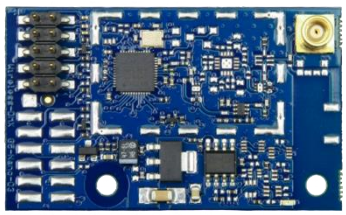
W-DMX™ OEM Partner

IMPLEMENTATION GUIDE
GENERATION 5

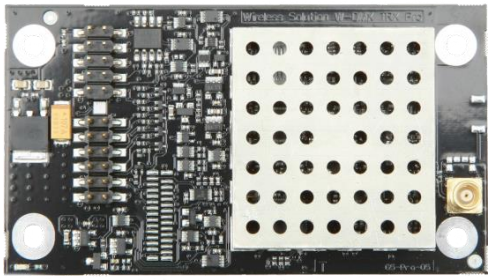
Revision 4
2021

TiNY series:

Nano series:



Pro series:



W-DMX™ OEM Partner

Author: Anders Zellén
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This document describes the mechanical and electrical properties, as well as the electrical interface, of the W-DMX™ OEM G5 series: TiNY, NANO, and Pro. Refer to Appendix 1 for a complete listing of Order Codes and descriptions.

The W-DMX™ system is the most advanced wireless lighting control system on the market today. With over 500,000 units sold, and over 50 OEM customers worldwide, the W-DMX™ wireless protocol has become the world's unofficial standard for Wireless DMX and RDM control.

The system is built with Adaptive Frequency Hopping technology, allowing to dynamically avoid other users of the radio spectrum, in order to ensure that we do not cause interference with other radio devices, like WLAN Wi-Fi networks, intercoms, among others. All radio cards come with this functionality as standard, with zero-configuration required.

Triple band support, with 2.4GHz, 5.2 GHz and 5.8GHz frequency bands is only available in the Pro range. These products are great to use in spaces with highly-congested wireless networks, and ensures functionality even in the toughest of environments, with a simple switch of frequency range.

All products support RDM communication, with a full managed proxy implementation. All RDM devices, when connected through the supporting W-DMX™ models will be exposed through the system to an upstream controller automatically.

DataSafe and InvisiWire technologies, which collectively ensure that data is more redundant to interference, is available as standard, making the systems respond just as a wire would.

Our G5 technology is backward compatible with G3 and G4S transmitters and receivers.

FCC STATEMENT

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

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

CONFIDENTIALITY NOTICE

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Please refer to our Non-Disclosure Agreement for complete information about Wireless Solution's confidentiality and non-disclosure policies.

Warning! ESD sensitive device

The W-DMX OEM PCB is sensitive to ESD.

Follow proper ESD control procedures when handling the W-DMX OEM PCB.

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1 Standards Compliance

1.1 FCC Declaration of Conformity

We,

Wireless Solution AB
Majorebergsvägen 2
451 75 Uddevalla
Sweden

declare under our sole responsibility that the product(s)

FCC ID: 2AZLM-WDMXPROG5
Model: A40890G5-SPI
Name: Pro G5
And
FCC ID: 2APCT-WDMXG5SB
Model: A40890G5-SPI
Name: Nano G5

These devices comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

NOTE: These equipment's 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 and correct the interference by one or more of the following measures:

- Reorient or locate 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.

FCC warning – module

The module is limited to OEM installation ONLY.

The module is limited to installation in mobile application.

The FCC Approval with FCC ID: 2AZLM-WMDXPROG5 or FCC ID: 2APCT-WDMXG5SB is only approving usage in mobile applications and with the antenna configuration stated in section 3A. A separate approval is required for all other operating configuration, including portable configuration with respect to Part 2.1093 and difference antenna configuration.

RF Exposure Warning for North America, and Australia

Warning!
This equipmen complies with FCC radiation exposure limites set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. This transmitter must not be co.-located or operating in conjunction with any other antenna or transmitter.

1.1.1 OEM Integrator instructions

The OEM Integrator is responsible for:

- Ensuring that the end-user has no manual instructions to remove or install the module.
- The Host equipment is equipped with information about the W-DMX modules FCC ID, if the modules label is not visible when it is installed, the wording such as the following
  "Contains FCC ID: 2AZLM-WDMXPROG5" for A40904G5-SPI
  or
  "Contains FCC ID: 2APCT-WMDXG5SB" for A40890G5-SPI
  or a similar wording that express the same meaning may be used.
- The Host equipment must have the following information abot the W-DMX module
  "This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
  (1) this device may not cause harmful interference, and
  (2) this device must accept any interference received, including interference that may cause undesired operation."
- The Host equipment manual must include the following information about the W-DMX module
  Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- The Host equipment manual must include the "RF Exposure Warning" as stated above.
- The final host/module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.
  If the host manufacturer needs assistance in meeting the FCC Part 15B requirements, Wireless Solution will provide guidance.

1.2 Industry Canada license-exempt

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) 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 est conforme aux CNR exempts de licence d'Industry Canada. Le fonctionnement est soumis aux deux conditions suivantes:

(1) Ce dispositive ne peut causer des interférences, et
(2) Cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'apparil.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS_102 RF exposure, users can obtain Canadian information on RF exposure and compliance.
Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.
Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

Host label:
The host equipment has to contain a label with the content:
Contains IC: iii-xxxxx for A40904G5-SPI
or
Contains IC: 23731-DMXG5SB for A40890G5-SPI

1.3 OEM Products' compliance

Wireless Solution has to the greatest extent possible mad regulatory compoliance for end products incorporating the W-DMX OEM TRX cards effortless for the OEM.
The W-DMX OEM TRX cards provide compliance with worldwide RF regulations with a few requirements outlined in this section:

1.4 USITT DMX-512A Compliance

This device complies with the USITT DMX-512A standard as described in ANSI E1.11-2008. See section 6.1 for details.

1.4 Product Marking

The following text and graphics have to be added to the product marking for compliance in the US and Europe:

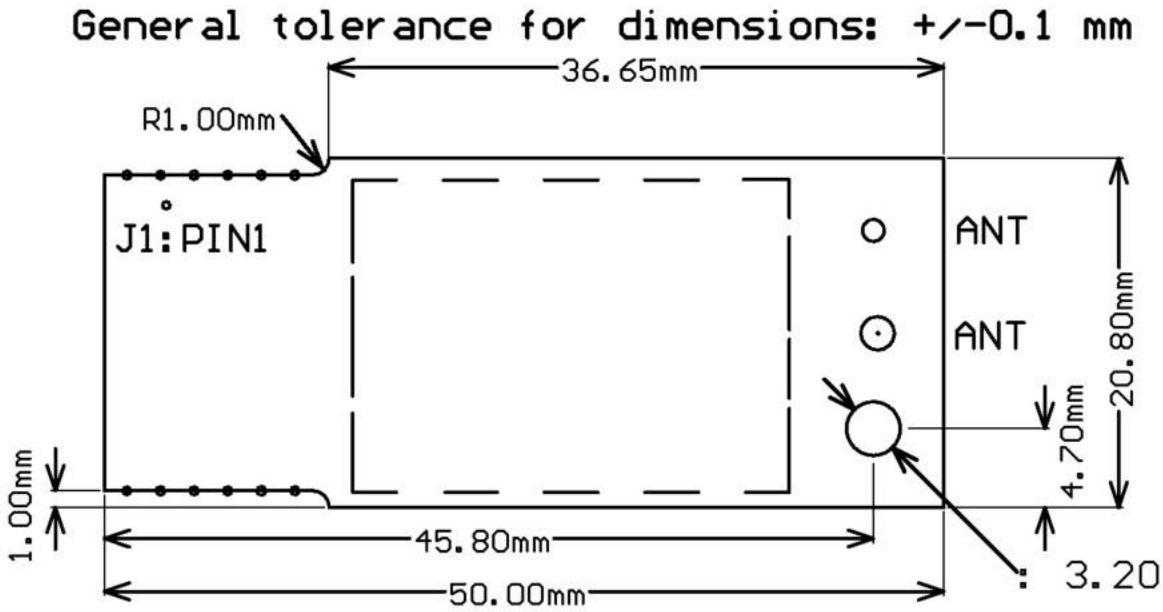
"This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. See instructions if interference to radio or television reception is suspected."

Original graphics in several file formats are available from Wireless Solution.

2 Mechanical Dimensions

2.1 TiNY Series

The card features one 3.2mm diameter mounting hole, one in the right bottom corner, next to antenna connector(s) – IPEX or RPSMA

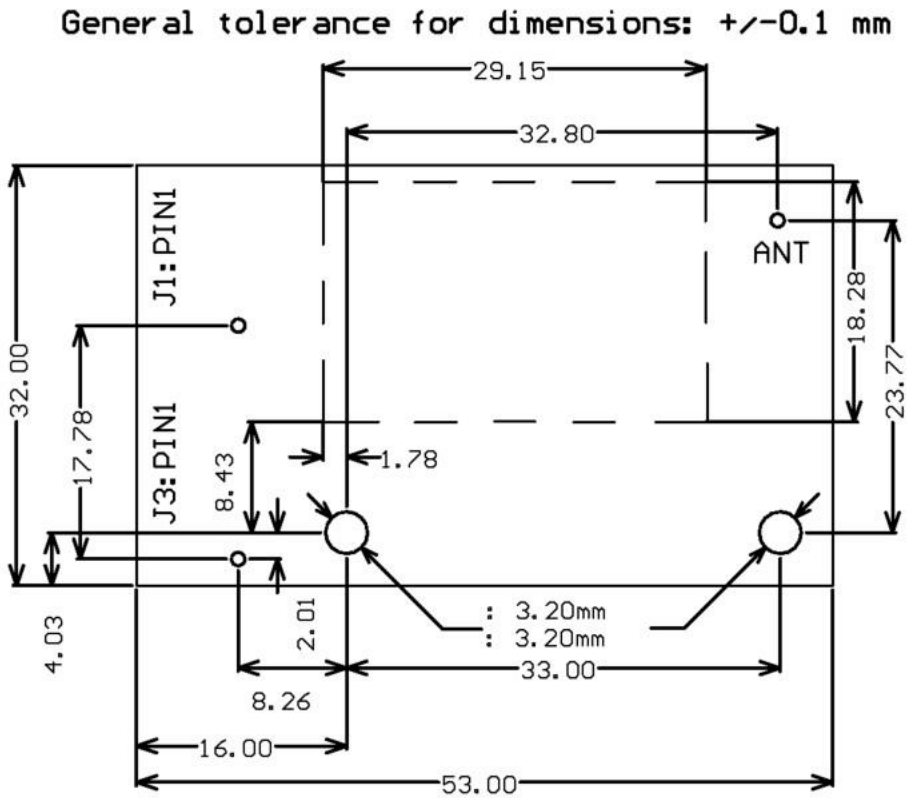


Mounting hole locations:

Screw #	X (mm)	Y (mm)
1	45.80	4.70mm

2.2 NANO series.

The card features two 3.2mm diameter mounting holes, one next to the antenna connector and one other opposite. Antenna options available is MCX connector or on-board internal antenna.

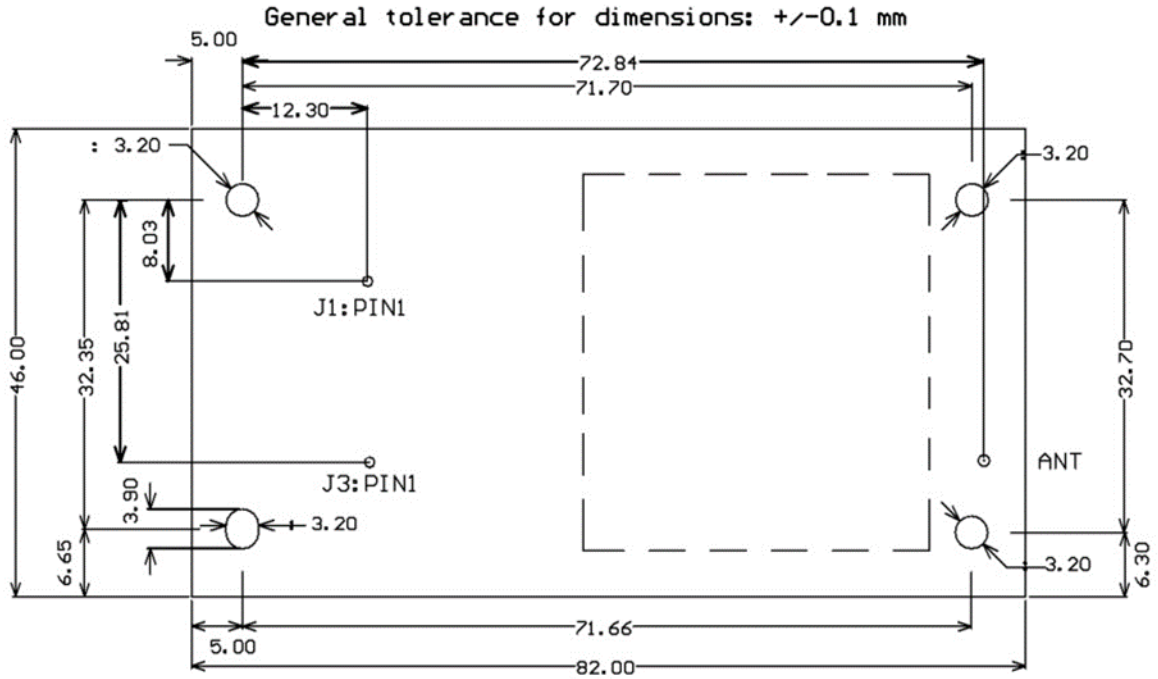


Mounting hole locations:

Screw #	X (mm)	Y (mm)
1	16	4
2	49	4

2.3 Pro series

S1 is a slot of 3,9 x 3,2 mm. S2, S3 and S4 are 3.2mm holes. Antenna options available is MCX connector or on-board internal antenna.



Mounting hole locations:

Screw #	X (mm)	Y (mm)
S1	5	6,65
S2	5	39,35
S3	76,66	39,35
S4	76,66	6,65

3. Antennas

Note that several aspects, including physical placement, should to be considered with both external antennas and the integral on-board antenna. While antenna placement is relatively flexible with the standard antennas recommended for OEM use, it is recommended to consult Wireless Solution prior to making the final antenna placement decision, to ensure optimal performance.

For fixtures made of aluminium housing, it's important to have an external antenna, or a backbone antenna that plugs into the MCX connector, as this material imposes a strong barrier against wireless signals.

The most common combination of W-DMX™ accessories is our MCX to RP-SMA connector with a 2 dBi omni-directional antenna. This is particularly popular among indoor installations.

For outdoor installations, products with an IP65 rating are required. An MCX to N-Type cable is recommended, as it provides a tighter seal between the housing and connector. If the installation is not directly exposed to the elements, an N to RP-SMA adaptor along with a standard 2dBi RP-SMA antenna can be used.

Short selection of cables and antennas from W-DMX™

Order Code	Name
A40920	W-DMX 20cm Antenna cable MCX – Chassis N Female Connector
A40921	W-DMX 20cm Antenna cable MCX – RP-SMA Chassis connector
A40922	W-DMX 40cm Antenna cable MCX – RP-SMA Chassis connector
A40924	W-DMX 30cm Antenna cable MCX – RP-SMA Chassis connector

A40501	Indoor 2dBi Omni Antenna. 2.45GHz
A40502	Indoor 5dBi Omni Antenna. 2.45GHz
A40511	Indoor 2dBi 2.45GHz / 4dBi 5 GHz
A40518G4B	Outdoor Black 3dBi 2.45GHz / 3dBi 5GHz
A40518G4W	Outdoor White 3dBi 2.45GHz / 3dBi 5GHz
A40520	Indoor 2dBi Omni Antenna. 2.45GHz. Mini
A40523	Indoor 2dBi Backbone antenna
A405021G4	IP65 chassis antenna 2dBi

More antennas are available from Wireless Solution. Please refer to our "W-DMX™ Antenna Options" guide, or consult the full catalogue online.

4. Power Supply considerations for transceivers and receivers

Transceivers and receivers have very different power requirements. Please read the following information carefully together with the electrical specifications at the end of this document.

4.1 Receivers

For a receiver only implementation a simple linear voltage regulator such as the common 7805 series is sufficient. Be sure to choose a package with sufficient cooling capabilities. A TO-220 or D-Pak is usually a good choice.

4.2 Transceivers

As transceivers can draw high currents when transmitting, a more sophisticated solution is generally required. It is especially important to make sure the supply can handle the brief peaks.
The W-DMX radio cards have built in under voltage detection which protects the system from permanent electrical damage, but data loss might still occur.
If the transceiver card is used as an RDM receiver, then you also need to take into consideration the current used during transmission.

4.3 Power Indicator

All OEM cards are equipped with an on-board green power indicator LED, which lights up when the card is powered properly.

4.4 Dynamic voltage

The Nano A40890G5SPI and Nano receivers have dynamic voltage input on PIN J1:6 and 3.3V on Pin J1:8, do not use both at the same time.
The Tiny range have 5V only on pin 6.
The Pro range have 5V only on both Pin J1:6 and J1:8.

4.4.1 Transceivers

The Nano transceiver A40890G5-SPI cards will take 5V up to 26V.

4.4.2 Receivers

The Nano receivers will take 5V up to 15V.

5. Interface Connectors

Pin 1, 2, and 3 of J1 will function as a DMX/RDM input on a Transmitter card and as a DMX/RDM output on a Receiver card.

No provisions are made on the W-DMX OEM TRX card for the secondary DMX data connections, or any other form of data, that is sometimes carried by Pin 4 & 5 on 5 pin DMX XLR connectors, and as such these two extra pins should never be connected to any pin on the radio card.

J1 and J3 are both commonly available standard dual row 2.54mm (0.1") pitch pin headers J1 and J3 are located in such way so that they together fit in a 24 pin header.

5.1 Pinout reference

TiNY

Nano

PRO:

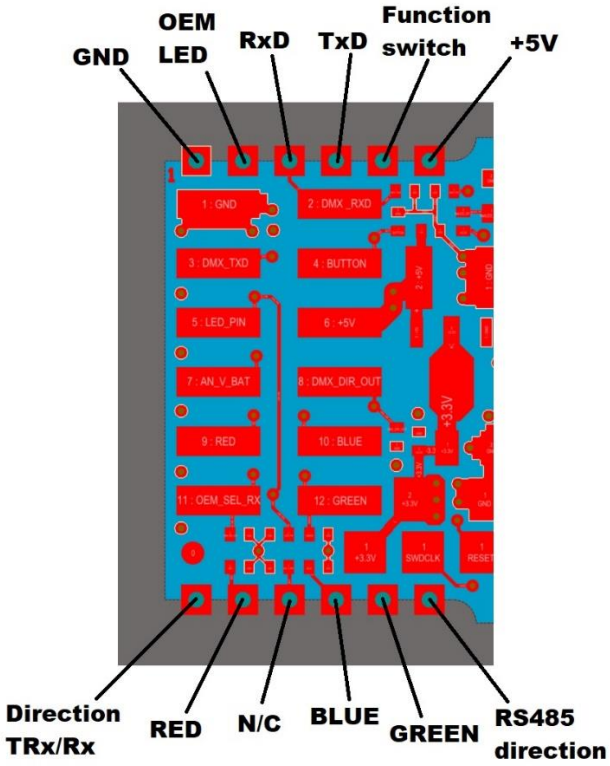
5.1.1 TINY series Pinout

Pin Nr	Function		Comment
1	GND	P	Ground
2	RxD	I	UART RxD pin
3	TxD	O	UART TxD pin
4	Function switch	I	Pull up to 3.3V internally
5	OEM LED	O	3.3V when high
6	5V	P	Power supply
7	N/C		Internal use
8	RS485 direction	O	Direction for an RS485 driver
9	Red	O	Red part of RGB indicator
10	Blue	O	Blue part of RGB indicator
11	Direction	I	Direction selection, pull up to 3.3V internally
12	Green	O	Green part of RGB indicator

IMPORTANT: DMX direction for cards
All transceiver cards can operate as transmitter or receiver, by setting the voltage on pin 11 in the following 3 configurations:

Pin 11 voltage	Function
GND	Transmitter (like G4 type O cards)
3.3V (Open)	Receiver (like G4 type O cards)
1.65V	Transmitter or receiver (like G4 type R cards) Direction is fetched from non-volatile memory; direction is changed if the button (pin 4) is connected to GND during power up

TINY Castellation vias signal description



5.1.2 NANO series Pinout

Pin number	Function		Comment
J1:1	GND	P	Ground
J1:2	Data - / RxD	I/O	RxD if J3:12 is connected to 3.3V, internal pull-down
J1:3	Data + / TxD	I/O	TxD if J3:12 is connected to 3.3V, internal pull-down
J1:4	Function switch	I	Pull up to 3.3V internally
J1:5	OEM LED	O	3.3V when high
J1:6	5V, 5-15V, 5-26V	P	VCC, Power supply depending on card model
J1:7	GND	P	Ground
J1:8	3.3V	P	3.3V power supply. Different compared to G4
J1:9	Reception Indicator / Mode	O	Different compared to G4
J1:10	Direction	I [1)]	Direction selection, pull up to 3.3V internally, for TRX cards
	J3 is only for cads with -SPI extension		
J3:1	RESET#	I	MCU reset, internally pulled high?
J3:2	RX_NOT_TX	O	Output, High as RX, low as TX
J3:3	Reserved	NC	N/C internal use
J3:4	Reserved	NC	N/C internal use
J3:5	Slave IRQ	O	IRQ signal when radio card is SPI slave, not implemented
J3:6	Overlay CS	O(I) [2)]	CS Signal for overlay, active high
J3:7	SLAVE CS	I	CS Signal when radio card is SPI slave, not implemented
J3:8	SCK	O(I) [2)]	Serial Clock signal
J3:9	MISO	I(O) [2)]	Master In, Slave out signal
J3:10	MOSI	O(I) [2)]	Master Out, Slave in signal
J3:11	RS485 DIR	O	Direction for RS485 driver
J3:12	RS485 DISABLE	I	Connect to 3.3V when internal RS485 driver should be turned off

1) IMPORTANT: DMX direction for cards
All transceiver cards can operate as transmitter or receiver, by setting the voltage on J1, pin 10 in the following 3 configurations.

J1:10 voltage	Function
GND	Transmitter (like G4 type O cards)
3.3V (Open)	Receiver (like G4 type O cards)
1.65V	Transmitter or receiver (like G4 type R cards) Direction is fetched from non-volatile memory; direction is changed if the button (pin 4) is connected to GND during power up To accomplish this, it is easiest to use two 4.7kOhm resistors, put one 4.7kOhm from J1:8, (3.3V) to J1:10 and one 4.7kOhm resistor from J1:7, 7(GND) to J1:10 .

2) The radiocard is default SPI Master but can be set to operate as SPI slave (via the OSP protocol) To set the radiocard to SPI slave, connect Overlay CS to GND during startup. Overlay CS will after that operate as an input signal to define if the communication is DMX data or commands.

5.1.2.1 Migrating from G4 to G5

PLEASE NOTE:

- Pin 6 can handle 5 to 15V input on all receiver cards
  A40895G5 and A40896G5SPI
- Pin 6 can handle 5V input on following transceiver cards
  A40891G5SPI
- Pin 6 can handle 5 to 26V input on following transceiver cards
  A40890G5SPI
- Pin 8 can only be connected to 3.3V.
- Connect only one power source to the card
- OEM LED output 3.3V when the LED should be on, adjust resistor to give enough current to the LED, maximum output current is 0.5mA, if higher current is required, a solution with a buffer or transistor driver is required.
- Pin 9 does not indicate MODE on the receiver, on receiver it is indicating reception
- Shutdown voltage:
  To ensure stable operation, the voltage need to be according to the pinout list. However, the card may be operational all the way down to 1.5V, to ensure that the card is disabled, voltage on power pin need to be reduced to 0V
- OSP interface are improved and the radio card will be SPI Slave during communication, to enable this, the Overlay CS signal need to be pulled low during power up, this will prevent the radio card from being master and output the Overlay signal. Further documentation of the OSP protocol will be available at a later date.
- Overlay interface has been changed

5.1.3 PRO series Pinout

Pin number	Function	Dir	Comment
J1:1	GND	P	Ground
J1:2	Data -	I/O	RS485 Negative or TTL level Rx
J1:3	Data +	I/O	RS485 Positive or TTL level Tx
J1:4	Function switch	I	Pull up to 3.3V internally
J1:5	OEM LED	O	3.3V when high
J1:6	5V	P	Power supply depend on card model
J1:7	GND	P	Ground
J1:8	5V	P	Power supply
J1:9	Reception Indicator / Mode	O	Indicates G3/G4/G5 Mode
J1:10	Direction	I/O	Direction selection, pull up 3.3V internally
J3:1	RESET#	I	MCU reset, internally pulled high
J3:2	RX_NOT_TX	O	Output, High as RX, low as TX
J3:3	Inter A	I/O	Reserved, do not connect
J3:4	Inter B	I/O	Reserved, do not connect
J3:5	OSP IRQ#	I	Slave interrupt request
J3:6	Overlay CS	O	Chip select for overlay interface
J3:7	OSP CS#	O	Chip select for slave MCU interface
J3:8	SCK	O	SPI Clock
J3:9	MISO	I	SPI Data In
J3:10	MOSI	O	SPI Data Out
J3:11	RS485 Ext. Dir.	O	RS485 direction for external driver
J3:12	RS485/TTL Sel.	I	Select RS485/TTL level internally pulled low to select RS485

1) IMPORTANT: DMX direction for cards
All transceiver cards can operate as transmitter or receiver, by setting the voltage on pin 10 in the following 3 configurations:

J1:10 voltage	Function
GND	Transmitter (like G4 type O cards)
3.3V (Open)	Receiver (like G4 type O cards)
1.65V	Transmitter or receiver (like G4 type R cards)
	Direction is fetched from non-volatile storage; direction is changed if the button J1:4, is connected to GND during power up.

2) The radiocard is default SPI Master but can be set to operate as SPI slave (via the OSP protocol) To set the radiocard to SPI slave, connect Overlay CS to GND during startup. Overlay CS will after that operate as an input signal to define if the communication is DMX data or commands.

5.1.3.1 Migrating from G4 to G5

PLEASE NOTE:

- OEM LED output 3.3V when the LED should be on, adjust resistor to give enough current to the LED, maximum output current is 0.5mA, if higher current is required, a solution with a buffer or transistor driver is required.
- Pin 9 does not indicate MODE on the receiver, on receiver it is indicating reception
  Output voltage is 3.3V, max current is 0.5mA
- Shutdown voltage:
  To ensure stable operation, the voltage need to be according to the pinout list. But the card may be operational all the way down towards 1.5V, to ensure that the cards is disabled, power need to be reduced to 0V
- All J1 pins (except for J1:2 and J1:3) is 5V tolerant
  J1:2 and J1:3 follows the DMX standard
- OSP interface are improved and the radio card will be SPI Slave during communication, to enable this, the Overlay CS signal need to be pulled low during power up, this will prevent the radio card from being master and output the Overlay signal. Further documentation of the OSP protocol will be available at a later date.
- Overlay interface has been changed
-

6 DMX Interface and Specification

The pin header provide DMX as non-isolated RS-485 signal available on pins Data+ and Data- (not valid for TiNY series). In addition, the pin header can also be configured to provide TTL level signals on the same pins (only for TiNY and cards with -SPI suffix in article code). This enables a designer to bypass the need for RS485 converters. To select TTL levels instead of RS485, pull the RS485/TTL Sel. pin J3:12 high. Refer to the connector description for pin numbering.
Note that all normal DMX/RDM timing requirements apply regardless of signal levels.

6.1 Conformity to ANSI E1.11-2008

The W-DMX G5 conforms to the USITT DMX-512A standard with the following specifications:

6.1.1 Loss of data handling procedure.

6.1.1.1 Loss of DMX or Radio Link

Recovery of DMX at the receiving end after loss and resumption of DMX signal at the transmitter is within 5 ms.
Recovery after complete loss of the radio link is less than 50ms when there are normal reception conditions.

The TRX OEM receiver cards will turn their DMX/RDM output into high impedance state upon loss of DMX at the transmitter, or loss of radio link at the receiver.
The W-DMX G5 radio protocol employs what is known as Data Safe which has redundancy on in the packets sent over the air and send each DMX slot at least twice, and distributes them on different frequencies, thereby greatly improving reliability and data fidelity, and greatly reducing the chance of data loss caused by spurious interference when compared to other Wireless DMX products. However, no radio system is 100% noise proof and if higher data reliability where no bytes can be allowed to be wrong, the user needs to implement some kind of error correction scheme above the DMX layer.

6.1.1.2 Loss of Power

Configuration information is stored in non-volatile memory and will not be lost upon loss of power to the card. This information includes system setup and settings for power level and frequency hopping pattern, as well as connection information for the previous transmitter the unit was connected to. The non-volatile memory will retain its information for a minimum of 10 years without power.

Upon loss of power to the card the RS-485 DMX ports of the device will go into a high impedance state, as mandated by the DMX standard.
Resumption of wireless transmission and reception of data takes place within a second after power is reapplied to the card, depending on configuration.

6.1.2 Packet processing latency.

The W-DMX™ systems have an average latency of 3ms from when data comes in to the radio transmitter to when data is transmitted from the radio receiver when running in G5 radio mode.

6.1.3 NULL START Code functionality.

The W-DMX™ system forwards all packets regardless of start code in G5 mode, with the exception of RDM start codes, which are processed internally on RDM enabled devices. In other radio modes only NULL START Code packages is forwarded.

6.1.4 Slot footprint.

The W-DMX system has a slot footprint of zero.

7. User Interface

The W-DMX™ system offers the following user interface options:

1. A push button (called function switch) and one or more status LEDs.
2. Overlay Interface
3. OEM SPI Protocol (OSP) interface
4. RDM interface

The developer is free to implement one or more of the above options. Note that option 1 and 2 can also be controlled or read from a microcontroller, but in such a case using the OSP is recommended.

IMPORTANT! The Function Switch and the LED indicator are the minimum requirement for a working OEM implementation. Without a way to interact with the system the user may be left with an inoperable device.

7.1 Function Switch

The function switch can be a simple momentary push button connected between pin J1:4 and ground or a transistor controlled by a micro controller. Refer to the table below for exact timings required.

7.1.1 Link

When the button is pressed for 1 to 2 seconds, the transmitter will pair with unlinked receivers within range.

7.1.2 Unlink

On a transmitter holding the button for more than 3s and then releasing it will cause any linked receivers to unlink. On a receiver holding the button for more than 3s will cause that receiver to unlink.

7.1.3 Transceiver direction

The W-DMX™ transceiver cards come in two configurations: transmitter and receiver. Cards configured as OEM, or Pin 10, rely on the state of pin J1:10 to set the direction of operation (TX or RX). An RDM enabled transmitter will periodically switch to radio receive mode to listen for replies without the need of any user interaction.
Pulling pin J1:10 low selects transmitter mode and pulling it high or leaving it floating selects receiver mode. Changing the pin state will immediately change the radio card configuration.

Cards configured as Flex Button read the state of pin J1:4 at start up and will, if the pin is low, switch mode. A receiver becomes a transmitter and vice versa. When J1:4 is held low at boot, the boot loader will be bypassed, giving control to the main program immediately. Thus the pin only has to be held low for a very short period of time.

7.1.4 Control Mode

Transmitters will enter a control mode when the button is held low for more than 10s. In this mode further button presses will cycle through G3, G4S, G5; G4S and G5 5.8GHz modes and G4S and G5 5.2GHz radio modes. 5GHz options are only available in certain radio cards.

Pushing the button for more than 3s leaves Control Mode and saves the new mode.

7.1.5 Function Switch Timing

The functionality provided by the Function Switch input and its timing parameters are described in the table below.

	Time min	**Time max**
Transceiver		
Idle / Normal Operation	-	-
Link Receivers	100ms	3s
Unlink all receivers	3s	10s
Toggle direction at boot (Flex Button Mode only)	100ms	-
Enter control mode	10s	-
Stepping between radio modes	100ms	2s
Store radio mode and leave control mode	3s	-
Receiver		
Idle/Normal Operation	-	-
Unlink from a transmitter	3s	-

7.1.6 Status Indicator LED

The Status LED indicates the current status of the wireless connection and the presence of DMX data. The status is valid after start-up process has finished after ~1.7s (worst case) from power on.

The LED is active high, and should be connected between J1:5 and ground, for example J1:7 (on a NANO) via a series resistor.

The indications below are valid during steady state, that is in normal running mode after the boot loader has finished.

 / "Off" denotes a dark LED and  "On" denotes a lit LED.

7.1.7 TiNY indicator LED

OEM LED indication of link as a transmitter:

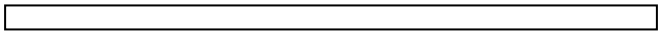
On 900ms / Off 100ms = no DMX present

Continuously On = DMX present

On 100ms / Off 100ms = linking receivers

On 500ms / Off 500ms = unlinking all receivers

OEM LED indication of link as a receiver:



Continuously Off = not assigned to a transmitter

On 900ms / Off 100ms = assigned to a transmitter, but no DMX present

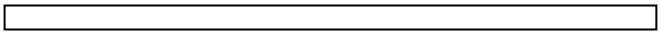
Continuously On = assigned to a transmitter and DMX present

On 100ms / Off 100ms = link to transmitter lost or linking to transmitter

RGB mode indication as a transmitter:

Blue On, Red and Green Off = G5 mode

Green On, Red and Blue Off = G4S mode



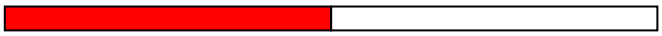
Red, Green and Blue Off = G3 mode

RGB mode indication as a receiver:

Green on, Red off, Blue Off = More than 90% reception

Green On, Red On, Blue Off = More than 75% reception

Green Off, Red On, Blue Off = More than 50% reception



Green Off, Red On, Blue Off = Less than 50% reception, 1Hz blinking

7.1.8 NANO/PRO indicator LED

OEM LED indication of link as a transmitter:

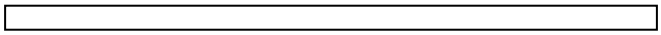
On 900ms / Off 100ms = no DMX present

Continuously On = DMX present

On 100ms / Off 100ms = linking receivers

On 500ms / Off 500ms = unlinking all receivers

OEM LED indication of link as a receiver:



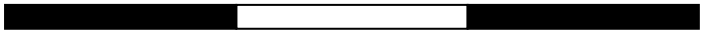
Continuously Off = not assigned to a transmitter

On 900ms / Off 100ms = assigned to a transmitter, but no DMX present

Continuously On = assigned to a transmitter and DMX present

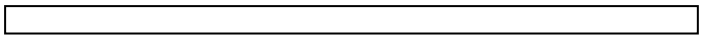
On 100ms / Off 100ms = link to transmitter lost or linking to transmitter

MODE LED indication of mode as a transmitter:



Continuously On = G5 mode, 1.6s period, 50% on

Continuously On = G4S mode



Continuously Off = G3 mode

MODE LED indication of mode as a receiver:

After a low pass filter [1]
The signal has a 1s period, that goes low in 100ms steps to indicate reception rate:
100% reception: High
90% reception: 900ms high, 100ms low
60% reception 600ms high, 400ms low

[1] The low pass filter should filter pulses that are up to 50 us long. Pin 9 can drive up to 0.5mA and for filter purpose, there is a 330ohm resistor on the PCB between the driver and the pin.

There will be a pulse for each received radio package, if the pulse is high or low depends on the current signal level, there will be an error of up to 2 pulses for each second, so the error is neglectable if the reception is measured with pulse counting.

7.2 LED Overlay Interface, G5 cards

This is applicable to G5 cards with SPI functionality (two pin headers).

It is possible to implement a display interface similar to the one used on the W-DMX™ BlackBox/WhiteBox range.

The overlay interface consists of an SPI interface that shifts out data for the LEDs as described below. To avoid flicker a latched shift register is recommended.

The SPI speed is 2.5MHz and Overlay CS is pulled high before the output start and pulled low after the SPI output has ended, SCK and MOSI is output signals.

7.2.1 LED order

Name	Bit	Text	Color	Description
Power	0	PWR	Blue	Power, blinking in control mode
RDM	1	RDM	Green	RDM on/off
Green of Mode LED	2	Mode	Green	Mode indicator, part of a RGB LED
Red of Mode LED	3	Mode	Red	Mode indicator, part of a RGB LED
Blue of Mode LED	4	Mode	Blue	Mode indicator, part of a RGB LED
2 Universe	5	UNIV	Green	Is receiving a 2 universe link
Link	6	LINK	Green	Link established
Data	7	DATA	Green	DMX Data present
Transmit Mode	8	TX	Green	Radio Transmitter
Receive Mode	9	RX	Green	Radio Receiver
Reserved	10			
Signal 1	11		Red	Signal Strength
Signal 2	12		Yellow	Signal Strength
Signal 3	13		Green	Signal Strength
Signal 4	14		Green	Signal Strength
Signal 5	15		Green	Signal Strength

The *MODE* RGB LED indicate as follow:

Off: G3 mode
Green steady: G4S mode 2.4GHz
Green slow blink: G4S mode 5.8GHz
Blue steady: G5 SU mode 2.4GHz
Blue slow blink: G5 SU mode 5.8GHz
Blue fast blink: G5 SU mode 5.2GHz

7.3 W-DMX™ OEM SPI Protocol (OSP) Interface

Wireless Solution's W-DMX™ G5 devices (marked with –SPI) support a simple SPI based communication interface that enables an external microcontroller to easily configure a radio card for operation. Commands available includes logging in and out, changing radio mode and power, reading out serial number and model.

The radio card assumes the role of SPI slave and the external MCU is operating as master.

NOTE: The OSP needs to be enabled when the radio card is powered up, by pulling overlay #CS low

7.3.1 Pin Configuration

The OSP uses the following signals:

MOSI	I	Data in to the W-DMX device
MISO	O	Data out from the W-DMX device
SCK	I	Clock signal to the W-DMX device
Overlay CS	I	Enable signal during power up. OSP MODE signal DMX / Command selection
Slave CS	I	W-DMX device Chip Select signal
Slave IRQ	O	Interrupt signal for DMX data from W-DMX device
GND	P	Ground return path

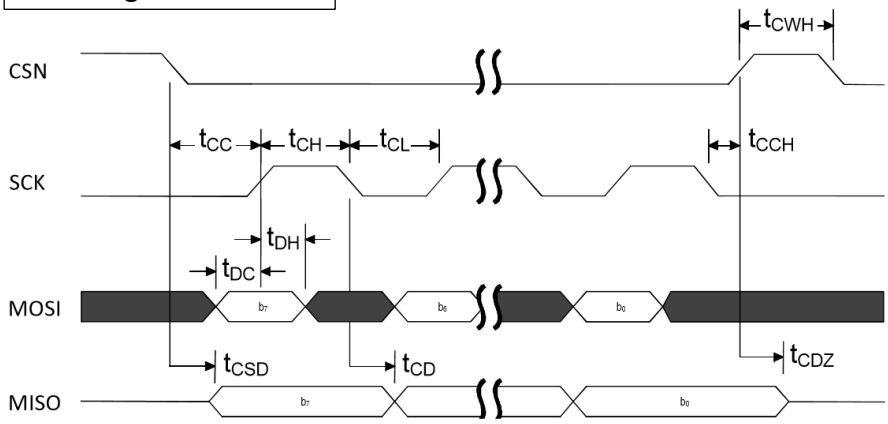
Please refer to the pinout guide for corresponding pins.

7.3.2 SPI Settings

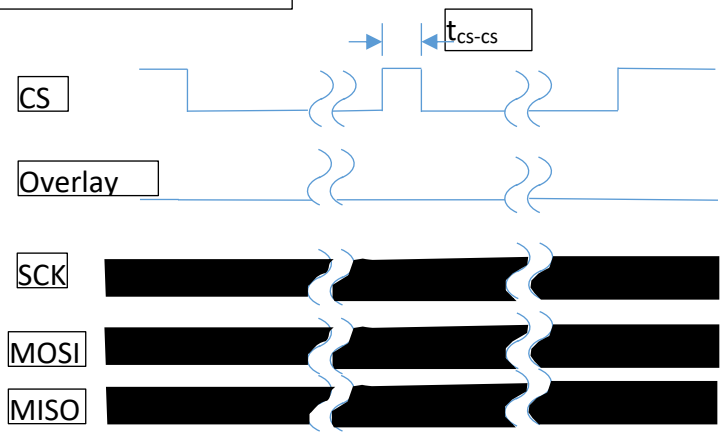
Parameter		Min	Typ	Max	Unit	Comment
SPI Mode						0. Clock idles low. Data valid on leading clock edge SPI Slave
Data Bit Rate	f_{SCK}	0.125		2	Mbps	
Minimum time between commands/data	t_{cs-cs}	60			us	From CS go high to CS low
Time between MODE goes high to active CS	$t_{dmxSetup}$	10			us	
Time from CS Inactive to MODE inactive	t_{dmxEnd}	60			us	
Dmx slots in one transmission		1		255		
Data to SCK setup	t_{DC}	10			ns	
SCK to data hold.	t_{DH}	10			ns	
CS to data valid	t_{CSD}			2100	ns	
SCK to data valid	t_{CD}			97	ns	
SCK low time	t_{CL}			40	ns	
SCK high time	t_{CH}	40			ns	
CS to SCK setup	t_{CC}	2			us	
Last SCK edge to CS hold	t_{CCH}	2			us	
CS inactive time	t_{CWH}	60			us	
CS to output high Z	t_{CDZ}			40	ns	
SCK rise and fall time	t_R, t_F			100	ns	

IMPORTANT: Do not have to short time between Command and Data package, that is separate SPI packages. Minimum time is noted in the table as t_{cs-cs}

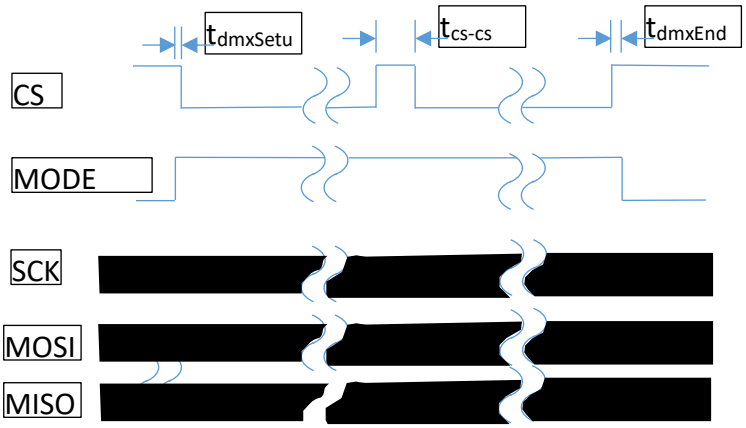
SPI Timing



Command package



Data package



7.3.3 Transaction Format

OSP packet format

The OSP packet consists of two parts:

Part 1: Send command byte to COB, Status byte is received
Part 2: Send/receive additional data bytes (1-32)

Each part starts with OSP CS is activated low and ends with OSP CS deactivates as high, between the parts, t_{CS-CS} need to elapse.

An OSP packet consists of at least a packet header of two status bytes and a command, and a number of data bytes depending on the command.
The status bytes are shifted out from the WDMX device at the same time as the command byte is shifted in.

DMX packet format

When transmit or receive DMX, pull MODE pin high, before DMX data is accepted / delivered on the SPI bus, the OSP_DMX_OVER_SPI need to be set to 1. When MODE pin is pulled high, the DMX package start from the beginning and expect the first package again.

Transmit DMX data

CS needs to be asserted for each SPI package to transmit DMX.

When transmitting DMX data, the first package contain Start Code and optional packet length and DMX speed according to the following format:

Byte	Optional	Content	Comment
0		Start Code	
1	X	High byte of slot count (16 bit)	
2	X	Low byte of slot count (16 bit)	Start Code is considered to be one slot, so when transmitting 512 slots, the 16 bit value should be 513. Default value is 513
3	X	DMX Speed	Select one of 3 DMX speeds: 0: High speed ~42 Hz 1: Middle speed ~33 Hz (default) 2: Low speed ~22 Hz

If byte 1 is transmitted, but not byte 2, byte 1 is ignored.
The following packages contains DMX slots, maximum up to 255 slots in each package.

First package DMX data

Byte	Optional	Content	Comment
1		Data slot 1	
2		Data slot 2	
..			
n		Data slot n	Can be anything from 1 to 255

Next package DMX data

Byte	Optional	Content	Comment
1		Data slot n+1	
2		Data slot n+2	
..			
y		Data slot n+y	y can be anything from 1 to 255

When the complete DMX package is received, the radio will start to transmit the DMX package according to the timing specification, to be able to have the receiving DMX speed out on cable to match the setting. This will also control the redundancy of the DMX data in radio packages when running G4S radio mode, the minimum redundancy is that each slot is sent two times.

Slots that are above the Slot Count limit will be ignored.

The IRQ line will be activated when the radio need is ready for the next DMX package.

Receive DMX data

When a complete DMX package is received on the radio, the IRQ line will indicate that a new DMX package has arrived.

CS needs to be asserted for each package on the SPI bus to receive DMX data.

First package contains start code and timing information, the MCU can select anything from 3 to 11 bytes to receive.

Byte	Optional	Content	Comment
1		Start Code	
2		High Byte of slot count	
3		Low Byte of slot count	The start code is counted as one slot
4	X	High byte of Break length	
5	X	Low Byte of break length	Break time in us
6	X	High byte of Mark after break	
7	X	Low Byte of mark after break	Mark after break time in us
8	X	High byte of interslot time	
9	X	Low byte of interslot time	Interslot time in us
10	X	High byte of Mark before break	
11	X	Low byte of mark before break	Mark before break time in us

Second and following package contains DMX data

Byte	Optional	Content	Comment
1		Slot 1	
2		Slot 2	
…		…	
n		Slot n	n is max 255

Third and following package contains DMX data

Byte	Optional	Content	Comment
1		Slot n+1	
2		Slot n+2	
…		…	
y		Slot n+y	y is max 255

When the last slot according to slot count (from the first package) is transmitted, the rest of the data is not valid. The following package will be a new “First package” with start code, slot count and optional timing data.

Command Byte

The first byte sent from the external uC determines the action to be taken. It has the following format.

Name	Bits	Description
OSP_COMMAND_MASK	0-6	Command, see the list of available commands
OSP_MODE_MASK	7	Mode, 0=GET, 1=SET

Status Bytes

Two status bytes are sent out from the W-DMX device at the same time as the command is shifted in. The lower byte is sent first.

The two status bytes have the following format:

Name	Bits	Description
OSP_STATUS_SIGNAL	0-2	Signal strength or output power
OSP_STATUS_DIR	3	0=Tx, 1=Rx
OSP_STATUS_LINK	4	0=No link, 1=Linked
OSP_STATUS_LOGGED_IN	5	1=Logged in
OSP_STATUS_DATA	6	1=DMX data present
OSP_STATUS_RDM	7	1=RDM Enabled
OSP_STATUS_CTRL	8	1=Control mode
	9-15	Reserved for future use

Note that the least significant byte is sent first.

7.3.6 Available commands

The seven least significant bits of the command byte sets the command. A receiver only card supports the subset represented in the RX column. Any unsupported mode/command combination is ignored. Size is number of data bytes after the header.

Command	ID	GET	SET	TRX	RX	Size	Comment
OSP_STATUS	0x00	X		X	X	0	Returns the status bytes
OSP_DMX_OVER_SPI	0x01	X	X	X	X	1	Enable or disable DMX on SPI port 0: Disable DMX on SPI, enable on UART 1: Enable DMX on SPI, disable on UART
OSP_RADIO_LOGIN	0x10		X	X		0	Initiates login
OSP_RADIO_LOGOUT	0x11		X	X	X	0	Initiates logout
OSP_RADIO_MODE	0x12	X	X	X		1	Sets the radio mode 0. Receiver Mode 1. - 2. - 3. - 4. - 5. G4S 2.4GHz Can only change to / from radio mode if pin 10 is set to 1.65V
OSP_RADIO_AFHSS	0x15	X	X	X		1	Adaptive frequency hopping
OSP_RADIO_SIGNAL	0x16	X		X	X	1	Receive Signal Strength, 0-255
OSP_RADIO_MASK24	0x18	X		X		11	Return the current frequency mask
OSP_DEVICE_LABEL	0x21	X		X	X	32	Returns the Device Label String
OSP_DEVICE_MODEL	0x22	X		X		32	Returns the Device Model String
OSP_DEVICE_SERIAL	0x24	X		X	X	5	Five bytes, BCD coded
OSP_RDM_UID	0x30	X		X		6	Six bytes RDM UID
OSP_RDM_DOWNSTREAM	0x31	X	X	X		1	Enable/Disable RDM propagation. See the WDMX RDM Manual for details.

7.3.8 Command and Status Enumerations for use in C code

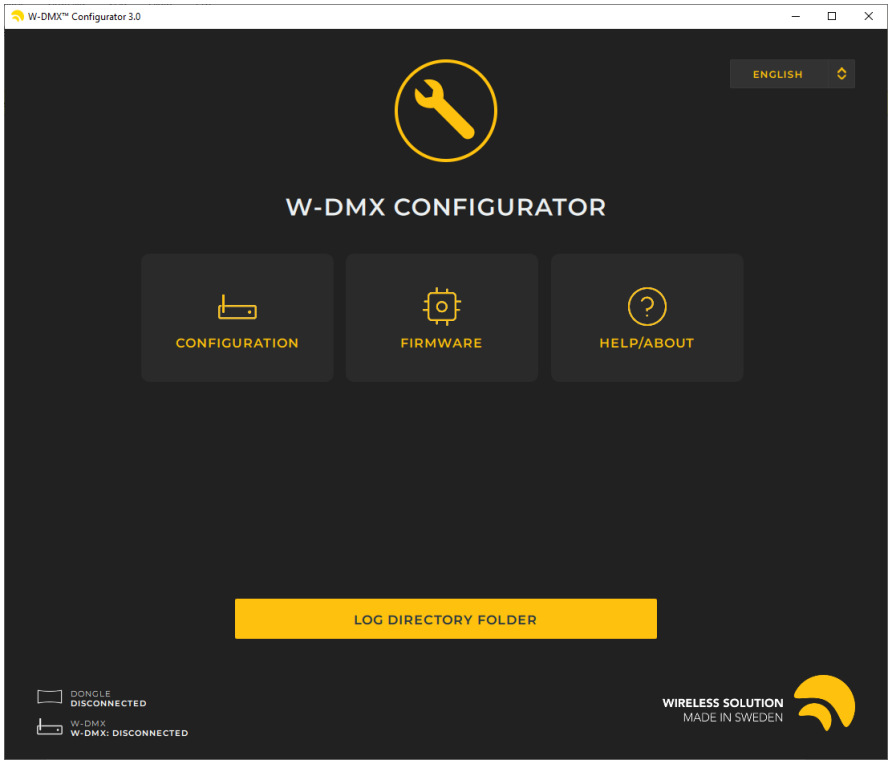
```
/** \enum OSP_CONTROL_BYTES
  \brief The two byte header
  */
enum OSP_CONTROL_BYTES {
    // The first status byte
  OSP_STATUS_SIGNAL =          0x01,
  OSP_STATUS_DIR =             0x08,
  OSP_STATUS_LINK =            0x10,
  OSP_STATUS_LOGGED_IN =       0x20,
  OSP_STATUS_DATA =            0x40,
  OSP_STATUS_RDM =             0x80,

// The second status byte
OSP_STATUS_CTRL =        0x100,
// Reserved for future use
};

/** \enum OSP_COMMANDS
 \brief List of OSP commands and mode masks
*/
enum OSP_COMMANDS {
// DMX routing
  OSP_DMX_OVER_SPI =           0x01

// Masks
  OSP_MODE_MASK =              0x80, ///<  Mode of operation, 0=GET, 1=SET
  OSP_COMMAND_MASK =           0x7f, ///<  Command is the 7 LSB

// GET or SET mode
  OSP_MODE_GET =               0x00, ///<  GET Mode
  OSP_MODE_SET =               0x80, ///<  SET Mode

// No command
  OSP_STATUS =                 0x00, ///<  No command, just get status

// Category Radio Control
  OSP_RADIO_LOGIN =            0x10, ///<  SET
  OSP_RADIO_LOGOUT =           0x11, ///<  SET
  OSP_RADIO_MODE =             0x12, ///<  GET/SET
  OSP_RADIO_AFHSS =            0x15, ///<  GET/SET
  OSP_RADIO_SIGNAL =           0x16, ///<  GET
  OSP_RADIO_MASK_24            0x18, ///<  GET


// Category: Device control
  OSP_DEVICE_LABEL =           0x21, ///<  GET
  OSP_DEVICE_MODEL =           0x22, ///<  GET
  OSP_DEVICE_SERIAL =          0x24, ///<  GET

// Category: RDM control
  OSP_RDM_UID =                0x30, ///<  GET
  OSP_RDM_DOWNSTREAM =         0x31, ///<  GET/SET
};
```

7.4 W-DMX™ RDM Interface

The W-DMX™ transceivers act as a managed RDM proxy. Please see the separate document "W-DMX™ RDM Manual" for details.

7.5 USB Dongle Connection

The W-DMX™ product range also includes an USB-dongle that can be used to configure most advanced parameters and update firmware when new releases become available. Please contact Wireless Solution for more info. This require the DMX port to be exposed on an external connector in the fixture.



8. In-system software updates (Boot Loader Support)

All W-DMX™ devices are equipped with a boot loader, which allows the end-user to upgrade their devices with a new firmware version, even when the cards are installed in a fixture.
When power is applied to the W-DMX™ device, the boot loader is entered and the Status LED is lit as an indication. In this mode, it waits for a sync signal from a W-DMX™ USB Dongle. If no signal is received within 0.5s normal operation is resumed and the system enters the main program.
If no valid program is found on the W-DMX™ card, for example because of an interrupted upgrade, the Status LED will blink slowly to indicate this.
During software upgrade the Status LED blinks once for every valid packet received.

8.1 Design Considerations

Designing for boot loader compatibility requires a few considerations that might not normally be included in a simple receiver setup:

8.1.1 Bidirectional connection

In a simple fixture external, DMX ports might not be present. For the boot loader to be able to communicate with the USB Dongle a bi-directional connection is required between the DMX terminals of the W-DMX™ device and an external connector.
Some fixtures offer an external XLR connector for DMX input, often to a separate UART on the uC. This will not work as the boot loader requires unhindered control of the data lines. Also, most repeaters/splitters will not work as the boot loader protocol uses the non-DMX data rate of 57.6kbps.

8.1.2 A means of resetting the device

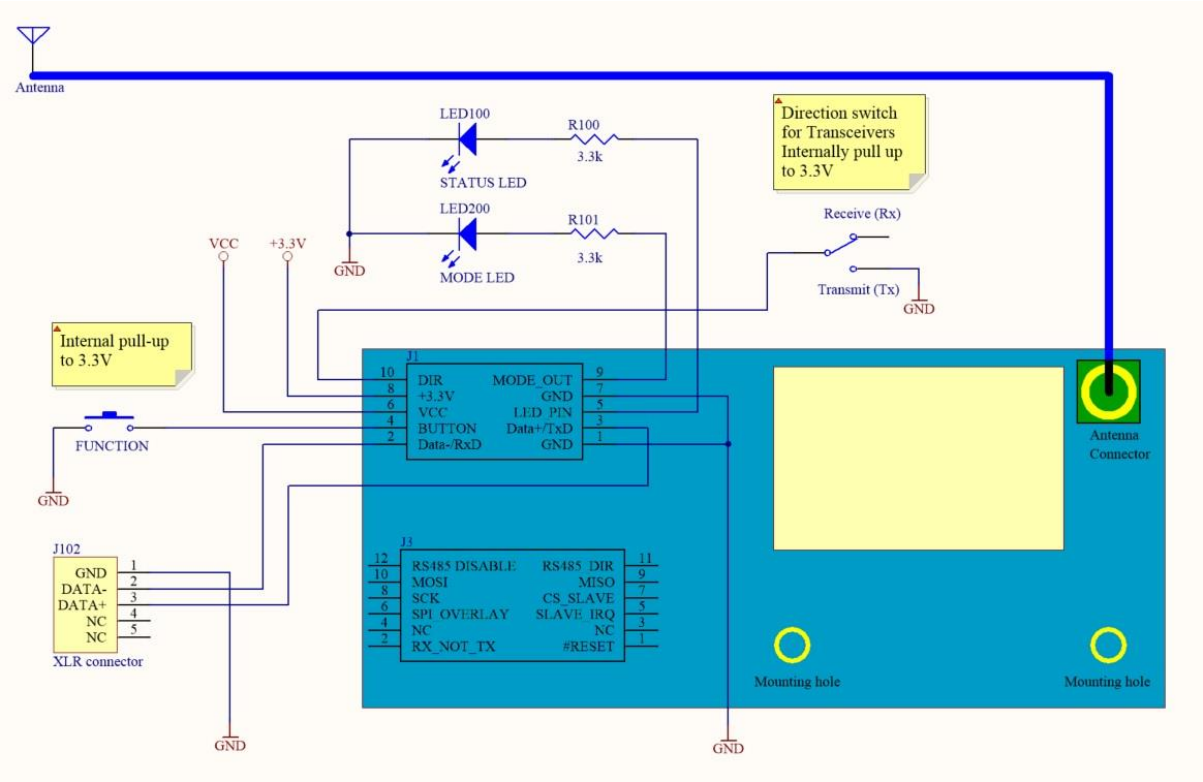
Since the W-DMX™ device enters the boot loader at start up, some way to restart the device is required in order for upgrades to work. This can be done either by power cycling the W-DMX™ card or by pulling the RESET pin low on an G5 card.
If the fixture controls the power state of the W-DMX™ device, care must be taken to ensure that the data lines are available to the device at start up.

8.2 Reference design

See section 9 for boot loader compatible reference designs.

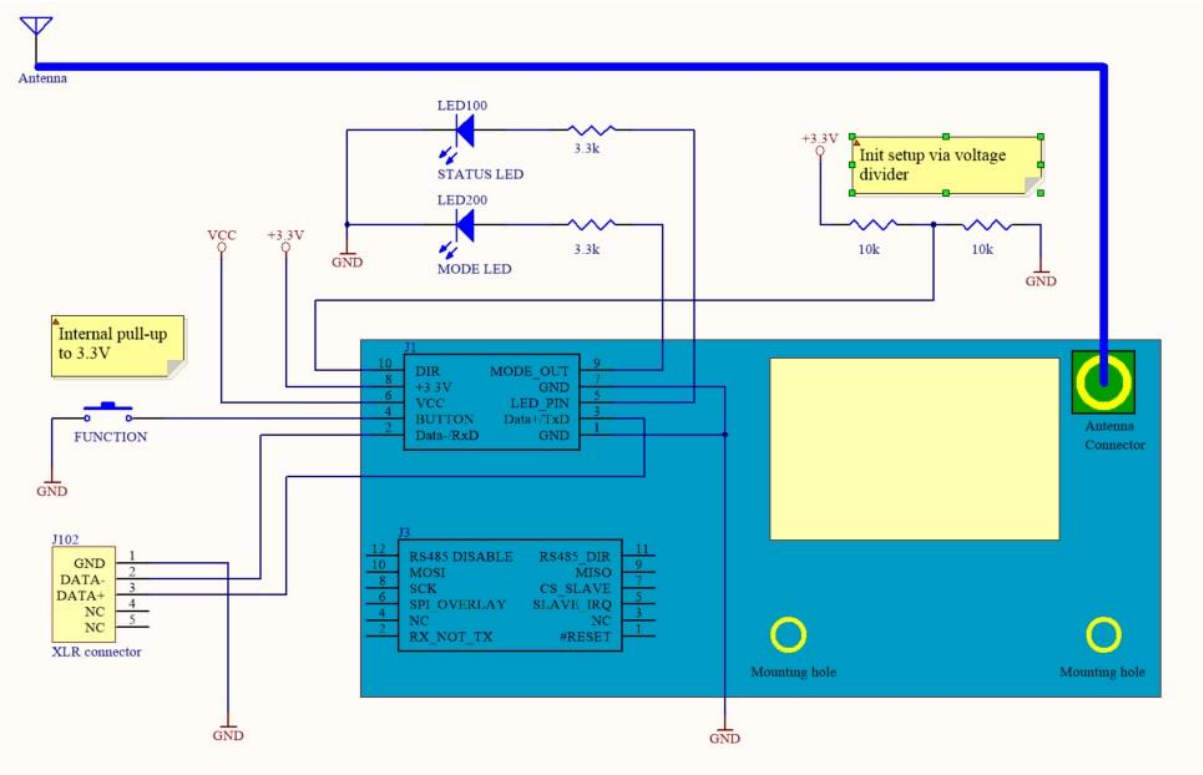
9 Reference Designs

9.1 G5 Minimal implementation, OEM Mode, Nano and Pro series



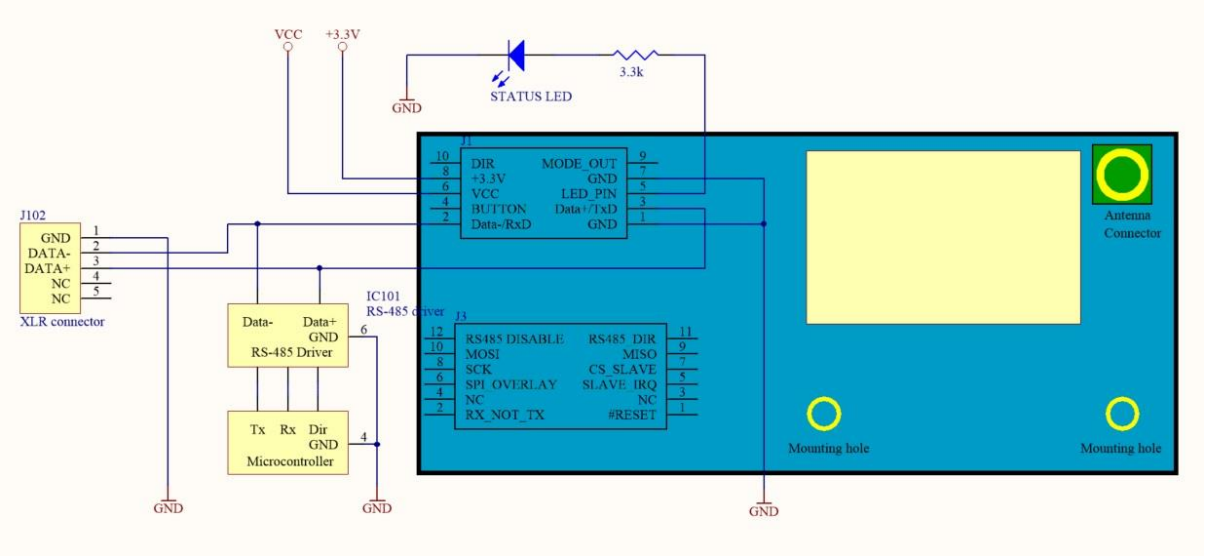
Minimal implementation for a G5 card configured in OEM mode, in which it polls the state of pin J1:10 to determine the radio direction. Receivers can leave pin J1:10 floating as the direction is fixed. DMX signals are at RS-485 levels.
For power input (J1:6 and J1:8) see pin out in section 5.1.2 and 5.1.3

9.2 Minimal Implementation, Transceiver in Flex Button Mode or Receiver, Nano and Pro series



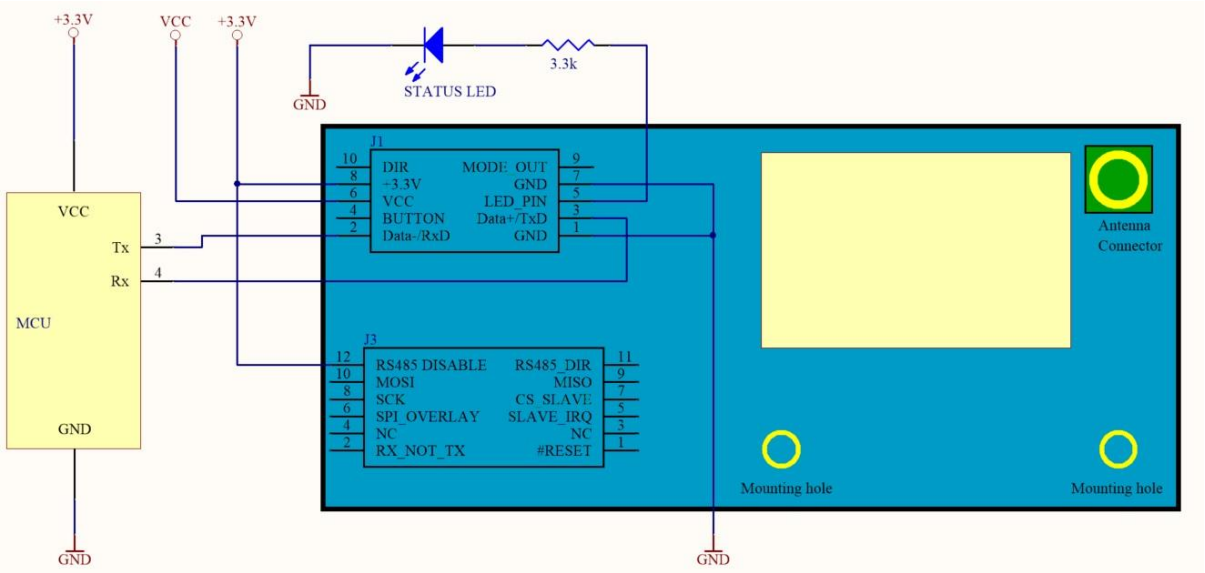
Minimal implementation for G5 card configured in Flex Button mode, in which polls pin J1:4 at startup to determine whether to should switch direction or not. Not applicable for receiver only cards.
DMX signals are at RS-485 levels.
For power input (J1:6 and J1:8) see pin out in section 5.1.2 and 5.1.3

9.3 External Micro Controller with Boot Loader Compatible DMX Connection, Nano and Pro series.



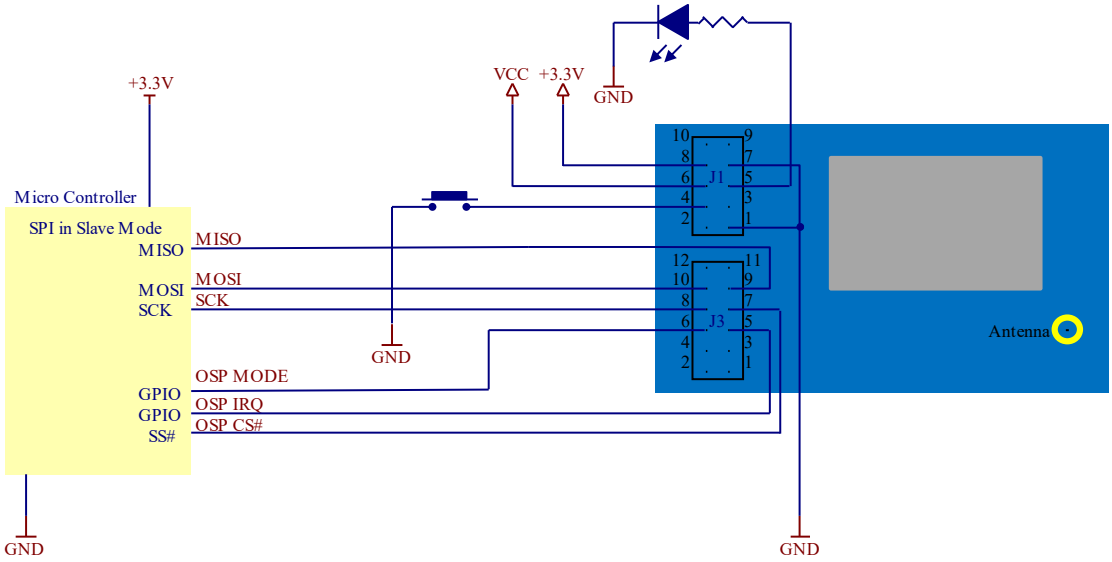
If boot loader support is desired the following connection scheme is recommended. The Status Led is not strictly required but strongly recommended since it will inform the user of the status of the firmware upgrade.
DMX signals are at RS-485 levels.
For power input (J1:6 and J1:8) see pin out in section 5.1.2 and 5.1.3

9.4 DMX signals at TTL level, Nano and Pro series with -SPI extension only



By pulling pin J3:12 high, the internal circuitry on the W-DMX card switches to TTL level signals instead of RS-485. This is very convenient when communicating with an external microcontroller as no Rs-485 transceiver is needed. Note that timing and data still must comply with the DMX/RDM standards. This design does not support boot loader functionality.
For power input (J1:6 and J1:8) see pin out in section 5.1.2 and 5.1.3

9.5 OEM SPI Protocol (OSP) Interface



The OSP interface uses standard 3.3V CMOS levels. For interfacing a 5V uC buffer/voltage translators will be needed. This implementation does not contain any DMX transfer at all, see SPI section.
For power input (J1:6 and J1:8) see pin out in section 5.1.2 and 5.1.3

10 Specifications

10.1 Electrical Specifications

Parameter	Min.	Typ	Max.	Unit
DC Supply				
5V – 18V input (Rx versions)	4.5		18	V
5V – 26V input (TRx versions)	4.75		26	V
5V input (5V only versions)	4.5		5.5	V
				V
LED Pin output source current*			0.5mA	mA
DMX interface				
Maximum number of units on the DMX/RS-485 bus	As per the DMX Standard			
DMX data rate		250		Kbps
ESD protection, human body model		None		kV
RF characteristics (2.4 GHz)				
Output power Actual limit depends on local regulations	20 100		24 250	dBm mW
Frequency range operation	2403		2479	MHz
Channel Bandwidth		1		MHz
Sensitivity at 0.1% BER		-96		dBm
Range with standard 2dBi antenna (measured)		500		m
RF characteristics (5.8 GHz)				
Output power Actual limit depends on local regulations	- -		27.0 500	dBm mW
Frequency range operation	5742		5829	MHz
Channel Bandwidth		1		MHz
Sensitivity at 0.1% BER		-96		dBm
Range with standard 4dBi antenna (measured)		400		m
RF characteristics (5.2 GHz)				
Maximum output power Actual limit depends on local regulations				
Frequency range operation				
Channel Bandwidth				
Sensitivity at 0.1% BER				
Range with standard 2dBi antenna (measured)				

* find high efficiency LED or drive control bipolar/MOSFET

DC Current Consumption

Code	Type (mA)	Max (mA)	Antenna	Operating Mode	Type input power (W)	Max input power (W)
A40893G5			IPEX	TRX		
A40894G5			RP-SMA	TRX		
A40898G5			IPEX	RX		
A40899G5			RP-SMA	RX		
A40890G5			MCX	TRX		
A40891G5-SPI			Internal	TRX		
A40890G5-SPI			MCX	TRX		
A40895G5			MCX	RX		
A40896G5-SPI			Internal	RX		
A40904G5-SPI			MCX	TRX		
A40905G5-SPI			MCX	TRX		

A40893G5 TRX – 2 bars, 3bars, 4bars, 5bars ??? @2.4GHz
A40890G5 TRX - 2 bars, 3bars, 4bars, 5bars ??? @2.4GHz
A40905G5-SPI – 2 bars, 3bars, 4bars, 5bars??? @2.4GHz, 5.2GHz, 5.8GHz

Environmental Requirements

Parameter	Min.	Type	Max.	Unit
Ambient Operating Temperature	-20		45	°C
Relative Humidity*	20		80	%
Option: coated relative humidity*	20		95	%

*non-condensing

11. Ordering Codes

Order Code	Name	Input Voltage	Band (GHz)	Direction	Antenna	RDM
A40893G5	TiNY TRX IPEX	5V	2.4	TRX	IPEX	Yes
A40890G5-SPI	NANO TRX G5. 3.3V/5-26V. MCX. SPI	3.3V 5-26V	2.4	TRX	MCX	Yes
A40891G5-SPI	NANO TRX G5. 3.3V/5V. PCB Antenna. SPI	3.3V/5V	2.4	TRX	Internal	Yes
A40895G5	NANO RX G5. 3.3V/5-18V. MCX	3.3V 5-18V	2.4	RX	MCX	
A40896G5-SPI	NANO RX G5. 3.3V/5-18V. PCB Antenna. SPI	3.3V 5-18V	2.4	RX	Internal	
A40904G5-SPI	PRO TRX G5. 5V. MCX. SPI	5V	2.4; 5.2; 5.8;	TRX	MCX	Yes
A40905G5-SPI	PRO RX G5. 5V. MCX. SPI	5V	2.4; 5.2; 5.8;	RX	MCX	

12. RDM Manual

12.1 W-DMX RDM Overview

Wireless Solution W-DMX supports a range of manufacturer specific RDM commands used for configuration of the radio system at the transmitter end. The RDM commands can be interleaved with the DMX data packets, allowing for seamless configuration of the unit without interrupting transmission of DMX data. All devices downstream of a transmitter (transceivers in receive mode and RDM enabled lighting products connected through these receivers) will be exposed transparently through RDM on the transmitter side, allowing use of any RDM controller on the transmitter side. Since the system is transparent, all RDM commands complying to the RDM standards document and subsequent extensions are supported. Due to the nature of the radio link, all requests to RDM devices downstream the transmitter will be replied to with an ACK_TIMER response, the controller need to be able to handle those responses.

A W-DMX transmitter is discoverable as an RDM device, with the W-DMX manufacturer ID of 0x5753 (ASCII WS). Once a W-DMX transmitter is discovered, it responds to the following standard RDM commands defined by ESTA E1.20 and the following manufacturer specific RDM commands. W-DMX receivers support the same range of commands, with implementation specific limitations mentioned below.

12.2 Controller considerations for good performance with W-DMX

12.2.1. Roundtrip delays and ACK_TIMER

The W-DMX system acts as a managed proxy and works transparently with the one exception imposed by the very nature of being a proxy. The roundtrip time for a request from the controller to a downstream device will exceed the maximum allowed response window of 5.8ms and thus the controller will respond to those requests with an ACK_TIMER of 100ms, which is the minimum time specified in the standards document. Issuing a GET_QUEUED_MESSAGE request or simply the same GET again after the minimum time will return the response. While a request is being process, further requests to the same downstream device will be responded to with a response of type NR_BUFFER_FULL.

12.2.2 Discovery

In order for RDM to coexist with normal DMX traffic the W-DMX system, just like a cable, uses only a limited amount of the available radio bandwidth for RDM requests. Thus to speed up the process of querying devices the controller should aim to at minimum establish a list of which devices are located below the transmitter. This can easily be obtained with the GET_PROXIED_DEVICES command. Using this list the controller can make intelligent decisions as to the order in which it queries devices.
An even better way is to also request the proxy list from the receivers and take the downstream location into account.
Note that while the W-DMX system will still forward all requests, the above mentioned steps are simply a way to make any system with a managed proxy run smoother.

12.2.3. The Downstream RDM setting

The downstream RDM setting controls whether a W-DMX device will output any RDM related traffic on its downstream interface (radio on transmitter or cable on a receiver). This provides a convenient way to avoid sending RDM traffic to devices that don't properly handle the RDM start code 0xCC.
When enabled, a radio receiver will perform a discovery on start up to find all connected responders, as well as perform repeated background discovery to find new devices.
A transmitter will attempt to discover all connected radio receivers.
W-DMX Devices are shipped with Downstream RDM disabled.

12.3. Supported standard PIDs

Category: Network Management

DISC_UNIQUE_BRANCH

This command is a standard RDM command for requesting discovery responses from a specific branch. The transmitter will as per E1.20 first respond for itself and, when muted, respond for all known proxied devices.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) DISCOVERY_COMMAND	(PID) DISC_UNIQUE_BRANCH	(PDL) 0x0C
(PD) Lower Bound UID (48-bit) Upper Bound UID (48-bit)		

Response:

Response Packet Slot		Slot Data		Comments
1		0xFE		Response Preamble bytes that may be dropped by an in-line device during turn-around. Not more than one byte may be dropped by each in-line device.
2		0xFE		
3		0xFE		
4		0xFE		
5		0xFE		
6		0xFE		
7		0xFE		
8		0xAA		Preamble separator byte
9	(EUID11)	Manufacturer ID 1 (MSB)	OR with 0xAA	Encoded UID (EUID). Encoding by bit-wise OR with 0xAA and 0x55 as shown.
10	(EUID10)	Manufacturer ID 1 (MSB)	OR with 0x55	
11	(EUID9)	Manufacturer ID0 (LSB)	OR with 0xAA	
12	(EUID8)	Manufacturer ID0 (LSB)	OR with 0x55	
13	(EUID7)	Device ID3 (MSB)	OR with 0xAA	
14	(EUID6)	Device ID3 (MSB)	OR with 0x55	
15	(EUID5)	Device ID2	OR with 0xAA	
16	(EUID4)	Device ID2	OR with 0x55	
17	(EUID3)	Device ID1	OR with 0xAA	
18	(EUID2)	Device ID1	OR with 0x55	
19	(EUID1)	Device ID0 (LSB)	OR with 0xAA	
20	(EUID0)	Device ID0 (LSB)	OR with 0x55	
21	(ECS3)	Checksum1 (MSB)	OR with 0xAA	Checksum is the sum of the previous 12 EUID slots. The checksum is an unsigned additive sum of the 8-bit fields into a 16-bit response value.
22	(ECS2)	Checksum1 (MSB)	OR with 0x55	
23	(ECS1)	Checksum0 (LSB)	OR with 0xAA	
24	(ECS0)	Checksum0 (LSB)	OR with 0x55	

When replying for itself, the manufacturer ID shall be 0x5753.

DISC_MUTE

This command is a standard RDM command for requesting RDM responders to stop responding to discovery messages.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) DISCOVERY_COMMAND	(PID) DISC_MUTE	(PDL) 0x00
(PD) NULL		

Response:

Response from itself:

(Response Type) ACK	(Message Count) 0x00-0xFF	(Sub-Device) 0x0000
(CC) DISCOVERY_COMMAND_RESPONSE	(PID) DISC_MUTE	(PDL) 0x02

(PD)

Control Field				
Bits 15-4 Reserved (Always set to 0)	Bit 3 Proxied Device Flag (0)	Bit 2 Boot-Loader Flag (0)	Bit 1 Sub-Device Flag (0)	Bit 0 Managed Proxy Flag (1)

Response on behalf of any represented device.
The response shall be as per ESTA E1.20. The managed proxy flag will be set high when W-DMX device responds to this command to indicate that the device is a managed proxy.

(Response Type) ACK	(Message Count) 0x00-0xFF	(Sub-Device) 0x0000
(CC) DISCOVERY_COMMAND_RESPONSE	(PID) DISC_MUTE	(PDL) 0x02

(PD)

Control Field				
Bits 15-4 Reserved (Always set to 0)	Bit 3 Proxied Device Flag (1)	Bit 2 Boot-Loader Flag (As received from device)	Bit 1 Sub-Device Flag (As received from device)	Bit 0 Managed Proxy Flag (As received from device)

Any Binding UID is removed from MUTE responses of represented devices.

DISC_UN_MUTE

This command is a standard RDM command for requesting RDM responders to start responding to discovery messages.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) DISCOVERY_COMMAND	(PID) DISC_UN_MUTE	(PDL) 0x00
(PD) NULL		

Response from itself:

(Response Type) ACK	(Message Count) 0x00-0xFF	(Sub-Device) 0x0000
(CC) DISCOVERY_COMMAND_RESPONSE	(PID) DISC_UN_MUTE	(PDL) 0x02

(PD)

Control Field				
Bits 15-4 Reserved (Always set to 0)	Bit 3 Proxied Device Flag (0)	Bit 2 Boot-Loader Flag (0)	Bit 1 Sub-Device Flag (0)	Bit 0 Managed Proxy Flag (1)

Response on behalf of any represented device.
The response shall be as per ESTA E1.20. The managed proxy flag will be set high when W-DMX device responds to this command to indicate that the device is a managed proxy.

(Response Type) ACK	(Message Count) 0x00-0xFF	(Sub-Device) 0x0000
(CC) DISCOVERY_COMMAND_RESPONSE	(PID) DISC_UN_MUTE	(PDL) 0x02

(PD)

Control Field				
Bits 15-4 Reserved (Always set to 0)	Bit 3 Proxied Device Flag (1)	Bit 2 Boot-Loader Flag (As received from device)	Bit 1 Sub-Device Flag (As received from device)	Bit 0 Managed Proxy Flag (As received from device)

Any Binding UID is removed from MUTE responses of represented devices.
The response shall be as described in E1.20, with control field settings as per the DISC_UN_MUTE message.

PROXIED_DEVICE_COUNT

This command returns the number of devices downstream of the W-DMX device requested as per E1.20. This count is updated every time a device is added or removed.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) PROXIED_DEVICE_COUNT	(PDL) 0x00
(PD) NULL		

Response:

(Response Type) ACK	(Message Count) 0x00-0xFF	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) PROXIED_DEVICE_COUNT	(PDL) 0x03

(PD)

Device Count (16 bit)	
List Change (0/1)	

PROXIED_DEVICES
This command returns the UIDs of devices downstream of the W-DMX device requested as per E1.20. This makes it possible for the controller to speed up discovery by muting the device in this list without first having to find them with a DISC_UNIQUE_BRANCH. It also enables the controller to construct a hierarchy of devices if desired.
A transmitter will return all connected receivers.
A receiver will return all devices connected on the DMX line.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) PROXIED_DEVICE_DEVICES	(PDL) 0x00
(PD) NULL		

Response:

(Response Type) ACK / ACK_OVERFLOW	(Message Count) 0x00-0xFF	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) PROXIED_DEVICE_DEVICES	(PDL) Variable (0x00- 0xE4)
(PD) Packed field with 48-bit UID's		

12.4 Category: Status Collection

QUEUED_MESSAGE
A W-DMX device will increase Message Count when there has been a change in the device list.
When QUEUED MESSAGE's is requested from a W-DMX device, it will respond with PROXIED_DEVICE_COUNT with the current number of devices.

12.5 Category: RDM Information

SUPPORTED_PARAMETERS
This command returns all supported PIDs for a transmitter or a receiver. Note that the range reported depends on the W-DMX model. For example, only the Pro models support commands controlling the 5.8GHz band.

PARAMETER_DESCRIPTION
This command returns the description of the requested PID.

12.5 Category: Product Information

DEVICE_INFO
This command returns the parameters as specified in E1.20.

DEVICE_MODEL_DESCRIPTION
MANUFACTURER_LABEL
DEVICE_LABEL
SOFTWARE_VERSION_LABEL
This command returns the current software version in the transmitter/receiver.

BOOT_SOFTWARE_VERSION_ID
BOOT_SOFTWARE_VERSION_LABEL

12.6 Category: Control

SOFTWARE_VERSION_LABEL

12.7 Category: Device Control

IDENTIFY_DEVICE
A SET request with value 1 will cause the device to identify itself by either, in the case of a W-DMX OEM card, flash its status LED repeatedly, or in the case of a BlackBox/WhiteBox, scroll through the signal LEDs.
The device will automatically leave Identify mode after three minutes.

RESET_DEVICE

12.8 W-DMX Manufacturer Specific PIDs

12.8.1 Category: Radio Control

WDMX_LOGIN, 0x8000
This command implements the login function on the transmitter i.e. it acts to push momentarily the function switch on front of the W-DMX unit, in order to connect to any unlinked W-DMX receivers.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND	(PID) WDMX_LOGIN (0x8000)		(PDL) 0x00
(PD) NULL			

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_LOGIN (0x8000)		(PDL) 0x00
(PD) NULL			

WDMX_LOGOUT, 0x8010

This command implements the logout function on the transmitter, logging out all connected receivers. If this command is sent to a receiver, it logs out that specific receiver. Note that using this command will cause affected receivers to be disconnected from the network until they are logged in again, and as such will not respond to further RDM messages until reconnected.

Note: When the command is sent to a receiver, the receiver will unlink itself before the response will be sent back to the transmitter and the controller.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND	(PID) WDMX_LOGOUT (0x8010)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_LOGOUT (0x8010)	(PDL) 0x00
(PD) NULL		

WDMX_RADIO_MODE, 0x8035

This command allows the user to switch a device to any supported radio mode in the list below. Note that changing the mode of a receiver will cause that device to drop of the network. Also note that when changing the mode of a transmitter, connected receivers will NOT be logged out and will NOT mirror the change in mode. 5.8GHz modes are only supported on devices capable of 5.8GHz links. If set on other devices the value will automatically decrease to next lower one.

Valid modes are:

0	Receiver
1	Transmitter G3
2	Not used
3	Transmitter G4 Compatibility mode
4	Not used
5	Transmitter G4S 2.4GHz
6	Transmitter G4S 5.8GHz
7	Not used
8	Not used
9	Transmitter G5 SU 2.4GHz mode
10	Transmitter G5 SU 5.8GHz mode
11	Transmitter G5 SU 5.2GHz mode

SET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND	(PID) WDMX_RADIO_MODE (0x8035)	(PDL) 0x01
(PD) RADIO_MODE		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_RADIO_MODE (0x8035)	(PDL) 0x00
(PD) NULL		

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_RADIO_MODE (0x8035)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_RADIO_MODE (0x8035)	(PDL) 0x00
(PD) RADIO_MODE		

WDMX_RADIO_POWER_24, 0x8031

This command sets the output power for the 2.4GHz band on the device. Note that this command is valid for a RDM-enabled receiver as it will respond to RDM commands over the radio.
Use this command to change the power to comply with different legal environments or types of installation.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND	(PID) WDMX_RADIO_POWER_24 (0x8031)	(PDL) 0x01
(PD) OUTPUT_RADIO_SETTING		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_RADIO_POWER_24 (0x8031)	(PDL) 0x00
(PD) NULL		

GET command:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_RADIO_POWER_24 (0x8031)	(PDL) 0x00
(PD) NULL		

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_RADIO_POWER_24 (0x8031)	(PDL) 0x01
(PD) OUTPUT_POWER_SETTING		

Possible output power settings for the parameter OUTPUT_POWER_SETTING are given in the table below.

Setting Name (Value)	Output Power 2.4 GHz, approximate
3	300mW
2	250mW
1	100mW
0	25mW

WDMX_RADIO_POWER_58, 0x8032

This command sets the output power for the 5.8GHz band on the device. Note that this command is valid for an RDM-enabled receivers as it will respond to RDM commands over the radio.
Use this command to change the power to comply with different legal environments or types of installation.

SET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND	(PID) WDMX_RADIO_POWER_58 (0x8032)		(PDL) 0x01
(PD) OUTPUT_POWER_SETTING			

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_RADIO_POWER_58 (0x8032)		(PDL) 0x00
(PD) NULL			

GET command:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_RADIO_POWER_58 (0x8032)		(PDL) 0x00
(PD) NULL			

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) GET_COMMAND	(PID) WDMX_RADIO_POWER_58 (0x8032)		(PDL) 0x01
(PD) OUTPUT_POWER_SETTING			

Possible output power settings for the parameter OUTPUT_POWER_SETTING are given in the table below:

Setting Name (Value)	Output Power 5.8GHz, approximate
3	TBA
2	TBA
0	TBA
Low (0)	TBA

WDMX_SIGNAL_STRENGTH, 0x8040

This command can be used to return signal quality from a receiver. On a transmitter it returns the current output power from the radio chip.

A receiver does not measure the actual signal strength, but returns a number representing the average of dropped packets, which normally is closely linked to the signal strength, but gives a better indication of signal quality.

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_SIGNAL_STRENGTH (0x8040)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_SIGNAL_STRENGTH (0x8040)	(PDL) 0x01
(PD) SIGNAL STRENGTH		

WDMX_MASK_24, 0x8033

This command can be used to set the frequency mask used for 2.4 GHZ in a W-DMX wireless link.
The W-DMX system allows setting of a frequency mask that will then be used as a basis for the AFHSS functionality.
While both transmitters and receivers support the GET command, only transmitters support setting the mask.
Note that when parsing the packed list the lowest frequency (channel 0) is in the first byte, bit 0 and channel 8 is in the second byte, bit 0.
If you have disabled AFHSS or running in legacy G3 or G4 mode that does not support AFHSS, you need to unlink the receivers, restart the transmitter and link the receivers before any change will take effect.

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) GET_COMMAND	(PID) WDMX_MASK_24 (0x8033)		(PDL) 0x00
(PD) NULL			

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_MASK_24 (0x8033)		(PDL) 0x0B
(PD)			

Byte Number	Meaning
0-10	Packed list of byte representing the frequency mask

The set command is:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND	(PID) WDMX_MASK_24 (0x8033)		(PDL) 0x0B
(PD)			

Byte Number	Meaning
0-10	Packed list of byte representing the frequency mask

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_MASK_24 (0x8033)		(PDL) 0x00
(PD) NULL			

WDMX_MASK_58, 0x8034

This command can be used to set the frequency mask used for 5.8GHz in a W-DMX wireless link. The W-DMX system allows setting of a frequency mask that will then be used as a basis for the AFHSS functionality. While both transmitters and receivers support the GET command, only transmitters support setting the mask.
Note that when parsing the packed list the lowest frequency (channel 0) is in the first byte, bit 0 and channel 8 is in the second byte, bit 0.
If you have disabled AFHSS, you need to unlink the receivers, restart the transmitter and link the receivers before any change will take effect.
This command is only supported on devices capable of 5.8GHz.

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_MASK_58 (0x8034)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_MASK_58 (0x8034)	(PDL) 0x0B

(PD)

Byte Number	Meaning
0-10	Packed list of bytes representing the base frequency mask

The set command is:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND	(PID) WDMX_MASK_58 (0x8034)	(PDL) 0x0B

(PD)

Byte Number	Meaning
0-10	Packed list of byte representing the base frequency mask

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_MASK_58 (0x8034)	(PDL) 0x00
(PD) NULL		

WDMX_RADIO_AHFSS, 0x8036

This command allows the user to turn the Adaptive Frequency Hopping Spread Spectrum functionality on or off. When on a transmitter will automatically and continuously scan the frequencies set by WDMX_MASK_XX and select the channels that allows the best data integrity and least interference.
This command is only supported on a transmitter.

SET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND	(PID) WDMX_RADIO_AFHSS (0x8036)		(PDL) 0x01
(PD) AFHSS_OFF(0) AFHSS_ON(1)			

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_RADIO_AFHSS (0x8036)	(PDL) 0x00
(PD) NULL		

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_RADIO_AFHSS (0x8036)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_RADIO_AFHSS (0x8036)	(PDL) 0x01
(PD) AFHSS_OFF(0) AFHSS_ON(1)		

WDMX_AFHSS_MASK_24, 0x8037

This command can be used to read the currently active mask for 2.4 GHZ in a W-DMX wireless link.
Note that when parsing the packed list the lowest frequency (channel 0) is in the first byte, bit 0 and channel 8 is in the second byte, bit 0.

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_AFHSS_MASK_24 (0x8037)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_AFHSS_MASK_24 (0x8033)	(PDL) 0x0B

(PD)

Byte Number	Meaning
0-10	Packed list of byte representing the base frequency mask

WDMX_AFHSS_MASK_58, 0x8038

This command can be used to read the currently active mask for 5.8 GHZ in a W-DMX wireless link.
Note that when parsing the packed list the lowest frequency (channel 0) is in the first byte, bit 0 and channel 8 is in the second byte, bit 0.
This command is only supported on devices capable of 5.8GHz.

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_AFHSS_MASK_58 (0x8038)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_AFHSS_MASK_58 (0x8038)	(PDL) 0x0B

(PD)

Byte Number	Meaning
0-10	Packed list of bytes representing the base frequency mask

Category: RDM Setup

WDMX_DMX_TO_RDM_RATIO, 0x8300

This command allows the user to trim the ratio between DMX and RDM packets to level that is suitable for the current application.
On a transmitter this controls how often DMX data over radio is overridden.
On a receiver this sets how many packets of DMX must come in between RDM packets.

SET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND	(PID) WDMX_DMX_TO_RDM_RATIO (0x8300)		(PDL) 0x01
(PD) 0-255, Lower means more RDM			

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_DMX_TO_RDM_RATIO (0x8300)		(PDL) 0x00
(PD) NULL			

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) GET_COMMAND	(PID) WDMX_DMX_TO_RDM_RATIO (0x8300)		(PDL) 0x00
(PD) NULL			

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000	
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_DMX_TO_RDM_RATIO (0x8300)		(PDL) 0x01
(PD) 0-255, Lower means more RDM			

WDMX_DOWNSTREAM_RDM, 0x8301

This command allows the user to turn on or off RDM communication downstream of the device. It will always be reachable from the upstream device.
A transmitter will still receive and respond to RDM commands directed to it, but will not forward any request over the radio, nor will it attempt to discover any linked receivers. When disabling RDM on a transmitter it will also tell all linked receivers to turn off RDM downstream.
A receiver will when downstream RDM is disabled cease to do any background discovery and will also not output any other RDM traffic. A GET command will return the local setting, not the actual state which is in part determined by the setting communicated from the transmitter.
A receiver will enable downstream RDM ONLY if both the the local setting, this command, and the setting from the radio allows it.

SET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND	(PID) WDMX_DOWNSTREAM_RDM (0x8301)	(PDL) 0x01
(PD) WDMX_DOWNSTREAM_RDM_OFF(0) WDMX_DOWNSTREAM_RDM_ON(1)		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_DOWNSTREAM_RDM (0x8301)	(PDL) 0x00
(PD) NULL		

GET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND	(PID) WDMX_DOWNSTREAM_RDM (0x8301)	(PDL) 0x00
(PD) NULL		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) GET_COMMAND_RESPONSE	(PID) WDMX_DOWNSTREAM_RDM (0x8301)	(PDL) 0x01
(PD) WDMX_DOWNSTREAM_RDM_OFF(0) WDMX_DOWNSTREAM_RDM_ON(1)		

Category: Device Control

WDMX_IDENTIFY_PROXIES, 0x8400
This command sets identify on the device and sends out a broadcast identify to all downstream devices. This is useful for identifying what fixtures are connected to a certain W-DMX transmitter/receiver.

SET command:

(Port ID) 0x00 – 0xFF	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND	(PID) WDMX_IDENTIFY_PROXIES(0x8400)	(PDL) 0x01
(PD) WDMX_IDENTIFY_PROXIES_OFF(0) WDMX_IDENTIFY_PROXIES_ON(1)		

The response is:

(Response Type) ACK	(Message Count) 0x00	(Sub-Device) 0x0000
(CC) SET_COMMAND_RESPONSE	(PID) WDMX_IDENTIFY_PROXIES(0x8400)	(PDL) 0x00
(PD) NULL		

Additional RDM commands
Additional RDM commands to configure transmitters will be published in later revisions of this document, when they are introduced.

13. Antenna Options

Most models of the W-DMX OEM TRX card are available with a connector for an external antenna or with an on-board antenna. Refer to the order list in the OEM Guide for a complete list of Order Codes and descriptions.

A wide range of antennas and standard, as well as custom, antenna cables with connectors and adaptors are available from Wireless Solution for applications that utilize external antennas.
The W-DMX OEM TRX card features a high frequency MCX connector, X2 in Figure 1, to which the internal antenna cable is plugged in. One end of the internal antenna cable is furnished with a MCX connector and the other end is furnished with a RP-SMA or N chassis connector for attachment of the antenna, antenna with adaptor, or external antenna cable.

The RP-SMA connector is only suitable for indoor use and is typically used in relatively light duty applications. Temporary outdoor use is possible if the unit is shielded from exposure to rain, water splashes, and other environmental factors.
The N connector is mandatory for permanent outdoor applications and also best suited for heavy duty applications where mechanical damage of the connector during e.g. transportation might be an issue. As an example, the W-DMX line of stand-alone transmitters and receivers use the N connector for its durability and water resistance.

Note that, if the customer chooses to use an N-type cable, they will require an external N to RP-SMA adaptor to utilize our standard indoor antennas.

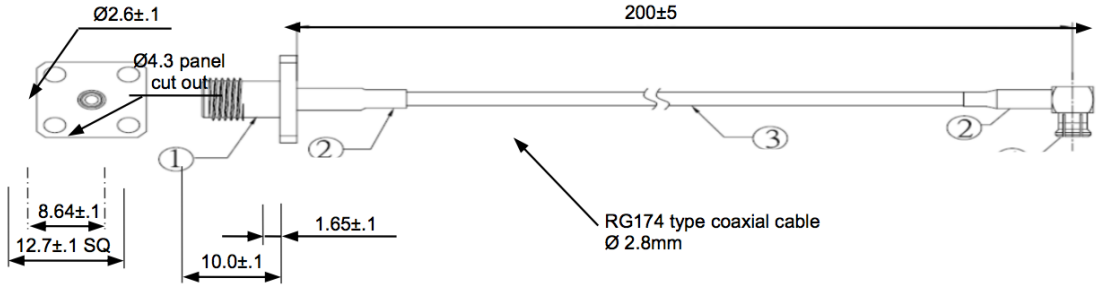
Indoor antennas are rated up to IP43, and can be used outdoors in covered conditions, provided provision has been made at the antenna connection to IP rate the fixture to the appropriate rating.
You will find dimensional drawing for our standard cables later in this section.
Custom solutions are available on request from Wireless Solution if the standard cables fail to satisfy the requirements for a particular application.

The W-DMX 2dBi 2.4GHz antenna has an operating range of 360 x 360 degrees. The W-DMX Indoor and Outdoor Dualband antennas have gains of 2dBi and 4dBi at 2.4GHz and 5.8GHz respectively, and have an operating range of 360 x 360 degrees in the 2.4GHz band, and 240 x 360 degrees in the 5.8GHz band.

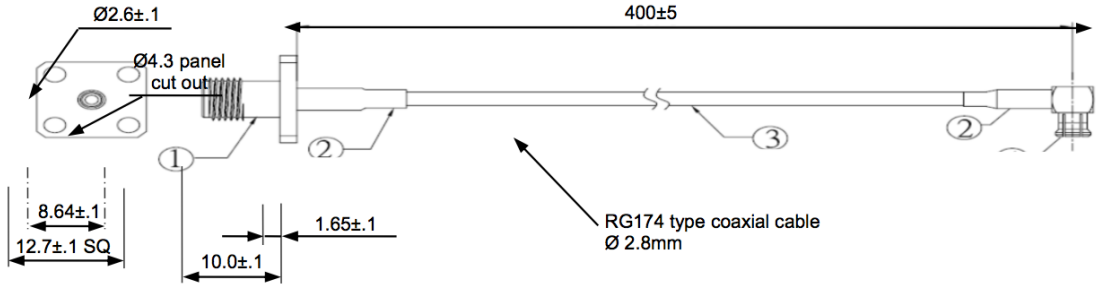
Note that all units are metric.

13.1 Cables

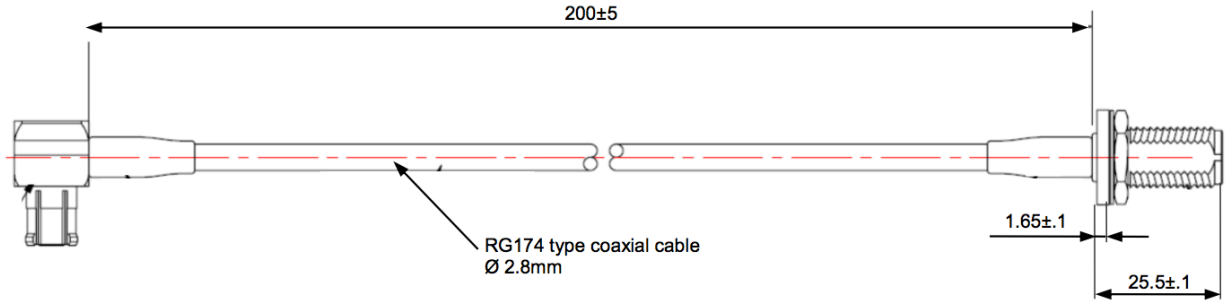
1. 102-A40921: W-DMX™ OEM RP-SMA Cable Indoor 20cm



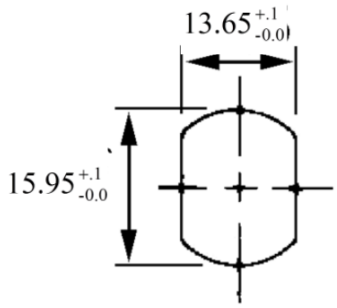
2. 102-A40922: W-DMX™ OEM RP-SMA Cable Indoor 40cm



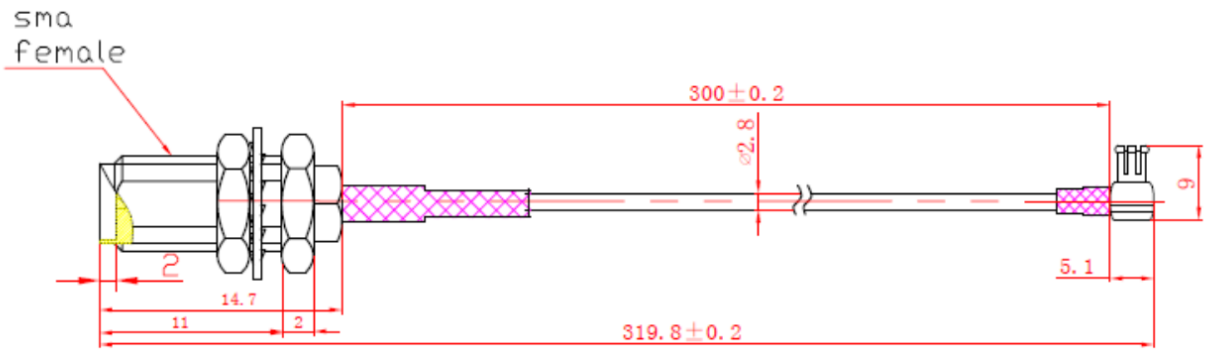
3. 102-A40920: W-DMX™ OEM N Cable Outdoor 20cm



N Type Panel Cut Out Dimensions, Metric:



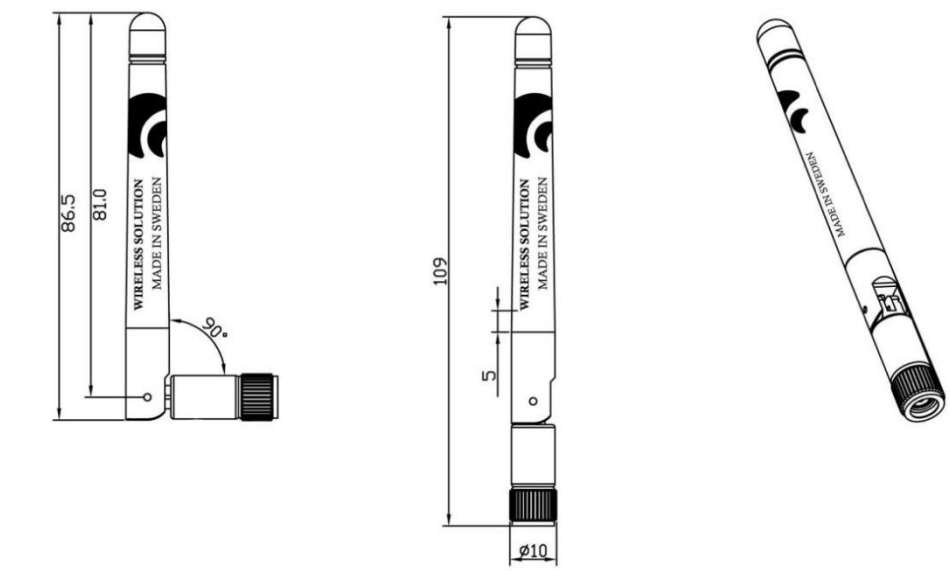
4. 102-A40924: W-DMX™ OEM RP-SMA Flange-Mount Cable Indoor 30cm



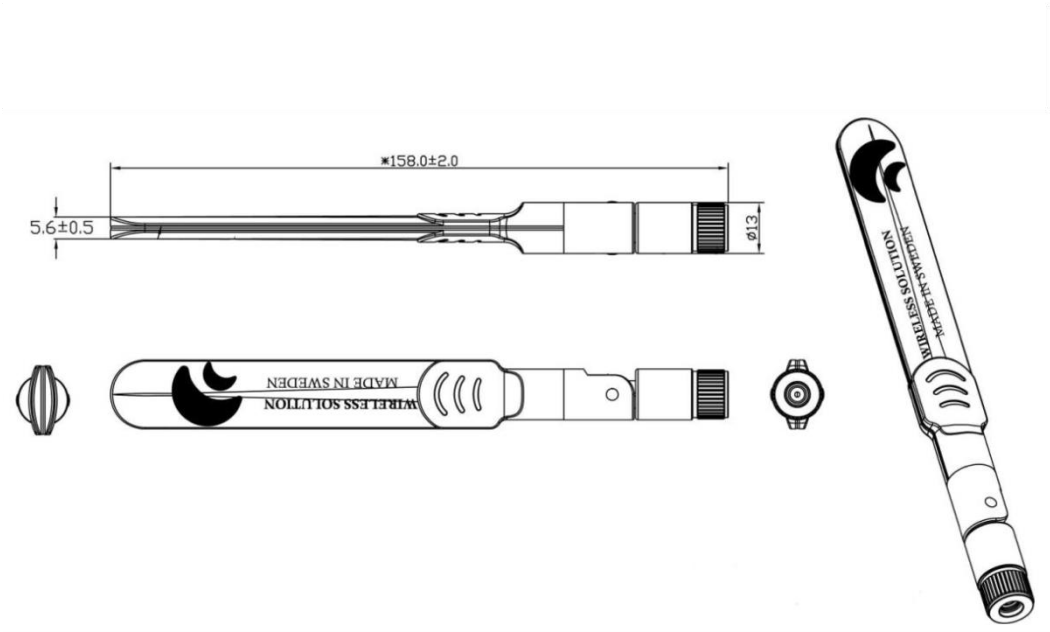
RP-SMA Flange-Mount Panel Cut Out Dimensions, Metric:

13.2 Indoor Antennas

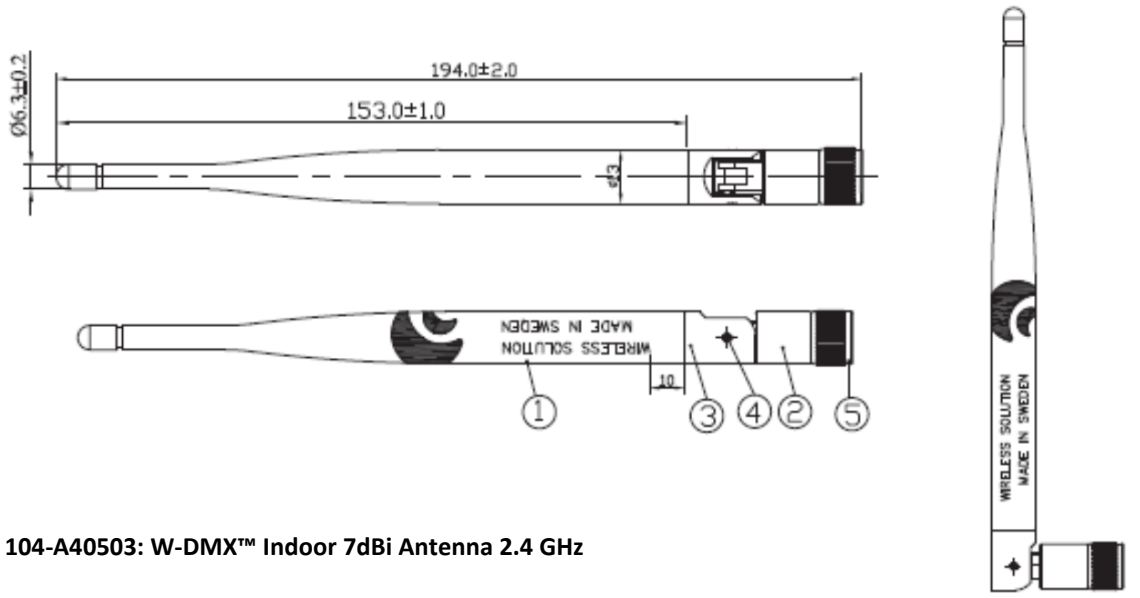
1. 104-A40501: W-DMX™ Indoor 2dBi Antenna 2.4GHz



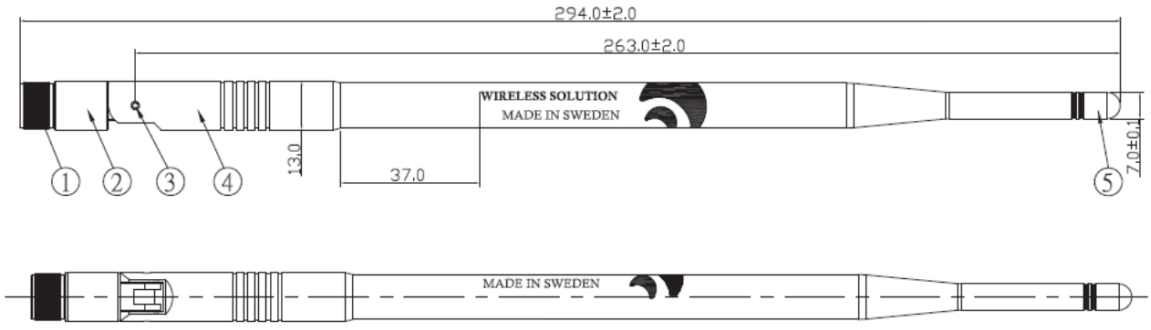
2. 104-A40511: W-DMX™ Indoor 2dBi/4dBi Dual band antenna 2.4/5GHz



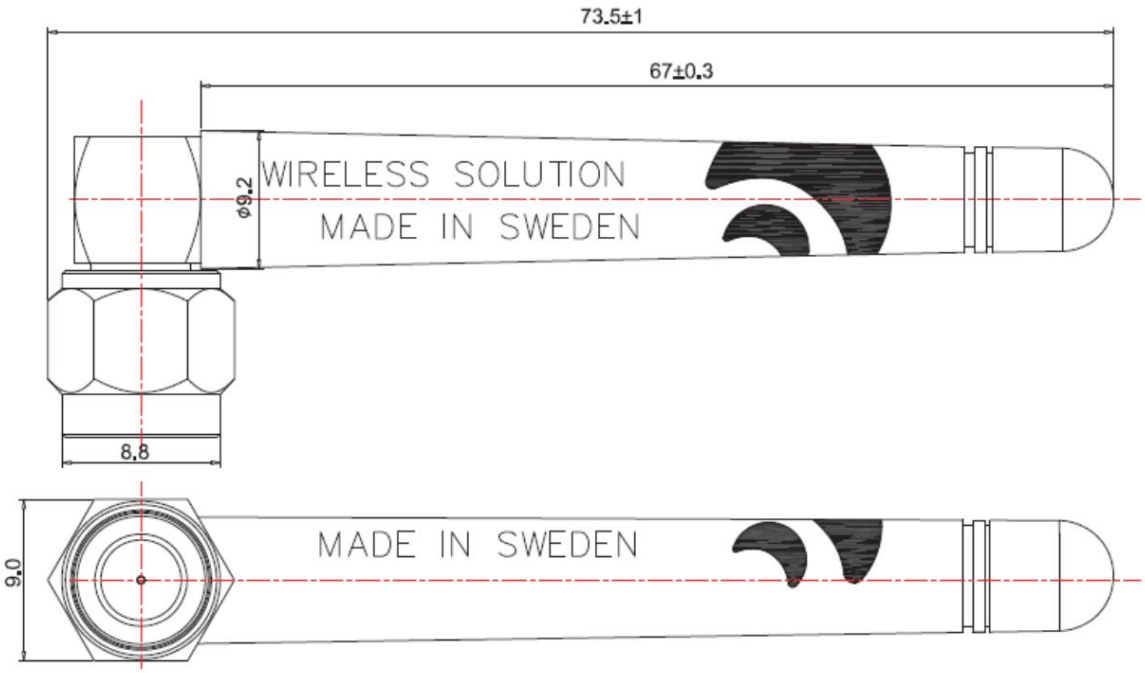
3. 104-A40502: W-DMX™ Indoor 5dBi Antenna 2.4 GHz



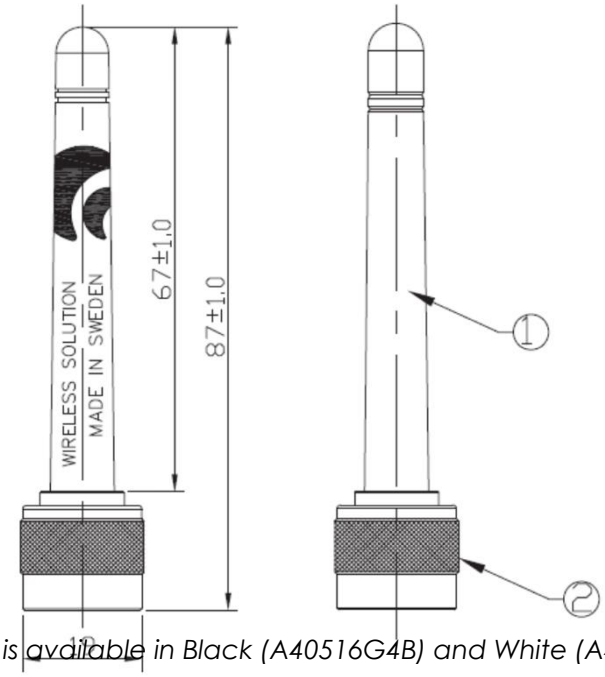
4. 104-A40503: W-DMX™ Indoor 7dBi Antenna 2.4 GHz



6. 104-A40520: W-DMX™ Indoor Mini 2dBi Antenna 2.4 GHz

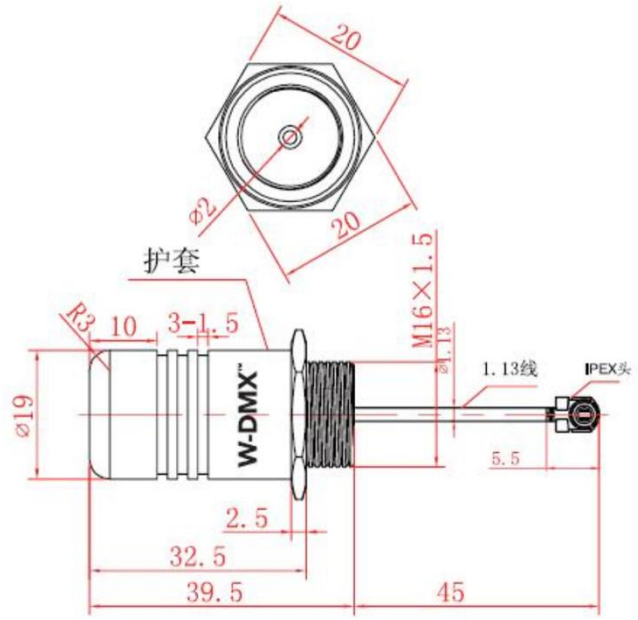


7. 104-A40516G4(B/W): W-DMX™ Outdoor Mini 2dBi Antenna 2.4 GHz



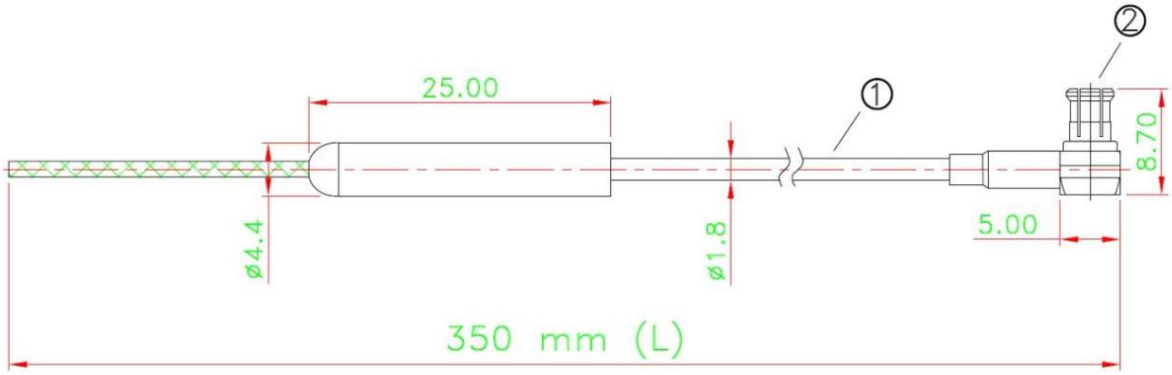
Note that this antenna is available in Black (A40516G4B) and White (A40516G4W).

8. 104-A40531G4(YAG/GS): W-DMX™ Outdoor Chassis 2dBi Heavy Duty 360x320 degrees.



Note that this antenna is available with 75cm cable (A40531G4YAG) and 30cm cable (A40531G4GS).

9. 104-A40523: W-DMX™ Internal OEM Antenna 2.4 GHz



Order Codes

Cables

Order Code	Name	Notes
A40920	*25cm Cable MCX – Chassis N Female Connector*	
A40921	*20cm Cable MCX – RP-SMA Chassis Connector*	
A40922-30CM	*30cm Cable MCX – RP-SMA Chassis Connector*	
A40922	*40cm Cable MCX – RP-SMA Chassis Connector*	
A40923	*20cm Cable MCX – RP-SMA Female flange*	
A40924	*30cm Cable MCX – RP-SMA Female flange*	
A40924-40CM	*40cm Cable MCX – RP-SMA Female flange*	

Note: *If the standard cables above do not meet your requirements, custom cables can be provided. Contact Wireless Solution for more information.*

Antennas

Order Code	Name	Notes
A40501	Indoor 2dBi Antenna 2.4GHz	
A40502	Indoor 5dBi Antenna 2.4 GHz	
A40503	Indoor 7dBi Antenna 2.4 GHz	
A40511G4	Indoor 2dBi/4dBi Dual band antenna 2.4/5GHz	
A40520	Indoor Mini 2dBi Antenna 2.4 GHz	
A40522	W-DMX™ Indoor 2dBi Small Antenna 2.4 GHz	
A40516G4B	Outdoor Mini 2dBi Antenna 2.4 GHz Black	
A40516G4W	Outdoor Mini 2dBi Antenna 2.4 GHz White	
A40523	W-DMX™ Internal OEM Antenna 2.4 GHz	
A40531G4YAG	Outdoor Chassis 2dBi Heavy Duty 360x320 degrees 75cm	
A40531G4GS	Outdoor Chassis 2dBi Heavy Duty 360x320 degrees 30cm	