CITY THEATRICAL

NEW YORK • LONDON

Multiverse® Node
P/N 5902

User's Manual
Rev 1.4

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Compliance

FCC Compliance Statement (United States)
This device complies with Part 15 of the Federal Communications Commission (FCC) Rules.
Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IC Statement
This device complies with Industry Canada's license-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Safety Notices
Please read this entire manual before using your new equipment. Please keep the manual in a safe place so you can refer to it in the future as required.

The Multiverse wireless DMX/RDM System is intended for use only by qualified professionals. Connection, installation, and hanging of this equipment must be performed in accordance with all pertinent local, regional, and national safety codes and regulations.

Multiverse wireless DMX/RDM equipment is intended for indoor use only unless specified for outdoor use. Keep the equipment dry! Do not operate the equipment if it gets wet!

Do not operate in excessive heat/direct sunlight. Be sure installation provides adequate ventilation.
There are no user-serviceable parts inside! Refer to qualified service personnel!

RF Exposure: The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

Introduction
City Theatrical's 5902 Multiverse® Node 900MHz/2.4GHz is the first building block of the Multiverse system. Each Multiverse Node 900MHz/2.4GHz is a transceiver. As a single universe transmitter, it functions in a similar plug and play manner to our SHoW DMX SHoW Baby® but contains two radios (you can choose one at a time on which to transmit) and a full user interface. As a receiver, it is the primary single universe standalone receiver in the Multiverse system, and can be part of a larger multi-universe setup.

5902 Multiverse Node Features

- **Choice Of Broadcast Radio**
  Transmit and receive on either the 2.4GHz band or the 900MHz band.

- **mDMX** (Multiverse SHoW IDs only)
  mDMX is a form of DMX optimized for wireless broadcast that dramatically reduces data being broadcast, thereby reducing unneeded radio energy.

- **mRDM** (Multiverse SHoW IDs only)
  Multiverse is able to broadcast RDM information without disrupting the DMX broadcast.   This feature is not available even in wired RDM systems. (Not available on SHoW DMX Neo SHoW IDs.)

- **SHoW Key Security** (Multiverse SHoW IDs only)
  SHoW Key is an additional three-digit code that can be added to the Multiverse SHoW ID that will prevent any other system set on the same SHoW ID from interfering with your system.

- **Forward Error Correction** (Multiverse SHoW IDs only)
  Allows the Receiver to detect and correct errors that may occur in the wireless transmission of data.

- **Ultra Low Latency**
  Total average system latency of 4ms.

- **User Selectable Adaptive Spread Spectrum Frequency Hopping**
  Adaptive Spread Spectrum Frequency Hopping identifies and masks off hopping channels that contain interference, replacing them in the hop sequence with alternate channels.

- **Adjustable Output Power**
  Sometimes an application calls for the most available broadcast power, but many entertainment systems can utilize lower output power to reduce detrimental effects on other radio systems in the venue, reduce reflections, and improve performance.

- **User Selectable SHoW IDs**
  City Theatrical has always produced wireless DMX products that allowed the user to select the optimum transmission method. Users may select full bandwidth hopping, hopping limited to a section of the spectrum (including areas of the spectrum outside of the Wi-Fi range), or adaptive hopping.

- Protocols supported: ANSI E1.11 DMX512-A; E1.20 RDM
- Built-in Multiverse 2.4GHz (for worldwide use) and 900MHz (for use in the Americas only) Frequency Hopping Spread Spectrum radios
- Compatible with all Multiverse and SHoW DMX Neo products
- User can select a single universe to receive
- A very simple user interface to set SHoW ID and universe
- RDM proxy and responder functions
- DMX 5-pin in and out/thru ports
- Rugged cast aluminum enclosure
- Antenna: Omni Broadband, 900MHz/2.4GHz, 2dBi/4dBi
- Auto-selection of transmit or receive mode
- Firmware updateable via USB port
- CL2 power supply with locking connector
- Built-in auto select DMX512 termination
- Selectable display timeout and brightness level
- A hanging bracket for hanging from pipe or truss

Installation

Multiverse Node 900MHz/2.4GHz requires standard DC power from 5-30VDC, and draws 45mA maximum. Power is provided through the on-board DC Jack and can be driven from the included 12VDC locking power supply.

Transmit mode is automatically selected when a DMX 5-pin cable is inserted into the input (male) port of the Multiverse Node 900MHz/2.4GHz. Without it, the Multiverse Node 900MHz/2.4GHz acts as a receiver.

A mounting plate is included to provide mounting with a c-clamp and includes a tie off hole for power strain relief and a hole for a safety cable.

The Multiverse Node 900MHz/2.4GHz is self-terminating if it is the last unit in the DMX512 chain. If the Multiverse Node 900MHz/2.4GHz is not the last device in the chain, ensure that the end device is properly terminated with a 120Ω ½ watt resistor between pins 2 and 3. A DMX connector with a built-in terminating resistor is available from your local distributor.

User Interface Screen

Upon power up, the Multiverse Node 900MHz/2.4GHz will boot into the main screen, which displays the SHoW ID and connection status. Pressing the "Up" or "Down" button will take you to the universe selection screen. Pressing "Enter" will select SHoW ID or universe for editing and will commit the change when done.

Pressing the "Menu" button will take you to the Menu screen. Holding the Menu button will cancel the current edit.

SHoW ID

Select the SHoW ID(s) for your system. In a single universe system with a Multiverse Node 900MHz/2.4GHz used as a transmitter and one or more Multiverse Nodes used as receivers, simply choose a SHoW ID and enter that SHoW ID into the user interface of the transmitter and all receivers. The universe number must match on transmitter and all receivers.
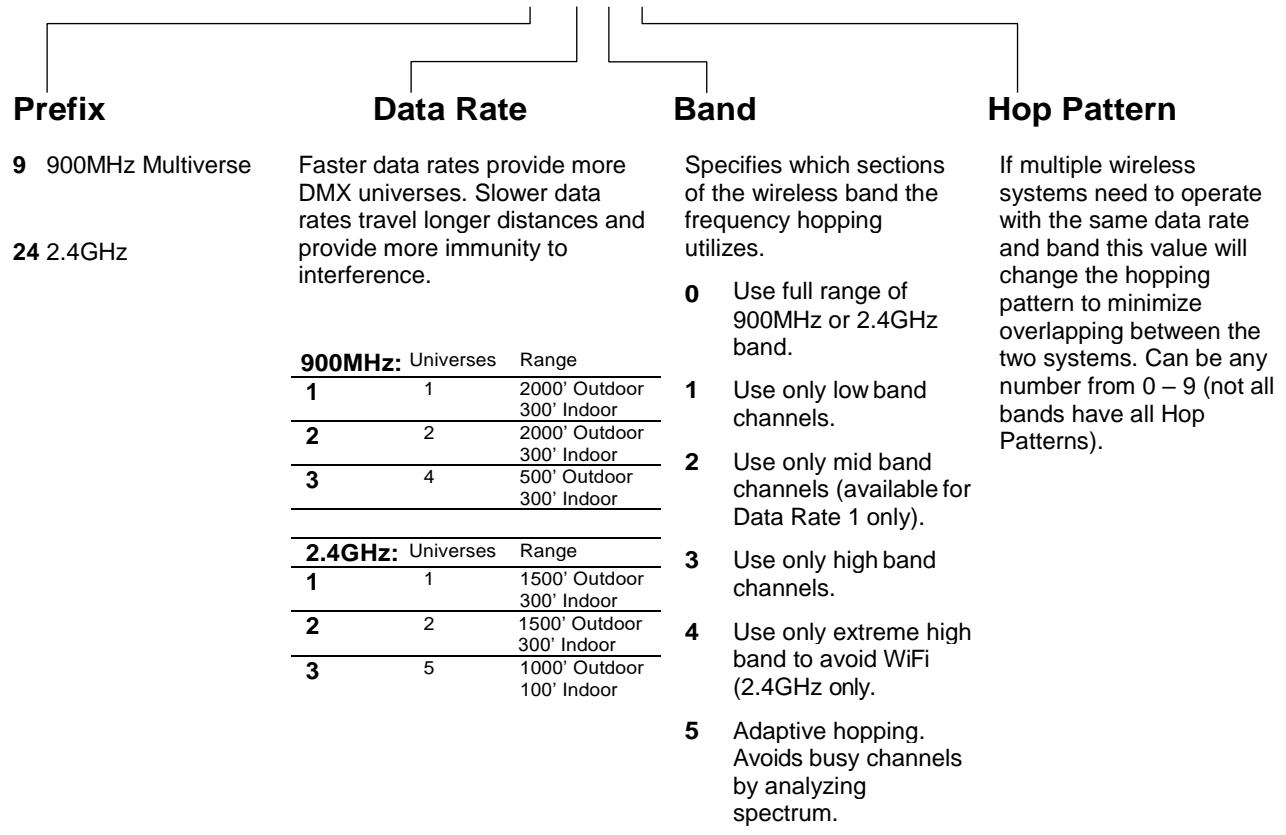
SHoW DMX SHoW IDs may be used with the 2.4GHz radio only for single universe systems. See Table 6 on page 13 for a list of SHoW DMX Neo SHoW IDs.

In a multi-universe system utilizing a Multiverse Transmitter or Multiverse Gateway as a transmitter, once you have selected the universes that you want to broadcast from the incoming Ethernet data, assigned SHoW IDs to your two radios, and have assigned universes to those SHoW IDs, you will need to set each Multiverse Node to match the same universe number and SHoW ID that it will be receiving.

Let's take a closer look at the SHoW ID numbering system:

Table 1: Selecting Your Multiverse SHoW ID

Multiverse SHoW ID Example: <u>24</u><u>3</u><u>0</u><u>2</u>

Prefix

9 900MHz Multiverse

24 2.4GHz

Data Rate

Faster data rates provide more DMX universes. Slower data rates travel longer distances and provide more immunity to interference.

900MHz:	Universes	Range
1	1	2000' Outdoor 300' Indoor
2	2	2000' Outdoor 300' Indoor
3	4	500' Outdoor 300' Indoor

2.4GHz:	Universes	Range
1	1	1500' Outdoor 300' Indoor
2	2	1500' Outdoor 300' Indoor
3	5	1000' Outdoor 100' Indoor

Band

Specifies which sections of the wireless band the frequency hopping utilizes.

0 Use full range of 900MHz or 2.4GHz band.

1 Use only low band channels.

2 Use only mid band channels (available for Data Rate 1 only).

3 Use only high band channels.

4 Use only extreme high band to avoid WiFi (2.4GHz only.

5 Adaptive hopping. Avoids busy channels by analyzing spectrum.

Hop Pattern

If multiple wireless systems need to operate with the same data rate and band this value will change the hopping pattern to minimize overlapping between the two systems. Can be any number from 0 – 9 (not all bands have all Hop Patterns).

Note: Not all combinations of digits are possible and unused numbers are reserved for future use.

Universe
When the Multiverse Node 900MHz/2.4GHz is configured as a receiver in a system where there is a multi-universe transmitter (Multiverse Transmitter or Multiverse Gateway) you can select the universe the Multiverse Node 900MHz/2.4GHz will receive and output on its DMX output port. The selected universe must match a valid universe being transmitted.

Note: Any Multiverse Node acting as a receiver that is set on a universe that Is not being broadcast by a Multiverse transmitter (either a Transmitter or Node) will show its universe in a yellow color.

User Interface Icons
At the top of the main screen are several icons that indicate Multiverse Node 900MHz/2.4GHz status. These include:

- **"TX" or "RX"**
  Each unit will display either "TX" (transmitter) or "RX" (receiver) depending on which mode the unit has detected. The Node is automatically set as a transmitter when there is a connector plugged into the DMX In (male) port. The "TX" or "RX" symbol remains solid when DMX data is detected, and blinks if no DMX data is being received.

- **Signal Quality Bars**
  The signal quality bars give a visualization of signal quality as seen at the receiver. The bars are not present when the unit is a transmitter. Signal quality of 85% or higher will achieve good fidelity, and signal quality of even 40-50% will often provide adequate fidelity.   Four bars is 80% or better signal quality, three bars is 50% or better, two bars is 30% or better, and one bar is 10% or better.

- **Restore Factory Defaults**
  Factory defaults can be restored by holding the "Menu" and "Enter" buttons while on the main screen. Screen will flicker to signal when default process is complete. Default settings are listed below.

Menu Screen
Pressing the "Menu" button takes you to the Menu screen.

- **Power**
  Output power may be user selected as Low, Med, Hi, or Maximum. It is a best practice to use the least amount of output power to achieve a successful show. This helps to reduce reflections which can reduce signal fidelity and to reduce any potential negative effect on other radio users in the area. You can monitor signal strength via RDM. Default is Maximum.

- **Antenna**
  If a panel (P/N 5981) or Yagi (P/N 5982) antenna is used instead of the default omni antenna, choose it on this menu for optimum performance and to remain in compliance with FCC and other radio compliance regulations. An (P/N 5638) adapter cable is required to use a panel or Yagi antenna.

- **SHoW Key Security** (Multiverse SHoW IDs only)
  The SHoW Key setting allows a user to enter a key to privatize their SHoW ID from another system on the same SHoW ID. SHoW IDs and SHoW Keys need to match in order for receivers and transmitters to talk to each other. Keeping your SHoW Key private will provide a level of security to your Multiverse system from unauthorized use. It is not recommended to use different SHoW Keys in a system that uses multiple Multiverse Nodes as Transmitters on the same SHoW ID. The range is 0 (Default) to 500.

Table 2: SHoW IDs and SHoW Keys

Situation		Condition	Outcome
Same SHoW Key	with	Different SHoW IDs	OK
Different SHoW Keys	with	Same SHoW IDs	Not OK
Different SHoW Keys	with	Different SHoW IDs	OK

- **Forward Error Correction** (Multiverse SHoW IDs only)
  High noise environments can affect wireless DMX performance. Enabling Error Correction adds additional information to the data packets to correct errors in slot data that would have otherwise been lost, restoring DMX delivery back to near perfect levels. The extra data reduces the number of slots that can be transported, Max reduces slots by 50%, Med by 33%, Min by 25%. Only needs to be set at the Transmitter. Default is Off.

- **mDMX** (Multiverse SHoW IDs only)
  Improves fidelity while dramatically reducing radio energy broadcast into the spectrum. Only needs to be set at the Transmitter. Default is On.

- **RDM Traffic**
  The RDM Traffic setting determines whether RDM data is passed downstream of the Multiverse Node 900MHz/2.4GHz. It does not affect whether the Multiverse Node 900MHz/2.4GHz is detectable by devices upstream. It is recommended that RDM be turned off before production situations as many DMX devices do not correctly handle RDM data and may exhibit flickering or other undesired behavior. Default is Off.

- **Backlight Timeout**
  The Backlight Timeout setting determines how long the LCD backlight will remain on after the last button press. The timeout can be set to off (backlight will never timeout) or any interval from 10 seconds to 1 hour. Default is 00:30. After a screen timeout, pushing any button will wake up the screen without changing the screen selection.

- **Backlight Level**
  Controls Backlight brightness. Range is 1%-100%. Default is 100%.

- **Information**
  The Information screen shows the RDM UID, firmware versions present, connection status, and the number of devices (receivers and fixtures) downstream.

RDM Settings

The Multiverse Node 900MHz/2.4GHz can be configured with a compatible RDM controller, such as DMXcat®. All of the settings available through the menu can be set via RDM. Aside from settings, you can also view the Device Model, Manufacturer, Firmware Versions, RDM UID, RF Signal Quality, and quantity of active Tx slots. You can also give each device a unique RDM Device Label to help with identification for configuration and troubleshooting.

Updating Firmware

Firmware updates and instructions for performing them are available on the product pages of the City Theatrical website.

Table 3: Troubleshooting Guide

Symptom	Solution(s)
Unit does not power up.	Check that power cable is properly installed.
	Test power outlet with another device.
Fixtures connected to the receiver are not responding.	Check that the Tx and Rx symbols on transmitters and receivers are solid.
	Check that SHoW ID and SHoW Key match on transmitters and receivers.
	Check that Universe setting matches on Tx and Rx.

Specifications

Table 4: Physical Characteristics

Product Information	
Product Name	Multiverse Node (900MHz/2.4GHz)
Part Number	5902
Maximum Concurrent Universes	1
Frequency Range:	2400 – 2480 MHz
	902 – 928 MHz

Physical Specifications	
Length	102.8mm (4.05 in)
Width	60mm (2.36 in)
Height	36.47mm (1.44 in)
Weight	0.4 Kg (0.4 lb)
Construction	Die Cast Aluminum, Black

Connection Specifications
*Locking DC Jack, 5.5mm x 2.1mm barrel, center positive,12.1mm mating depth
5-Pin XLR DMX512 in and out/thru ports
RP-SMA female antenna connector
USB Type-A port

Functionality	
User Interface	4 Button/Backlit LCD display
RDM Features	RDM Proxy, RDM Responder

Power	
Input Power	5-30VDC, 0.6W
Max Draw	45mA max draw at 12V
AC Adapter Voltage	100VAC to 240VAC 50/60Hz

Radio Technology	
Latency	4 ms average
RF Sensitivity	-95dBm
Loss of Data Behavior	Output stops
Broadcast Power	3.2mW, 10mW, 32mW, 100mW EIRP
Broadcast Modes	Adaptive, Full, Low, Mid, High, Max
Show IDs	307 (Americas)

Product Information	
Use Environment	Indoor
Operating Temperature	0° C to 40° C
Storage Temperature	-40° C to 85° C
IP Rating	IP50
Compliance	FCC, IC
Warranty	One year

*Note: This power supply connector is not compatible with SHoW Baby.

What's Included

Figure 1: What's Included

Table 5: Included Item Descriptions and Part Numbers

Label in Figure	Item Description	Part Number
1	Multiverse Node 900MHz/2.4GHz	5902
2	Mounting Plate with hardware	5975
3	12VDC Power Supply with locking connector and plug kit	5972
4	Antenna, Omni Broadband, 900MHz/2.4GHz, 2dBi/4dBi	5980
5	Multiverse Locking Barrel Connector Lead, 6"	5970

Face Panel

Receiver Mode: Transmitter Mode:

Antenna (folded forward)

USB Port

Mode

Current SHoW ID or Universe

Clickable Buttons: Menu, Up Arrow, Down Arrow, Enter

Part Number

Signal Quality (bars)

Locking DC Jack, 5.5mm x 2.1mm barrel, center positive,12.1mm mating depth

DMX out

DMX in   **DMX out**

*Note: This power supply connector is not compatible with SHoW Baby.

Figure 2: Face Panel

Mounting

Figure 3: Pipe Mount

Table 6: SHoW DMX Neo SHoW IDs for Use with the 2.4GHz Radio in Single Universe Systems

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
165	Neo	1	Max, Wi-Fi 13-14
166	Neo	2	Max, Wi-Fi 13-14

SHoW ID	Mode	Universe	Bandwidth
201	Neo Adaptive	A	Full
202	Neo Adaptive	B	Full
203	Neo Adaptive	C	Full
204	Neo Adaptive	D	Full