aDDa-W

- **Transparency wireless communication**
- **Distance up to 100m**
- **2.4 GHz free frequency**
- **Up to 7 slaves per pico-network**

- o Up to 16 pico-networks
- o Quick start
- o Automatic slaves detection
- o Standard SMA antenna
- o Self adjustment of transmitting power
- o Display of transmit quality
- o Same module for master and slave

DESCRIPTION

At least two **aDDa-W** interfaces with one master and any slaves have to replace a cabled RS485 bus by a wireless bus. Contrary to the other modules aDDa, the aDDa-W do not need RS485 address. They thus have total "a transparency" on RS485 bus. Of course, all the aDDa modules (aDDa-M, aDDa-R) of mechanic *Tfx-Technology*™ gone up in network receive different addresses, as it is the case in their common use.

Radio frequency used is of 2.4Ghz (2402~2480Mhz). It forms part of the ISM band (Industry Scientific and Medical) which is recognized universally and which can be used without licence.

79 channels of 1Mhz make cohabit several radio links independent in the same way standard in the same place at the same moment. A radio link in general represents a connection between 2 interfaces, but when more than 2 communicate between them, one speaks then about "pico-network". This term is thus used to represent a virtual connection desired between at least 2 interfaces.

To prevent finding itself on a frequency already occupied by another pico-network, each pico-network changes frequency 1' 600 times a second according to a random pseudo algorithm that each configuration of a pico-network recognizes. Therefore, even if a collision of several pico-networks proceeds on the same channel, 625µs later, all the pico-networks will be on other channels, and will be able to thus retransmit the data not transmitted at the time of the collision. This jump of frequency also functions to solve the electromagnetic problems of noise at fixed frequency.

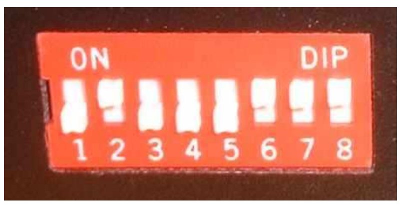
Transmission power between each link is variable. It depends on the quality of reception of each interface. If this one is too weak the power of the transmitter is increased. The power of emission saturates with 20dBm. 2 very close interfaces will transmit thus with very little power. This principle of adaptation of the power allows the coexistence of a maximum of pico-networks in a given space, by ensuring of course the quality of transmission.

Cohabitation with Bluetooth™ products function very well since the physical layer with the aDDa-W interface is the same one. However, the Bluetooth™ products do not manage to detect the presence of the aDDa-W interfaces in their environment, and vice versa. Thus inappropriate transfers of data between aDDa-W and Bluetooth™ are removed.

REQUIREMENT

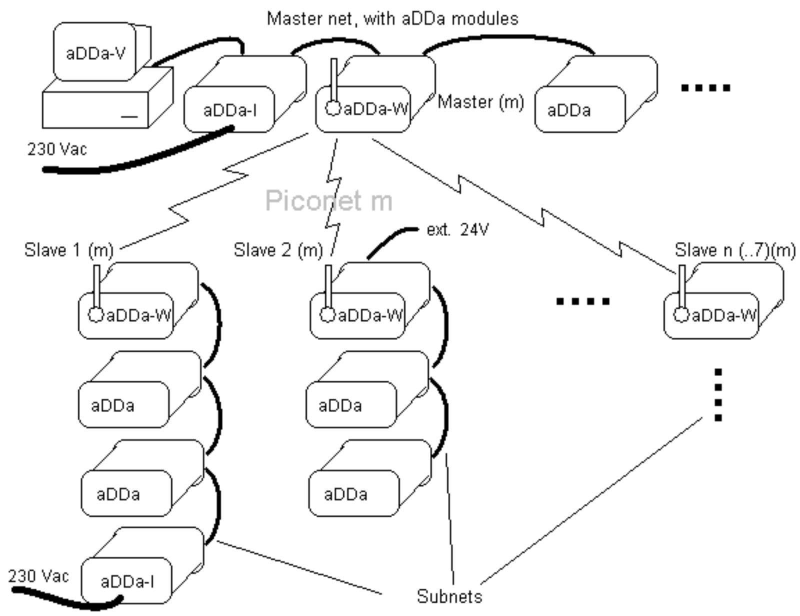
The system requirements are very simple: Determinate a aDDa-W master, all other aDDa-W interfaces are slaves, all with an identical ID of pico-network.

Bit	Function	ON	OFF
1	Mode	Slave	Master
2, 3, 4 et 5	Pico-network ID (PNID) Range from 0 to 15.		
6 et 7	Reserves.	Clear on OFF	
8	Reset	Run	Halt



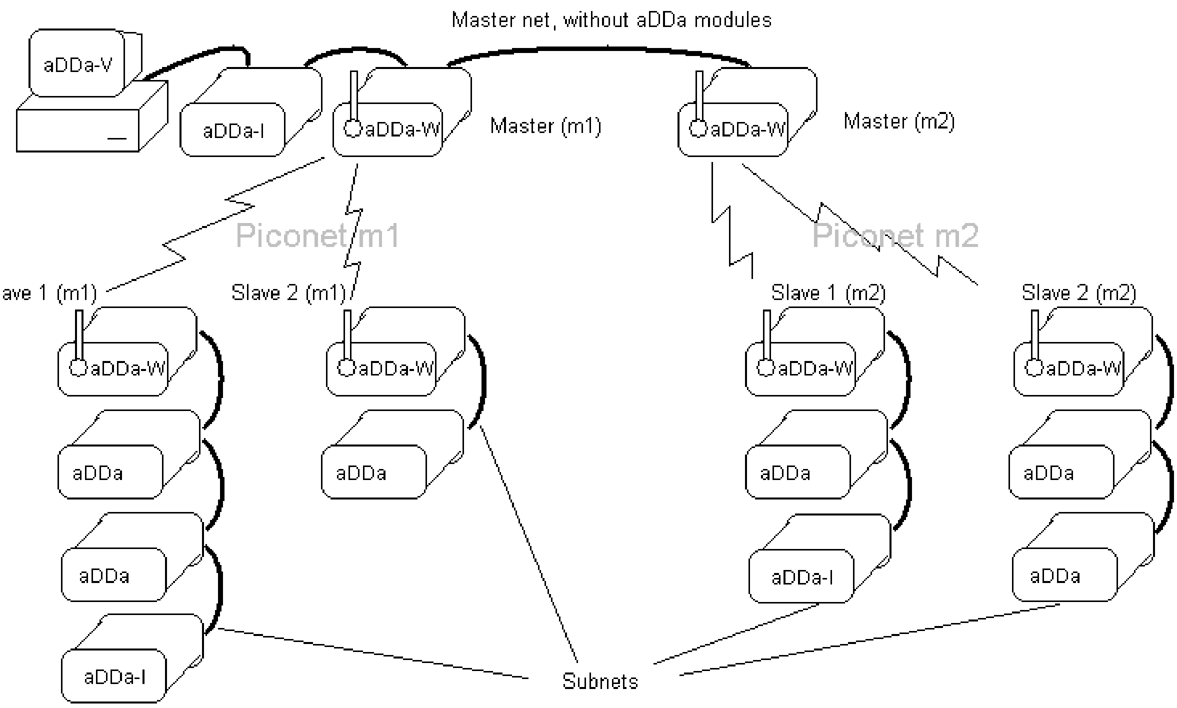
PICO-NETWORKS

SINGLE PICO-NETWORK



It is enough to select an identical number of pico-network for all interfaces. Maximum of 7 sub-networks slaves.

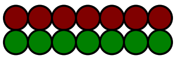
MULTIPLE PICO-NETWORKS



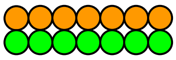
It is enough to select different pico-networks ID for each pico-network. Each master will occupy himself then as of his own slaves. A maximum of 10 pico-networks is a functional limit. With 7 slaves per pico-network, a maximum of 70 sub-networks seems a sufficient limit.

DISPLAY

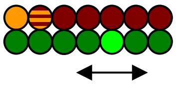
Each vertical pair of red and green LED represents one of the 7 channels of communication allotted to the moment of the opening of connections between the Master and his slaves.



State not fed or wait state if fed.

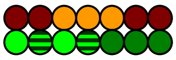


Just after the interlocking of the food, all LEDs lit show the starting of the module.

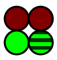
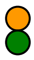


Mode of detection of the master only, this one searches its slaves. Green LEDs indicate scanning. The lit red LED (channel 1) shows already established connection. The flickering red LED (channel 2) indicates the discovery of a new slave. The opening of the channel will be made as soon as the detection mode will be finished.

1 7



State representing the quality of transmission between the modules of same the pico-network.
Channels 1 and 2 are optimum, because only green LEDs are lit. Channel 1 has its green LED lit constantly; therefore the module does not receive data on this channel. Channel 2 with its green LED which flickers indicates a reception of data.
Channels 3 and 4 are weak because reds and green LEDs are lit. Channel 4, with the difference of the 3, receives data because its green LED flickers.
Channel 5 is too weak, because only its red LED is lit. It is absolutely necessary to improve quality of transmission of this channel. There is a high risk to lose the connexion.
Channels 6 and 7 are unutilised.
The table has the quality of transmission according to the state of LEDs: transmission

Transmission	Optimal	Weak	to improve
LED state			

ANTENNA

A SMA jack on the aDDa-W interface makes it possible to connect an antenna with a SMA plug, either directly, or with an SMA extension. There is an industry connector very close to the SMA and which should not be confused: "Reverse Polarity SMA", so met under the names of RSMA, R-SMA or RP-SMA. **Check to connect only SMA plug on an aDDa-W**.

An antenna which emits/receives in all the directions is called omnidirectional. An antenna which emits/receives in a limited zone around it is directional. One speaks then about aperture (in degrees) to qualify a directional antenna. It is easily comprehensible that a directional antenna can have a larger range than an omnidirectional antenna, but only in one direction, because the radio power is concentrated only on one zone of space. The performances of the commercial antennas of omnidirectional type are more or less equivalent.

PRINCIPLE OF OPERATION

At start of the interface, the PNID is defined with the buttons. The slave who does not have connection with a master puts in the mode of waiting of a master. The master who does not have any connection with slaves puts to seek slaves with the same PNID as itself. He creates then necessary connections with the found slaves.
As long as the master does not receive data by RS485, he starts again the detection of slaves periodically. As soon as one byte is received by RS485, the interface prepares data transmission with the connected slaves. When it receives a message by RS485, it sends this package per radio to its opposite (master slave). The package (request) received by the master by RS485 gets a single identifier that it keeps throughout his radio transfer and that is transmitted with the answer. Thus all aDDa-W master returns a response by RS485 only if the identifier of the request and the answer are identical. Any package with a preceding identifier is destroyed.
Each aDDa-W master manages a pico-network (with a single PNID) but to the maximum 7 slaves. To ensure a maximum reliability, the packages are not broadcasted with the slaves. When the master must send a package, it does it with each slave; one after the other with a confirmation of reception each time. If a package requires a retransmission, it will wait first of all until the other slaves are served. Then only the retransmissions are carried out. The retransmission does not have a time out. It ends either in a confirmation of reception, or by a loss of communication between the 2 radio interfaces (~25s). If a master definitively loses a connection with a slave, it will not arrive to reconnect, as long as it receives data by RS485. Because it must above all guarantee optimum times with the other slaves. To make it possible to a master to find slaves (lost), it is enough to stop sending data by RS485 during 30 seconds.

SUPPLY AND COMMUNICATION

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Min	Typ	Max	Units
VCC	Operating voltage	6.2	24	30.8	V_{DC}
I_{in}	Supply current		15		mA

- Protected against reverse voltage

COMMUNICATION

RS485 type, half duplex, with proper protocol.

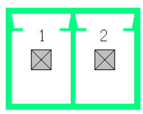
Symbol	Parameter	Min	Typ	Max	Units
B_{rate}	Transfer data rate		19'200		bps
Address	aDDa-M-F and aDDa-M-F+O	0x10	**0x11**	0xEF	
Address	aDDa-M-F+T and aDDa-M-F+T+O	0x10	**0x12**	0xEF	

PIN CONFIGURATION FOR USB TYPE A STACKED

Pin	Symbol	Parameter
1	VCC	Power supply
2	D-	RS485 differential communication, negative signal
3	D+	RS485 differential communication, positive signal
4	GND	Ground
Screen	Earth	Screen continuity

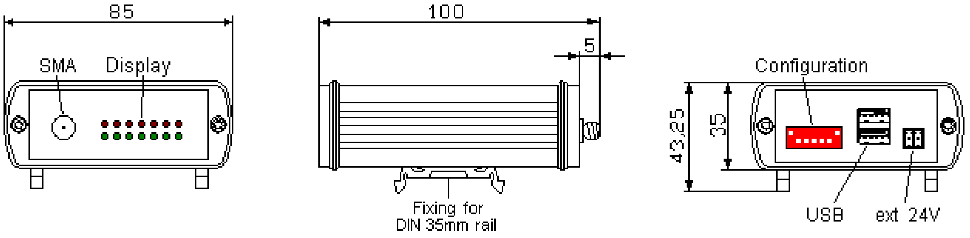
EXTRA CONNECTOR: PHOENIX MC 1,5/2-ST-3.5

Pin	Name	Description
1	VCC	For wire 0.14..1.5 mm^2 (AWG28..16)
2	GND	For wire 0.14..1.5 mm^2 (AWG28..16)



Remark: both connectors are internally connected.

CASE OUTLINE



CONTENTS

- 1 aDDa-W interface
- 1 USB cable type A-A of 0.3m
- 1 direct antenna (Titanis 2.4GHz SMA)
- 1 Phoenix 2 pins jack for external supply

TFX SA reserves the right to change the circuitry and specifications without notice at any time.