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OverledBUSpilot è un sistema di trasmissione DMX over power, si tratta di trasmissione del DMX/RDM sulla alimentazione da 12Vdc fino al max 50vdc, senza che sia necessario polarizzare i conduttori. Questo permette di semplificare il cablaggio e di rendere possibile la installazione in piscine o fontane dato che si alimenta in bassa tensione. Il numero massimo di dispositivi slave collegabili sul BUS in parallelo è 32 per Pilot,con massimo 8 byte di dati (DMX 8 canali/slot per modulo driver collegato alla lampada),mentre il carico totale massimo ammesso è di 500Watt @24vdc.Il Pilot è compatibile con sistemi ART NET dove può anche essere utilizzato come nodo ad un universe DMX, oppure puo essere controllato tramite DMX input rimanendo compatibile con RDM,permettendo tutte le azioni possibili di settaggio canali DMX e personalità, e viene visto dal DMX come oggetto trasparente, cioè si comunica direttamente con i moduli ad esso collegati. Il Pilot è anche utilizzabile come DMX recorder dotato di SD per memorizzare degli Show,e di ingressi digitali per attivare appunto la funzione di memorizzazione e di play degli show.La comunicazione sul bus è di tipo time slot dove OverledBUSpilot II è il master che fornisce ai moduli driver alimentazione e DMX negli stessi conduttori elettrici, i conduttori che collegano i moduli driver al Pilot dovranno opportunamente essere dimensionati per il carico e per la lunghezza.

OverledBUSpilot:

- RDM/DMX/ArtNet to OverLed Bus Network
- ArtNet to DMX
- ArtNet Recorder
- DMX Recorder
- ArtNet + DMX Player

OverledBUSpilot it's a data over power,the DMX signal or ART NET is coupled and transmitted over power. The power supply for OverledBusPilot can be from12VDC up to 50VDC, the DMX/RDM data trasmission over power is made by Pilot, with correct cable gauge depending on the total power required from the fixture connected.The maximum number of the fixture are 32, the maximum DMX channel (Slot) per fixture are 8, the maximum power is 500W @24Vdc, and 100mt cable.OverledBUSpilot it is also a DMX recorder and ART NET node for one Universe (512 DMX channel). OverledBUSpilot it is the MASTER of the entire system, where the data are transimitted in time slot, error free, if a data packet isn't received correctelely from the slave module (driver or node), this will be sent again in 20-35mSec. OverledBUSpilot, it is a poprietary Overled bus.
The OverledBUS system require Master (OverledBUSpilot) and Slave OverledBUSdriver or node, those board can drive LED or STRIP led. The OverledBUSdriver board can be integrated with the lamp (OEM module), the OverledBUSnode it is native in a box, for wall applications, with screw driver connectors for the Harness.

Overled OverledBUSpilot II

DDS629B puo' fungere da ricevitore DMX (DMX In mode) o generatore DMX (DMX Out Mode).La modalita' viene selezionata mediante comando via ethernet utilizzando il software eSuite o JArtNet. L'IP di default e' 10.0.0.190.Lo stato e la modalita' di funzionamento sono indicati dai 5 led, descritti piu' avanti.Quando si trova in DMX In Mode, il dispositivo risponde a tutti i comandi RDM standard (impostazione personalita', indirizzo DMX di base, indirizzo DMX dei singoli point OverledBus, etc etc).Se viene avviato il Play di uno show registrato su sd-card, il dispositivo diventa temporaneamente un generatore DMX anche se la modalita' selezionata e' DMX In.Se il dispositivo viene lasciato in modalita' DMX Out e non si dispone di connessione Ethernet per riportarlo in DMX In, applicare segnale DMX in ingresso ed accendere il dispositivo: il segnale viene rilevato e provoca la commutazione in modalita' Dmx In.

Funzioni degli Ingressi:

Il dispositivo dispone di 4 ingressi digitali (IN1 – IN4) la cui funzionalita' e' di seguito descritta.

Ingressi IN1-IN2: lancio in PLAY di uno di tre show registrati su sd-card, secondo la seguente tabella. 0 = ingresso non attivo; 1 = ingresso attivo (chiuso sul morsetto del comune):

IN2	IN1	Risultato
0	0	Stop
0	1	Play dello show n. 1
1	0	Play dello show n. 2
1	1	Play dello show n. 3

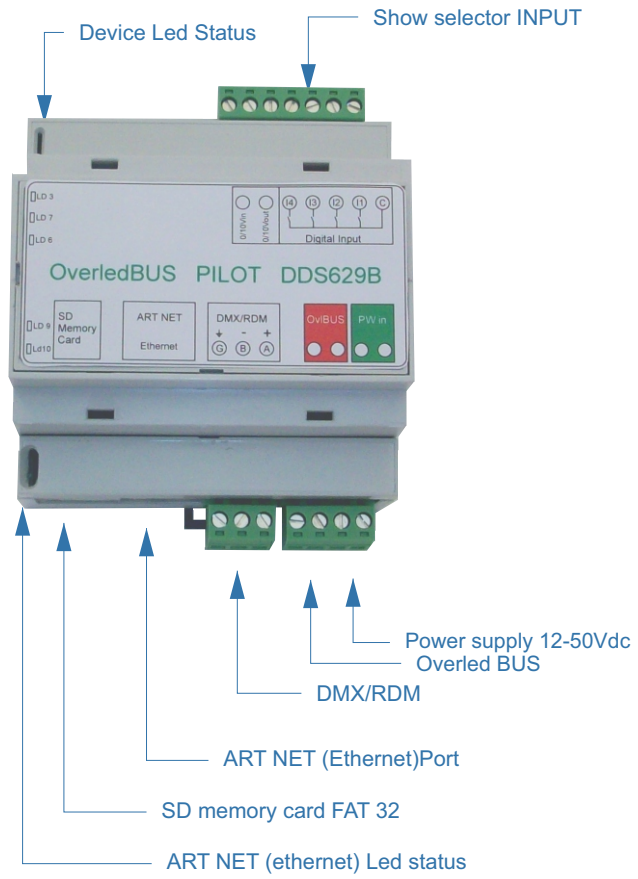
IN3: Riservato per future espansioni
IN4: Comando di Play Stop / Play Start / Record Stop / Record Start su singolo tasto:
L'ingresso IN4 e' utile in caso si desideri registrare uno show in una delle tre posizioni disponibili.Una pressione breve produce lo stop di un eventuale Play / Record in corso. Se il dispositivo e' gia' in Stop, produce l'avvio dello show selezionato sugli ingressi IN1-IN2. Se gli ingressi sono entrambi a riposo, verra' avviato lo show n. 1 oppure l'ultimo show attivato via Ethernet (1-999).
Per lanciare un Play non e' necessario agire su IN4, perche' gli ingressi IN1-IN2 eseguono questa operazione automaticamente nel momento in cui cambia il loro stato.

Volendo registrare uno show, agire come segue:
- Selezionare il n. dello show che si desidera registrare (1-3) agendo sugli ingressi IN1-IN2;
- Se uno show e' presente (e quindi e' partito in PLAY), fermarlo attivando brevemente IN4;
- Fornire il segnale da registrare (su DMX In oppure ArtNet);
- Avviare la registrazione attivando IN4 per > 2 secondi;
- Per terminare la registrazione, attivare brevemente In4.

Le funzioni degli ingressi non impediscono il regolare funzionamento di comandi di PLAY /RECORD impartiti da eSuite o JartNet. A tale scopo, agiscono solo su cambiamento dello stato.
E' possibile lasciare scollegati gli ingressi ed ottenere egualmente il funzionamento del PLAY / REC da remoto via ethernet, nonostante IN1-IN2 siano a 0 (condizione che normalmente corrisponde a STOP).Il numero di show selezionato da remoto via ART NET (ethernet) (1 – 999) rimane operativo ed e' possibile lanciarlo successivamente in PLAY anche mediante attivazione breve di IN4. Viene revocato soltanto agendo sugli ingressi IN1-IN2, perche' essi selezionano lo show 1-3 in base al proprio stato.

Lo stato degli ingressi IN1-IN2 puo' essere alterato in tutte le combinazioni; non c'e' bisogno di passare per lo STOP per attivare il play di uno show diverso. Il dispositivo provvede a chiudere preventivamente il file di un eventuale show in corso, prima di lanciare quello nuovo.

In caso di avvio del PLAY mediante comando ethernet, il dispositivo ricorda il proprio stato anche in caso di spegnimento dell'alimentazione ed esegue il play dello show eventualmente attivato precedentemente.Se pero' gli ingressi IN1-IN2 sono diversi da zero, verra' attivato lo show da essi selezionato.



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DDS629B This board can be used as ART Net to DM interface, or DM recorder. The operation mode can be selected by ethernet command or using software Esuite, Default factory IP address is 10.0.0.190. The operation mode status is indicated by 5 led, as mentioned in the next page.
During DMX mode operation, the device can receive RDM 2.0 standard command (personality setting, DMX address, Dmx address of each connected overledbus node, ecc.)
If is playing a show recorded on the SD CARD the device is a DMX generator also if the operation mode is DMX IN. If the device is in DMX operation no Ethernet connection available , to bring back to DMX Input, apply external DMX generator to DMX and power on DDS629B, the unit go to DMX IN Operation automatically.

Available input description:

The device has 4 digital input (IN1 – IN4)

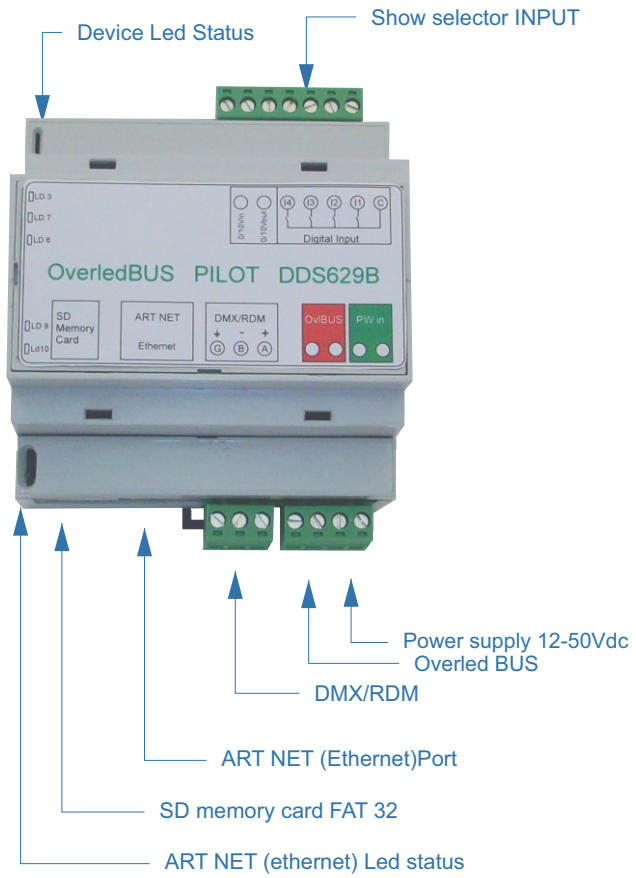
Input IN1-IN2: Run prerecordered Shows on sd-card, in according to table below:

0 = input false 1 = input true (connecting with common on the connector):

IN2	IN1	Function
0	0	Stop
0	1	Play show n. 1
1	0	Play show n. 2
1	1	Play show n. 3

IN3: Reserved for future use
IN4: Command Play Stop / Play Start / Record Stop / Record Start on toggle:

To record a show in the SD card, select one of 3 show in according with the table above, connecting to IN1-2 connectors the combination for the number of the show you want, then connect input4 shortely to ensure there are no show in play, then follow those step:
-Select the number of show you want record by input 1-3
-Send DMX signal to DMX input or send ART NET
- connect input 4 > 2 second
- stop recording connect input 4 shortelely
The status of DDS629 can be monitored by LED.
To make run SHOW in play mode just switch IN1-IN2 they automatically play the show number as specified by IN 1 and 2.
In case of ART NET command PLAY/ RECORD will be accepted with priority respect digital input, ART NET can be found in Esuite software or Jartnet.
Switching the In1 and In2 will change the show in Play immediately as soon the first selected show is finished.



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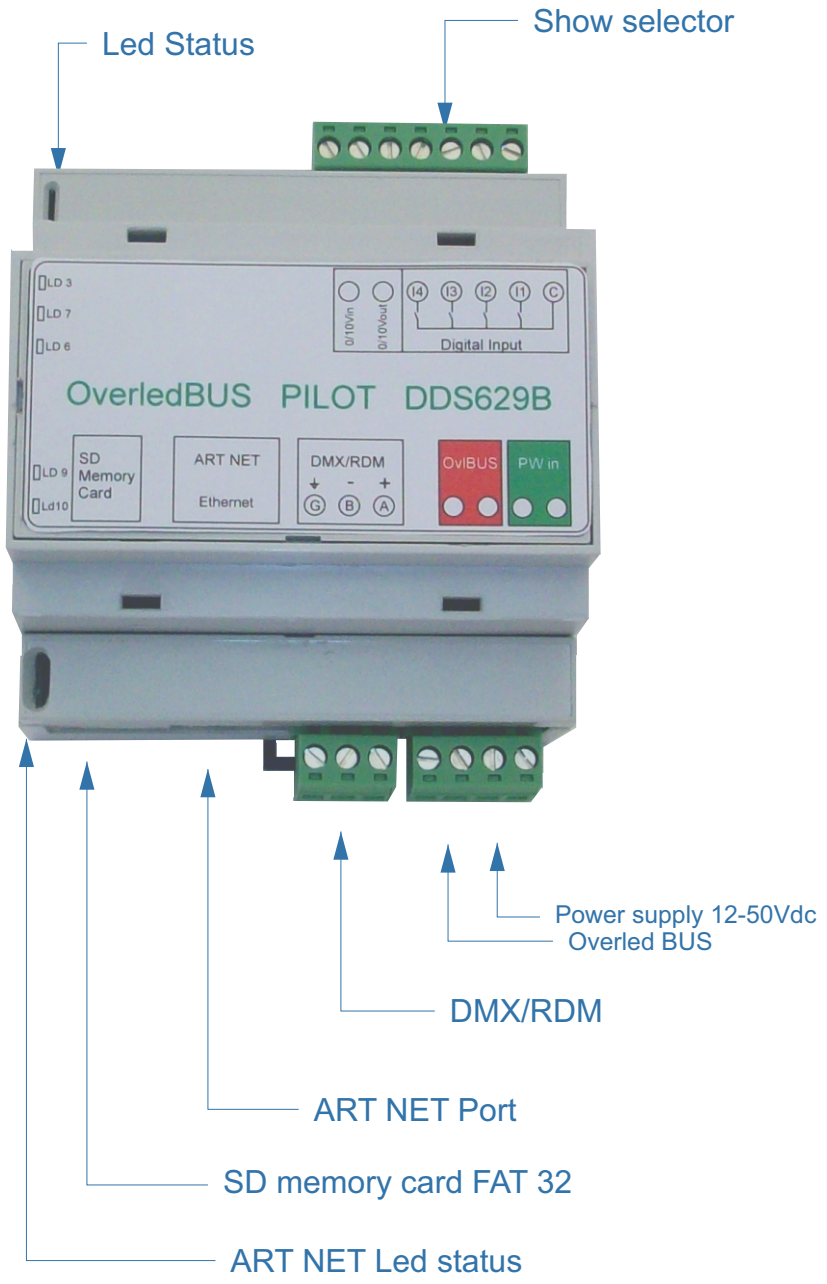

Segnalazioni LED
I led giallo/rosso sul lato connettore Ethernet indicano lo stato del link ethernet (art net):
- Entrambi spenti = cavo scollegato
- Rosso acceso / lampeggiante = link a 10mbit LED 9
- Giallo acceso / lampeggiante = link a 100mbit LED 10

LED Status Dispositivo
LED 3 = verde
LED 6 = Rosso
LED 7 = Giallo

Alla accensione si ha led6 Rosso che lampeggia durante caricamento del bootloader, poi Giallo LD7 che indica la fase di detect DMX In, che puo' revocare eventuale stato di DMX Out Mode. Infine, rimane acceso led3 Verde o led6 Rosso a seconda della condizione di funzionamento, descritta di seguito:

Ld3 Verde ON = Dmx Input mode;
Ld3 Verde Flash = Dmx presente in ingresso

Ld6 Rosso ON = Dmx Output mode;
Ld6 Rosso Flash = ArtNet in ingresso

Se c'e' ArtNet ma dispositivo in DMX In mode, avremo combinazione di Verde ON e Rosso flashing (tx solo verso Overled Bus)

Durante il funzionamento, il led Giallo si accende se il primo canale DMX / ArtNet e' >= 128 (monitor di ricezione).

Logica di segnalazione Led per il player:

Led3 Verde slow flash = PLAY (sd-card)
Led3 Verde very slow flash = Show automatico

Led6 Rosso slow flash = RECORD; se ci sono frames in ingresso (come deve essere), contemporaneamente Verde flash 25%.

Se play/rec in pausa, rispettivo led lampeggia con duty 20% (praticamente un blink lento).

Se errore sd-card, Rosso slow_flash con duty 90% per tre secondi.

Tabella esaustiva segnalazioni Led: Condizione	LED6 ROSSO	LED 3 VERDE
DMX IN Mode, nessun segnale in ingresso	off	on
DMX IN mode, DMX In presente, trasmissione ArtNet + OverledBus	off	flash
DMX IN mode, ArtNet In presente, trasmissione OverLedBus	flash	on
DMX OUT, nessun segnale in ingresso	on	off
DMX OUT, ArtNet IN presente, generazione DMX OUT + OverledBus	flash	off
Se filtro universi attivo, abbiamo 25% di duty sul verde:	flash	flash 25%
sd-card REC in corso; verde lampeggia se ci sono frames in entrata	slow_flash	flash)
sd-card PLAY in corso	off	slow_flash
show automatico in corso	off	very_slow_flash
Errore sd-card	slow,90%	off
Sia Play che Rec: se in pausa, il rispettivo led lampeggia con duty 20%		
Un Nodo sta registrandosi su piu' di uno slot (normale al power-on)	on	on
Un Nodo non ha completato registrazione (linea difficoltosa)	fast_flash	fast_flash

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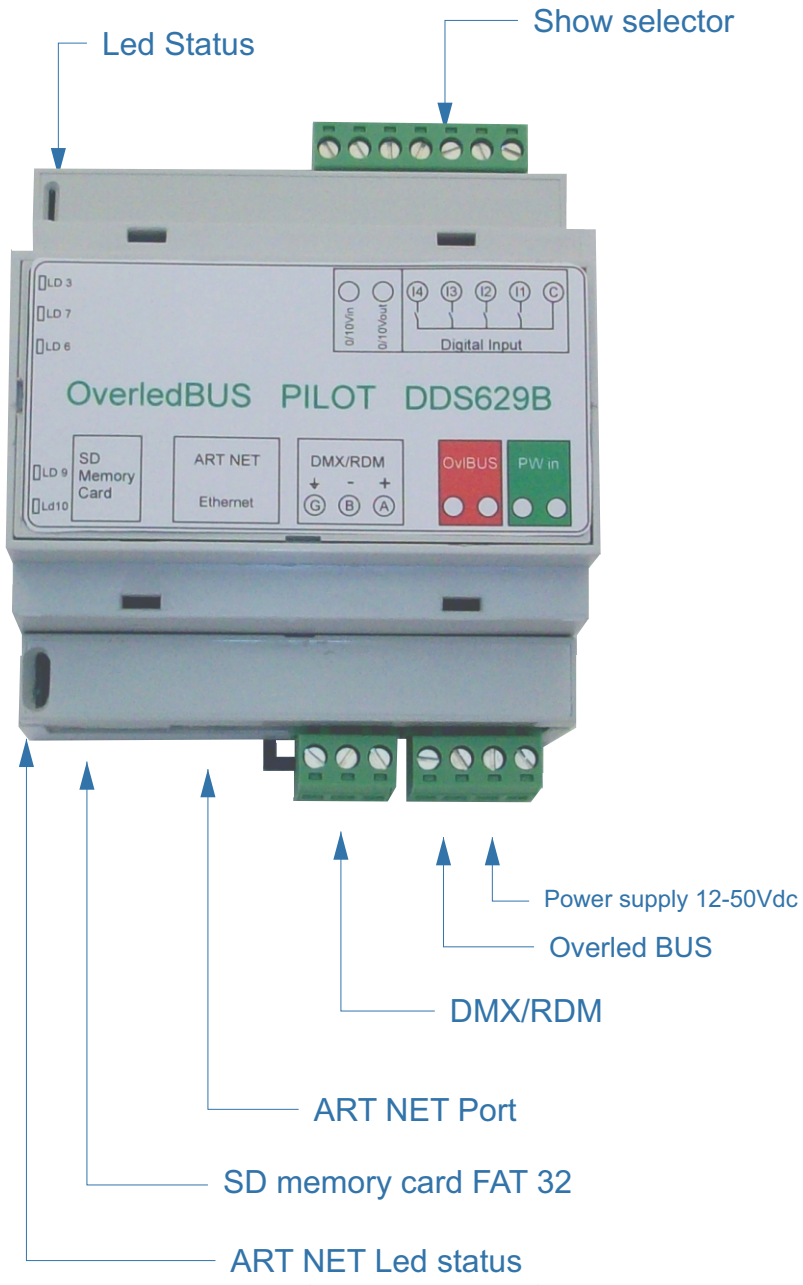


LED status Art NET Ethernet
Yellow and RED LED (9-10) indicate Ethernet status:
-Both off = cavo scollegato
- Red on - blinking = link a 10mbit
- Yellow on - blinking = link a 100mbit

LED Status device
LED 3 = verde
LED 6 = Rosso
LED 7 = Giallo

At power on LED6 (red) blink during boot loader loading, yellow Ld7 on, DMX detection this can stop DMX out operation (in case play of show DMX become output), LED 3 and LED 6 are indicating the following status

Ld3 Green ON = Dmx Input mode
Ld3 Green Flash = Dmx engaged

Ld6 Red ON = Dmx Output mode to slave unit
Ld6 Red Flash = ArtNet input

If ART NET is receiving and device is in DMX mode, green LED is on and RED LED is flashing the data are transmitted to OverledBUS

During OverledBUS data transmission yellow LED on means first DMX channel is sending data value > 128 bit (receiving monitor).

Player mode LED indicatio:

Led3 Green slow flash = PLAY (sd-card) the recorded show is in play
Led3 Green very slow flash = Automatic Show

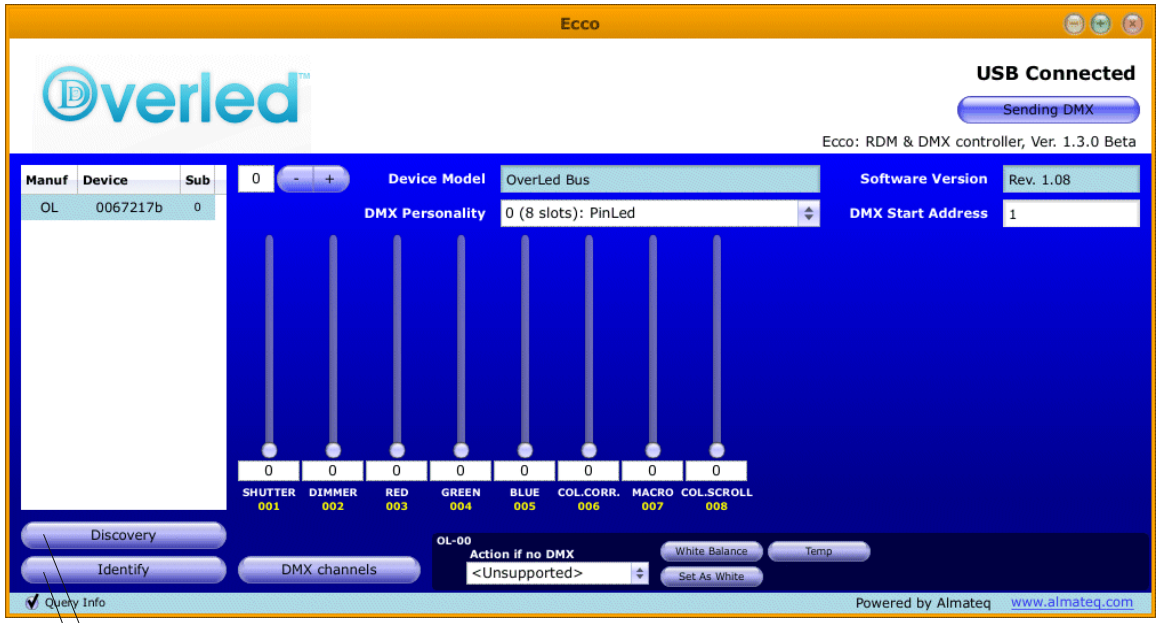
LED 6 RED slow flash = RECORD if DMX input is receiving data frames, in mean time the green led flash at 25%.

Play/rec in pause, RED led blink duty 20% , slow blink.If an error occur on SD-CARD Red led flash with 90% of duty for 3 second.

Reference table for LED: Condiction	LED6 RED	LED 3 GREEN
DMX IN Mode, no signal in	off	on
DMX IN mode, DMX Engaged, trasmission ArtNet + OverledBus	off	flash
DMX IN mode, ArtNet In available, trasmission OverLedBus	flash	on
DMX OUT, no signal in	on	off
DMX OUT, ArtNet IN , DMX OUT + OverledBus	flash	off
Universe filter on , 25% duty on GREEN	flash	flash 25%
sd-card REC in progress; GREEN blink if DMX frames input	slow_flash	flash)
sd-card PLAY	off	slow_flash
Auto Show n progress	off	very_slow_flash
sd-card Error	slow,90% off	
Play or REC pause led blink duty 20%		
Node during connection to pilot (normal at power-on)	on	on
Node not registered line problem	fast_flash	fast_flash

Overled OverledBUSpilot

RDM Setting Screen shot

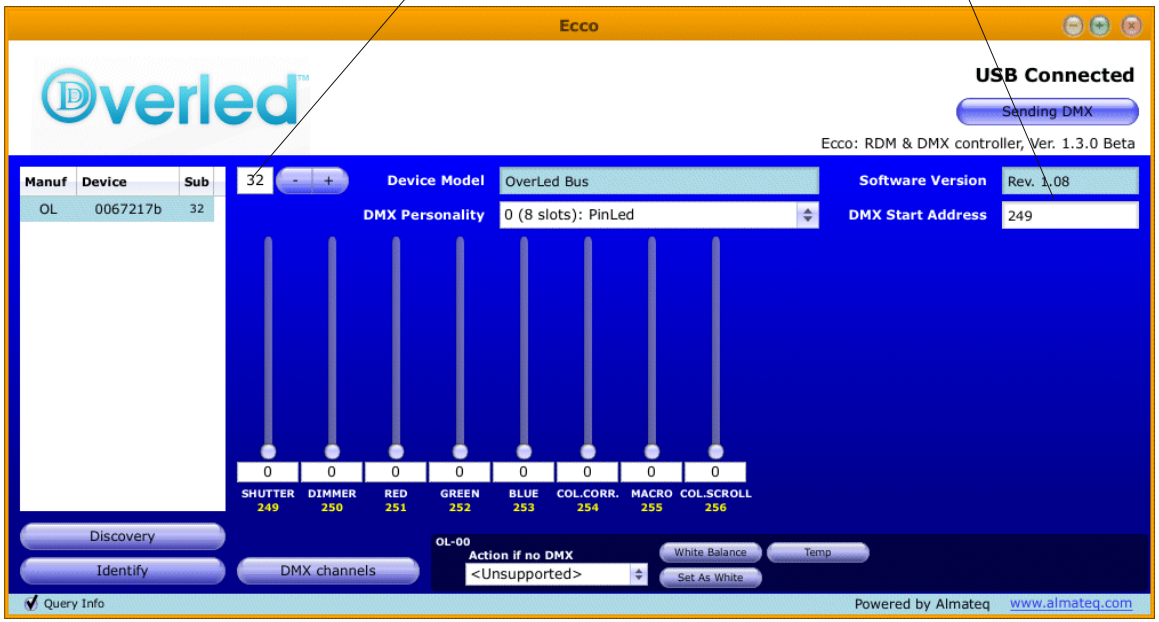


Slave Discovery

Slave identification on bus

Sub Net device

DMX address



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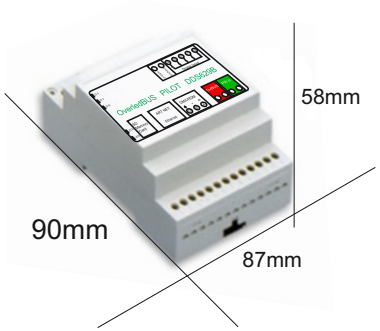
Electrical

	Min	TYP	MAX
VOLTAGE	11,5		49,5
CURRENT	0.1A	.15A	10A
WATT	.5W		480W
DIGITAL IN	6VDC	12VDC	24VDC



DIN bar mounting

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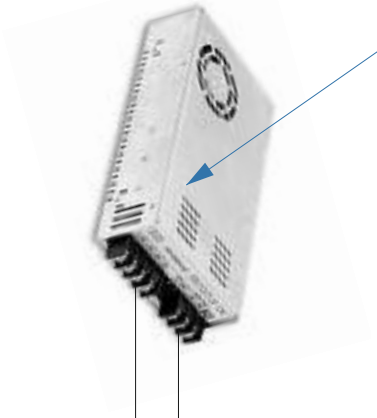
Cablaggio
Wiring:



Alimentatore12-48Vdc
d i m e n s i o n a t o
per il carico lampade

12/48vdc power supply

External switching power supply 12-48VDC out with correct power for the load.

110/220VAC

cavo 2 poli non polarizzato con sezione appropriata

MAX 300mt

Lampada led con OverledBUSdriver installato all'interno

Led fixture with embedded OvrledBUSdriver embedded

modulo #1 .... #32

module #1 .... #32

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Overled OverledBUSpilot

Cable shielding Ethernet:

Main article: Electromagnetic shielding
STP cable format

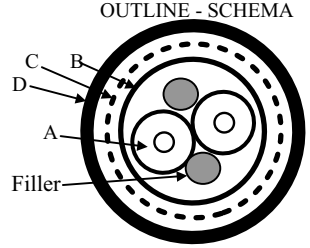
Twisted pair cables are often shielded in attempt to prevent electromagnetic interference. Because the shielding is made of metal, it may also serve as a ground. However, usually a shielded or a screened twisted pair cable has a special grounding wire added called a drain wire. This shielding can be applied to individual pairs, or to the collection of pairs. When shielding is applied to the collection of pairs, this is referred to as screening. The shielding must be grounded for the shielding to work.Shielded twisted pair (STP or STP-A) STP cabling includes metal shielding over each individual pair of copper wires. This type of shielding protects cable from external EMI (electromagnetic interferences). e.g. the 150 ohm shielded twisted pair cables defined by the IBM Cabling System specifications and used with token ring networks.Screened unshielded twisted pair (S/UTP) Also known as Foiled Twisted Pair (FTP), is a screened UTP cable (ScTP).
Screened shielded twisted pair (S/STP or S/FTP) S/STP cabling, also known as Screened Fully shielded Twisted Pair (S/FTP), is both individually shielded (like STP cabling) and also has an outer metal shielding covering the entire group of shielded copper pairs (like S/UTP).This type of cabling offers the best protection from interference from external sources, and also eliminates alien crosstalk.
Note that different vendors and authors use different terminology (i.e. STP has been used to denote both STP-A, S/STP, and S/UTP) .

DMX cable specification

DESCRIPTION: Round Cable Sec. 2x0.25 mm² d.5.50 mm
DESCRIZIONE: Cavo tondo sez. 2x0.25 mm² d.5.50 mm

FLAMAR COD: -
CUSTOMER CODE: -

OUTLINE - SCHEMA



A

Conductor Conduttore

Material	Materiale	Bare Copper	
Conductor nr.	N.dei conduttori	2	
Stranding	Trefolatura	14x0.15	mm
Section nom	Sezione nominale	0.25	mm²
Electric resistance	Resistenza elettrica	<77.5 (IEC 344)	Ω/km
Insulation material	Materiale di isolam.	PE	
Color ins.	Colore isolamento	Red-Blue	
Hardness ins.	Durezza isolamento	55	Shore D
Diameter	Diametro	1.75+/-0.10	

1th Shielding 1° Schermo B

Material	Materiale	Tape Al-Pet (Al outside)	

2nd Shielding 2° Schermo C

Material	Materiale	Tin Copper	
Avg. coverage	Copertura media	95	%
Electric resistance	Resistenza elettrica	<35	Ω/km

Protectiv Cover Guaina D

Material	Materiale	PVC	
Color	Colore	Black	
Hardness	Durezza	76	Shore A
Diameter	Diametro	5.50+/-0.20	mm

Marcatura a ink-jet da definire

Temperature Rating:	-20°C to +70°C
Voltage Rating:	30V (Only Electronic use, not for Power)
Dielectric Strength	2000Vx1'
Capacità nominale c/c	64 pF/m
Impedenza nominale	120 Ohm

Cable conforming to: Standard 2002/95/CE (RoHS)
Packaging Confezionamento Bobina d.230

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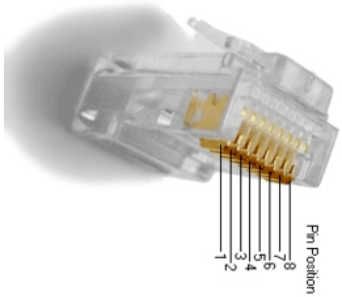
Ethernet connectors

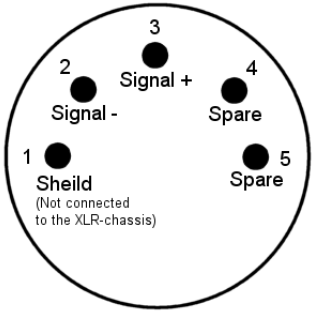


TIA/EIA-568-B T568A Wiring Pin

Pair	Wire	Color	
1	3	tip	Pair 3 Wire 1 white/green
2	3	ring	Pair 3 Wire 2 green

Pin	Pair	Wire	Color
1	2	tip	Pair 2 Wire 1 white/orange
2	2	ring	Pair 2 Wire 2 orange
3	3	tip	Pair 3 Wire

DMX connector



Pin 1 = signal reference = cable shield
Pin 2 = signal inversion = ' - ' or B, blue
Pin 3 = signal = ' + ' or A, red
Pin 4 = not used
Pin 5 = not used

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DMX512

Developed by the Engineering Commission of United States Institute for Theatre Technology (USITT), the standard was created in 1986, with subsequent revisions in 1990 leading to USITT DMX512/1990.DMX512-A In 1998 the Entertainment Services and Technology Association (ESTA) began a revision process to develop the standard as an ANSI standard. The resulting revised standard, known officially as "Entertainment Technology — USITT DMX512-A — Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories", was approved by the American National Standards Institute (ANSI) in November 2004. This current standard is also known as "E1.11, USITT DMX512-A", or just "DMX512-A", and is maintained by ESTA.

Network topology

A DMX512 network employs a multi-drop bus topology with nodes strung together in what is commonly called a daisy chain. A network consists of a single DMX512 controller — which is the sole master of the network — and one or more slave devices. For example, a lighting console is frequently employed as the controller for a network of slave devices such as dimmers, fog machines and intelligent moving lights.
Each slave device has a DMX512 "IN" connector and, in many case, a DMX512 "OUT" connector (sometimes marked "THRU") as well. The controller, which has only an OUT connector, is connected via a DMX512 cable to the IN connector of the first slave. A second cable then links the OUT or THRU connector of the first slave to the IN connector of the next slave in the chain, and so on. The final, empty, OUT or THRU connector of the last slave on the daisy chain should have a terminator plugged into it. A terminator is a stand-alone male connector with a built-in resistor. The resistor — typically 120 Ω to match the cable characteristic impedance, is connected across the primary data signal pair. If a secondary data pair is used, then another termination resistor is connected across it as well. Although simple systems, i.e., systems having few devices and short cable runs, may work reliably without a terminator, it is considered good practice always to use a terminator at the end of the daisy chain. Some DMX devices have built-in terminators that can be manually activated with a mechanical switch or by software, or by automatically sensing the absence of a connected cable.
Each DMX network is called a "DMX universe". Large control desks (operator consoles) may have the capacity to control multiple universes, with an OUT connector provided for each universe.

Electrical

DMX512 data are sent using EIA-485 voltage levels. However, quoting from E1.11, "The electrical specifications of this Standard are those of EIA-485-A, except where specifically stated in this document. Where a conflict between EIA-485-A and this document exists, this document is controlling as far as this Standard is concerned."

DMX512 is a bus network no more than 1200 meters long, with not more than 32 devices on a single bus. If more than 32 devices need to communicate, the network can be expanded across parallel buses using DMX splitters. Network wiring consists of a shielded twisted pair, with a characteristic impedance of 120 Ohms, with a termination resistor at the end of the cable furthest from the controller to absorb signal reflections.

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Connectors

DMX512 1990 specifies that where connectors are used, the data link shall use five-pin XLR style electrical connectors (XLR-5), with female connectors used on transmitting (OUT) ports and male connectors on receiving ports. DMX512-A (E1.11) requires the use of an XLR-5 connector, unless there is insufficient physical space on the device, in which case an XLR-5 adapter shall be supplied. DMX512-A (E1.11-2008) allows the use of eight-pin modular (RJ-45) connectors for fixed installations where regular plugging and unplugging of equipment is not required.Some DMX512 equipment manufacturers employ non-compliant connectors and pinouts; the most common of these is the three-pin XLR connector, since the electrical specification currently only defines a purpose for a single wire pair. There is risk of equipment damage if a novice unfamiliar with lighting technology accidentally plugs XLR 3-pin DMX into an audio device, since the DMX signal voltages are much higher than what audio equipment normally uses.Also, devices are sometimes fitted with four-pin connectors when both communications and power are sent through a common cable.

XLR-5 pinout

1. Signal Common
2. Data 1- (Primary Data Link)
3. Data 1+ (Primary Data Link)
4. Data 2- (Optional Secondary Data Link)
5. Data 2+ (Optional Secondary Data Link)

RJ-45 pinout

1. Data 1+
2. Data 1-
3. Data 2+
4. Not Assigned
5. Not Assigned
6. Data 2-
7. Signal Common (0 V) for Data 1
8. Signal Common (0 V) for Data 2

The RJ-45 connector pinout matches the conductor pairing scheme used by Category 5 (Cat5) twisted pair patch cables. The avoidance of pins 4 and 5 helps to prevent equipment damage, if the cabling is accidentally plugged into a single-line public switched telephone network phone jack.
Cabling for DMX512 was removed from the standard and a separate cabling standards project was started in 2004. Two cabling standards have been developed, one for portable DMX512 cables (ANSI E1.27-1 - 2006) and one for permanent installations (draft standard BSR E1.27-2). This resolved issues arising from the differences in requirements for cables used in touring shows versus those used for permanent infrastructure.
The electrical characteristics of DMX512 cable are specified in terms of impedance and capacitance, although there are often mechanical and other considerations that must be considered as well. Cable types that are appropriate for DMX512 usage will have a nominal characteristic impedance of 120 ohms. Cat5 cable, commonly used for networking and telecommunications, has been tested by ESTA for use with DMX512A. Also, cables designed for EIA485 typically meet the DMX512 electrical specifications. Conversely, microphone and line level audio cables lack the requisite electrical characteristics and thus are not suitable for DMX512 cabling. The significantly lower impedance and higher capacitance of these cables distort the DMX512 digital waveforms, which in turn can cause irregular operation or intermittent errors that are difficult to identify and correct.

RDM Physical layer

The RDM protocol and the RDM physical layer were designed to be compatible with legacy equipment. All compliant legacy DMX512 receivers should be usable in mixed systems with an RDM controller (console) and RDM responders (receivers). DMX receivers and RDM responders can be used with a legacy DMX console to form a DMX512 only system. From a user's point of view the system layout is very similar to a DMX system. The controller is placed at one end of the main cable segment. The cable is run receiver to receiver in a daisy-chain fashion. RDM enabled splitters are used the same way DMX splitters would be. The far end (the non console or splitter end) of a cable segment should be terminated.RDM requires two significant topology changes compared to DMX. However, these changes are generally internal to equipment and therefore not seen by the user.First, a controller's (console's) output is terminated. Second, this termination must provide a bias to keep the line in the 'marking state' when no driver is enabled.The reason for the additional termination is that a network segment will be driven at many points along its length. Hence, either end of the segment, if unterminated, will cause reflections.A DMX console's output drivers are always enabled. The RDM protocol is designed so that except during discovery, there should never be data collisions. To assure this lack of collisions, while making possible implementation on different platforms, there are times when all line drivers are required to be disabled. If nothing more than the termination was done, the line would float to some unknown level. In that case one or more random changes might be read on the line. These random changes greatly decrease system accuracy. So the biasing of the line is requiredTo assure this, section 2.4.1 (Line Bias Networks) of the standard says; "The command port shall provide a means to bias the termination of the data link to a value of at least 245 mV and verified by using the test circuit described in Appendix F."The standard further states that, the biasing mean "shall be polarized such that Data+ of the data link is positive with respect to Data- the data link. The Line Biasing network shall maintain this bias when the data link is loaded with the equivalent of 32 unit loads and common mode voltage is varied over the range of +7 volts to -7 voltThe standard does not require any particular circuit for providing the basis and termination; however, the simplest method is often a passive pull apart network.Whatever method is used must be tested with the chosen driver chip to see that the design combination still meets the requirement of E1.20. Tests are given in Appendix F of the standard. These tests are for design verification and are not required as production testing. Experience has shown many EIA485 drivers designed for 5 volt operation will pass the required tests. It is not so clear that all 3.3 volt parts will pass. In either case this performance must be verified. Details of the pull apart network and the tests can be found in ANSI E1.20 - 2006.

Protocol

RDM packets are inserted in-between the existing DMX data packets being used to control the lighting data. The DMX 512 specification always requires that DMX packets begin with the start code. The default Start Code is 0x00(also known as the Null Start Code). By using the start code 0xCC, RDM packets can be safely inserted between DMX data packets without older non-RDM aware devices attempting to read them.The DMX 512 specification required DMX connectors to be a 5-pin XLR type, with only the first 3 pins being used (pins 4 and 5 were reserved for "future use"). Unfortunately, various manufacturers started using the final two pins for various, proprietary purposes, such as low-voltage power or proprietary talk-back protocols. As a result, the decision was made to have all RDM communication on pins 2 and 3. This raises data collision concerns.The RDM standard addresses this problem by ensuring that in all cases (except discovery) only one device is authorized to be transmitting at any given time (somewhat similar to the token passing approach). Only the controller (of which there can be only one) can start an RDM exchange. Responders can speak only if spoken to. The controller will always initiate all RDM communication.

All RDM devices have a unique identifier (UID) that consists of a manufacturer ID and serial number.Protocol

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Art-Net is an Ethernet protocol based on the TCP/IP protocol suite. Its purpose is to allow transferof large amounts of DMX512 data over a wide area using standard networking technology.The latest revision of the protocol implements a number of new features and also simplifies thedata transfer mechanism. The hanges are all based on feed back from manufacturers who are usingthe protocol.

Limitations:
A theoretical limit of 255 universes of DMX512 exists in this specification. However a simplistic data rate comparison (DMX runs at 250KBaud, 10BaseT at 10MBaud) suggests a maximum of 40 universes of DMX is the limit. Art-Net uses a simple delta transmission compression technique that will provide about 40 universes. If an installation of more than say 30 universes is contemplated, then it is necessary to use the unicast features of Art-Net II and 100BaseT or better physical layer. If this is done the number of universes limit becomes purely related to the network bandwidth.

Credits:
Artistic Licence require that companies who implement Art-Net in their products include a user guide credit of: "Art-Net™ Designed by and Copyright Artistic Licence (UK) Ltd".

Terminology:
• Node: A device that translates DMX512 to or from Art-Net is referred to as a Node.
• Universe: A single DMX512 frame of 512 channels is referred to as a Universe.
• Sub-Net: A group of 16 consecutive universes is referred to as a sub-net. (Not to be confused with the subnet mask).
• A central controller or monitoring device (lighting console) is referred to as a Server.
• IP: The IP is the Internet protocol address. It is expressed in either a long word format (0x12345678) or dot format (2.255.255.255). Convention is that the former is hexadecimal and the latter is decimal. The IP uniquely identifies any Nodes or Servers on a network.
• Subnet Mask: Defines which part of the IP represents the Network address and which part represents the Node address. All Art-Net implementations require a Sub-Net mask of 255.0.0.0. This means that the first byte of the IP is the network address and the remaining three bytes are the Node address.
• Port: Actual data transmission on Art-Net uses the UDP protocol that operates 'on top of' the TCP/IP protocol. UDP data transfer operates by transferring data from a specific IP:Port address on a Node or Server to a second specific IP:Port address on a second Node or Server. Art-Net uses only one port address of 0x1936.
• Limited Broadcast: When a network first connects, the Server does not know the number of Nodes on the network, nor does it know their IP addresses. The Limited broadcast address allows the Server to send an ArtPoll to all Nodes on the network.
• Server: A generic term describing an Art-Net device with the primary task of generating control data. For example, a lighting console.
• Node: A generic term describing an Art-Net device with the primary task of receiving control data. For example, a dimmer or an Ethernet to DMX gateway.
• Media Server: A generic term describing an Art-Net device capable of generating control data based on the 'mx' Media Extensions to Art-Net.

Protocol Operation:

A Node operates in one mode, each Node having a unique IP address derived from its Ethernet MAC address. The UDP port used as sources and destinations is 0x1936.

IP address configuration
The Art-Net protocol can operate on either a DHCP managed address scheme or using static addresses. By default an Art-Net product will factory start using a Class A IP address scheme. This allows Art-Net products to communicate directly and without the need for a DHCP server to be connected to the network.IP address configuration - DHCPNodes report whether they are DHCP capable in the ArtPollReply packet. This document details packets on the assumption that static addressing is used. When DHCP is used, the addressing and subnet masks will be modified as dictated by the DHCP server.IP address configuration – Static AddressingThe use of Class A addressing is allowed within a closed network. It is important to ensure that Art-Net data is not routed onto the Internet.Products implementing Art-Net should default to the Primary IP address of 2.?.?.?.The IP address consists of a 32 bit number designated as A.B.C.D. The lower the bytes B.C.D is calculated from the MAC address. The high byte 'A' is set to one of two values as shown in the following table.The MAC address is a 48 bit number designated u:v:w:x:y:z. This is a globally unique number. The upper three bytes 'u.v.w' are registered to a specific organisation. The lower three bytes 'x.y.z' are assigned by that organisation. In order to ensure that there is minimal possibility of IP address conflicts between different manufacturers supporting Art-Net, the product OEM code is added to the MAC address.
The 'B' field of the IP address is calculated by adding the high byte of the OEM code with the low byte of the OEM code and the 'x' field of the MAC address.On power up, the Node checks its configuration for IP addressing mode. If it has been programmed to use a custom IP address, the following procedure is not used.

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