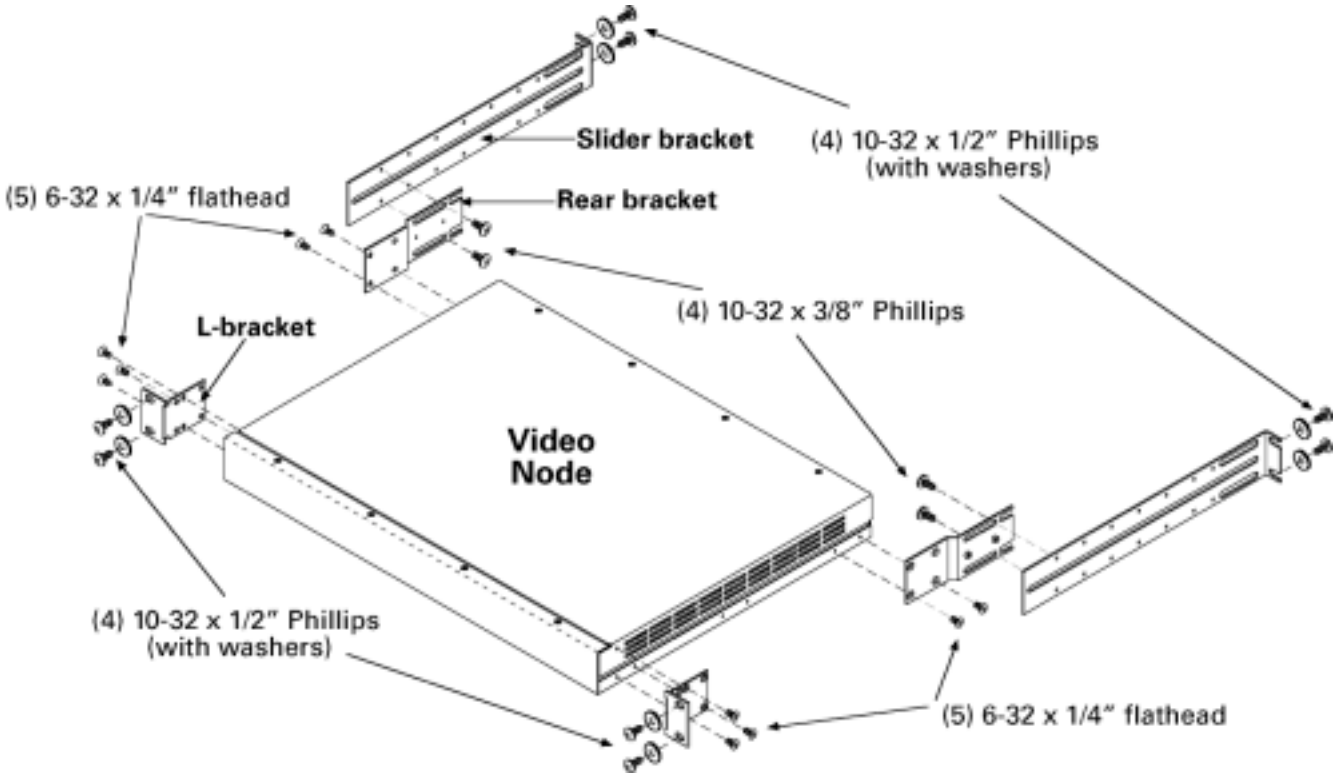
Free-standing

In portable situations, the Video Node may be placed, unsecured, on a horizontal surface. Simply attach the four rubber bumpers to the bottom of the case with the 4-40 x 3/8" screws provided.

When your Node is free-standing, you can secure the power supply by mounting the cradle directly to one side of the Node. Information about ways to mount the power supply cradle is given under *Making connections, page 7*.

Rack mounting

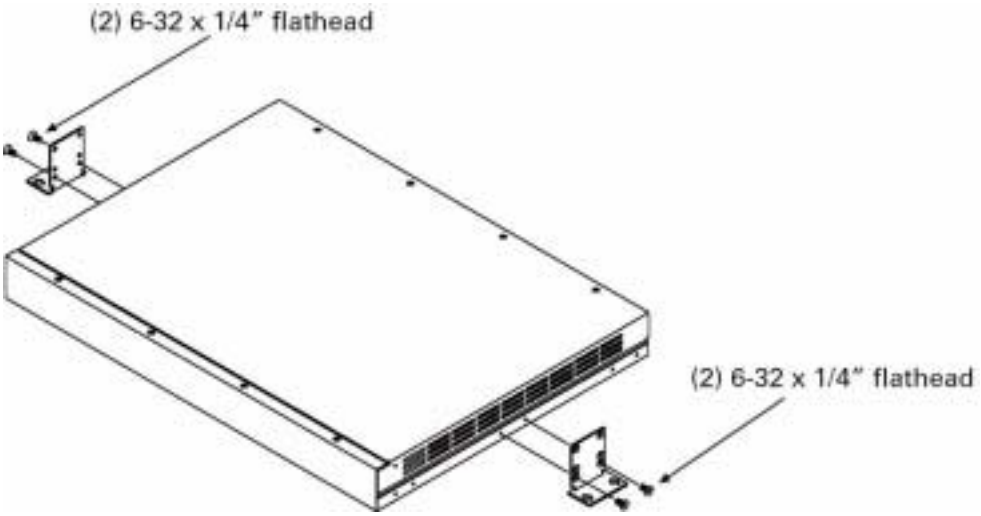
Follow this procedure to mount the Video Node in a standard 19" rack.



1. Remove all mounting hardware from the plastic bag.
2. Place one black washer on each of the eight 10-32 x 1/2" screws.
3. Attach the two L-brackets to the side panels of the device using three 6-32 x 1/4" flathead screws each. Choose the bracket holes that position the bracket flush with the front panel.
4. Secure the two rear brackets to the device's side panels using two 6-32 x 1/4" flathead screws each, orienting the brackets as shown.
5. Fit the device through the front of the rack and position over the mounting holes. The L-brackets should be on the outside of the rack.
6. Secure the device to the rack's front rail using four 10-32 x 1/2" screws and washers as shown. If the rack holes are not threaded, slide the black clips furnished in the hardware package over the rack mounting holes and thread the screws into them. **CAUTION:** Keep the rear of the device supported to avoid bending the front brackets.
7. Using four 10-32 x 1/2" bolts (and threaded clips if necessary), attach the two slider brackets to rear holes in the rack that are opposite those holes used to mount the front of the device. Do not secure yet.
8. Line up the slider brackets with the rear brackets at each side of the device. The threaded studs on the rear bracket should fit into slider bracket slots. Attach each rear bracket to a slider using two 10-32 x 3/8" screws each. The screws go through slots in the brackets and into threaded slider bracket holes.
9. Secure all bolts so that the assembly is level and tight.

On a horizontal or vertical surface

Follow this procedure to mount the Video Node to the top of a horizontal surface or to a vertical surface.



1. Remove all mounting hardware from the plastic bag.
2. Securely attach the four rubber bumpers to threaded holes in the bottom of the device using 4-40 x 3/8" screws.
3. Securely attach the two L-brackets to the device's side panels as shown, using two 6-32 x 1/4" flathead screws each. Choose the bracket holes closest to its bend.
4. Place the device on the surface where you want it. Mark the surface through the mounting holes in each bracket. Remove the device.
5. Drill holes at the marks. You will provide the mounting screws (and anchors if necessary), so choose a drill bit accordingly.
6. Securely attach the device to the mounting surface.

Beneath a horizontal surface

Follow this procedure to mount the Video Node to the bottom of a horizontal surface, such as under a desktop or platform. Refer to the illustration above when following these instructions.

1. Remove all mounting hardware from the plastic bag.
2. Fasten the four rubber bumpers to the device's top surface with double-sided tape (not furnished).
3. Securely attach the two L-brackets to the device's side panels. The brackets should be flipped 180^{o} from the bracket position shown in the illustration, with the mounting flange facing the top. Choose the bracket holes farthest from its bend.
4. Place the device on the surface where you want it. Mark the surface through the mounting holes in each bracket. Remove the device.
5. Drill holes at the marks. You will provide the mounting screws (and anchors if necessary), so choose a drill bit accordingly.
6. Securely attach the device to the mounting surface.

Front panel features

Below is an illustration of the Video Node's front panel, followed by a listing of prominent features. In some cases, the listing contains references to other sections in this Installation Guide where additional information is available.

Features from left to right:

- **Power switch**
- **RFU connector** ~ Remote Focus Unit port. See *Remote focus unit (RFU)*, below, to learn about using this port.
- **Keyboard connector** ~ Alphanumeric keyboard port.
- **Reset switch** ~ This switch enables you to interrupt Node operation when an error condition develops.
- **Power LED** ~ Blue indicator that signals power status, connection to the console and reset status. See *Power LED*, below, for an explanation.
- **Network activity LED** ~ Green indicator that flickers or glows continuously when the Video Node is processing network packets.

Power LED

[Net1] When the Node is configured for ETCNet operation, the power LED blinks on for three seconds and off for one second if the Node is powered on and has established a connection with the system console. It blinks at a 2 Hz rate if the node is powered on but there is no connection with the system console.

[Net2] When the Node is configured for ETCNet2, the power LED glows steady when the Node is powered on.

Remote focus unit (RFU)

Install an RFU to operate with the Video Node in exactly the same way you would install it when connecting directly to a console. Information about installing an RFU is given in the *Installation* section of your console user manual. Information about using an RFU, can be found in the *Accessories* chapter of your console user manual.

Rear panel features

Below is an illustration of the Video Node's rear panel, followed by a listing of prominent features. In some cases, the listing contains references to other sections in this Installation Guide where additional information is available.

Features from left to right:

- **Ground terminal** ~ Grounding point for optional use.
- **CRT 1 connector** ~ VGA port that can replicate your console's first display.
- **Power cord strain relief clamp** ~ Use to protect the power cord.
- **DC Power Input** ~ Site for the power supply connection.
- **ETCNet connector** ~ Network port.
- **+12V Out** ~ Red LED that indicates the condition of the output power circuit. See *Power protection, page 9*, for information on its function.
- **[Net1] Digitizer/Serial connector** ~ If your lighting control device can operate with the Designer's Worksheet, connect the digitizer to this port. See *Designer's Worksheet*, below, to learn about using this port.
- **CRT 2 connector** ~ If your lighting controller operates with two video monitors, this port can replicate displays on the second monitor.
- **[Net2] Remote Macro connector** ~ Reserved for future development.

Designer's Worksheet

[Net1] The Designer's Worksheet is a method of controlling the console using a digitizer tablet. Not all ETC consoles are equipped with the Designer's Worksheet feature. To find out if it is available in your system, see your console user manual.

Install the digitizer tablet for the Designer's Worksheet using the instructions given in the *Installation* appendix of your console user manual. Information about using the Designer's Worksheet can be found in the user manual's *Accessories* chapter.

Making connections

Connecting power to the Video Node and connecting the network cable enables it to communicate on your network. Connecting devices between the Node and other devices enables them to communicate on the network too. Various ways to install the Node's external power supply are discussed below. Connecting the Node to other devices relies primarily on information provided in your console user manual, but introductions to those installations are given elsewhere in this Installation Guide. See, for example, *Remote focus unit (RFU), page 5*, and *Designer's Worksheet, page 6*.

Network connection

Plug your UTP network cable into the ETCNet port on the rear panel of the Video Node. The cable should be Category 5 compliant.

Power connection

For the most sturdy installation, secure the external power supply to a convenient surface using the power supply cradle supplied with the Video Node. Mounting hardware is included for most mounting methods.

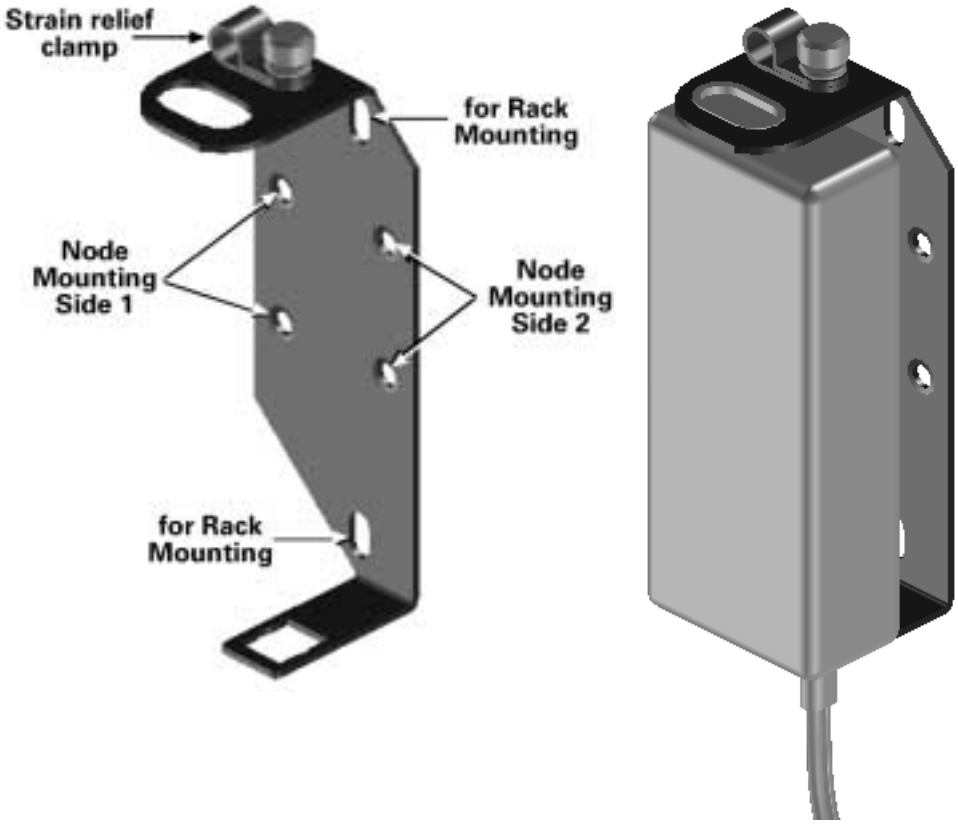
There are three steps to securely installing the power supply: (A) mount the power supply cradle, (B) snap the power supply into the cradle, (C) hook up the input and output cables.

A. Mounting

You have three options for mounting the power supply cradle:

- **Rack-mounted** ~ Use this option when installing the Node in a rack.
- **Node-mounted** ~ You can attach the cradle to either side of the Node. Attach the cradle with its strain relief clamp facing the Node's front panel.
- **Surface-mounted** ~ You can bolt the cradle to a nearby surface, such as a table top. This is probably the best option when mounting the Node to a horizontal or vertical surface.

The left illustration below shows you which holes to use for each of these mounting options. Note that there are four holes for Node-mounting—two for each side of the Node. This allows you to choose the pair that will center the cradle on the side. The right illustration below shows the power supply in its cradle. In these illustrations, the AC end of the power supply is at the top.



B. Snapping together

The power supply comes with the dc cable attached. Route the free end of the dc cord through the square hole in one end of the cradle, passing the cable from the inside to the outside of the cradle (see the left illustration above). After pulling the cable all the way through, the flange on the power supply should seat snugly in the square hole. Rotate the power supply until it snaps into the cradle at the other end, as shown in the right illustration above.

C. Hooking up cables

Remove the strain relief clamp from the rear panel of the Node. Pass the power supply's dc cable through the eye of the clamp, then plug it into the Node connector. Bolt the clamp back in place on the rear panel.

Remove the clamp located at one end of the power supply cradle. Pass the power supply's ac cable through the eye of the clamp, then plug the cable into the power supply. Loop the cable slightly so you can line up the clamp with its mounting hole. Bolt the clamp in place.

Operation

Power protection

The Video Node's power input circuit and its +12V output circuit each contain in-line polyswitches to guard against overloads. Polyswitches act as self-resetting protectors, opening if the current drain is too high and then resetting when they cool. If the Node power is normal, the front panel Power LED signals according to the information given under *Power LED, page 5*. If the output circuit power is normal, the +12V Out LED on the rear panel will glow.

If you unexpectedly lose Node power, switch the Node power off to give the input polyswitch time to cool and reset. If you have an RFU connected to the Node and it is powered on, switch it off. After waiting a few minutes, switch the Node power back on. If the Power LED stays on, the problem may be in the RFU. After verifying that the output LED is glowing, switch the RFU back on. If a polyswitch fails (either one) only when the RFU is connected and on, the fault is most likely in the RFU or with its connection to the Node. If you need assistance, contact ETC Technical Services at one of the offices listed on the back page of this Installation Guide.

Node reset

The Video Node has a reset switch visible through a small hole in the front panel. If you believe there is an error in Video Node signal processing or want to start from initial conditions, press the reset switch momentarily. This causes the Node to reboot, which temporarily interrupts all signal processing and signal outputs. The Node returns almost immediately to normal operation.

Network Configuration Editor

[Net2] ETC provides utility software called the Network Configuration Editor (NCE) to enable you to set and edit node configurations. NCE runs on a computer connected to the network. For information about obtaining and using NCE, contact ETC Technical Services at the office nearest you.

Appendix A ~ Specifications

Electrical

- Power required: 25 watts at 10-28 Vdc
- Furnished power supply: 100-240 VAC, 3.0 amp, 50/60 Hz
- Power supply connector: IEC barrel type (2.5mm I.D. x 5.0mm O.D.)
- DC input protected with in-line, self-resetting polyswitch (rated at 2.5 amp at 30 Vdc)
- Power on indicator: Blue LED on front panel
- Front panel power switch

Mechanical

- 1U high: 17" x 12.5" x 1.7"
- Includes brackets and fasteners for rack or surface mounting

Temperature

- Normal operating range: 0^{o}–40^{o} C (32^{o}–104^{o} F)

Remote Focus Unit (RFU) interface

- Supplies RFU power
- RFU power protected in the Video Node with an in-line, self-resetting polyswitch (rated at 2.5 amp at 30 Vdc)
- Uses XLR6 female front panel connector

Keyboard interface

- PS/2 front panel connector

Ethernet interface

- Network activity indicated by a front panel green LED
- Rear panel UTP connector (RJ45)

Appendix B ~ Default settings

[Net2] A new Video Node arrives with the following factory defaults. Except for the Node Properties class, all default settings are per port.

Default Class	Property	Default Setting
Node Properties	Name	ETC Video Node
	IP Address	10.101.0.99 [a]
	Subnet Mask	255.255.0.0 [a]
	Gateway IP	10.101.0.99 [a]
	ETCNet Operating Mode	2
Video Port Properties (VideoPort)	System ID	0
	Display Number	0-based port number
	Locked	false
RFU Port Properties	Multidrop	Disabled
	System ID	0
PC Keyboard Port Properties (PCKeyboardPort)	System ID	0

a) These are temporary values that enable the Node to communicate until steady state values are assigned by the ETC Address Server.

Appendix C ~ Limited warranty

Electronic Theatre Controls, Inc. (ETC™) warrants to the original owner or retail customer (Customer) that during the warranty period ETC will repair or replace its products that are defective in materials or workmanship under normal use and service, subject to the terms of this limited warranty. The warranty period shall begin on the date of delivery of a portable system or on the date of energization of a permanently installed system, and shall continue for the following periods: (a) one year, for all Irideon products, and (b) two years, for all other ETC products. Warranty is limited to (60) days from shipment for purchase of demo or loaner products.

Warranty does not cover any product or part of a product subject to accident, negligence, alteration, abuse or misuse, or any accessories or parts not supplied by ETC. Warranty does not cover "consumable" parts such as fuses, lamps, color media or components warranted directly to the owner by the original manufacturer. ETC's warranty does not extend to items not manufactured by us. Freight terms on warranty repairs are FOB ETC factory or designated repair facility. Collect shipments or freight allowances will not be accepted.

ETC's sole responsibility under this warranty shall be to repair or replace at ETC's option such parts as shall be determined to be defective on ETC's inspection. ETC will not assume any responsibility for any labor expended or materials used to repair any equipment without ETC's prior written authorization. ETC SHALL NOT BE RESPONSIBLE FOR ANY INCIDENTAL, GENERAL OR CONSEQUENTIAL DAMAGES, DAMAGES TO PROPERTY, DAMAGES FOR LOSS OF USE, TIME, PROFITS OR INCOME, OR ANY OTHER DAMAGES.

The customer's obligations during the warranty period under this warranty are to notify ETC at ETC's address within one week of any suspected defect, and to return the goods prepaid to ETC at their factory or authorized service center.

THIS WARRANTY IS CONTINGENT ON THE CUSTOMER'S FULL AND TIMELY COMPLIANCE WITH THE TERMS OF PAYMENT SET FORTH IN THE "TERMS AND CONDITIONS." THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND OF OTHER OBLIGATIONS AND LIABILITIES ON OUR PART. THE CUSTOMER ACKNOWLEDGES THAT NO OTHER REPRESENTATIONS WERE MADE TO HIM OR RELIED UPON BY HIM WITH RESPECT TO THE QUALITY AND FUNCTION OF THE GOODS SOLD.

This written warranty is intended as a complete and exclusive statement of the terms thereof. Prior dealings or trade usage shall not be relevant to modify, explain or vary this warranty. Acceptance of, or acquiescing in, a course of performance under this warranty shall not modify the meaning of this agreement even though either party has knowledge of the performance and a chance to object.

Terms and Conditions

The following terms and conditions, and those on the face hereof, shall control as to any order accepted by Electronic Theatre Controls, Inc. (ETC), notwithstanding any terms and conditions that may be contained in any purchase order or other document of Customer, and ETC's acceptance of any order is expressly made conditional on Customer's assent to such terms and conditions. Such terms and conditions will constitute the entire agreement between the parties as to any order and will supersede any prior understandings, agreements, representations, or warranties. Such terms and conditions will not be modified, added to, superseded or otherwise altered except by written document signed by an authorized representative of ETC, notwithstanding any terms and conditions contained in the purchase order or other document of Customer. ETC's commencement of performance and/or delivery shall not constitute a waiver of

these terms and conditions or any acceptance of any terms and conditions contained in the Customer's order or other documents. Acceptance of any product or service by the Customer will be construed as acceptance of ETC's terms and conditions. Any dispute or questions of construction with respect to any order placed with ETC shall be governed by the laws of the State of Wisconsin.

All prices are in US Dollars, FOB ETC's factory or warehouse. Prices, models and specifications are subject to change without notice. Orders must be in writing. Phone orders will be accepted from established accounts when followed by written confirmation. The acceptance of any order does not imply conformance with plans and specifications unless the plans and specifications accompany the order and are accepted as binding by ETC. Equipment ordered which differs in any way from our standard catalog items will require drawings approved in writing by the Customer. When drawings are approved, they shall take precedence over all other written or verbal instructions. Orders are effective only when accepted and acknowledged by the factory. Minimum order is $25.00 net, exclusive of freight.

Price protection will be given on orders entered for immediate shipment and for project orders entered before the effective date of a price increase. All other orders will be billed at the current price at time of shipment. Quotations for custom products are valid for thirty (30) days.

ETC will attempt to ship goods for delivery on or about the times stated on the reverse side hereof, although time shall not be the essence in this contract. ETC will attempt to follow customer's written instructions as to mode and routing of shipments. In absence of such instructions, ETC shall have absolute discretion as to mode and routing of shipments, including express or parcel post for small shipments. Where the customer has requested expedited freight, the customer will be responsible for the incurred additional charges.

ETC shall not be liable for late delivery and/or inability to perform due to unforeseen circumstances or conditions, including our ability to obtain supplies and raw materials, government regulations, labor stoppages, casualties, fire, and other causes beyond our control. When such circumstances or conditions have been remedied, ETC will make and Customer will accept delivery/performance. Equipment is shipped at the Customer's risk and our obligation to deliver equipment is discharged upon their delivery in good condition to the carrier. Shipments are FOB ETC factory or warehouse. ETC will prepay and bill freight on UPS shipments. Freight and air are sent collect unless specifically quoted otherwise. Unless specifically prohibited, partial shipments will be made. Federal, state and/or local taxes, duties and other charges are the responsibility of the purchaser.

Any changes in engineering drawings, specifications, or in other terms of manufacture, assembly or shipment, requested by customer, must be in writing and approved by ETC. If any such change by Customer causes an increase in the cost of, or in the time required for performance of, any part of the contract, then ETC shall make a reasonable adjustment to the price of the goods.

If purchaser cancels any portion of a Purchase Order prior to shipment, Purchaser shall be liable to ETC for a cancellation charge equal to ETC's actual costs incurred in connection with that portion of the Purchase Order that is cancelled, including, without limitation, labor and materials. Customer represents that it is solvent. ETC retains a security interest in the goods to secure payment of the purchase price and all other indebtedness now or hereafter owed by the customer to ETC. At ETC's request, customer will execute a financing statement or statements evidencing such security interest and will take any other action necessary to perfect the same.

Payment terms are net 30 days after date of invoice. If ETC in good faith doubts customers ability or willingness to pay, ETC may in its discretion complete its performance of this contract upon a cash in advance basis or make deliveries only upon a C.O.D. basis or file a UCC filing or suspend all or part of its performance here under. All payments are applied to the oldest outstanding invoice. Accounts over

thirty (30) days are subject to a 1 1/2% (one and one-half percent) per month late payment penalty. ETC will have the option of withholding performance under any and all orders from the Customer if an invoice remains unpaid after 30 days. All disputes otherwise unresolved between ETC and Customer shall be resolved in a court of competent jurisdiction in the location of ETC's offices, Dane County, Wisconsin. If suit or action is instituted by ETC to enforce payment or performance by the Customer, the Customer agrees to pay all costs and attorney's fees incurred.

Claims for shortage or damaged goods must be made within ten (10) days. Equipment is carefully packed and delivered in good condition to the carrier. All claims for loss or damage in transit must be made by the consignee directly to the carrier. ETC will render every aid and assistance in the presentation and enforcement of such claims without waiver of our rights to have compliance with the terms of payment of our invoices.

Equipment returned without ETC's written permission will not be accepted. Equipment returned for credit must be in accordance with established RMA procedures. Equipment must be unused, in original cartons and in saleable condition, subject to ETC's quality control and test inspection. Restocking charges of $25.00 or 25% of invoice (whichever is greater) plus any repacking or reconditioning costs will be deducted from the credit. Returns for warranty work will be via warranty procedures. In no case will permission be granted to return specially-modified or custom equipment, or merchandise invoiced more than six (6) months prior to date of Customer's return request.

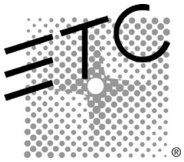
No failure of ETC to insist upon or compel compliance by the customer with any of these terms and conditions shall be constructed as a waiver by ETC of its right to insist upon compliance. No waiver by ETC of any breach by customer shall be effective unless in writing signed by ETC, and no waiver by ETC of any breach by customer shall be deemed a waiver of any other breach.

If ETC shall fail to repair or replace defective goods within a reasonable time after they are returned to ETC, or if ETC shall wrongfully fail to make delivery or shall wrongfully repudiate this contract, then customer shall be entitled to recover from ETC such part of the purchase price as has been paid by customer to ETC. The remedy stated in the preceding sentence shall be customer's exclusive remedy for any breach, non delivery, or repudiation by ETC or for any other liability of ETC to customer. This exclusive remedy shall not be deemed to have failed its essential purpose so long as ETC is willing and able to repair or replace defective parts in the prescribed manner.

Node Chart

For information about using the Node Chart, see *Locate your Node, page 2*.

MAC Label	Type	Name	Location



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