CITY THEATRICAL

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The SHoW DMX Neo® Installation and Application Guide

Rev 1.0

SHoW DMX Neo Transceivers are covered by U.S. Patent # 7,432,803 and other patents pending.

US HEADQUARTERS
475 BARELL AVENUE
CARLSTADT, NEW JERSEY 07072
TEL 800 230 9497 / 201 549 1160
FAX 201 549 1161

LONDON OFFICE
UNIT 1-3 WYVERN ESTATE, BEVERLEY WAY
NEW MALDEN, SURREY KT3 4PH
TEL +44 (0) 20 8949 5051
FAX +44 (0) 20 7183 6061

www.citytheatrical.com

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Radio Compliance Information

5792 SHoW DMX Neo Radio Transceiver
FCC ID: VU65792
IC ID: 7480A5792

FCC Part 15
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

Radio Frequency Notifications

FCC Notifications
RF Radiation The Product is an intentional radiator of Radio Frequency (RF) energy. In order to limit RF exposure to personnel in the immediate area, the Product should be located and installed such that a separation of at least 20 centimeters is maintained between the Product's antenna and personnel in the vicinity of the device.

Modification Warning
Caution: changes or modifications to this equipment, not expressly approved by City Theatrical Inc. could void the user's authority to operate the equipment.

Industry Canada Notifications
This Class B digital apparatus complies with Canadian ICES-003. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.
Product Installation and Configuration Guide © City Theatrical Inc. 2007

5792 Approved Antenna
To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.
This device has been designed to operate with the antennas listed below. Antennas not included in this list or having a gain greater than 5 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Antennas

The model: 5792 can be configured with any one of the approved antennas listed below for fixed, point-to-point one server and one client configuration. When the model: 5792 is configured for point-to-multipoint one server and multiple clients configuration (clients talk to server only one at a time), clients can use any of the approved antennas listed below and the server can use any of the approved antennas listed below, with the exception of the 14dBi antenna.

5792 FCC/IC Approved Antennas:

Manufacturer	Model	Type	Connector	Gain
Nearson	S151AH-2450S	Omni whip	SMA plug reverse polarity	5dBi
Nearson	S141AH-2450	Omni whip	SMA plug reverse polarity	2dBi

Nearson	S131AH-2450	Omni whip	SMA plug reverse polarity	2dBi
Nearson	DG102N-2.4/5.25	Omni whip, outdoor use	SMA plug reverse polarity via provided Antenna Cable	5dBi
Tekfun	F40-N	Omni whip, outdoor use	Male N	4.5dBi
Centurion	WCP2400-MMCX4	Omni whip	MMCX jack on 4” coax pigtail	2.5dBi
Maxrad	MP24008XFPT	Panel, outdoor use	SMA plug reverse polarity via provided Antenna Cable	8dBi
Maxrad	MYP24010PT	Yagi, outdoor use	SMA plug reverse polarity via provided Antenna Cable	10dBi
Maxrad	MYP24014PT	Yagi, outdoor use	SMA plug reverse polarity via provided Antenna Cable	14dBi

5792 CE Approved Antennas:

Manufacturer	Model	Type	Connector	Gain
Nearson	S151AH-2450S	Omni whip	SMA plug reverse polarity	5dBi
Nearson	S141AH-2450	Omni whip	SMA plug reverse polarity	2dBi
Nearson	S131AH-2450	Omni whip	SMA plug reverse polarity	2dBi
Nearson	DG102N-2.4/5.25	Omni whip, outdoor use	SMA plug reverse polarity via provided Antenna Cable	5dBi
Tekfun	F40-N	Omni whip, outdoor use	Male N	4.5dBi
Centurion	WCP2400-MMCX4	Omni whip	MMCX jack on 4” coax pigtail	2.5dBi

For installations governed by FCC and/or IC rules, any of the approved antennas listed above may be used with the SHoW DMX Vero Transceiver (please note the special installation requirements for use with the CTI # 5636 14 dBi Yagi Antenna).

Please note that some of the antennas listed are intended for indoor use only.

For use in locations governed by CE rules, some antenna restrictions apply. Antennas from the **5792 CE Approved Antennas** meet all requirements. Contact City Theatrical for details.

ETSI power settings for all 5792 SHoW DMX Neo Radio module equipped products, including the SHoW DMX Vero Transceiver, are based on use with the CTI 5630 5 dBi Omni Antenna. ETSI power and range will vary with the antenna used. Contact your dealer or City Theatrical for more information. CE Mark Conformity
City Theatrical Inc. declares that this product conforms to the specifications listed in this manual, following the provisions of the European R&TTE directive 1999/5/EC:

City Theatrical Inc. vakuuttaa täten että dieses produkt tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien näiden direktiivien muiden ehtojen mukainen.
City Theatrical Inc. déclare que le produit est conforme aux conditions essentielles et aux dispositions relatives à la directive 1999/5/EC.
• EN 301 489-1, 301 489-17 General EMC requirements for Radio equipment.
• EN 60950 Safety
• EN 300 328 Technical requirements for Radio equipment.

CAUTION—This equipment is intended to be used in all EU and EFTA countries.
Outdoor use may be restricted to certain frequencies and/or may require a license for operation. Contact local Authority for procedure to follow.
Note: ESD precautions should be used when attaching or removing the antenna.
Note: Combinations of power levels and antennas resulting in a radiated power level of above 100 mW equivalent isotropic radiated power (EIRP) are considered as not compliant with the above mentioned directive and are not allowed for use within the European community and countries that have adopted the European R&TTE directive 1999/5/EC. For more details on legal combinations of power levels and antennas, contact City Theatrical Inc.
Do not use this product near water, for example, in a wet basement or near a swimming pool.
Avoid using this product during an electrical storm. There may be a remote risk of electric shock from lightning.

Product Installation and Configuration Guide © City Theatrical Inc. 2011

Q52 Regulatory information
Radio Frequency Notifications
Belgique Dans le cas d'une utilisation privée, à l'extérieur d'un bâtiment, au-dessus d'un espace public, aucun enregistrement n'est nécessaire pour une distance de moins de 300m. Pour une distance supérieure à 300m un enregistrement auprès de l'IBPT est requise. Pour une utilisation publique à l'extérieur de bâtiments, une licence de l'IBPT est requise. Pour les enregistrements et licences, veuillez contacter l'IBPT.
France 2.4 GHz Bande : les canaux 10, 11, 12, 13 (2457, 2462, 2467, et 2472 MHz respectivement) sont complétement libres d'utilisation en France (en utilisation intérieur). Pour ce qui est des autres canaux, ils peuvent être soumis à autorisation selon le department. L'utilisation en extérieur est soumis à autorisation préalable et très restreint. Vous pouvez contacter l'Autorité de Régulation des Télécommunications (http://www.art-telecom.fr) pour de plus amples renseignements.

5792 SHoW DMX Neo Radio Module CE Declaration of Conformity

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CE

EC Certificate of Conformity

Products covered by this Certificate

SHoW DMX Neo™

5792 Radio Module

Standards Applied

EN 301-489-1 V1.8.1 (2008-04)
EN 301 489-17 V2.1.1 (2009-05)
ETSI EN 300 328 v1.7.1 (2006-10)

Product Conforms to CE Marking Directive 93/68/EEC

Date of Issue: August 15, 2011

Year CE Marking First Affixed: 2011

Lauren E. Dunn

Lauren E. Dunn, Head of Engineering

US HEADQUARTERS
475 BARELL AVENUE
CARLSTADT, NEW JERSEY 07072
TEL 800 230 9497 / 201 549 1160
FAX 201 549 1161

www.citytheatrical.com

LONDON OFFICE
UNIT 1-3 WYVERN ESTATE, BEVERLEY WAY
NEW MALDEN, SURREY KT3 4PH
TEL +44 (0) 20 8949 5051
FAX +44 (0) 20 7183 6061

Introduction

City Theatrical's SHoW DMX Neo Wireless DMX Technology includes a range of transceivers, and receivers for wireless distribution of DMX512 and RDM. The SHoW DMX Neo family includes the SHoW DMX Neo Transceivers and Receivers with advanced selectable features and sophisticated user interfaces, the affordable plug and play SHoW DMX SHoW Baby Transceiver, and the SHoW DMX Vero Net and SHoW DMX Vero Transceivers for outdoor use.

This document explains in detail what SHoW DMX Neo Technology is, how it works, and how to set-up and configure a SHoW DMX Neo system.

The SHoW DMX Neo Product Range

5701 SHoW DMX Neo® Transceiver

The SHoW DMX Neo Transceiver is user configurable as either a Transmitter or a Receiver, and incorporates CTI's powerful Ethernet Gateway functions and connectivity.

Wireless DMX Features

- SHoW DMX Neo Mode
  - DMX Synchronized Hopping
  - Low Latency
  - User selectable Full or Limited Bandwidth
  - User selectable Full or Limited Burst
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

- SHoW DMX Neo Adaptive Mode
  - DMX Synchronized Hopping
  - Adaptive Frequency Hopping
  - Low Latency
  - Adaptive Modified Full Bandwidth
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

- SHoW DMX Classic Mode
  - Communicates with original SHoW DMX equipment
  - DMX Synchronized Hopping
  - User selectable Full or Limited Bandwidth
  - User selectable Full or Limited Burst
  - User selectable Output Power

RDM Features

- Supports any RDM controller or RDM enabled console
- Fast and reliable wireless RDM Proxy and Responder functions

Electronic / Functional Features

- DMX in and out via Neutrik 5P XLRs
- USB Port
- User Interface
  - Five button Keypad
  - LCD Screen
- 12-24VDC 3W Power Input via 5.5mm DC Power Jack with included CL2 12VDC Power Supply with international plug set
- Ethernet Port via Dual RJ 45 Jack

- Supports multiple Ethernet show control protocols including sACN, Art-Net, and KiNet

Construction: NEMA 1 / IP 20 Steel and Aluminum enclosure

Compliance

- CE Certified
- FCC Certified
- RoHS Compliant
- Provided power supply is UL Listed

CTI Part #: 5701

Dimensions: 6.25”/160mm W x 2.375”/60mm H x 5.125”/130mm D

Weight: 2 lbs / 0.91 Kilos

Accessories:

- 5602 Mounting Plate (provided)
- 5627 AC/DC CL2 Power Supply (provided)
- 5630 5dBi Omni Antenna (provided)
- 5632 8dBi Panel Antenna
- 5634 10dBi Yagi Antenna
- 5636 14dBi Yagi Antenna
- 5637 Antenna Splitter
- 5638 Adapter Cable
- 5639 Gender Change
- 5730 2dBi Omni Antenna

5711 SHoW DMX Neo® Receiver

The SHoW DMX Neo Receiver works with the SHoW DMX Neo Transceiver to create the communications backbone of the SHoW DMX Neo wireless DMX distribution system.

Wireless DMX Features

- SHoW DMX Neo Mode
  - DMX Synchronized Hopping
  - Low Latency
  - User selectable Full or Limited Bandwidth
  - User selectable Full or Limited Burst
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

- SHoW DMX Neo Adaptive Mode
  - DMX Synchronized Hopping
  - Adaptive Frequency Hopping
  - Low Latency
  - Adaptive Modified Full Bandwidth
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

- SHoW DMX Classic Mode
  - Communicates with original SHoW DMX equipment
  - DMX Synchronized Hopping
  - User selectable Full or Limited Bandwidth
  - User selectable Full or Limited Burst
  - User selectable Output Power

RDM Features

- Supports any RDM controller or RDM enabled console
- Fast and reliable wireless RDM Proxy and Responder functions

Electronic / Functional Features

- DMX in and out via Neutrik 5P XLRs
- USB Port
- User Interface
  - Five button Keypad
  - LCD Screen
- Dual Power Input
  - 100-240 VAC 3W 50/60 Hz Mains Input via IEC C-14 Inlet
  - 12-24VDC 3W Input via 5.5mm DC Power Jack

Construction: NEMA 1 / IP 20 Steel and Aluminum enclosure

Compliance

- CE Certified
- IC Certified SHoW DMX Neo Radio Module
- FCC Certified
- RoHS Compliant
- ETL Listed

CTI Part #: 5711

Dimensions: 6.25”/160mm W x 2.375”/60mm H x 5.125”/130mm D

Weight: 2 lbs / 0.91 Kilos

Accessories

- IEC/NEMA 5-15P power cable (provided)
- 5602 Mounting Plate (provided)
- 5627 AC/DC CL2 Power Supply
- 5630 5dBi Omni Antenna (provided)
- 5632 8dBi Panel Antenna
- 5634 10dBi Yagi Antenna
- 5636 14dBi Yagi Antenna
- 5637 Antenna Splitter
- 5638 Adapter Cable
- 5639 Gender Change
- 5730 2dBi Omni Antenna

5702 SHoW DMX SHoW Baby®

The SHoW DMX SHoW Baby is a simple and affordable plug and play transceiver that is permanently set to SHoW ID 201, and supports one 512 slot universe of wireless DMX with the same high fidelity SHoW DMX Neo Radio technology used in all of the SHoW DMX Neo range.

Wireless DMX Features

- SHoW DMX Neo Adaptive Mode
  - DMX Synchronized Hopping
  - Adaptive Frequency Hopping
  - Low Latency
  - Adaptive Modified Full Bandwidth
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

RDM Features

- Supports any RDM controller or RDM enabled console
- Fast and reliable wireless RDM Proxy and Responder functions

Electronic/ Functional Features

- DMX in and out via Neutrik 5P XLRs
- LED indicators:
  - Tx (set as transmitter)
  - Rx (set as receiver)
  - Data (data present)
  - RF Signal Strength (4 LEDS) Low to High
- 12-24VDC 2.4W Power Input via 5.5mm DC Power Jack with included CL2 12VDC Power Supply with international plug set

Construction: NEMA 1 / IP 20 Steel and ABS enclosure

Compliance

- RoHS Compliant
- CE Certified
- IC Certified SHoW DMX Neo Radio Module
- FCC Certified
- Power Supply NRTL Listed

CTI Part #: 5702

Weight: 0.4 lbs / 0.18 Kilos

Dimensions: 3.625” / 92mm W x 1.8” / 46mm H x 3” / 76mm D

Accessories:

- 5780 Pipe Mount Bracket (provided)
- 5627 AC/DC CL2 Power Supply (provided)
- 5630 5dBi Omni Antenna
- 5632 8dBi Panel Antenna
- 5634 10dBi Yagi Antenna
- 5636 14dBi Yagi Antenna
- 5637 Antenna Splitter
- 5638 Adapter Cable
- 5639 Gender Change
- 5730 2dBi Omni Antenna (provided)

7400-5708 SHoW DMX Vero Net™ Transceiver

The Vero Net is the outdoor use version of the SHoW DMX Neo Transceiver. It offers all of the Neo functionality and Ethernet Gateway features in a NEMA 4 / IP 66 package, with a simplified user interface, optimized for permanent installation.

Wireless DMX Features

- SHoW DMX Neo Mode
  - DMX Synchronized Hopping
  - Ultra Low Latency
  - User selectable Full or Limited Bandwidth
  - User selectable Full or Limited Burst
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

- SHoW DMX Neo Adaptive Mode
  - DMX Synchronized Hopping
  - Adaptive Frequency Hopping
  - Ultra Low Latency
  - Adaptive Modified Full Bandwidth
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

- SHoW DMX Classic Mode
  - Communicates with original SHoW DMX equipment
  - DMX Synchronized Hopping
  - User selectable Full or Limited Bandwidth
  - User selectable Full or Limited Burst
  - User selectable Output Power

RDM Features

- Supports any RDM controller or RDM enabled console
- Fast and reliable wireless RDM Proxy and Responder functions

Electronic / Functional Features

- DMX In and Out via 3P Screw Terminal
- USB Port
- Ethernet Port via RJ 45 Jack
  - Supports multiple Ethernet show control protocols including sACN, Art-Net, and KiNet

- User Interface
    - 3 x ROTARY Switches for SHoW ID entry
    - 5P DIP Switch for configuration
- 100-240 VAC 50/60 Hz 3W Mains Power Input via 3P Screw Terminal

Construction: NEMA 4 / IP 66 Aluminum enclosure

Compliance

- CE Certified
- IC Certified SHoW DMX Neo Radio Module
- FCC Certified
- RoHS Compliant
- ETL Listed

CTI Part #: 7400-5708

Dimensions: 7.75”W / 196mm x 8.75” / 222mm H x 4” / 102mm D

Weight: 2.6 lbs / 1.18 Kilos

Accessories:

- Mounting Bracket (provided)
- 5732 4.5dBi Outdoor Omni-directional Antenna (provided)
- 5632 8dBi Panel Antenna
- 5634 10dBi Yagi Antenna
- 5636 14dBi Yagi Antenna
- 5637 Antenna Splitter
- 5639 Gender Changer

7400-5707 SHoW DMX Vero™ Transceiver

The Vero is a simplified outdoor-use Transceiver with all of the Neo RF functionality of Vero Net but without the Ethernet features or SHoW DMX Classic operating mode. It is housed in a NEMA 4 / IP 66 package, and provided with a simplified user interface for permanent installation.

Wireless DMX Features

- SHoW DMX Neo Mode
  - DMX Synchronized Hopping
  - Ultra Low Latency
  - User selectable Full or Limited Bandwidth
  - User selectable Full or Limited Burst
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

- SHoW DMX Neo Adaptive Mode
  - DMX Synchronized Hopping
  - Adaptive Frequency Hopping
  - Ultra Low Latency
  - Adaptive Modified Full Bandwidth
  - User selectable Output Power
  - Lost Data Replacement
  - Advanced High Speed RDM functions
  - Supports reduced DMX slot frames for higher refresh rates

RDM Features

- Supports any RDM controller or RDM enabled console
- Fast and reliable wireless RDM Proxy and Responder functions

Electronic / Functional Features

- DMX In and Out via 3P Screw Terminal
- User Interface
  - 3 x ROTARY Switches for SHoW ID entry
  - 5P DIP Switch for configuration
- 100-240 VAC 50/60 Hz 3W Mains Power Input via 3P Screw Terminal

Construction: NEMA 4 / IP 66 Aluminum enclosure

Compliance

- CE Certified
- IC Certified SHoW DMX Neo Radio Module
- FCC Certified
- RoHS Compliant

- ETL Listed

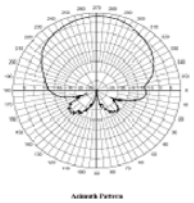
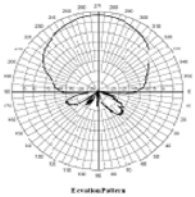
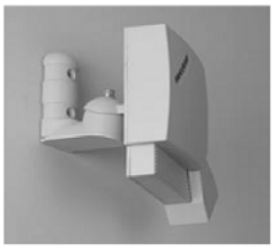
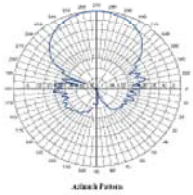
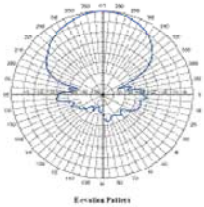
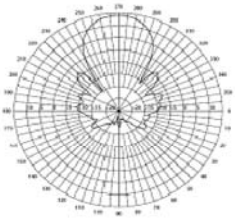
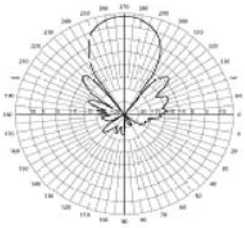
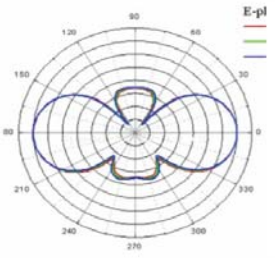
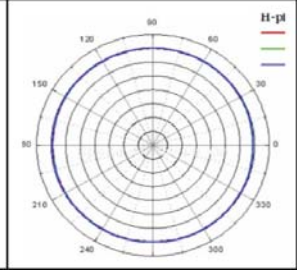
CTI Part #: 7400-5707

Dimensions: 6” / 152mm W x 6.5” / 165mm H x 4” / 102mm D

Weight: 1.70 lbs / 0.77 Kilos

Accessories:
- Mounting Bracket (provided)
- 5732 4.5dBi Outdoor Omni-directional Antenna (provided)
- 5632 8dBi Panel Antenna
- 5634 10dBi Yagi Antenna
- 5636 14dBi Yagi Antenna
- 5637 Antenna Splitter
- 5639 Gender Changer

Antennas

CTI PN	Description	Azimuth Patterns	Elevation Patterns	Photo
5632	8dBi Panel			
5634	10dBi Yagi			
5636	14dBi Yagi			
5732	4.5dBi Omni			

Antenna Accessories

CTI PN	Description	Photo
5637	Antenna Splitter	
5638	Antenna Adapter Cable	
5639	Gender Changer	

Antenna / Device Connection Matrix

Here is a chart showing what is required to connect the various SHoW DMX Neo products with antennas and antenna accessories:

Antenna/Device Connection Matrix	5630 5dBi Omni RSMA (M)	5632 8dBi Panel Antenna N (F)	5634 10 dBi Yagi Antenna N (F)	5636 14 dBi Yagi Antenna N (F)	5637 Antenna Splitter 3 x N (F)	5730 2dBi Omni	5732 4.5dBi Outdoor Omni N (M)
5637 Antenna Splitter	n/a	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	n/a	n/a	n/a
5701 SHoW DMX Neo® Transceiver RSMA (F)	standard, no adapter needed	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	no adapter needed	custom cable/adapter
5702 SHoW DMX SHoW Baby® RSMA (F)	no adapter needed	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	no adapter needed	custom cable/adapter
5711 SHoW DMX Neo Receiver	standard, no adapter needed	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	5638 Adapter Cable RSMA (M) to N (M)	no adapter needed	custom cable/adapter
7400-5707 SHoW DMX Vero® Transceiver N (F)	n/a	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	n/a	standard, no adapter needed
7400-5708 SHoW DMX Vero Net® Transceiver N (F)	n/a	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	5639 Gender Changer N (M) to N (M)	n/a	standard, no adapter needed

To use this matrix, match the Product row to the Antenna column. For example, to find what you need to connect a 5702 SHoW DMX SHoW Baby to a 5637 Antenna Splitter, follow the 5702 SHoW DMX SHoW Baby row to the 5637 Antenna Splitter column, and you find a 5638 Adapter Cable.

Antenna Connectors

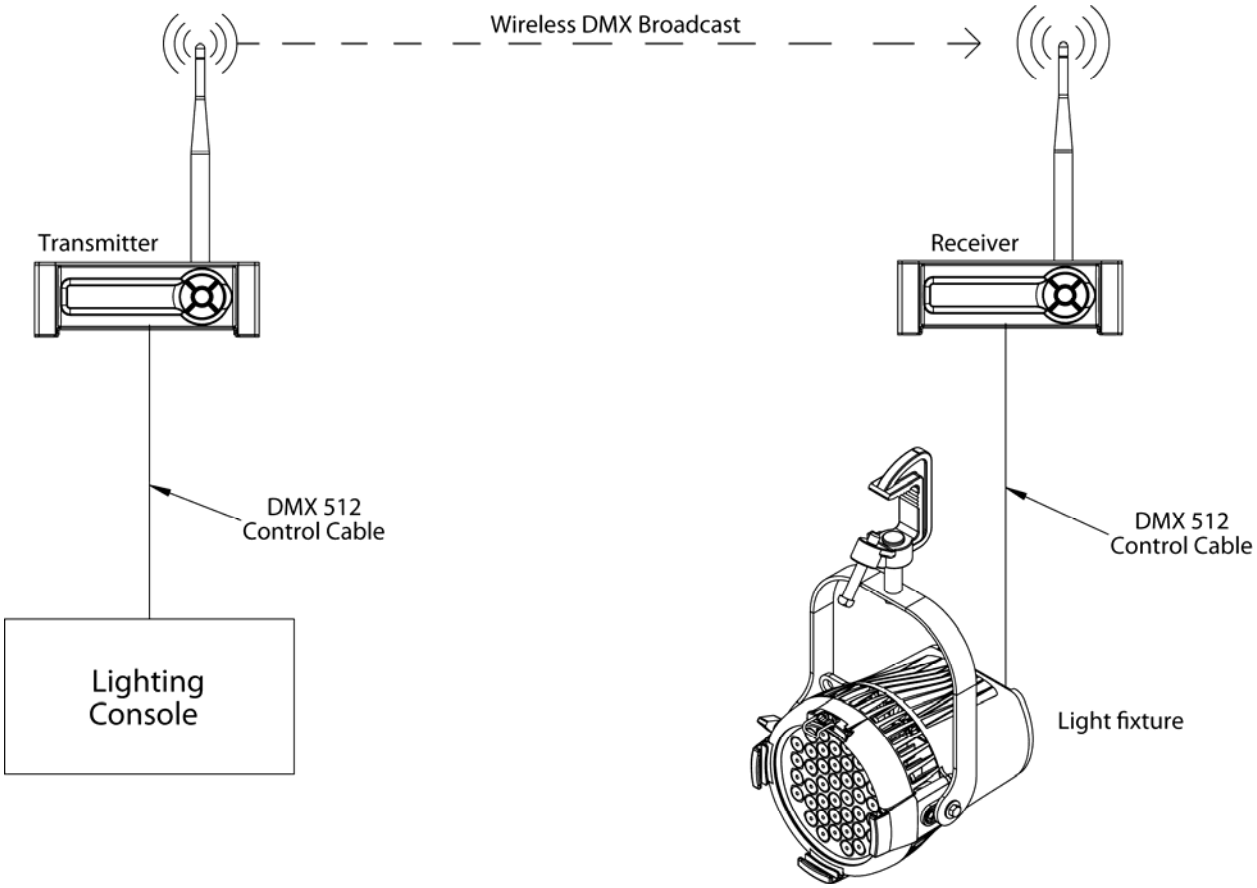
These connectors are referred to in the table above.

Description	Photo
N Male RF Connector	
N Female RF Connector	
RSMA Female RF Connector	

SHoW DMX Neo Operation

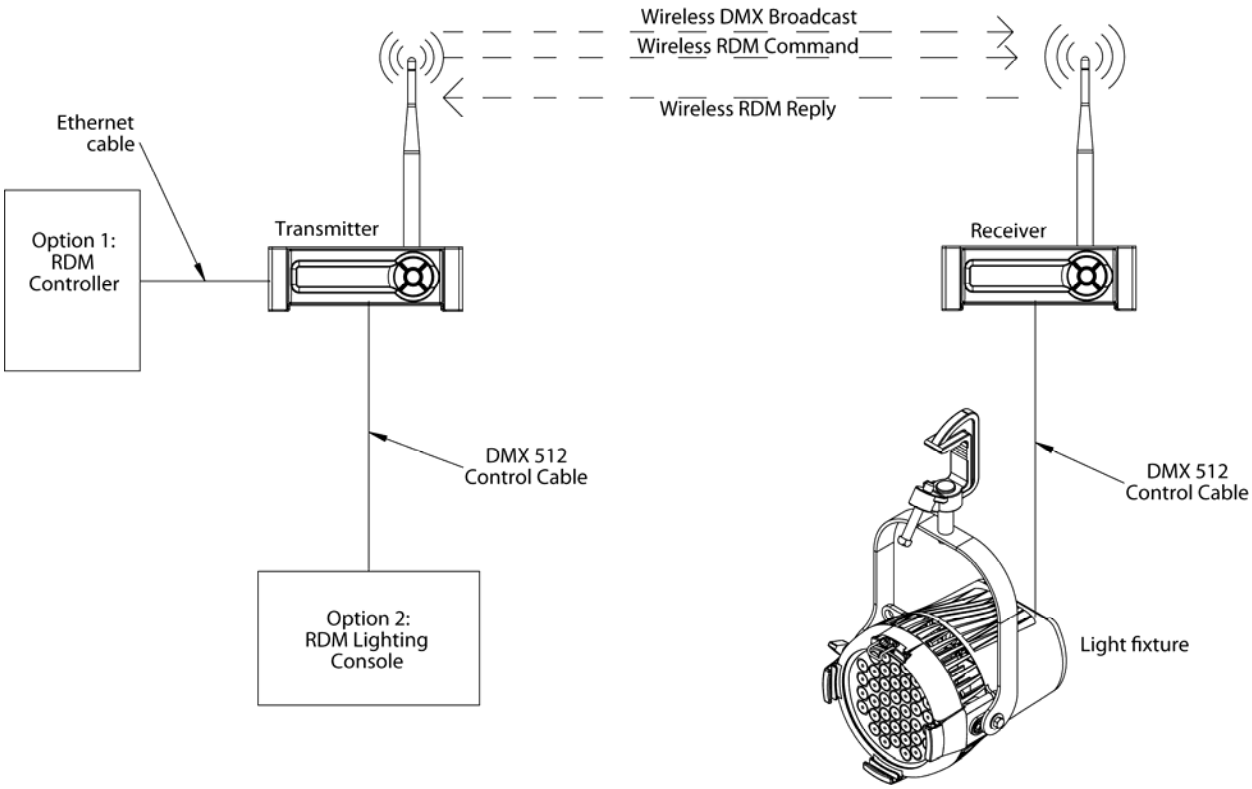
SHoW DMX Neo is a wireless DMX512/RDM distribution system that uses 2.4GHz Frequency Hopping Spread Spectrum (FHSS) radio frequency technology to wirelessly transmit DMX data to, and RDM data to and from, DMX / RDM devices.

FHSS radio broadcasts utilize many discrete radio channels in the selected frequency band by hopping rapidly from channel to channel in a pseudo-random pattern that is synchronized between the transmitter and receiver. This makes a robust broadcast that has reduced sensitivity to interference and has a degree of inherent encryption.



DMX System Flow

DMX 512 control data from any standard DMX 512 console is output to the SHoW DMX transmitter, which converts that DMX data to a radio signal and broadcasts it to the SHoW DMX receiver (or receivers). The SHoW DMX receiver takes the radio broadcast and converts it back into standard DMX 512 data, which can then be connected via standard cables to DMX devices such as moving lights, effects, etc.



RDM System Flow

The SHoW DMX system also functions as an RDM proxy system, by passing RDM commands and replies back and forth between any connected RDM controllers and responders. As with DMX, the principal thing to remember about RDM function is that the transmitter and receiver(s) *replace* DMX cable. The main difference between DMX and RDM operation is that RDM is a two-way system and so both transmitters and receivers may need to function as wireless broadcasters or receivers of the RDM data.

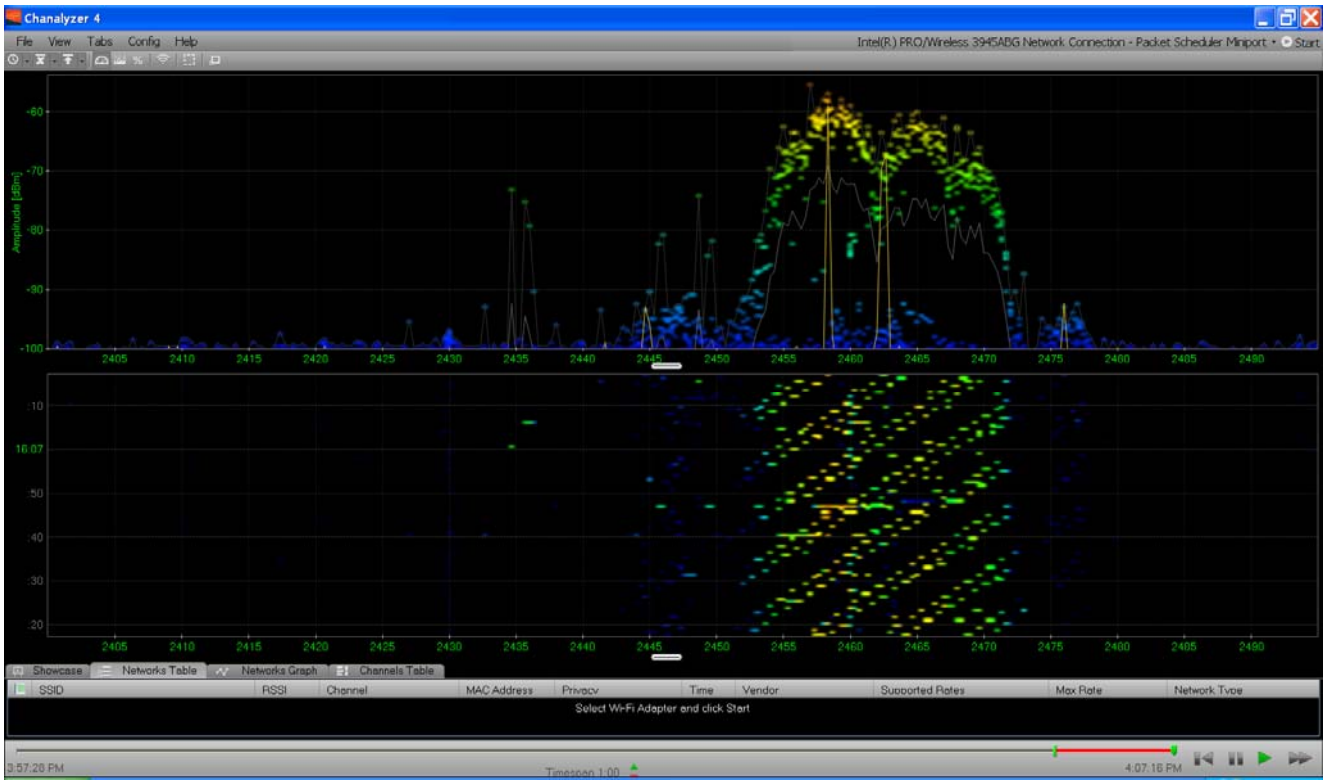
In RDM mode, the SHoW DMX transmitter converts incoming RDM commands to a radio signal and broadcasts them to the SHoW DMX receiver (or receivers). The SHoW DMX receiver takes the radio broadcast and converts it back into standard RDM data, then responds to it and/or passes it along to connected RDM responders, collects any reply data from the RDM responders, then converts the RDM responses back to a radio signal which is broadcast back to the transmitter. The transmitter converts the radio signals from the receiver back to wired RDM and sends it back upstream to the RDM controller. Note that as shown in the drawing, the RDM controller can be a separate system, or RDM control may be provided from an RDM enabled lighting control console.

Performing a Wireless DMX Site Survey

In Addition to SHoW DMX and Wi-Fi, there are other devices that transmit in the 2.4GHz spectrum that may be present in any given venue. The Zigbee and Bluetooth protocols as well as microwave ovens and some cordless phones all broadcast in this range.

A spectrum analyzer is a useful tool in identifying all of the radio frequency (RF) in a certain range. Spectrum analyzers vary from very sophisticated and precise lab equipment to simple and inexpensive PC applications, and operation varies by brand and feature set. The images below are from a Wi-Spy Chanalizer USB spectrum analyzer. The Wi-Spy Chanalizer is a simple and affordable tool for this purpose. More detail is available at: http://www.metageek.net.

The purpose of performing a site survey is to locate and identify other devices in the same frequency range as the SHoW DMX System. Once this information is gathered, it can be evaluated to determine which devices can and should be avoided.



The spectrum analyzer image above shows a Wi-Fi access point set to Wi-Fi channel 11. Interference with or from this Wi-Fi broadcast could be avoided by setting the SHoW DMX Neo system to Low (Wi-Fi 1-6) Limited Bandwidth broadcast mode (see *Limited Bandwidth Frequency Hopping* below).

The basics of performing a survey are:

1. Set-up and perform a spectrum analysis (as above) of the environment, concentrating on the likely positions of SHoW DMX Neo Receivers and Transmitters planned for the system.

2. Identify any 2.4Ghz broadcasts within range (such as Wi-Fi) and try to determine if they are generated and controlled in-house. If they are, you may be able to work with the venue staff to optimize their channel assignment(s) if necessary.

3. Perform the survey during the times the SHoW DMX Neo system is most likely to be used.

4. Perform the survey at different times of the day to understand how the activity may vary. Wireless activity may vary in a predictable way during the course of a day.

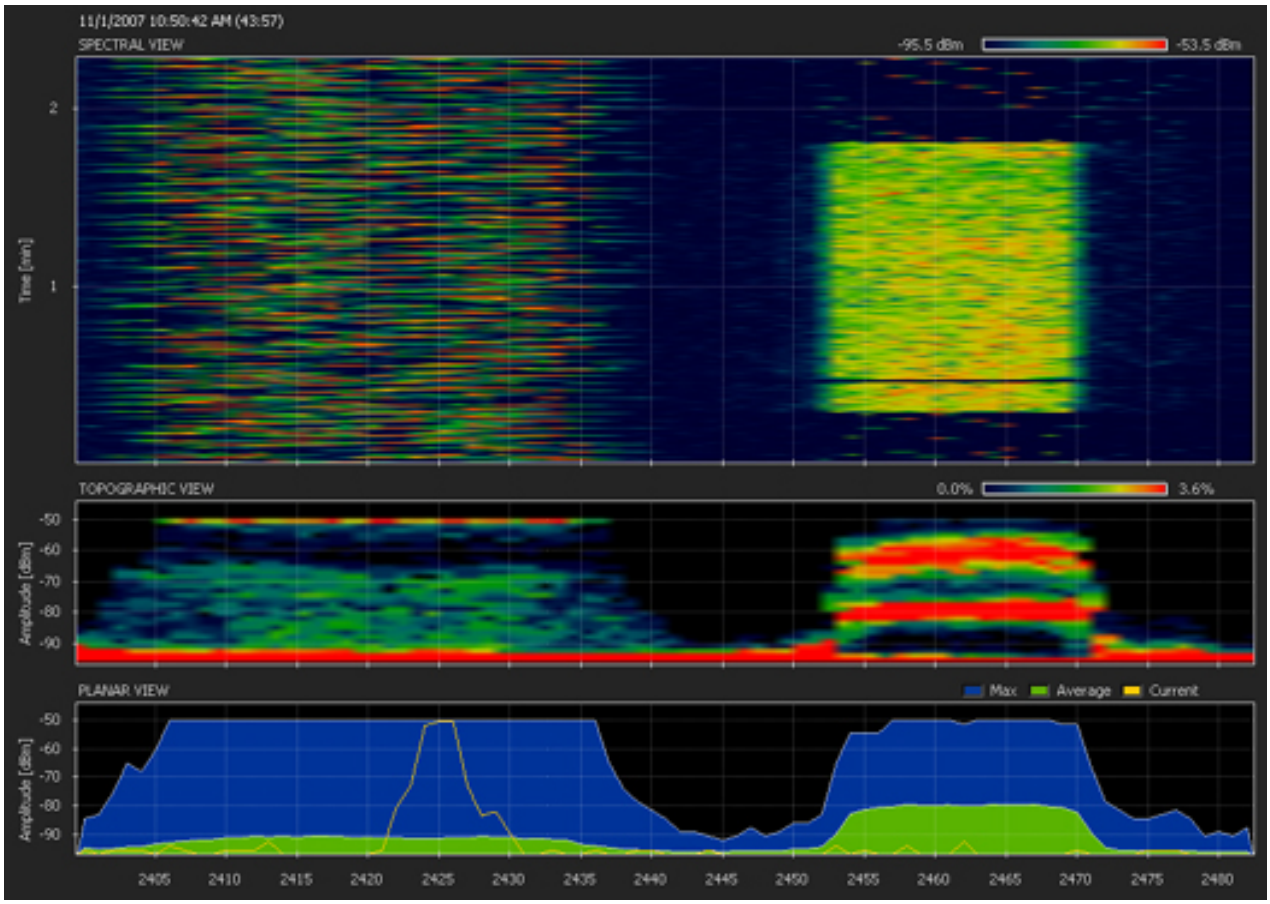
5. Set up a temporary SHoW DMX Neo system in the likely locations and check Received Signal Strength (RSS). Signal strength on the LCD Display is shown as bars, however an RDM check will allow you to monitor the RSS more accurately in -dB. SHoW DMX Neo RSS in a well setup system with little interference can approach -40dB, while communication becomes unreliable beyond -90dB.

Using the SHoW DMX Neo Features to Optimize Performance

Once you have determined the state of the wireless DMX environment, you can select the features that provide the best fidelity and lowest impact to other 2.4Ghz wireless systems in the venue.

Limited Bandwidth Frequency Hopping

SHoW DMX can operate in full spectrum 2.4GHz FHSS mode or may be configured to work in one of three sub-bands of the full 2.4GHz spectrum. Each sub-band occupies approximately 2/5s of the full band, with one sub-band positioned at the low end, one in the center, and one at the high end of the full spectrum. The three sub-bands overlap and each avoids some combination of Wi-Fi channels. This allows the SHoW DMX system to broadcast in a different part of the spectrum than other equipment being used in the area, in order to minimize or eliminate interference with Wi-Fi or other channel specific or limited bandwidth equipment.



The figure above shows a Wi-Fi Transmission (to the right of the image) assigned to Wi-Fi channel 11 and a SHoW DMX transmission (on the left of the image) assigned to Low Limited Bandwidth (Wi-Fi 1-6). As shown, the two transmissions are occurring in different areas of the 2.4GHz band.

Limited Burst DMX Transmission

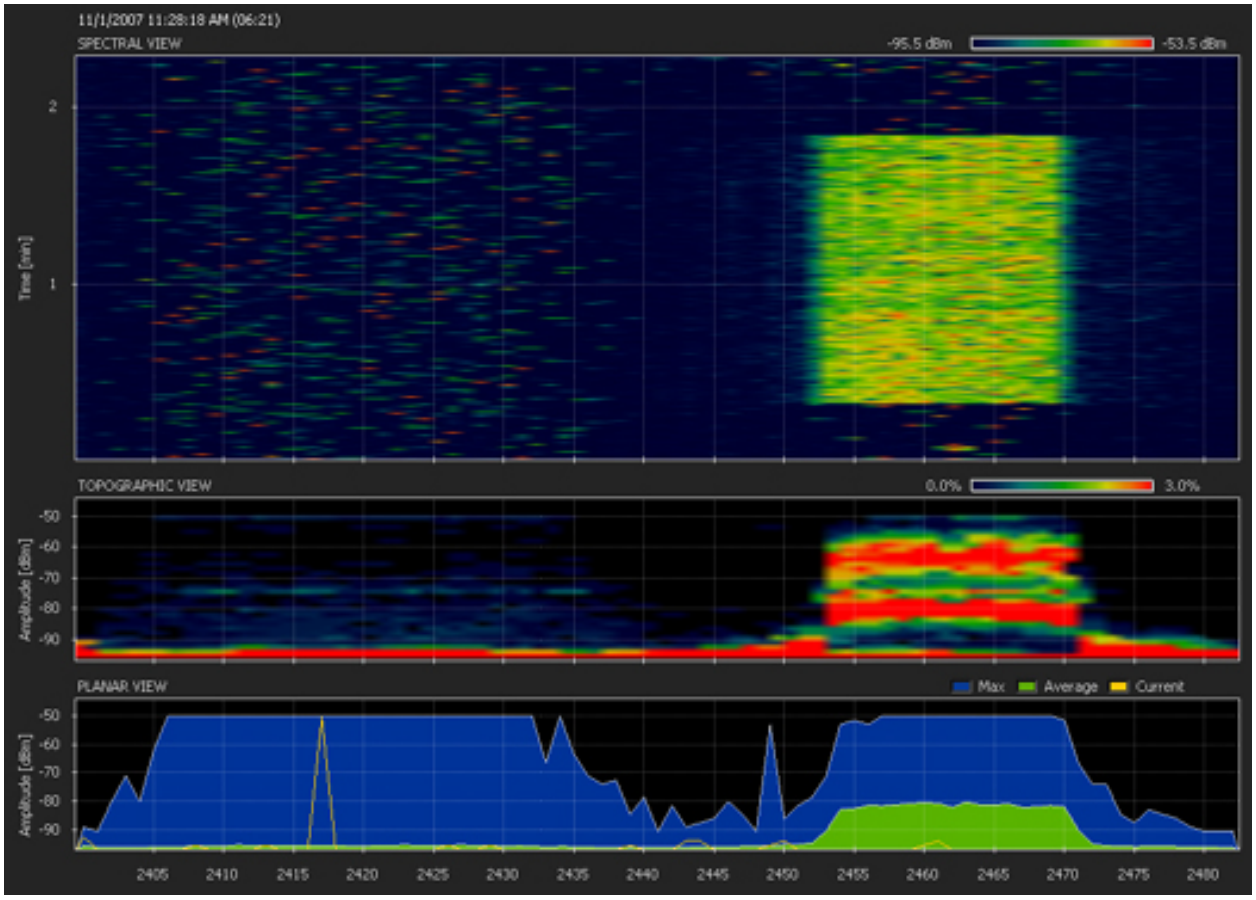
Limited Burst mode reduces the number of DMX slots and the amount of radio energy that is broadcast by the SHoW DMX Neo Transmitter. If all 512 DMX slots are not being used and the radio energy in the venue must be controlled as much as possible, then Limited Burst can be used to target only the DMX slots needed and reduce the system's radio footprint even further.

Limited Burst DMX Output Settings

In Neo Limited Burst mode, the user may select a contiguous group of 51 slots or more DMX slots in multiples of 52 slots (51+52, 51+104, etc.). Limited Burst slot counts include: 51, 103, 155, 207, 259, 311, 363, 415, and 467. These may be assigned to any starting address that will not exceed the total 512 slot count when added to the remaining slots in the selected Burst size (e.g. with 467 slots, the highest allowed starting address is 46, as 46+466 = 512).

In Classic Limited Burst Mode, burst options begin with 30 DMX channels and increase in increments of 32, so the options are 30, 62, 94, 126, etc. to 478.

The figure below also shows a Wi-Fi transmission (to the right of the image) assigned to Wi-Fi channel 11 and a SHoW DMX Limited Bandwidth transmission (on the left of the image) assigned to Low Limited Bandwidth (Wi-Fi 1-6), but in this case the SHoW DMX Neo transmission is also Limited Burst. Note that the two transmissions are occurring in different areas of the 2.4GHz band, and that the SHoW DMX transmission appears much sparser and fainter than in the Limited Bandwidth Full Burst shown in the figure above.



Adjustable Broadcast Power

The SHoW DMX Neo system's adjustable output power feature allows the user to match the system's power to the requirements of the application, and many applications do not require the maximum power available. While SHoW DMX Neo is capable of up to 72mW ETSI broadcast power, lower settings are frequently adequate for many professional venues. Further, excessive broadcast power can create multipath signals, adding to the ambient noise and impacting fidelity.

SHoW DMX Neo broadcast power is adjustable between four settings:

- 1mW ETSI
- 14mW ETSI
- 28mW ETSI
- 72mW ETSI

All setting levels are post antenna, based on use with a 5dBi antenna.

Broadcast Power, Antennas, and Range

With standard supplied antennas, correctly polarized and in a clear line-of-sight setting, the typical range for SHoW DMX Neo systems set at full power is rated at 100 meters indoors / 500 meters outdoors. Actual maximum range may vary, based on site conditions, but these distances are typically achievable with good fidelity.

Lowering broadcast power will not automatically reduce range. In cases with a high level of multipath interference, lowering the power can actually improve range.

Antennas are part of the power equation. As noted above, SHoW DMX Neo's power ratings are based on use with a 5dBi antenna. If a more powerful antenna is used, the emitted power will go up. Each increase of 3dB in antenna rating effectively doubles the broadcast power of the system. In addition, the broadcast pattern of the antenna can have a big effect on range.

Directional antennas focus the RF energy in a limited beam that can be pointed, putting more of the RF energy on the targets. This not only improves the efficiency of the RF delivery, in addition it improves the system's ability to reject interference coming from other directions. High power directional antennas can greatly increase range and can improve rejection of interference.

Adaptive Spread Spectrum Frequency Hopping (AFHSS)

Adaptive frequency hopping reduces interference by determining which channels in the hopping pattern are having problems and then replacing those channels with channels held in reserve. Neo's AFHSS protocol tests and updates the valid hopping channel list constantly, to manage changes in the RF environment. Note that because of FCC rules, the AFHSS mode must use the full bandwidth. Since the Neo Adaptive mode is triggered to adapt by interference with its broadcast, it may not adapt away from activity that doesn't interfere with the Neo broadcast, and so Adaptive mode may not provide as much protection to other systems as one or more of the other methods. SHoW DMX Neo offers four AFHSS patterns, allowing up to four universes of wireless DMX in the same system.

All of these features can be combined with different antennas to further improve reception and reduce interference.

About SHoW ID

CTI's SHoW ID system organizes most of the SHoW DMX RF features into a set of simple settings that allow you to match your transmitter to your receiver(s) and to quickly select Neo, or Neo Adaptive, or Classic broadcast modes, as well as Full or Limited Bandwidth and Hopping pattern settings (in Neo or Classic modes).

SHoW DMX Neo Technology provides 16 different FHSS hopping patterns in each bandwidth setting (Full, Limited Low Wi-Fi 1-6, Limited Mid Wi-Fi 5-9, and Limited High, Wi-Fi 7-11) for a total of 64 combinations of each FHSS mode supported (SHoW DMX Neo Mode, SHoW DMX Classic Mode). Each combination of hopping pattern and bandwidth setting in each mode is assigned a unique SHoW ID. In addition, SHoW DMX Neo offers four different Adaptive

Spread Spectrum Frequency Hopping (AFHSS, see above) settings in Neo Adaptive mode, and each of these settings is assigned a unique SHoW ID as well.

In order for a transmitter and a receiver to communicate, they must have matching SHoW IDs.

SHoW DMX Neo and Neo Adaptive Modes are the current broadcast modes and are supported by all SHoW DMX Neo products. SHoW DMX Classic Mode is the broadcast mode used by the original 5600/01 SHoW DMX Transmitter and 5610/11 SHoW DMX Receiver, and has its own set of 64 SHoW IDs.

The 5701 SHoW DMX Neo Transceiver and 5711 SHoW DMX Neo Receiver support SHoW DMX Neo, SHoW DMX Neo Adaptive, and SHoW DMX Classic Modes with a total of 132 SHoW IDs.

In the 5701 SHoW DMX Neo Transceiver, you can set the hopping pattern and bandwidth setting and the unit will calculate and display the resulting SHoW ID, or simply enter the SHoW ID directly. Then you can just enter that SHoW ID into your 5711 SHoW DMX Neo Receiver and the units will be set to communicate.

The 7400-5708 SHoW DMX Vero Net Transceiver supports SHoW DMX Neo, SHoW DMX Neo Adaptive, and SHoW DMX Classic Modes with a total of 132 SHoW IDs.

The 7400-5707 SHoW DMX Vero Transceiver supports SHoW DMX Neo, and SHoW DMX Neo Adaptive Modes With 68 SHoW IDs.

In the 7400-5708 SHoW DMX Vero Net and the 7400-5707 SHoW DMX Vero, you enter the SHoW ID directly via SHoW ID Rotary Switches.

In all of the above systems you can also set/change SHoW ID via RDM. Remember that when using RDM, you need to change the SHoW ID in the receiver first, and that once you have changed the SHoW ID in the receiver, the transmitter and receiver will lose contact until you change the transmitter's SHoW ID to match the new setting in the receiver.

SHoW DMX SHoW Baby is permanently set to SHoW DMX Neo Adaptive Mode SHoW ID 201.

About Latency

Latency refers to the time between the arrival of DMX at the input to the transmitter and its appearance at the output of the receiver; it is also referred to as propagation delay. All DMX processing devices have some latency. The human eye can pick up latency above about 30ms, below that it becomes imperceptible. SHoW DMX Neo offers very low 7ms latency, so SHoW DMX Neo transmission latency is imperceptible and comparable to wired DMX.

Neo Adaptive Mode Operation

The SHoW DMX Neo system can be configured to operate in the new Neo Adaptive (AFHSS) Mode. Neo Adaptive Mode uses an Adaptive Spread Spectrum Frequency Hopping broadcast format in which the system detects interference and adapts its frequency hopping channel set automatically to avoid it.

In Neo Adaptive Mode, the SHoW DMX Neo system uses a low latency AFHSS broadcast format that provides further resistance to interference susceptibility or creation.

Neo Adaptive Mode supports Adjustable Broadcast Power and provides four new Neo Adaptive Mode SHoW IDs.

Neo Adaptive SHoW ID Table

SHoW ID	Mode	Hopping Pattern	Bandwidth
201	Neo Adaptive	Adaptive	Full
202	Neo Adaptive	Adaptive	Full
203	Neo Adaptive	Adaptive	Full
204	Neo Adaptive	Adaptive	Full

Note: all SHoW DMX Neo systems use Neo Adaptive SHoW ID 201 as the default setting.

Neo Mode Operation
The SHoW DMX Neo system can be configured to operate in the Neo (FHSS) Mode. Neo Adaptive Mode uses an Adaptive Spread Spectrum Frequency Hopping broadcast format in which the system detects interference and adapts its frequency hopping channel set automatically to avoid it.

In Neo Mode, the SHoW DMX Neo system uses a low latency FHSS broadcast format that provides further resistance to interference susceptibility or creation.

Neo Mode supports Adjustable Broadcast Power, Limited Bandwidth, Limited Burst, and provides 64 new SHoW IDs, providing 16 hopping patterns in each Bandwidth setting.

Neo SHoW ID Tables

SHoW ID	Mode	Hopping Pattern	Bandwidth
101	Neo	1	Full
102	Neo	2	Full
103	Neo	3	Full
104	Neo	4	Full
105	Neo	5	Full
106	Neo	6	Full
107	Neo	7	Full
108	Neo	8	Full
109	Neo	9	Full
110	Neo	10	Full
111	Neo	11	Full
112	Neo	12	Full
113	Neo	13	Full

114	Neo	14	Full
115	Neo	15	Full
116	Neo	16	Full

SHoW ID	Mode	Hopping Pattern	Bandwidth
117	Neo	1	Limited Low, Wi-Fi 1-6
118	Neo	2	Limited Low, Wi-Fi 1-6
119	Neo	3	Limited Low, Wi-Fi 1-6
120	Neo	4	Limited Low, Wi-Fi 1-6
121	Neo	5	Limited Low, Wi-Fi 1-6
122	Neo	6	Limited Low, Wi-Fi 1-6
123	Neo	7	Limited Low, Wi-Fi 1-6
124	Neo	8	Limited Low, Wi-Fi 1-6
125	Neo	9	Limited Low, Wi-Fi 1-6
126	Neo	10	Limited Low, Wi-Fi 1-6
127	Neo	11	Limited Low, Wi-Fi 1-6
128	Neo	12	Limited Low, Wi-Fi 1-6
129	Neo	13	Limited Low, Wi-Fi 1-6
130	Neo	14	Limited Low, Wi-Fi 1-6
131	Neo	15	Limited Low, Wi-Fi 1-6
132	Neo	16	Limited Low, Wi-Fi 1-6

SHoW ID	Mode	Hopping Pattern	Bandwidth
133	Neo	1	Limited Mid, Wi-Fi 5-9
134	Neo	2	Limited Mid, Wi-Fi 5-9
135	Neo	3	Limited Mid, Wi-Fi 5-9
136	Neo	4	Limited Mid, Wi-Fi 5-9
137	Neo	5	Limited Mid, Wi-Fi 5-9
138	Neo	6	Limited Mid, Wi-Fi 5-9
139	Neo	7	Limited Mid, Wi-Fi 5-9
140	Neo	8	Limited Mid, Wi-Fi 5-9
141	Neo	9	Limited Mid, Wi-Fi 5-9
142	Neo	10	Limited Mid, Wi-Fi 5-9
143	Neo	11	Limited Mid, Wi-Fi 5-9
144	Neo	12	Limited Mid, Wi-Fi 5-9
145	Neo	13	Limited Mid, Wi-Fi 5-9
146	Neo	14	Limited Mid, Wi-Fi 5-9
147	Neo	15	Limited Mid, Wi-Fi 5-9

148	Neo	16	Limited Mid, Wi-Fi 5-9

SHoW ID	Mode	Hopping Pattern	Bandwidth
149	Neo	1	Limited High, Wi-Fi 7-11
150	Neo	2	Limited High, Wi-Fi 7-11
151	Neo	3	Limited High, Wi-Fi 7-11
152	Neo	4	Limited High, Wi-Fi 7-11
153	Neo	5	Limited High, Wi-Fi 7-11
154	Neo	6	Limited High, Wi-Fi 7-11
155	Neo	7	Limited High, Wi-Fi 7-11
156	Neo	8	Limited High, Wi-Fi 7-11
157	Neo	9	Limited High, Wi-Fi 7-11
158	Neo	10	Limited High, Wi-Fi 7-11
159	Neo	11	Limited High, Wi-Fi 7-11
160	Neo	12	Limited High, Wi-Fi 7-11
161	Neo	13	Limited High, Wi-Fi 7-11
162	Neo	14	Limited High, Wi-Fi 7-11
163	Neo	15	Limited High, Wi-Fi 7-11
164	Neo	16	Limited High, Wi-Fi 7-11

Classic Mode Operation

In Classic Mode, the SHoW DMX Neo system uses the original SHoW DMX Classic broadcast format and will communicate with Classic SHoW DMX devices such as 5600/01 Transmitter, 5610/11 Receiver, etc. You can use this mode if you want to combine SHoW DMX Neo and Classic equipment in the same system. Classic Mode supports Adjustable Broadcast Power, Limited Bandwidth, Limited Burst, and uses 64 original SHoW IDs, providing 16 hopping patterns in each Bandwidth setting.

Classic SHoW ID Tables

SHoW ID	Mode	Hopping Pattern	Bandwidth
1	Classic	1	Full
2	Classic	2	Full
3	Classic	3	Full
4	Classic	4	Full
5	Classic	5	Full
6	Classic	6	Full
7	Classic	7	Full
8	Classic	8	Full

9	Classic	9	Full
10	Classic	10	Full
11	Classic	11	Full
12	Classic	12	Full
13	Classic	13	Full
14	Classic	14	Full
15	Classic	15	Full
16	Classic	16	Full

SHoW ID	Mode	Hopping Pattern	Bandwidth
17	Classic	1	Limited Low, Wi-Fi 1-6
18	Classic	2	Limited Low, Wi-Fi 1-6
19	Classic	3	Limited Low, Wi-Fi 1-6
20	Classic	4	Limited Low, Wi-Fi 1-6
21	Classic	5	Limited Low, Wi-Fi 1-6
22	Classic	6	Limited Low, Wi-Fi 1-6
23	Classic	7	Limited Low, Wi-Fi 1-6
24	Classic	8	Limited Low, Wi-Fi 1-6
25	Classic	9	Limited Low, Wi-Fi 1-6
26	Classic	10	Limited Low, Wi-Fi 1-6
27	Classic	11	Limited Low, Wi-Fi 1-6
28	Classic	12	Limited Low, Wi-Fi 1-6
29	Classic	13	Limited Low, Wi-Fi 1-6
30	Classic	14	Limited Low, Wi-Fi 1-6
31	Classic	15	Limited Low, Wi-Fi 1-6
32	Classic	16	Limited Low, Wi-Fi 1-6

SHoW ID	Mode	Hopping Pattern	Bandwidth
33	Classic	1	Limited Mid, Wi-Fi 5-9
34	Classic	2	Limited Mid, Wi-Fi 5-9
35	Classic	3	Limited Mid, Wi-Fi 5-9
36	Classic	4	Limited Mid, Wi-Fi 5-9
37	Classic	5	Limited Mid, Wi-Fi 5-9
38	Classic	6	Limited Mid, Wi-Fi 5-9
39	Classic	7	Limited Mid, Wi-Fi 5-9
40	Classic	8	Limited Mid, Wi-Fi 5-9

41	Classic	9	Limited Mid, Wi-Fi 5-9
42	Classic	10	Limited Mid, Wi-Fi 5-9
43	Classic	11	Limited Mid, Wi-Fi 5-9
44	Classic	12	Limited Mid, Wi-Fi 5-9
45	Classic	13	Limited Mid, Wi-Fi 5-9
46	Classic	14	Limited Mid, Wi-Fi 5-9
47	Classic	15	Limited Mid, Wi-Fi 5-9
48	Classic	16	Limited Mid, Wi-Fi 5-9

SHoW ID	Mode	Hopping Pattern	Bandwidth
49	Classic	1	Limited High, Wi-Fi 7-11
50	Classic	2	Limited High, Wi-Fi 7-11
51	Classic	3	Limited High, Wi-Fi 7-11
52	Classic	4	Limited High, Wi-Fi 7-11
53	Classic	5	Limited High, Wi-Fi 7-11
54	Classic	6	Limited High, Wi-Fi 7-11
55	Classic	7	Limited High, Wi-Fi 7-11
56	Classic	8	Limited High, Wi-Fi 7-11
57	Classic	9	Limited High, Wi-Fi 7-11
58	Classic	10	Limited High, Wi-Fi 7-11
59	Classic	11	Limited High, Wi-Fi 7-11
60	Classic	12	Limited High, Wi-Fi 7-11
61	Classic	13	Limited High, Wi-Fi 7-11
62	Classic	14	Limited High, Wi-Fi 7-11
63	Classic	15	Limited High, Wi-Fi 7-11
64	Classic	16	Limited High, Wi-Fi 7-11

SHoW IDs in Multiple Universe Systems

The FHSS broadcast method allows more than one system to use the same radio frequencies (channels) with little interaction since they are using the channels in different patterns, however there is some possibility of random collision on any given channel when there are multiple broadcasts on the same hopping channel set.

SHoW DMX improves on this with different even and odd SHoW ID channel sets.

The radio channels used in any SHoW DMX hopping pattern are separated by 2 Mhz. The odd numbered SHoW IDs use a separate set of hopping pattern channels from the even numbered SHoW IDs. Odd and even hopping pattern channels are offset by 1 Mhz. Thus, an even

numbered SHoW ID shares no channels with an odd SHoW ID in the same range. This can be used to maximize fidelity in multiple universe systems, even in limited bandwidth, by distributing SHoW ID assignment between even and odd SHoW IDs.

Working with Different Antennas

All of City Theatrical's SHoW DMX Neo Transceivers and Receivers are provided with omni-directional antennas as standard equipment when shipped from the factory. This is a good general purpose choice when nothing else is known about the application the equipment will be used for; the antennas provide adequate power and the omni-directional pattern adapts well to a wide variety of environments. But specialized antennas can enhance the performance of a wireless system in a variety of ways if the environmental conditions are known, or if particular problems need to be overcome. CTI offers a range of approved specialized antennas that can enhance system performance in a range of applications.

Antenna Approval

2.4GHz antennas are available on the general market and are often sold without caveat or restriction, however federal authorities require antennas used with transmitting radios to be approved for the specific radio system they are used with. Beware of unapproved after-market antennas that may push your system out of compliance and may be illegal.

The CTI antennas have all been tested and approved for use in both the US and Canada with CTI's SHoW DMX Neo family, including all of the CTI wireless products that utilize built-in SHoW DMX technology.

CTI antennas can also be used in EU countries and locations that adhere to CE rules, providing some conditions are met. Notably, antennas rated over 5dBi require attenuators in CE applications. Extension cables provide inherent attenuation, and may be considered as part of the attenuation needed. For example, an 8dBi panel used in the EU would require a 3dBi attenuator, or you could use a 5-meter long CTI LMR 195 cable (CTI Antenna extension cables are made to order, contact City Theatrical for details).

Note that the 5636 14dBi Yagi Antenna has special requirements for FCC / IC use, and may not be used in CE countries; see the Antennas section (page Antennas6).

Power Ratings

CTI's antennas are rated in decibels or "dBi". The dBi rating describes the gain of the antenna (how powerful it is), with higher numbers indicating greater power. 8dBi is more powerful than 5dBi.

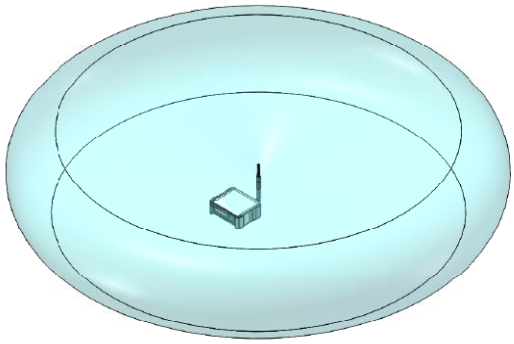
Range

SHoW DMX Neo systems used with the CTI 5630 7" Omni-Directional Antenna have a typical range of 100 meters indoors, 500 meters outdoors. Actual range will vary with the installation and environment. Range can be greatly increased with directional antennas, as discussed below.

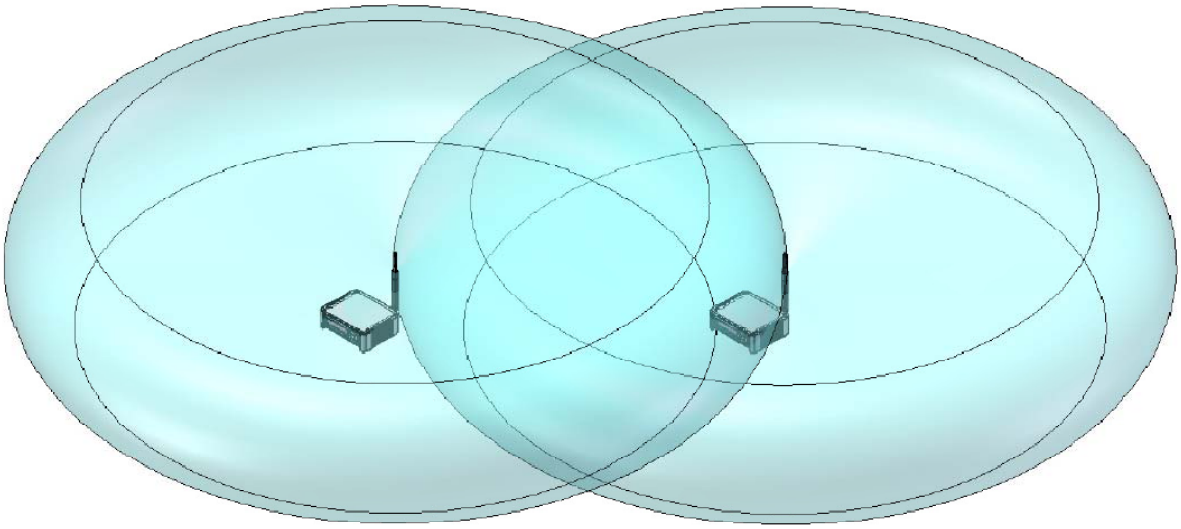
Omni-Directional Antennas

Omni-Directional antennas produce a pattern of radio waves that looks almost like a donut around the antenna axis. These antennas basically broadcast in a donut shaped pattern that radiates 360° from the antenna, so their available energy is spread out over a wide area.
The CTI 5630 7" Omni-Directional Antenna provided with most SHoW DMX Neo models is a typical small omni-directional antenna. The 5730 2dBi antenna provided with SHoW DMX SHoW Baby is similar, with lower gain and a smaller size.

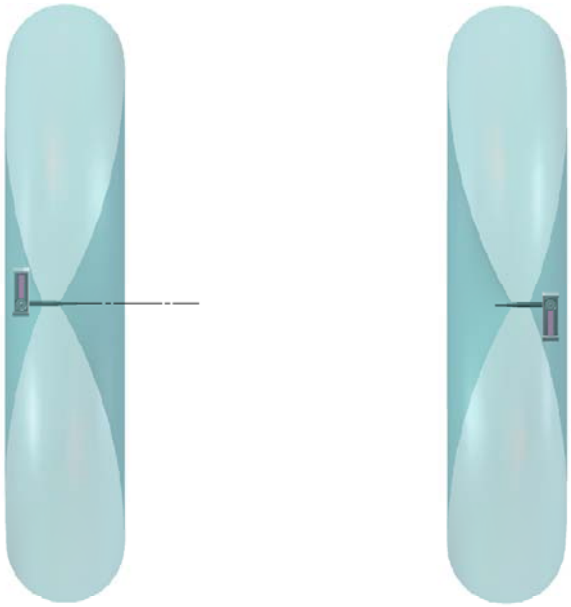
The omni antenna pattern resembles a large donut:



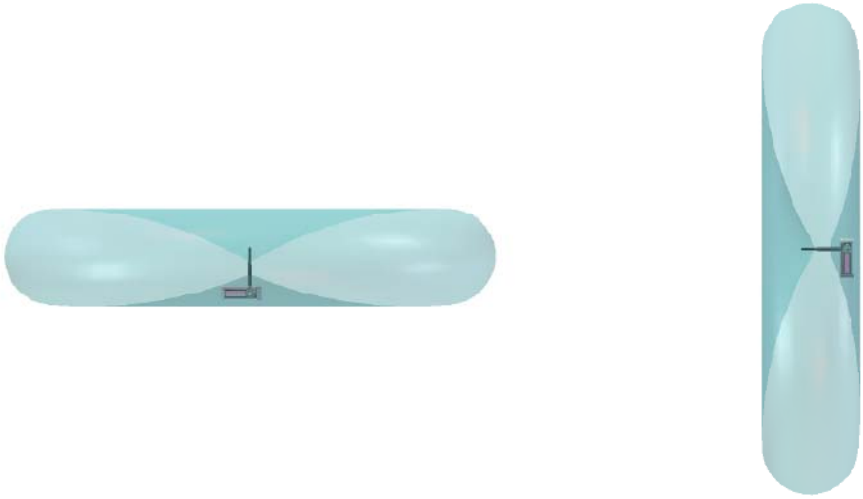
In order for the transmitter or receiver to communicate, the donuts need to touch:



This is achieved when the antennas are oriented in the same direction (e.g. vertically or horizontally) and are not on the same axis. The orientation of the antennas is referred to as “polarity”; the units in the picture above are vertically polarized. Note that in the image below, the antennas are both polarized the same way however they are on the same axis so there is no contact between the “donuts”. This would be a poor setup and likely would not produce the best possible signal strength.



Antennas of different polarities will also tend to have less connectivity. The units below are polarized differently, one is vertical and one is horizontal:

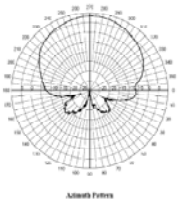


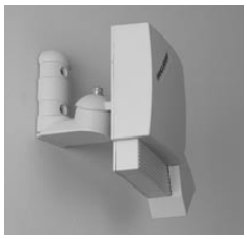
Therefore, for best results, always orient the antennas in the same direction on both the transmitter and receiver, avoid on-axis setups, and locate the units within sight of each other.

Note that in cases with multiple broadcasters in the same environment, the separation resulting from miss-matched polarity between different systems can also be an advantage. Since most wireless system's antennas tend to be set with vertical polarity because it looks "right", you can often get some extra isolation for your system in a crowded space by using different (often horizontal) polarity. This is discussed further in the section on setting up Panel Antennas.

Using Omni Antennas in Multiple Universe Systems
SHoW DMX Neo will perform well in multiple universe systems. When setting up a system with more than one transmitter using omni antennas, separate the transmitter antennas by 5 meters, either by separating the transmitters or using cable to separate the antennas.

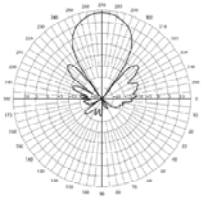
Panel Antennas
Panel antennas are basically flat box shaped units, and radiate primarily from their front "panel" surface. These antennas produce a relatively wide beam of radio waves that can be aimed or directed toward targets and away from things that might cause problems.





The CTI 5632 8dBi Panel Antenna (pictured) has a 60º beam angle, meaning that most of the antenna's energy is shaped into a 60º wide beam (see the beam pattern near right), and much like a light fixture with a 60º beam angle, this antenna can be focused at a desired target or group of targets.
The 5632 Panel Antenna is rated for outdoor use, however the provided plastic mounting bracket is not, so for outdoor installations, use this antenna with the CTI 5670 Outdoor Use Panel Antenna Mounting Bracket.

Yagi Antennas
Yagi antennas focus most of their energy forward, producing a highly directional, narrow beam. The CTI Yagi antennas are enclosed in a plastic cylinder and radiate from the flat end of the cylinder. A mounting bracket is provided at the other end. To focus the Yagi antenna, simply point it along the axis of the cylinder, away from the mounting bracket. These antennas are useful for very long range broadcast to fixed targets.



The CTI 5636 14dBi Yagi Antenna (pictured right) is a very powerful, highly directional antenna, and is capable of significant range when installed correctly.

Using Directional Antennas
In general, using a directional antenna instead of an omni-direction antenna is a trade; you are trading the 360º coverage of the omni for the added power and reduced interference of the directional antenna. If you are broadcasting to spread out and/or moving targets within an acceptable range, omni-directional antennas are usually best. If your target is stationary or limited in motion, or if you have multiple targets in a defined area, then a directional antenna can improve your range and fidelity.

All antennas must be installed correctly to get the best results. Mount the antennas above the ground and away from hard reflective surfaces (directional antennas should be positioned to point away from a mounting surface). Locate antennas above/away from radio barriers. Water, metal, and some kinds of glass are typical radio barriers (people, plants, and animals are mostly water).

Note the polarity markings on the antennas and orient them so that transmitter and receiver antennas are polarized the same way. Start with the vertical polarity marks pointed up (see the sections on Omni and Panel Antennas for example diagrams).

Increasing Range
One of the most popular uses for directional antennas is to increase range. Adding a directional antenna to the transmitter can increase effective range significantly, even if the power of the directional antenna is no greater than the omni-directional unit it replaces. Some of the longest distance transmissions have been achieved with yagi antennas connected to both receiver and transmitter, and with the antennas correctly like-polarized and pointed at each other. Note that the tight beam angle of these antennas requires careful aiming to get the antennas aligned.

Reducing Interference
Using directional antennas can effectively reduce the amount of reflection or *multi-path* signals created by your broadcast, and can also help your system "cut through" interference created by other systems operating in the area. Using a directional antenna with lower broadcast power can be a very effective combination.
Using directional antennas at lower power settings can also reduce the amount of interference that *your system creates for other systems* operating in the same part of the spectrum, while still giving you the punch and fidelity you need.

Splitters
Sometimes you may want to broadcast to two different areas, which are divided by a barrier or are separated in some way. You can achieve this by using a pair of identical directional antennas and a splitter. When using this solution, there are a few things to remember:

- The antennas must be identical
- The splitter will divide the transmitter power between the antennas, so each will be only half the output that the same antenna would have alone
- Position the antennas so that the beams don't overlap; overlapping can cause signal corruption and poor reception
- Height improves fidelity

Cables
Radio performance can be impaired if poorly made or excessively long cables are used for antenna connection. It is important that the correct coaxial cable material is used and that the cable is properly assembled. See the Cable Chart below for details regarding cable loss verses cable length. CTI's antenna adapters and extension cables are carefully matched to our radio transceivers and antennas to assure the best possible operation. Cable performance can be significantly impaired if the cable is sharply bent or kinked, or if it is compressed in some way. When installing antenna cables, be careful not to bend cables excessively or kink them. If strain reliefs such as cable ties are used, be careful not to over-tighten them.

Extension cables may also be used to locate the antenna some distance from the Transmitter or Receiver. All cables, whether short adapters or longer extension cables, must be properly constructed from materials intended for RF applications. Cables that are made from improper components or are poorly assembled can impair or completely block radio transmissions.

All cables will attenuate the signals to the antenna to some degree. For short runs the attenuation/loss will be insignificant with any good RF rated cable, but if longer cables are needed, a special low-loss cable should be used. Low loss RF cable materials are typically thicker and less flexible than the standard cables.

RF cables must be carefully installed. Overly tight bends will increase attenuation, as will excessive numbers of bends. Excessive compression of the cable will also add attenuation, so cable ties should be used carefully.

Attenuation and bend specifications for CTI RF cables are given in the table below:

Cable Type	Attenuation, dB per 100ft/ 30.48M	Minimum Radius, Single Bend	Minimum Radius, Multiple Bends	Number of Bends Max
CTI 5638 N to RSMA Adapter	19	.5"/12.7mm	2"/50.8mm	Not rated
LMR-195-DB	19	.5"/12.7mm	2"/50.8mm	Not rated
LMR-400-UF	6.8	1"/25.4mm	4"/101.6mm	Not rated
Andrew FSJ-50	6.78	1"/25.4mm	1"/101.6mm	30

Setting Up Panel Directional Antennas

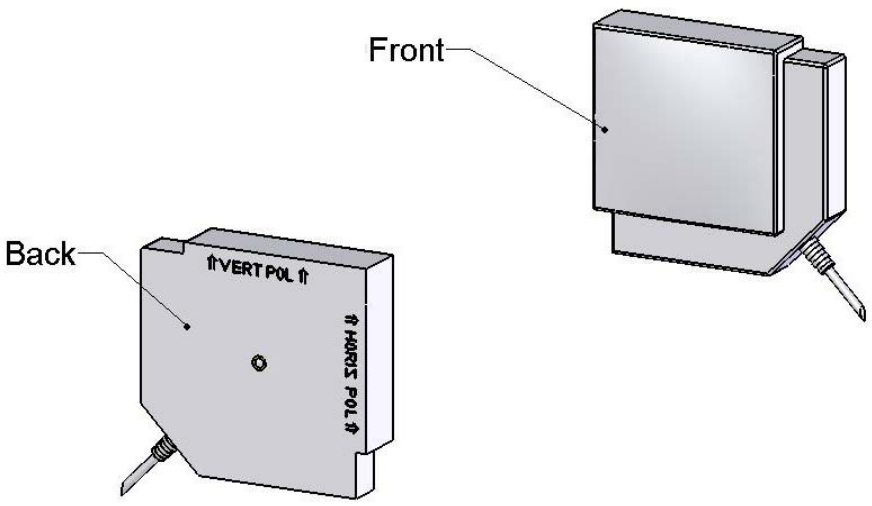
One or more CTI 5632 8dBi Panel Antennas can significantly improve performance in a SHoW DMX wireless DMX/RDM system, providing they are set up correctly. This document will provide you with a number of techniques for effectively setting up and using panel antennas.

In general, it is best to setup your system well in advance of the show, and to plan to do some testing and adjustment in order to optimize system performance. Whenever possible plan your setup/testing time for the same time of day when your show is scheduled.

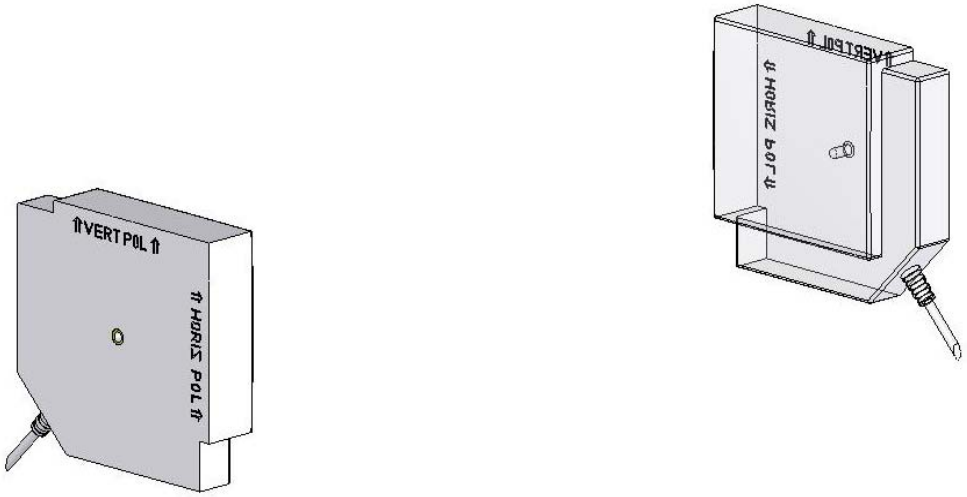
Installing and Optimizing a Panel Antenna System

Panel antennas may be used together for both transmitters and receivers to create a highly directional system with extended range, good immunity to interference, and reduced interference creation.

Whenever possible, mount the antennas with direct line of sight. For best results, the antennas should be elevated above the ground. In outdoor installations, adding distance from the ground will usually be beneficial. In indoor installations, height is good, and so is distance from ceiling and walls (if practical). Mount the antennas so they are parallel and are facing each other as shown in the figure below, with the front surfaces facing each other.



Polarize Antennas the Same Way
Mount the antennas with matched polarity markings pointing up. The antennas in the figure below are polarized vertically (note the “VERT POL” marking on both units is pointing up).



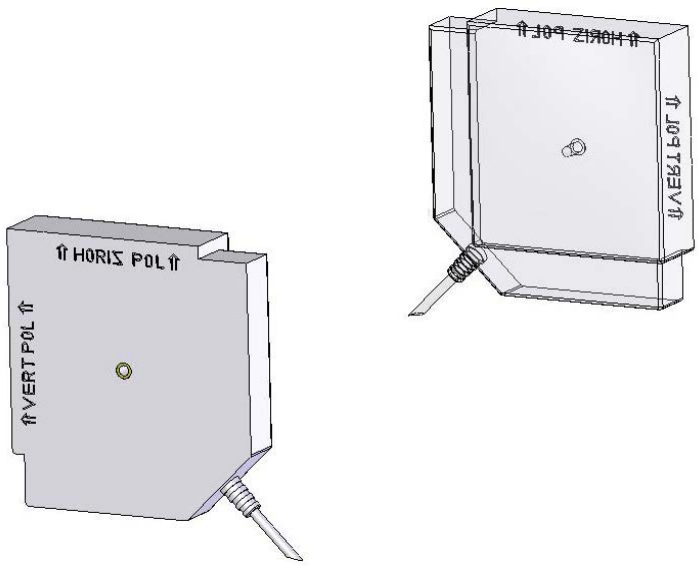
Test the Reception of the System
Once you have your system set up, start your DMX source (console, DMX tester, etc.), initiate wireless DMX broadcasting, and check the received signal strength at the receiver. You can do this using the visual signal strength indicators on your receiver (which may be LEDs or a read out on an LCD screen, depending on your receiver), or you can use RDM to get a more specific value in dB from the Receiver.

Adjust the Height and Rotation
Adjust height and rotation of the antennas to optimize reception.

Check for Obstacles between the Antennas
One of the most insidious obstacles to RF is the human body. Be sure and consider your audience location when setting up your system, and locate the antennas so that audience members won’t come between the antennas. *As you are setting up and adjusting your system, note what happens to received signal strength when you grasp an antenna to adjust it.* Another common obstacle is glass; some window glass will block radio waves. If you want to broadcast out a window, use a cable to put the antenna outside of the window.

Test both Vertical and Horizontal Polarity
Sometimes, one will work better than the other because of environmental conditions or due to the presence of other wireless systems in the area. If there are other 2.4GHz wireless systems operating within range that are interfering with your SHoW DMX system (or being interfered with by your system) you may be able to significantly reduce that interference by changing the polarity of your system. Radio systems are frequently setup by default with vertical polarity, so changing your system to horizontal polarity may significantly improve things for all of the systems within range.

The antennas in the figure below are horizontally polarized:



Test Different Power Levels
CTI panel antennas add gain (power) to the broadcast signal and also focus the radio energy directionally. Both effects tend to deliver more of the radio signal to the desired target, so you may not need to operate your transmitter at the highest setting. In some installations, system fidelity *may improve* at lower broadcast power settings. In settings where more than one system is in use, lower broadcast power settings will reduce inter-system interference.

Using Panel Antennas in Combination with Omni-Directional Antennas

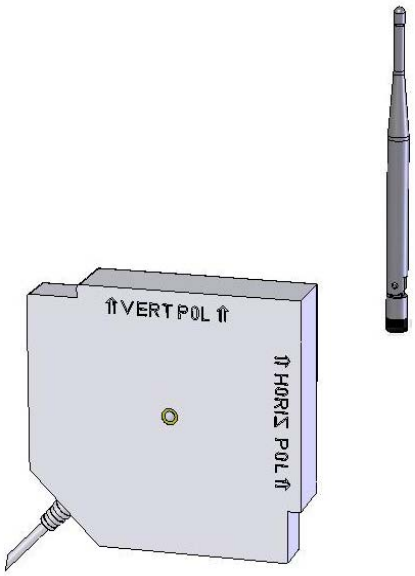
Sometimes an installation will not lend itself to panel-to-panel antenna configuration, such as a system in which there is a single transmitter broadcasting to receivers located far apart from each other, so that the receivers could not all be within the beam angle of the transmitter's panel antenna. In setups like this, the system may still benefit from using panel antennas on the receivers and an omni-directional antenna on the transmitter. Using panels on the receivers will increase their range and limit their susceptibility to radio interference from other sources located outside of the beam of their panel antennas.

Many of the same setup techniques will work with omni-to-panel antenna systems that work with panel-to-panel systems:

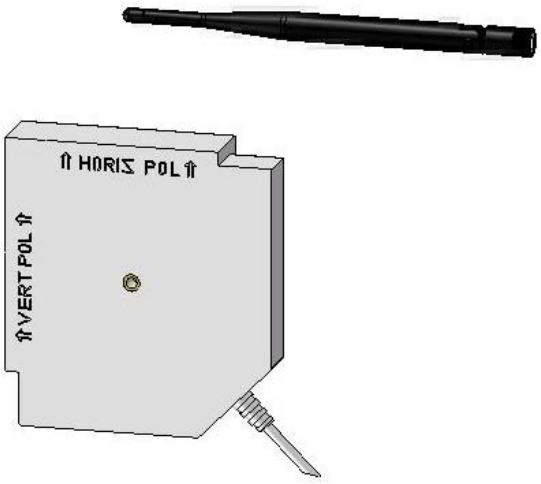
- Mount the antennas with direct line of sight
- Adjust height and rotation to optimize performance
- Avoid RF obstacles

Elevate the antennas above the ground, but leave clearance for other reflective surfaces indoors.

Match antenna polarity. The figure below shows a vertically polarized panel and omni:



Test both Vertical and Horizontal Polarity
As with panel-to-panel systems, horizontal polarization may improve performance in some systems. The figure below shows a horizontally polarized panel and omni:



Test Different Power Levels
Lower power levels may actually improve reception due to a reduction in multipath interference.

Planning a SHoW DMX Neo System

The Proscenium Theatre System

This is one of the most straightforward types of installation. SHoW DMX is used daily all over the world in classic proscenium theatre systems including many Broadway and West End theatres.

Range in a classic theatre system is usually 20-30 meters, a very short range for SHoW DMX Neo.

Typical systems will include 5701 Neo Transceivers for transmitters and receivers, or 5701 SHoW DMX Neo Transceivers for transmitters and 5711 SHoW DMX Neo Receivers. Small systems may use 5702 SHoW DMX SHoW Babies for both transmitter and receivers. Note that SHoW DMX SHoW Baby only supports one SHoW ID, so multiple systems cannot be used within range of each other.

Antennas: Proscenium theatre systems usually utilize the provided omni-directional antennas, and may sometimes benefit from 5632 Panel antennas.

Location: Locate the transmitter(s) with good height and in clear line of sight with the receiver targets. A good location is on a grid, balcony rail, electric, or similar structure. Receivers will often by necessity be located on stage, sometimes in scenery, props, or even costumes. If the receivers are out of sight, try to arrange the antennas so they are in sight of the transmitter. Keep transmitters with omni antennas separated by 5 meters. Check received signal strength during performance, as the actors' bodies are potential radio barriers. Don’t be overly concerned about some radio barriers or limited line of sight, as SHoW DMX will make it through many radio barriers, and the range in these settings is usually short. If signal strength is weak or varies significantly, consider switching to an 8 dBi Panel antenna for the transmitter(s). Remember that the 8 dBi Panel has a 60° beam angle so at a moderate distance can usually hit anywhere on stage. Be careful to polarize antennas correctly, and test horizontal as well as vertical polarity if interference is significant.

System settings: This may be a good application for limited bandwidth configuration, as many theatres have significant Wi-Fi activity. If the wireless slot count is low enough, consider Limited Burst as well, as it will reduce inbound and outbound interference further. Consider lower power settings, as range is usually short and the lower power settings will reduce the potential for multipath, as well as further improving co-existence.

The Stadium System

This can be a challenging environment, as major sports arenas and the large concerts and events that fill them always have a lot of RF activity as well as large and complex lighting systems where wireless DMX is very attractive. Fortunately, these venues frequently employ an RF supervisor to negotiate bandwidth and facilitate cooperation. SHoW DMX technology performs very well in these environments when setup correctly; the U2 360 Tour used 5 universes of SHoW DMX in major arenas throughout the world.

Range in an arena system can exceed 100 meters with high ambient interference; a good application for Panel or even Yagi antennas.

Typical systems may include 5701 Neo Transceivers for transmitters and receivers, or 5701 Transceivers for transmitters and 5711 Neo Receivers. Alternatively, 7400-5708 Vero Net or 7400-5707 Vero transceivers may be specified to take advantage of their weather proof construction in this typically outdoor setting.

Antennas: High Powered directional antennas can be of great benefit in these systems to help cut through any ambient interference, and also to reduce side-looking interference with other systems working in the same spectrum.

Location: Locate the transmitter(s) with good height and in clear line of sight with the receiver targets. These are very large places, so take advantage of the architecture whenever possible to gain altitude. Receivers may be located on stage, but often will be located with pods or towers of equipment providing good opportunities for mounting elevation and clear line of sight.

Keep transmitter directional antennas pointed away from each other. Check received signal strength during performance. Remember that the 8 dBi Panel has a 60° beam angle so at a moderate distance it can usually hit anywhere on stage. Be careful to polarize antennas correctly, and test horizontal as well as vertical polarity if interference is significant.

System settings: This may be a good application for limited bandwidth configuration to accommodate other 2.4Ghz system in the area, as well as to protect your own signals.

Monitoring activity with Wi-Spy or another spectrum analyzer during setup, tech, and show is recommended, and be sure to cooperate with the RF Czar.

The Urban Outdoor System

One type of application that is growing in popularity is the urban outdoor setting, such as building, bridge, or highway lighting. This type of system is often used for decorative or holiday/event lighting. These systems often incorporate color changing LEDS, so steady DMX transmission is needed to assure smooth color changes.

Range in an outdoor urban system can exceed 100 meters but often ambient interference is fairly weak. This is also a good application for Panel or Yagi antennas.

Typical systems will include 7400-5708 Vero Net or 7400-5707 Vero transceivers for this outdoor setting.

Antennas: High Powered directional antennas can be of great benefit in these systems to help cut through any ambient interference, and also to reduce side-looking interference with other systems working in the same spectrum. These systems often include receiver targets in the same DMX universe but located far apart, even 180 degrees away from the transmitter. This can be a great application for an antenna splitter feeding two identical antennas pointed in different directions. When a splitter is used, the power from the transmitter is divided between the two antennas so each antennas gain is effectively reduced by half. Note that antennas on a splitter must be identical and extension cables from the splitter must also be identical in length and material to assure equal attenuation. Note that Panels or Yagis can be used on both receivers and transmitters to maximize range and rejection of interference.

Location: Locate the transmitter(s) with good height and in clear line of sight with the receiver targets. Take advantage of the architecture whenever possible to gain altitude.

Keep transmitter directional antennas pointed away from each other. Check received signal strength during intended periods of operation. Remember that the 8 dBi Panel has a 60° beam angle so at a moderate distance it can usually hit anywhere near the target. Be careful to polarize antennas correctly, and test horizontal as well as vertical polarity if interference is significant.

System settings: This may be a good application for full bandwidth configuration, depending on how many universes you are using.

The Park / Rural Outdoor System

Similar to the urban setting is a system in a park or lightly built up outdoor area.

Range in an outdoor park system can exceed 100 meters, sometimes greatly so, but often ambient interference is fairly weak. This is also a good application for Panel or Yagi antennas. Remember that Yagis may require careful aiming, and that there are some additional limitations on the installation of the powerful 14dBi Yagi. See the SHoW DMX manual for the equipment you are using, or contact CTI for details.

Typical systems will include 7400-5708 Vero Net or 7400-5707 Vero transceivers for this outdoor setting.

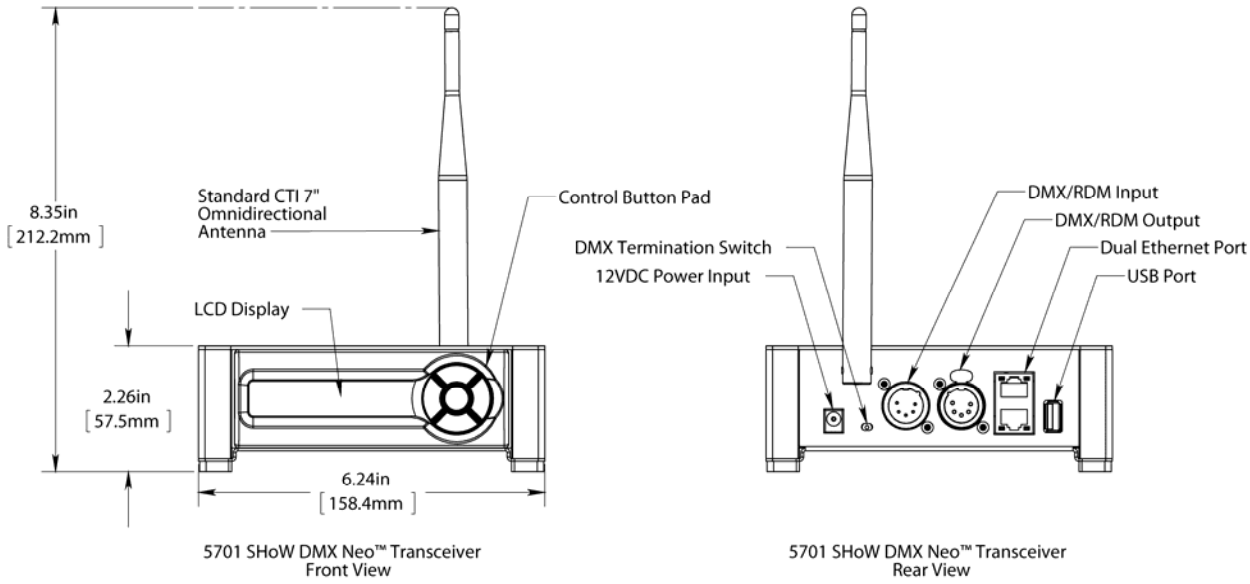
Antennas: High powered directional antennas can be of great benefit in these systems, primarily where significant range is required. Like the urban outdoor system, these systems often include receiver targets in the same DMX universe but located far apart, even in different directions, 180 degrees away from the transmitter. This can be a great application for an antenna splitter feeding two identical antennas pointed in different directions. When a splitter is used, the power from the transmitter is divided between the two antennas so each antenna's gain is effectively reduced by half. Note that antennas on a splitter must be identical, and extension cables from the splitter must also be identical in length and material to assure equal attenuation. Note that Panels or Yagis can be used on both receivers and transmitters to maximize range and rejection of interference.

Location: Locate the transmitter(s) with good height and in clear line of sight with the receiver targets. Take advantage of the architecture whenever possible to gain altitude.

Keep multiple transmitter directional antennas pointed away from each other. Check received signal strength during intended periods of operation. Remember that the 8 dBi Panel has a 60° beam angle so at a moderate distance it can usually hit anywhere near the target. Be careful to polarize antennas correctly, and test horizontal as well as vertical polarity if interference is significant.

System settings: This may be a good application for full bandwidth configuration, depending on how many universes you are using.

The 5701 SHoW DMX Neo Transceiver Configuration Guide



The 5701 SHoW DMX Neo Transceiver

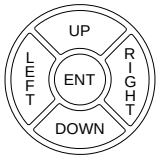
Controls, Connections and Features

Front Panel

LCD Display

This 2 line by 16 character display shows all of the Menu titles, command options, configuration data, and other text and graphic data. The backlight turns on whenever a button is pushed and turns off automatically after a preset time-out. The backlight off time-out is adjustable via the Misc. Menu (see below).

Control Button Pad



This five-button pad is the main control interface for the 5701 SHoW DMX Neo Transceiver. The button functions are UP, DOWN, LEFT/BACK, RIGHT/FORWARD, and ENTER.

Panel Lockout

Panel lockout provides a means to lock the front buttons from accidentally changing settings. When enabled, a key sequence is required to enter the menu system. When a button is pressed and the button panel is locked, the word “Locked” will appear on the screen for 2 seconds. To unlock the button panel, press and hold both right and left buttons until the word “Unlocked” appears.

The button panel lock timeout can be set from 5 to 60 seconds via the Misc. Menu (see below). Every button press resets the lockout timer. When the lock timeout has elapsed, the button

panel will automatically lock and return to the main status screen. If any parameters were being edited at the time of lockout, that parameter will return to its previous state.

The lockout feature can be enabled or disabled via the Misc. Menu (see below). By default the button panel lockout is set to disabled.

Back Panel

Power Input Jack: This is the +12VDC power input for the 5701 Transceiver and mates directly with the plug on the CTI # 5627 power supply, as well as the CTI # 5550 Battery Twofer. Although provided with a CTI 12VDC power supply (such as the 5727 above), the 5701's internal power circuit will work with any +DC voltage power supply from 9 to 24VDC, allowing a wide range of battery power options. This connector's polarity is Ring- / Tip+. *Be sure the power connection is polarized correctly* before *connecting an alternative supply.*

DMX Termination Switch: The 5701 Transceiver DMX Port is provided with a conventional manual termination switch. Switch the handle to ON for end-of-line DMX Termination.

Standard CTI # 5530 7" 5dBi Omni Directional Antenna: This antenna is removable and position-able. The SHoW DMX Neo Transceivers and Receivers are certified with this antenna and should be used with it or another approved antenna only to assure compliance.

5P XLR Male and Female Connectors: DMX Port. Connect your DMX512 source here using any ESTA compliant DMX512 cable. These two connectors are wired in parallel. Port direction is controlled by configuration options.

RJ45 Jacks: Ethernet lighting control input. This input is for connection to a lighting control Ethernet network or connection to a PC for use with the Jese GetSet RDM Controller.

USB A Port: This port is used for firmware installation and upgrades only. Firmware updates are posted on the City Theatrical, Inc. website www.citytheatrical.com.

To Install a Firmware Update:
Download the new firmware file from the CTI Website
Place file in root directory of a FAT (16 or 32) formatted USB memory stick
Plug stick into USB jack
Browse to "Misc->Firmware->Update"
Wait for unit to reboot with new firmware
Once complete, remove USB stick

The SHoW DMX Neo Transceiver Menu Structure

The SHoW DMX Neo System has many user configurable features to enhance performance and minimize impact on other RF systems. The SHoW ID allows most of the critical RF settings to be set in the Transceiver, and then easily transferred to the Receiver by simply setting the SHoW ID in the Receiver (see *About Show ID*, below).

About SHoW ID:

CTI's SHoW ID system organizes most of the SHoW DMX RF features into a set of simple settings that allow you to match your transmitter to your receiver(s) and to quickly select Neo, Neo Adaptive, Or Classic modes, as well as Full or Limited Bandwidth and Hopping pattern settings.

Once the transmitter's hopping pattern and bandwidth are configured, the transmitter will calculate and display a unique *SHoW ID*. Set the receiver to that same SHoW ID to configure it to respond to that Transmitter.

The transmitter and receiver SHoW IDs must match for the units to communicate.

The 5701 SHoW DMX Neo Transceiver's top label includes a list of the primary menus:

Transceiver Menus

The Main Menu reads:

SHoW DMX Neo →
[Active Input]
The SHoW DMX Neo Transceiver can be connected to one or more control inputs, combining DMX and Ethernet input levels on an HTP (Highest Takes Precedence) basis.
Connected Inputs are displayed in the Active Input window.
[status] Status messages will vary with the input control method selected
(→) indicates that there is more information available by pressing the Right button.

Pressing the Enter button will access the next level of menus and then the options and submenus are viewed using the up and down buttons (as detailed above).

RF Settings

The RF Settings menu includes all the configuration options for the radio, including Hop Pattern, Broadcast Power, Broadcast Bandwidth, and the number of DMX Slots transmitted ("Channels").

SHoW ID You can edit the SHoW ID directly here and set all affected parameters
Power Adjust broadcast power, in milliwatts ETSI (post antenna), based on use with a 5dBi Antenna.

Operation: Set the 5701 to be a Transmitter or Receiver

Restore Show ID? This is the "quick start" option. Select this option to set the Transmitter back to the default Hopping pattern (1) and Bandwidth (Full) settings.

Advanced Setup Select advanced options in this menu:

SHoW DMX Mode: Select SHoW DMX Neo Adaptive, SHoW DMX Neo, or SHoW DMX Classic

Universe ID: Selects one of four Universes in Neo Adaptive Mode, A, B, C, or D.

Low Latency: Select Low Latency or Normal Latency (works only in Neo Modes). Low Latency provides very low 7ms latency (propagation delay) and data healing, while Normal Latency provides 30ms latency with the highest possible data fidelity in low interference environments.

Classic Mode Operation
In Classic Mode, the SHoW DMX Neo system operates identically to a Classic 5600 series SHoW DMX system and will communicate with 5600 units. You can use this mode if you want to combine SHoW DMX Neo and Classic equipment in the same system. Classic Mode supports Adjustable Broadcast Power, Limited Bandwidth, Limited Burst, and uses 64 original SHoW IDs, providing 16 hopping patterns in each Bandwidth setting.

Neo Mode Operation
In Neo Mode, the SHoW DMX Neo system uses a new broadcast format that reduces latency to ~ 7ms max and provides further resistance to interference susceptibility or creation.
Neo Mode supports Adjustable Broadcast Power, Limited Bandwidth, Limited Burst, and uses 64 new SHoW IDs, providing 16 hopping patterns in each Bandwidth setting.

Neo Adaptive Mode Operation
The SHoW DMX Neo system can be configured to operate in the new Neo Adaptive (AFHSS) Mode. Neo Adaptive Mode uses an Adaptive Spread Spectrum Frequency Hopping broadcast format in which the system detects interference and adapts its frequency hopping channel set automatically to avoid it.
Neo Adaptive Mode supports Adjustable Broadcast Power and uses four new Adaptive Mode SHoW IDs. Latency is also reduced to ~7ms max in Adaptive Mode.

Hop Pattern: For Classic or Neo Modes, select one of 16 hopping patterns. For Neo Adaptive Mode, select one of four Universes (A-D). Each hopping pattern is unique and will configure the broadcast so that only receivers with the same hopping pattern will sync up with that Transmitter and receive the DMX broadcast.

Power: Select the desired transmit power setting. The power settings are 1mW, 14mW, 28mW, or 72mW ETSI.

Bandwidth: Select one of four Bandwidth options: Full, Wi-Fi 1-6, Wi-Fi 4-9, or Wi-Fi 7-12.

# of Channels (limited burst): Select the full burst of 512 DMX channels (slots), or a shorter limited burst.

Neo Mode: Limited burst options begin with 51 DMX channels and increase in increments of 52, so the options are 51, 103, 155, etc. to 467.

> **Slot Start Addr:** If a Limited burst is selected, select the first transmitted DMX Slot, e.g. with a setting of 51 slots and a Start Address of 1, the broadcast slots would be 1-51.

Classic Mode: Limited burst options begin with 30 DMX channels and increase in increments of 32, so the options are 30, 62, 94, 126, etc. to 478 .

> **Slot Start Addr:** If a Limited burst is selected, select the first transmitted DMX Slot, e.g. with a setting of 30 slots and a Start Address of 31, the broadcast slots would be 31-60.

DMX512 / Art-Net / sACN Control Input

The SHoW DMX Neo Transceiver will accept DMX512, Art-Net, or sACN control input. All inputs are live and will be combined in a Highest level Takes Precedence (HTP) arrangement. If a network protocol is used, you must configure the network settings for your Art-Net/sACN network in the Network Settings menu.

Input Settings

The input settings menu allows you to select the input format for the system and change any additional input specific settings. The Neo Transceiver currently supports DMX, Art-Net, and sACN. The Art-Net implementation incorporates source addressing as defined in the PRG S400 distribution system.

> **DMX Port Direction:** Set the DMX Port as an Input or an Output. When set as an output in Transmit mode, a DMX Universe from incoming network protocols can be assigned to this port separately from the Universe selected for wireless broadcast.
>
> **sACN Settings:**
>
> - Select the desired wireless universe number
> - Select the desired wired universe number (only active if the DMX Port is set as an Input)

- 63999 Universes are supported

Art-Net Settings:

- Select the desired wireless address
- Select the desired wired address
- Select address format as Hex, Alpha, or Decimal

RDM Settings

The RDM Settings Menu controls the RDM settings for the Neo Transceiver

RDM Traffic: Enables or Disables the RDM proxy features. Responder functions cannot be disabled. Choosing enabled will initiate a proxy discovery

Device Label: This is an editable field that allows the user to create a unique alpha-numeric 32 character RDM label for the unit

Devices Found: Indicates the number of RDM responder devices discovered by the Neo Transceiver

RDM Interleave: Adjusts the ratio of RDM and DMX packets in the transmission

Unique ID: This is a non-editable field that displays the RDM Unique ID

Notes on Using RDM

Remember that when RDM is enabled, the system uses ~ 25% of its available DMX bandwidth for RDM so DMX fidelity and refresh rate are reduced. For best DMX fidelity, disable RDM traffic from the Receivers back to the Transmitting unit when you are not using RDM.

You can use RDM to change SHoW IDs in connected devices. Remember that once you have changed the SHoW ID in a connected receiver, you will lose communication with that receiver until you change your transmitter to the matching SHoW ID.

The SHoW DMX Neo Transceiver is fully enabled as an RDM proxy system, so you can use RDM to manage your SHoW DMX system and any connected RDM responders that are downstream of the system.

Network Settings

The network settings Menu accesses configurable and permanent network settings for both Ethernet interfaces.

Misc. Settings

Backlight T-Out: Allows adjustment of the Backlight automatic shutoff time-out from Always off, through 1-240 seconds on, to Always on.

Restore Defaults: Resets all factory defaults, including Backlight Time-out 10 Seconds, Hop pattern 1, Power 72mW, Full Bandwidth broadcast, 512 DMX Channels (slots), and

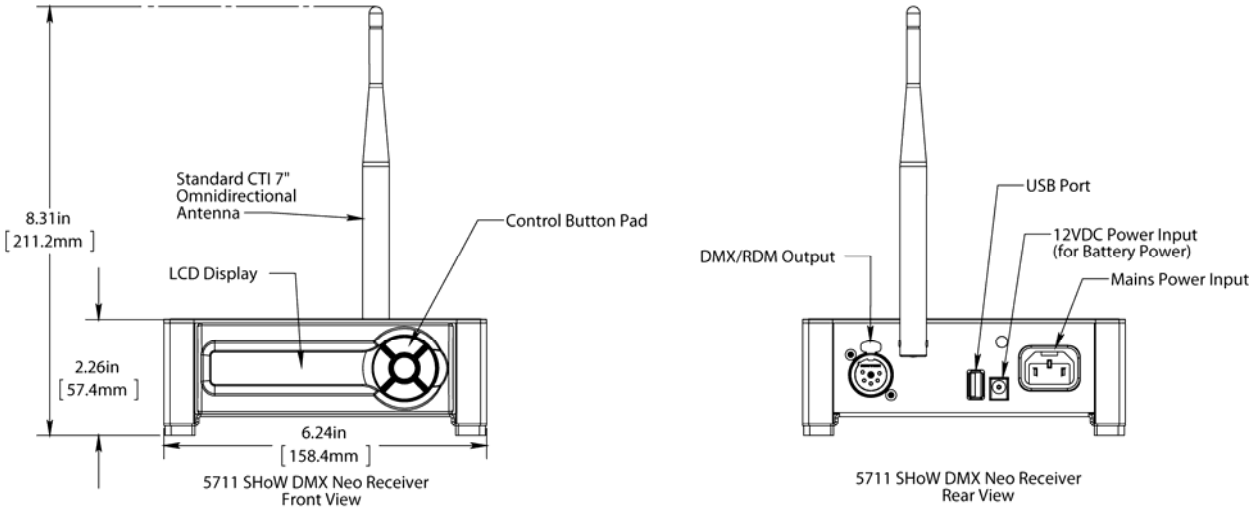
Show ID 201.

Input Status: Displays the Input Status.

Panel Lockout: Enables, disables, and adjusts time out of the panel lockout feature.

Firmware version: Displays the firmware version.

The 5711 SHoW DMX Neo Receiver Configuration Guide



The 5711 SHoW DMX Neo Receiver

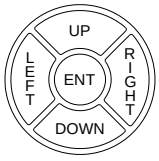
Since the 5711 SHoW DMX Neo Receiver is configurable as a half duplex RDM Responder, it is capable of transmitting as well as receiving when used in the RDM mode.

Controls, Connections and Features

Front Panel

LCD Display: This 2 line by 16 character display shows all of the Menu titles, command options, configuration data, and other text and graphic data. The backlight turns on whenever a button is pushed and turns off automatically after a preset time-out. The backlight off time-out is adjustable via the Misc. Menu (see below).

Control Button Pad: This five-button pad is the main control interface for the 5610/5611 Receiver. The button functions are UP, DOWN, LEFT/BACK, RIGHT/FORWARD, and ENTER.



Back Panel

DC Power Input Jack: This is the +12VDC power input for the 5711 SHoW DMX Neo Receiver, and mates directly with the plug on the CTI 5627 power supply, as well as the CTI # 5650 Battery Twofer. The 5711's internal power circuit will work with any +DC voltage power supply from 9 to 24VDC, allowing a wide range of battery power options. This connector's polarity is Ring- / Tip+. *Be sure the power connection is polarized correctly* before *connecting an alternative supply.*

IEC Mains power Input connector: The 5711 SHoW DMX Neo Receiver can be powered with 100-240VAC 50/60 Hz mains power. Connect the provided IEC tail to this connector for use with mains power.

Standard CTI # 5630 7” 5dBi Omni Directional Antenna: This antenna is removable and position-able.
5P XLR Female Connector: DMX/RDM Output.

USB A Port: This port is used for firmware installation and upgrades only. Firmware updates are posted on the City Theatrical, Inc. website www.citytheatrical.com.

To Install a firmware update:
Download the new firmware file from the CTI Website
Place file in root directory of a FAT (16 or 32) formatted USB memory stick
Plug stick into USB jack
Browse to “Misc->Firmware->Update”
Wait for unit to reboot with new firmware
Once complete, remove USB stick

The SHoW DMX Neo Receiver Menu Structure

The SHoW DMX Neo Receiver’s top label includes a list of the primary menus:

Receiver Menus

After power-up the LCD display will read:

SHoW DMX Rx
SHoW ID: *X*

alternating with:

SHoW DMX Rx
IN/OUT of Range

and:

Signal: -*XXX*dBm

The Start Up display reports RF connection status (“In Range” or “Out of Range”), reports the SHoW ID that the Receiver is configured for (see RF Settings Below), and reports the RF signal strength.

Press the center ENTER button to access the menus.

SHoW ID

Set the SHoW ID number to match the number calculated by the Transmitter.

The Transmitter and Receiver SHoW IDs must match for the units to communicate.

SHoW ID

Set the SHoW ID number to match the number calculated by the Transmitter.

The Transmitter and Receiver SHoW IDs must match for the units to communicate.

RDM Settings

The RDM Settings Menu controls the RDM settings for the Receiver.

RDM Proxy Disabled/Enabled: Enables or Disables the RDM features.

Power: Select the desired RF transmit power setting. For the 5610 (North American) the available power settings are 5mW, 10mW, 50mW, 100mW, or 125mW FCC. For the 5611, the power settings are 5mW, 10mW, 50mW or 100mW ETSI.

RDM Label: This is an editable field that allows the user to create a unique alpha-numeric 32 character RDM label for the unit.

Devices Found: Indicates the number of RDM responder devices discovered by the Receiver.

RDM Unique ID: This is a non-editable field that displays the RDM Unique ID.

Notes on Using RDM
Remember that when RDM is enabled, the system uses ~ 25% of its available DMX bandwidth for RDM so DMX fidelity and refresh rate are reduced. For best DMX fidelity, disable RDM traffic from the Receivers back to the Transmitting unit when you are not using RDM.

Misc. Settings

Backlight T-Out: Allows adjustment of the Backlight automatic shutoff time-out from Always off, through 1-240 seconds on, to Always on

Signal Strength: Displays the RF signal strength in -dBm

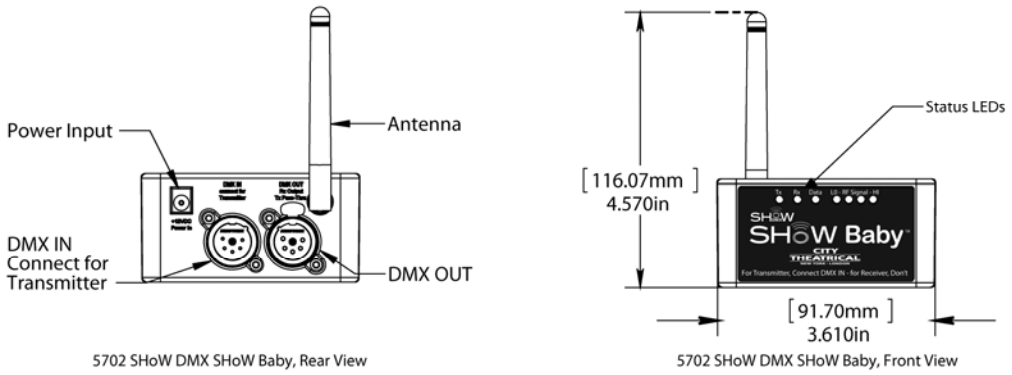
SHoW Status: Displays In or Out of Range

Firmware version: Displays the firmware version

Radio Firmware: Displays the Radio firmware version

Restore Defaults: Resets all factory defaults, including Backlight Time-out 10 Seconds, Hop pattern 1, Power 72mW, Full Bandwidth broadcast, 512 DMX Channels (slots), and Show ID 201

The 5702 SHoW DMX SHoW Baby Configuration Guide



The SHoW DMX SHoW Baby

SHoW DMX SHoW Baby Neo Settings

The SHoW DMX SHoW Baby uses the 5792 SHoW DMX Neo Radio Module. It is permanently configured with SHoW ID 201 for Adaptive Spread Spectrum Frequency Hopping and Neo Low Latency broadcast mode. Using RDM, you can adjust the broadcast power, edit the RDM Device Label, and enable or disable RDM traffic. No other settings are adjustable.

Transmitter Setup

You can use one SHoW DMX SHoW Baby per system as a transmitter.

1. Install the SHoW Baby you will use for a transmitter in a convenient location where you can reach it with the DMX cable from your console or controller. For best results, locate the unit higher in the air; 8 feet up is better than 5, and 20 feet up is better than 8. Consider where you will put your SHoW DMX SHoW Baby receivers and place the SHoW DMX SHoW Baby transmitter where its antenna will be within line of sight with the receivers (if possible).

2. Install the provided antenna and point it straight up in the air.

3. Connect the provided 12VDC Power Supply to the unit, and connect to mains power.

4. Connect the DMX cable from the console/controller to the DMX IN. The SHoW DMX SHoW Baby will be configured as a transmitter and the ***Tx*** LED will light. The DMX IN will be automatically terminated, and the DMX OUT will be available as a DMX pass-thru. If you also connect a cable to the DMX OUT the termination is lifted.

5. As soon as you begin sending DMX from your console, the SHoW DMX SHoW Baby will begin broadcasting and the ***Data*** LED will light.

Receiver Setup

You will need at least one SHoW DMX SHoW Baby to use as a receiver.

1. Install the SHoW DMX SHoW Baby you will use for a receiver in a convenient location where you can reach it with a DMX cable to the device (or devices) it will be providing DMX for. As with the SHoW DMX SHoW Baby transmitter, locate the unit higher in the air for best results, and try to place your SHoW DMX SHoW Baby receiver where its antenna will be within line of sight with the transmitter.

2. Install the provided antenna and point it straight up in the air.

3. Connect the provided 12VDC Power Supply to the unit, and connect to mains power. The SHoW DMX SHoW Baby will be configured as a receiver and the ***Rx*** LED will light.

4. Connect a DMX cable from the SHoW DMX SHoW Baby DMX OUT to the first DMX device you want to provide DMX to. You can then continue to add up to 32 more DMX devices to the chain as with any DMX data stream, and like any other DMX system, be sure the last connected device is properly terminated.

5. As soon as you begin broadcasting from the SHoW DMX SHoW Baby set up as your transmitter, the data will be received by the SHoW DMX SHoW Baby(s) set up as receiver(s) and the transmitted DMX will be output from the receiver unit's DMX OUT. The received signal strength will be displayed on the four ***LO – RF Signal – HI*** LEDs. This four LED "meter" will light to show you your signal strength; a good wireless signal is three or more LEDs, and weaker signal is two or less.

You can set up any number of additional SHoW DMX SHoW Baby units as receivers.

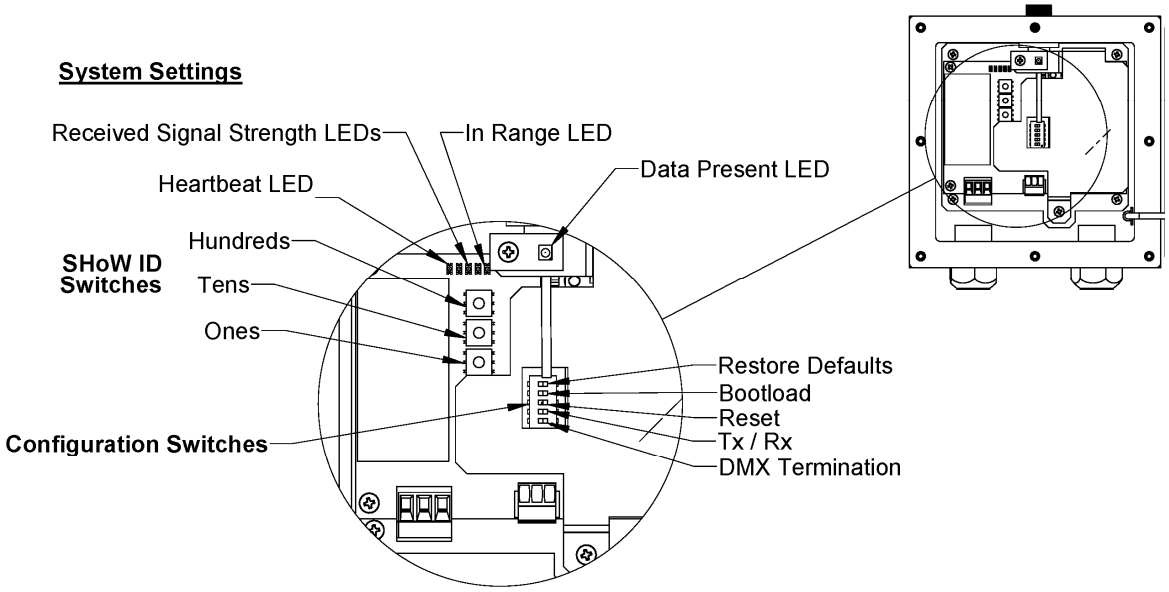
Notes on Using RDM

Remember that when RDM is enabled, the system uses ~ 25% of its available DMX bandwidth for RDM so DMX fidelity and refresh rate are reduced. For best DMX fidelity, disable RDM traffic from the Receivers back to the Transmitting unit when you are not using RDM.

You can use RDM to change SHoW IDs in connected devices. Remember that once you have changed the SHoW ID in a connected Receiver, you will lose communication with that Receiver until you change your Transmitter to the matching SHoW ID.

The SHoW DMX SHoW Baby is fully enabled as an RDM proxy system, so you can use RDM to manage your SHoW DMX system and any connected RDM responders that are downstream of the system.

The 7400-5707 SHoW DMX Vero Transceiver Configuration Guide



Configuration
You can configure the Vero Transceiver's basic operating settings using the System Settings (SHoW ID and Configuration) switches shown in the detail above.

Configuration switches:

P5, DMX Term: DMX512 termination On or Off. Turn On for end-of-line DMX512 connection

P4, Rx/Tx: Receiver (Rx) On, or Transmitter (Tx) Off. Selects Receiver or Transmitter operation

P3, Reset: On or Off. Switch On to hold in Reset

P2, Bootloader: On or Off. Sets the unit to Bootloader mode to upload and install radio firmware upgrades from a connected SHoW DMX Neo Transceiver or Receiver

P1, Default: On or Off. To restore the system to factory default settings:

1. Set P1 Default to On
2. Wait for Data Present LED to blink rapidly
3. Switch P1 to Off

SHoW ID
Like the original SHoW DMX Classic system, the SHoW DMX Neo system uses SHoW IDs as a quick way to set RF configuration options. Each SHoW ID represents a combination of one of

16 hopping patterns and one of four bandwidth settings. 7400-5707 Vero Transceiver supports Neo and Neo Adaptive SHoW IDs only.

The Transmitter and Receiver SHoW IDs must match for the units to communicate.

The SHoW DMX Vero Transceiver is preset at the factory with SHoW ID 201 for Adaptive Spread Spectrum Frequency Hopping and Neo Low Latency broadcast mode.

SHoW ID may be set manually using the SHoW ID rotary switches or using RDM. Whichever method is used last takes precedence. The unit maintains the last used setting over power cycles, and checks on power up to see if switches have been changed while the unit was off.

To set the SHoW ID manually, simply set the SHoW ID rotary switches to the desired SHoW ID. You may override the ROTARY settings with RDM.

In order to use RDM, you will also need an RDM controller or a lighting control console with a built-in RDM controller.

Notes on Using RDM

Remember that when RDM is enabled, the system uses ~ 25% of its available DMX bandwidth for RDM so DMX fidelity and refresh rate are reduced. For best DMX fidelity, disable RDM traffic from the Receivers back to the Transmitting unit when you are not using RDM.

You can use RDM to change SHoW IDs in connected devices. Remember that once you have changed the SHoW ID in a connected Receiver, you will lose communication with that Receiver until you change your Transmitter to the matching SHoW ID.

The SHoW DMX Vero Transceiver is fully enabled as an RDM proxy system, so you can use RDM to manage your SHoW DMX system and any connected RDM responders that are downstream of the system.

The SHoW DMX Vero Transceiver supports the following RDM PIDs:

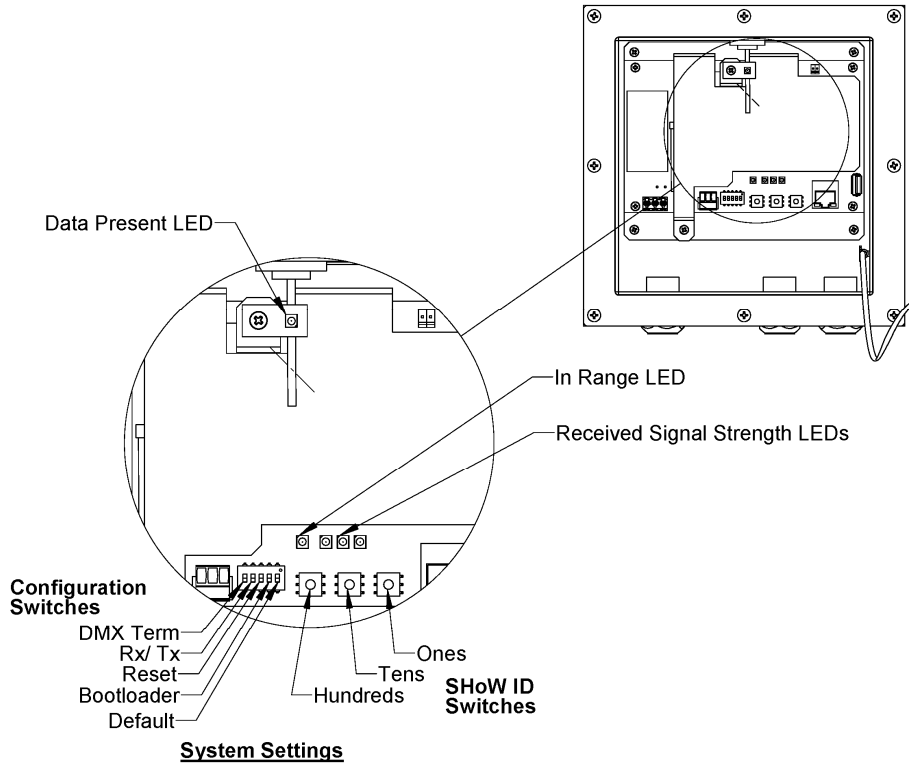
Get Allowed	Set Allowed	Reduced RDM	RDM Parameter	PID	Comment
		X	DISC_UNIQUE_BRANCH	0x0001	
		X	DISC_MUTE	0x0002	
		X	DISC_UN_MUTE	0x0003	
X		X	PROXIED_DEVICES	0x0010	
X		X	PROXIED_DEVICE_COUNT	0x0011	
X		X	QUEUED_MESSAGE	0x0020	
X		X	SUPPORTED_PARAMETERS	0x0050	
X		X	PARAMETER_DESCRIPTION	0x0051	
X		X	DEVICE_INFO	0x0060	Reports Category 0x0801
X		X	PRODUCT_DETAIL_ID_LIST	0x0070	Repots ID 0x0604
X		X	DEVICE_MODEL_DESCRIPTION	0x0080	

X		X	MANUFACTURE_LABEL	0x0081	City Theatrical, Inc.
X	X	X	DEVICE_LABEL	0x0082	
X	X	X	FACTORY_DEFAULTS	0x0090	
X		X	SOFTWARE_VERSION_LABEL	0x00C0	Reports CE/FCC
X	X		DMX_PERSONALITY	0x00E0	Sets Limited Burst
X			DMX_PERSONALITY_DESCRIPTION	0x00E1	
X	X		DMX_START_ADDRESS	0x00F0	
X		X	SENSOR_DEFINITION	0x0200	RSSI, Temp
X		X	SENSOR_VALUE	0x0201	
X	X	X	IDENTIFY_DEVICE	0x1000	
X	X	X	RDM_TRAFFIC_ENABLE	0x7FE2	Draft
X	X		SHOW_ID	0x8000	
X	X		OUTPUT_POWER	0x8001	
X	X		HOP_PATTERN	0x8002	
X	X		BANDWIDTH	0x8003	
X	X		LATENCY	0x8019	
X	X	X	DMX_RDM_ INTERLEAVE_RATIO	0x801B	
X	X	X	PROXIED_DEVICES_ENHANCED	0x801C	
X	X		ADAPTIVE_ON_OFF	0x801D	

In order to allow RDM traffic and discovery and control of connected Responders you must enable RDM Traffic (Set RDM_TRAFFIC_ENABLE to 01).

To learn more about RDM, a good place to start is the Wikipedia article on RDM (lighting) at: http://en.wikipedia.org/wiki/RDM_(lighting).

The 7400-5708 SHoW DMX Vero Net Transceiver Configuration Guide



Configuration
You can configure the Vero Net Transceiver's basic operating settings using the System Settings switches shown in the detail above.

Configuration switches:

P5, DMX Term: DMX512 termination On or Off. Turn On for end-of-line DMX512 connection

P4, Rx/Tx: Receiver (Rx) On, or Transmitter (Tx) Off. Selects Receiver or Transmitter operation

P3, Reset: On or Off. Switch On to Reset

P2, Bootloader: On or Off. Sets the unit to Bootloader mode to upload and install Host and radio firmware upgrades from a connected USB Memory device

P1, Default: On or Off. To restore the system to factory default settings:

1. Set P1 Default to On
2. Wait for PCBA LED to blink rapidly
3. Switch P1 to Off

SHoW ID
Like the original SHoW DMX Classic system, the SHoW DMX Neo system uses SHoW IDs as a quick way to set RF configuration options. Each SHoW ID represents a combination of one of 16 hopping patterns and one of four bandwidth settings.

The Transmitter and Receiver SHoW IDs must match for the units to communicate.

The SHoW DMX Vero Net Transceiver is preset at the factory with SHoW ID 201 for Adaptive Spread Spectrum Frequency Hopping and Neo Low Latency broadcast mode.

SHoW ID may be set manually using the SHoW ID ROTARYs or using RDM. Whichever method is used last takes precedence.

To set the SHoW ID manually, simply set the SHoW ID ROTARY Switches to the desired SHoW ID.

In order to use RDM, you will also need an RDM controller or a lighting control console with a built-in RDM controller.

You can set SHoW ID either with the ROTARY switches as described, or via RDM. All other RF settings must be set via RDM.

RDM Operation

Remember that when RDM is enabled, the system uses ~ 25% of its available DMX bandwidth for RDM so DMX fidelity and refresh rate are reduced. For best DMX fidelity, disable RDM traffic from the Receivers back to the Transmitting unit when you are not using RDM.

You can use RDM to change SHoW IDs in connected devices. Remember that once you have changed the SHoW ID in a connected Receiver, you will lose communication with that Receiver until you change your Transmitter to the matching SHoW ID.

The SHoW DMX Vero Net Transceiver is fully enabled as an RDM proxy system, so you can use RDM to manage your SHoW DMX Vero Net Transceiver system and any connected RDM responders that are downstream of the system.

The SHoW DMX Vero Net Transceiver supports the following RDM PIDs:

Get Allowed	Set Allowed	Reduced RDM	RDM Parameter	PID	Comment
		X	DISC_UNIQUE_BRANCH	0x0001	
		X	DISC_MUTE	0x0002	
		X	DISC_UN_MUTE	0x0003	
X		X	PROXIED_DEVICES	0x0010	
X		X	PROXIED_DEVICE_COUNT	0x0011	
X		X	QUEUED_MESSAGE	0x0020	
X		X	SUPPORTED_PARAMETERS	0x0050	

X		X	PARAMETER_DESCRIPTION	0x0051	
X		X	DEVICE_INFO	0x0060	Reports Category 0x0801
X		X	PRODUCT_DETAIL_ID_LIST	0x0070	Repots ID 0x0604
X		X	DEVICE_MODEL_DESCRIPTION	0x0080	
X		X	MANUFACTURE_LABEL	0x0081	City Theatrical, Inc.
X	X	X	DEVICE_LABEL	0x0082	
X	X	X	FACTORY_DEFAULTS	0x0090	
X		X	SOFTWARE_VERSION_LABEL	0x00C0	Reports CE/FCC
X	X		DMX_PERSONALITY	0x00E0	Sets Limited Burst
X			DMX_PERSONALITY_DESCRIPTION	0x00E1	
X	X		DMX_START_ADDRESS	0x00F0	
X		X	SENSOR_DEFINITION	0x0200	RSSI, Temp
X		X	SENSOR_VALUE	0x0201	
X	X	X	IDENTIFY_DEVICE	0x1000	
X	X	X	RDM_TRAFFIC_ENABLE	0x7FE2	Draft
X	X		SHOW_ID	0x8000	
X	X		OUTPUT_POWER	0x8001	
X	X		HOP_PATTERN	0x8002	
X	X		BANDWIDTH	0x8003	
X	X		LATENCY	0x8019	
X	X	X	DMX_RDM_ INTERLEAVE_RATIO	0x801B	
X	X	X	PROXIED_DEVICES_ENHANCED	0x801C	
X	X		ADAPTIVE_ON_OFF	0x801D	

In order to allow RDM traffic and discovery and control of connected Responders you must enable RDM Traffic (Set RDM_TRAFFIC_ENABLE to 01).

DMX512 / Art-Net / sACN Control Input

The SHoW DMX Vero Net Transceiver will accept DMX512, Art-Net, or sACN control input. All inputs are live and will be combined in a Highest level Takes Precedence (HTP) arrangement.