WRC-CANR-DF-DN
and
WRC-CANR-DF-SM
Series IV
CAN-Bus Fiber Optic Bus Extender
User's Manual
Revision 4.06

Western Reserve Controls

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Table of Changes		
Revision	**Changes**	**Date**
4.03	Initial Release for ProSoft	January 2012
4.05	Corrected 2600V to 2500V in Section 1, Updated List of WRC Products Available in Section 6	December 2014
4.06	Updated WRC Logo, Removed "Inc." from WRC, Added Table of Changes, Updated List of WRC Products Available in Section 6	October 2022

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Label Markings

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1. Overview

The WRC-CANR-DF Fiber Optic CAN Bus Extenders convert a copper cable medium CAN-Bus network to a fiber optic medium. The WRC-CANR-DF-DN uses multimode fiber optic cable, while the WRC-CANR-DF-SM uses single-mode fiber optic cable. Both are always used in pairs with a length of fiber media in between. The primary purposes of this type of configuration is to extend the maximum length defined for one continuous network cable bus up to 2.2km (for multimode with WRC-CANR-DF-DN) or 12km (for single-mode with WRC-CANR-DF-SM) and to provide network protection from external, high-energy electrical interference, such as lightning storms, arc welders, etc. They can be connected in a bus trunk line or drop line.

A WRC-CANR can be used for quite a number of helpful purposes, including

- To provide an electrically-isolated fiber transmission segment to your CAN bus for more secure network in high-energy environmental conditions

- to extend the network beyond its absolute maximum at the slowest speed

- to implement a longer network for a given baud rate (e.g., pushing a 500K baud network beyond 100 m for DeviceNet)

- to provide higher speed baud rates for a given network length

- to extend the length of the drop cable (e.g., longer drops than 6 m for DeviceNet)

- to provide 2500V electrical isolation between the 2 sub-nets

- to create a unique network topology instead of a conventional bus structure, such as a star configuration

The Extenders are transparent to the other nodes on the bus. They receive and actively re-transmit (store-and-forward) each message received at either side of the network without interpreting the message or acting upon it. The Fiber Extenders perform all appropriate CAN Bus arbitration on the copper bus as it re-transmits the message.

The WRC-CANR-DF-DN and WRC-CANR-DF-SM are members of WRC's family of products that extend the system communications lengths for DeviceNet, CANopen, SDS (Smart Distributed System), J1939 and other CAN, V2.0, Part A or Part B, serial bus systems. By allowing the user to extend the bus length for any given speed, they assist the user in cost-effectively implementing I/O or other nodes on these buses at remote locations that would be more difficult or more expensive to do otherwise.

The unit derives its power through the copper network connector on Side A.

1.1. Series IV Specific Features

The Series IV WRC-CANR provides enhancements over previous the previous Series III products, including:

*   Single Mode Fiber Cable Option is now available.

* Expanded DIP Switch settings allow selection for CAN-bus (including CANopen) speeds up to 1 M Baud in addition to the standard DeviceNet Baudrates
    * 9.6K, 10K, 20K, 40K, 50K, 100K 125K, 250K, 500K, 800K and 1M baud
* Improved Reverse voltage protection and CAN data lines noise immunity
* Increased message internal buffers – Automatic Memory Technology (AMT) operation
* Eliminates the distinction between WRC's earlier version Type 1 and Type 2 CANR
* **WARNING: Series IV F/W Revision 4.002 is not backward compatible.**

1.2. Standard Features

The WRC-CANR-DF-DN and WRC-CANR-DF-SM have the following features:

* Extends CAN-Bus cable lengths - trunk line or drop lines
* Expands the usable applications for CAN-Bus systems
* Allows operation at higher speeds for specific distances
* Provides superior electrical interference protection to copper cables
* Switch-selectable Autobaud or fixed baud rate operation
* Automatic speed selection - no configuration required
* Isolates the two sections of the copper bus
* Transparent to the Master and Slave devices on the bus
* No address selection needed
* No configuration parameters
* DeviceNet; SDS; CANopen; J1939; CAN, V2.0, Part A and Part B compatible
* Powered from the 24Vdc supplied by bus network or the user
* Sealed NEMA-4X enclosure
* Standard round, mini-style M18 connector with male pins for copper cable
* *For WRC-CANR-DF-DN*: Standard Fiber Optic ST female connector, 62.5/125µm technology
* *For WRC-CANR-DF-SM*: Standard Fiber Optic ST female connector, 9/125µm technology
* Standard CAN chips manage bus error detection
* Standard CAN chips handle message bus contention
* Less than 900 µsec latency
* Jumper-selectable termination built in on cable side
* 4 bi-color (red/green) status LEDs
* 2 green fiber transmit and receive LEDs

1.3. Basic Operation

Two CANR-DF units are included in an order and both are required for each application – both units are identical. It does not matter which is placed in which position with respect to the network topology or other devices on the network.

There are two bus connections for each CANR-DF, referred to as the Copper Cable Network Side (Side A) and Fiber Cable Network Side (Side B). The CAN Bus copper cable is connected to side A of the CANR-DF receives its power from side A.

Figure 1-1 shows a typical application.

Whenever a message is transmitted on the Bus to which CANR-DF is connected, CANR-DF receives the message on the side where it was initiated and performs a store-and-forward of the message to the other side. This action is performed in each direction and is performed for any valid CAN message independent of who generated it or to whom it is intended.

There is approximately a 900 µsec propagation delay of the message through the CANR-DF.

The CANR-DF is not addressed as a specific device on the Bus and cannot be interrogated by other nodes. It is transparent to all other nodes on the bus.

Fiber-optic extenders -
especially useful for outdoor applications

Host PLC

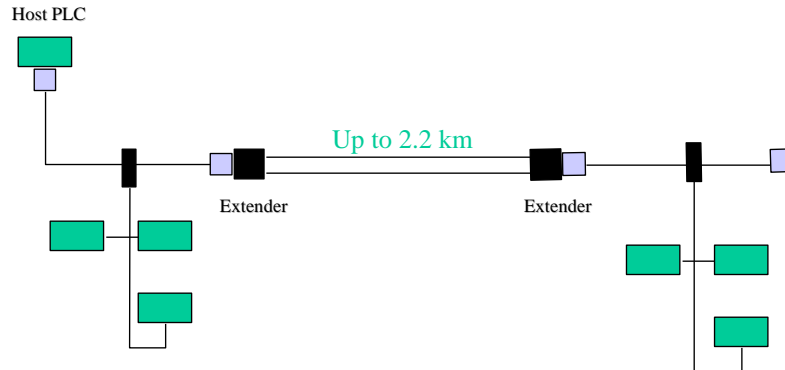Up to 2.2 km

Extender   Extender

Figure 1-1 Typical fiber optic bus extension application

1.4.   Reference Documents

The following documents are referenced in this User's Manual

* ODVA DeviceNet Specification

* Honeywell Micro Switch Specification GS 052 104, "SDS Smart Distributed System Physical Layer Specification", release date 12/8/1994

2. Quick Start

To quickly and easily install your CAN-Bus Fiber Optic Extenders in your DeviceNet system, follow the instructions below. For more details, see Section 4.

WARNING: Series IV F/W Revision 4.002 is not backward compatible.

1. These units are used in pairs. You need **two (2) CANR-DF** units and **two (2) 62.5/125μm, multi-mode fiber cable lengths** or **two (2) 9/125μm single mode fiber cable lengths** with **ST male connectors**.

2. Leave the DIP switches on the 8-position switch block **SW1** in the factory setting position of FF or **all OPEN** positions to set the baudrate of each CANR-DF to **Autobaud**.

3. Using on-board jumper W1, terminate CAN-Bus network, as appropriate. (This is especially critical at the higher baud rates.)

   - **For trunk lines, install W1.**

   - **For drop lines, remove W1.**

4. **Connect the fiber cables** to the CANR of one unit. Make sure they are clearly marked on both ends to differentiate between the two lines.

5. Make sure that there is power on the CAN-Bus Network and **plug the Network cable with a 5-pin round female MINI connector** into the CAN-Bus Extender.

6. The CANR-DF Extender will undergo its initialization sequence, flashing the LEDs. After approximately 5 seconds, the Module Status LED (labeled "MS") will go on solid green and network LEDs (labeled "NSA" and "NSB") will flash green. The DGN led might stay solid red until the fiber cables are connected to the other CANR and both CANRs are powered up.

7. **Repeat steps 2-6 above for the second CANR-DF**.

   Note: Be sure to connect the fiber from the TX port on one device to the RX port on the other.

8. Connect the desired network devices to both sides of the copper CAN bus.

9. Both Network A and B Status LEDs (NSA and NSB) will go on solid on each unit once a valid CAN message is received into either side of the Extender and the baudrate auto-detect has been successfully performed.

10. You may observe the small green LEDs marked RXF and TXF, next to the fiber ports, illuminate when data is received or transmitted.

11. The CAN-Bus Extenders are now operating on the network and they are ready operate in the CAN network.

12. If any of the LED's – marked DGN, NSA and NSB – blink red, this indicates that the internal message buffer on the CANR-DF has been filled before the device could transfer all previously received messages out the other side. Some messages may be lost. Slowing down the scan rate should help eliminate this.

3. General Specifications

Product: WRC-CANR-DF-DN and WRC-CANR-DF-SM, Series IV CAN-Bus Extender and Fiber Optic Converter

Description: Electrical Extender to extend the cable distances of CAN-based protocol products and convert the copper network to a fiber optic link.

Device Type: Communications Extender

Product Revision: 4.xx **WARNING: Series IV F/W Revision 4.002 is not backward compatible**

DeviceNet Conformance: Designed to conform to the ODVA DeviceNet Specification

Baud rate: 9.6K, 10K, 20K, 40K, 50K, 100K 125K, 250K, 500K, 800K and 1M baud fixed or auto-detect baud rate on DeviceNet

Address selection: Not applicable

Bus Connection:
Used On Device: Woodhead # 1R5006A17A120, male pins, male threads
CAN-Bus Cable: See accessories list

Fiber Optic Cable:
For WRC-CANR-DF-DN:
- 62.5/125μm, multi-mode, ST termination
For WRC-CANR-DF-SM:
- 9/125μm single mode, ST termination

Fiber Cable Length:
DN: 2200 meters (max)
SM: 12k meters (max)

Fiber Connection:
Used On Device: ST female
Fiber Cable: ST male

Status Indicators:
MS - Module Status: green/red bi-color LED
NSA - Copper Network A Status: green/red bi-color LED
NSB - Fiber Network B Status: green/red bi-color LED
DGN - Diagnostic Data: green/red bi-color LED
TXF - Fiber Transmit Active: green LED
RXF - Fiber Receive Active: green LED

Voltage Isolation: Provided by fiber cable system

Maximum power:
Voltage: 11 - 25 Vdc
Current: 110 mA @ 11 Vdc - 60 mA @ 25 Vdc
Power: 1.5 W

Mounting: Panel-mount, 4 screws or DIN-mount with kit

Size:
Length: 5.11" (130 mm)
Depth: 2.27" (57.7 mm)
Height: 3.70" (94.0 mm)

Operating Temp: 0-70 ºC

Humidity: 0-95% RH, non-condensing

Agency Approvals and Certifications: **Agency:** CE

4. Hardware Installation and Configuration

4.1. Overview

A CAN-Bus Extender is a single device connected to two parts of a single CAN-Bus network. The CANR-DF is a NEMA-4X enclosure and is panel mounted.
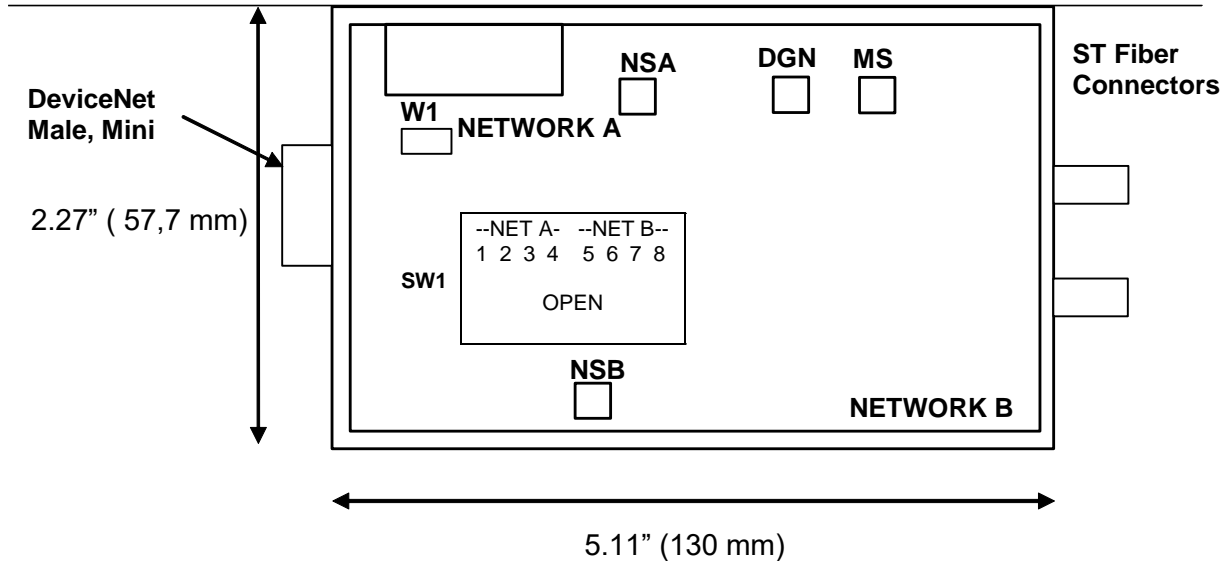
Figure 4-1   WRC-CANR-DF-xx CAN-Bus Extender (2 per)

4.2. LED Operation

A WRC-CANR-DF-DN Multiplexer has six (6) LEDs that provide visual status information to the user about the product and the DeviceNet network. The LED's definitions are summarized as follows and more thoroughly in the tables below in Table 4-1, Table 4-2 and Table 4-4.

- **MS** – Module Status – indicates the general health of the unit and its ability to Store-and-Forward messages.
- **NSA** – Network Status A – indicates the condition of the CAN bus connection of this Local unit.
- **NSB** – Network Status B – indicates the condition of the Remote unit's CAN bus operation on the other end of the fiber cable.
- **DGN** – Diagnostic – indicates status of the fiber-optic link.
- **RXF** – Receive Fiber – green indicates electrical signals being received by the CANR.
- **TXF** – Receive Fiber – green indicates electrical signals being sent by the CANR.

Table 4-1 Module Status LED (labeled MS)

LED State	Module Status	Meaning
OFF	No Power	There is no power through DeviceNet.
Green	Device Operational	WRC-CANR is operating normally.
Flashing Red	Minor Fault	Advanced Memory Technology (AMT) buffers space exceeded.
Red	Unrecoverable Fault	WRC-CANR may be damaged.
Flashing Red/Green	Device Self-Testing	WRC-CANR is in self-test mode.

Table 4-2 Local Device's Network Status LEDs (labeled NSA)

LED State	Module Status	Meaning
OFF	No Power / Not on-line	WRC-CANR has no power or device is not operating.
Flashing Green	Idle	WRC-CANR has not received a valid message for 0.5 sec.
Fast Flashing Green	Autobaud selection	The WRC-CANR is waiting for a valid message to fix the baudrate.
Green	On-line	WRC-CANR is operating normally and receiving messages.
Flashing Red	CAN controller buffer overflow	There is more traffic on the network than the system can handle.
Red	Critical link failure (Bus Off)	WRC-CANR has detected an error that makes it incapable of communicating on the link.

Table 4-3 Remote Device's Network Status LEDs (label NSB)

LED State	Module Status	Meaning
OFF	No Power / Not on-line	WRC-CANR has no power or device is not operating.
Flashing Green	Idle	WRC-CANR has not received a valid message for 0.5 sec.
Fast Flashing Green	Autobaud selection	The WRC-CANR is waiting for a valid message to fix the baudrate.
Green	On-line	WRC-CANR is operating normally and receiving messages.
Flashing Red	CAN controller buffer overflow	There is more traffic on the network than the system can handle.
Red	Critical CAN link failure (Bus Off)	WRC-CANR has detected an error that makes it incapable of communicating on the CAN bus.

Table 4-4 Diagnostic Status LEDs (labeled DNG)

LED State	Module Status	Meaning
OFF	Normal	Normal operation.
Green	Fiber Link OK	Serial link to fiber network operating.
Red	Time-out	Unit has not received a serial message (status or can) from the fiber link.
Flashing Red	Communications error	Internal FIFO stack has overflowed on the fiber link interface.

The Green TXF and RXF LED's are illuminated when data is actively transmitted out to the fiber link.

4.3. DIP Switch Settings

The WRC-CANR-DF has an 8-pole DIP switch.

- Switch positions 1-4 are used to set the baud rate of the CANR on which it is located (the local unit).
- Switch positions 5-8 are used to set the baud rate on the CANR at the other end of the fiber cable (the Remote Device).

The baud rates can be set independently, or one side can take its baud rate from the other side (in the "Remote" setting).

The Autobaud detects from DeviceNet bauds.

For CANopen speeds, select the fix baud rate setting.

When both the CANR units are set to all open switch positions (remote-remote) it scans through DeviceNet baud rates.

Table 4-5 Baud Rate Settings for Switches

| Baud rate | Local | Position 1 | Position 2 | Position 3 | Position 4 | Meaning |
	Remote	Position 5	Position 6	Position 7	Position 8	
125K		CLOSED	CLOSED	CLOSED	CLOSED	Fixed
250K		CLOSED	CLOSED	CLOSED	**OPEN**	Fixed
500K		CLOSED	CLOSED	**OPEN**	CLOSED	Fixed
Autobaud		CLOSED	CLOSED	**OPEN**	**OPEN**	Autobaud for DeviceNet Bauds (125k,250k,500k)
9.6K		CLOSED	**OPEN**	CLOSED	CLOSED	Fixed
10K		CLOSED	**OPEN**	CLOSED	**OPEN**	Fixed
20K		CLOSED	**OPEN**	**OPEN**	CLOSED	Fixed
40K		CLOSED	**OPEN**	**OPEN**	**OPEN**	Fixed
50K		**OPEN**	CLOSED	CLOSED	CLOSED	Fixed
100K		**OPEN**	CLOSED	CLOSED	**OPEN**	Fixed
800K		**OPEN**	CLOSED	**OPEN**	CLOSED	Fixed
1M		**OPEN**	CLOSED	**OPEN**	**OPEN**	Fixed
Remote		**OPEN**	**OPEN**	**OPEN**	**OPEN**	Takes baud rate from the opposite end device. If both sides are remote, Autobaud from either side.
Autobaud		ALL OTHER SWITCH POSITIONS				Autobaud

4.4. Power Requirements

The WRC-CANR-DF CAN-Bus Extender subsystems are powered from the 11-25 Vdc provided by the DeviceNet network. The WRC-CANR consumes 60 mA of current at 25 Vdc, or 1.5 Watts, typical. See Section 3.

4.5. CAN Network Cabling and Configuration

This section provides general guidelines for connecting DeviceNet and SDS systems. You can find detailed specifications in the referenced ODVA DeviceNet and Honeywell SDS specifications.

4.5.1. Cable Lengths

The following provide cable length limits for DeviceNet and SDS systems. These numbers apply independently to each physical section of the CAN (copper) network.

Table 4-6 Network Maximum Lengths - DeviceNet

| Baud Rate | Trunk Line Length | | Drop Length | | | |
| | Maximum Distance | | Maximum | | Cumulative | |
	Meters	Feet	Meters	Feet	Meters	Feet
125 Kbits/s	500 m	1640 ft	6 m	20 ft	156 m	512 ft.
250 Kbits/s	250 m	820 ft	6 m	20 ft	78 m	256 ft.
500 Kbits/s	100 m	328 ft	6 m	20 ft	39 m	128 ft.

DeviceNet has a limit of 64 nodes per network for any baud rate.

Table 4-7 Network Maximum Lengths - SDS

| Baud Rate | Trunk Line Length (maximum) | | Drop Length (maximum) | | No. of Nodes |
	Meters	Feet	Meters	Feet	
125 Kbits/s	457.2	1500	3.6	12	64
250 Kbits/s	182.8	600	1.8	6	64
500 Kbits/s	91.4	300	0.9	3	64
1 Mbits/s	22.8	75	0.3	1	32

SDS has a limit of 32 nodes per network for any baud rate.

Note: The CANR-DF CAN bus extender does not enable the user to add more nodes. In addition, it is transparent to the network and does not count as an addressed device.

4.5.2. Network Termination

A CAN-Bus system **must be terminated at each end of a copper trunk line**. The host controller and the **last** node device or WRC CAN-Bus Extender on the network must always be terminated to match impedance and eliminate reflections, even if only two nodes are present. Follow the information below when using a CANR-DF.

The CANR Series IV has a built-in terminator, which can be selectively included or omitted from the network. To include the on-board terminator (on the DeviceNet side), install jumper W1; or remove the W1 jumper if the on-board terminator in not desired. The CANR is shipped from the factory with the jumper installed. See Figure 4-1 for the location of the jumper.

Trunk line use:

For the purpose of network termination, the CANR-DF is treated as the last node on the copper section of the trunk network (side A) to which it is connected. Therefore, when a CANR-DF is used directly in a trunk line, it must be terminated on side A. The terminating resistor built into the CANR-DF at W1 must be installed, or another terminator at the end of the line could be used in the place of the W1 terminator.

Drop line use:

When CANR-DF is used in a drop line (the Network A side is toward the main trunk), the Network A connection must **not be terminated**. The user must remove the built-in terminator by removing the jumper plug at W1.

Some specifications for the terminating resistor are:

Table 4-8 Terminating Resistors

DeviceNet	SDS
121 ohm	120 ohm
1% metal film	2%
1/4 watt	1/4 watt

Important: Per the DeviceNet and SDS specs -- do not terminate devices on drop lines.

4.5.3. CAN-Bus Connection Wiring

The CANR-DF uses the round, mini-style connector on the copper side A and standard ST connectors on the fiber side B.
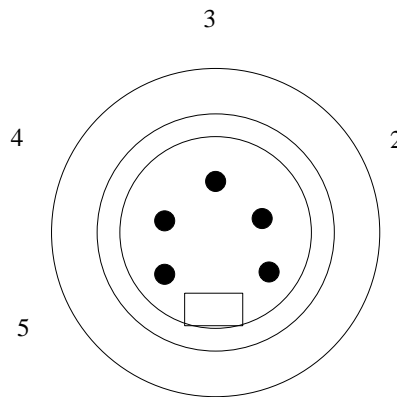
Figure 4-2**DeviceNet** Network Side A cable connector – Male (pins)

Pin #	Function	Wire color
1	Drain	bare
2	V+	red
3	V-	black
4	CAN_H	white
5	CAN_L	blue

Table 4-9 **DeviceNet** cable specifications

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FACE VIEW OF
MALE
MINI CONNECTOR

FACE VIEW OF
FEMALE
MINI CONNECTOR
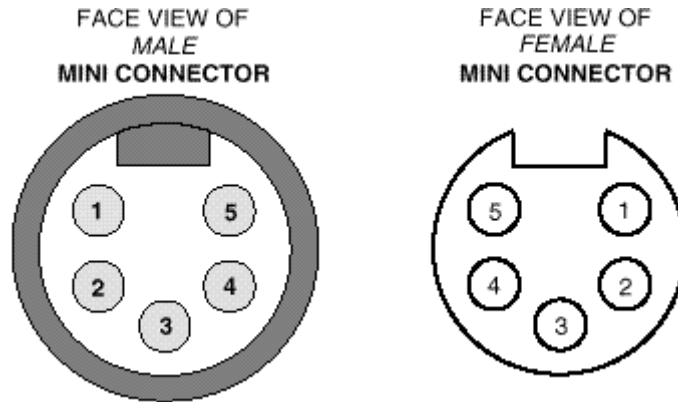
Figure 4-3 **SDS** Mini Connector

Pin #	Function	Wire color
1	Drain	Bare
2	V+	Brown
3	GND	Blue
4	CAN_H	Black
5	CAN_L	White

Table 4-10 SDS cable specifications

4.5.4. **Alternate Connector Options**

Cable sets may be purchased from an appropriate vendor or custom-made. Turck supplies individual connectors that may be used to build custom DeviceNet or SDS copper cables. Turck part number B 4151-0/16 is a 5-pin, 600V, 9A connector that mates with a number of cables that may be used for the Network A side on the CANR. Contact WRC or your local Turck dealer.

4.6. Fiber Cable

The WRC-CANR-DF-DN employs fiber optic driver and receiver that are capable of operating 62.5/125μm multi-mode cable a distance of 2200 meters. They use ST connectors. The Series IV WRC-CANR-DF-SM can operate with 9/125μm single mode fiber optic cable.

Two fiber cables are required. Each fiber cable is connected between TX of one CANR and RX of the other.

For custom applications using different fiber cable technology, contact WRC.

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5. Operation

Each CANR system receives CAN messages and then packs and transmits the messages over the fiber link to the other CANR, which produces the messages onto its CAN bus network. The CANR pair provides electrical isolation between the two CAN sub-networks. It has no CAN address and is logically transparent to the CAN network protocol. The CANR does not interpret nor act on the CAN messages.

The CAN Bus is connected to the A Side of the CANR-DF and receives its power from the Bus.

Whenever a message is transmitted on the Bus to which the CANR-DF pair is connected, one CANR-DF receives the message on the side where it was initiated and performs a store-and-forward of the message to the other side. This action is performed for any valid CAN message independent of who generated it or to whom it is intended.

There is a propagation delay of the message through the CANR-DF system, consisting of 2 parts: each CANR introduces approximately a 900 µsec delay, and the transmission time on the fiber link (in both directions) introduces additional delay.

The CANR Series IV also has the capability for each unit to monitor and report on the status of the other unit in the pair. The NSB LED on one unit reflects the status of the other unit. In this manner you can determine the operating status of both units by observing just one of them.

Also the CANR allows you set up the baud rate for both units from just one. See the section on switch settings, 4.3 above, for more details.

5.1. Application Notes

NOTE: CANR-DF'S ARE ALWAYS USED IN PAIRS!

To help insure ease of installation and reliable operation of your system, the following guidelines should be followed CANR-DF installation in your CAN network.

Proper CAN bus termination is critical to reliable operation of the network. Set the W1 jumpers on the CANR's appropriately.

Other than improper terminators, the most common problem is correct fiber cable connection and termination. Make sure one cable connects TX on one to RX on the other and vice versa. Also confirm that the fiber itself is good quality and the ends are correctly polished and terminated with ST connectors.

Use the on-board LEDs to help determine the health of the fiber cable interconnection.

In Autobaud applications, the baud rate that each device selects will be defined by the first valid message received from either the CAN-Bus or via the fiber connection from the other device.

Although multiple CANR's can be used in series, use only one CANR-DF pair in any network section. That is, only use one CANR-DF pair per trunk line or drop line.

 CANR-DF is not a grounded device and the Bus shield is not connected electrically to the device. Therefore, follow appropriate wiring practices to eliminate noise and other problems.

Example of a valid drop line applications are shown in the following figures. See Figure 1-1 for an example trunk line application.
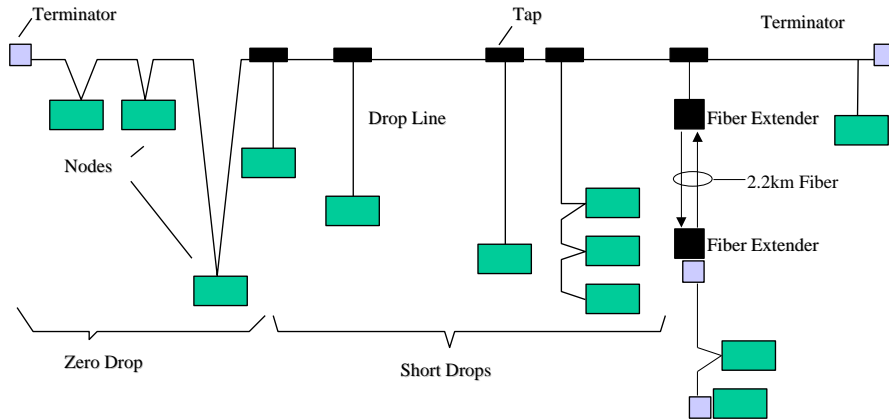
Linear Bus Topology - extended fiber drop

Terminator

Tap

Terminator

Drop Line

Nodes

Fiber Extender

2.2km Fiber

Fiber Extender

Zero Drop

Short Drops

Figure 5-1 CANR-DF on a drop line

Linear Bus Topology - multiple fiber drops

Terminator

Taps

Terminator

Drop Line

Nodes

Fiber Extender

Fiber Extender

2.2km Fiber

Fiber Extender
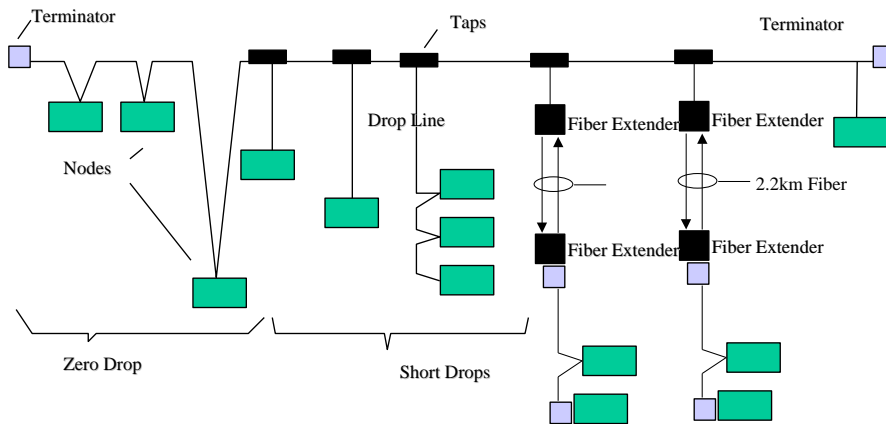
Fiber Extender

Zero Drop

Short Drops

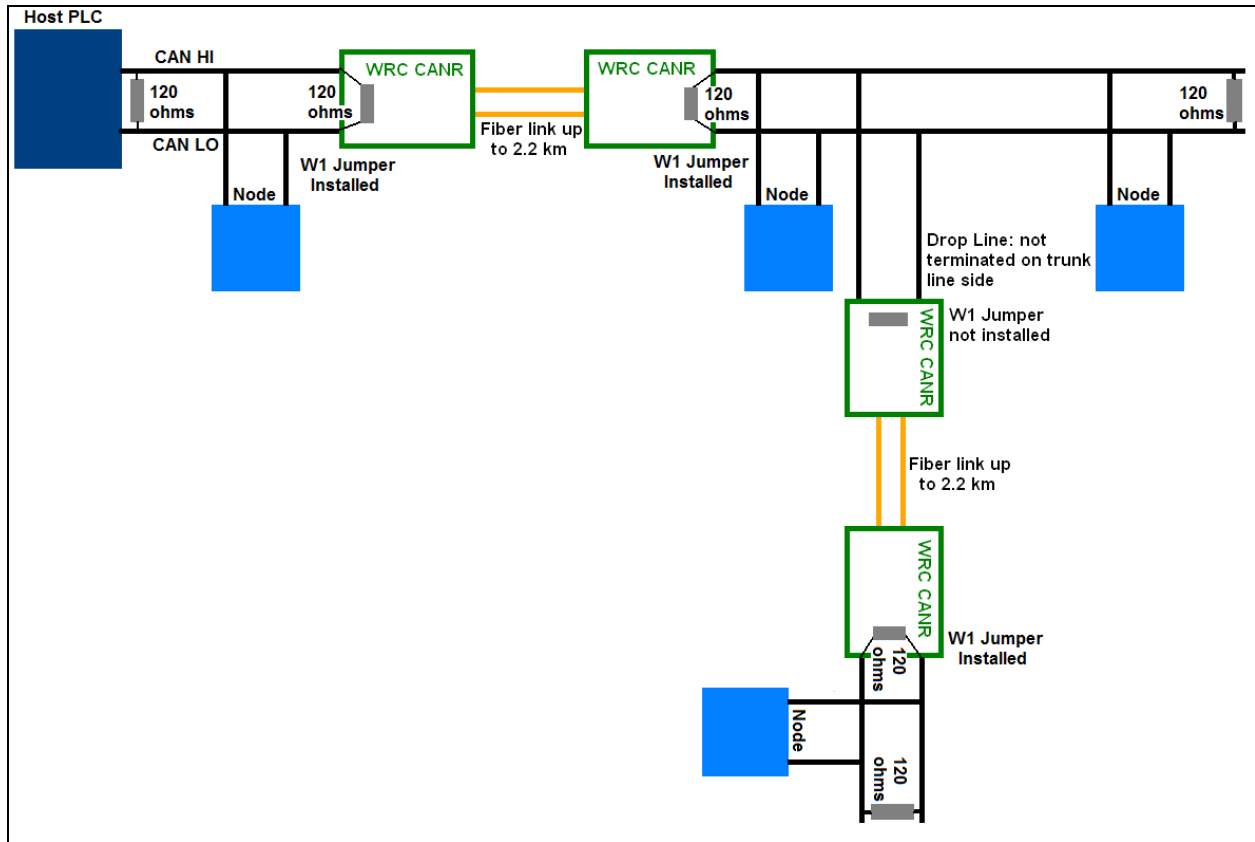Figure 5-2 CANR-DF on multiple drop lines

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Figure 5-3 Sample CANR-DF Setup

6.   Additional WRC Products

The following WRC products and components are also available.

Table 6-1 Additional WRC Products Available from ProSoft Technology

Part	WRC Part Number
DeviceNet, CANopen Extender, DIN mount	WRC-CANX-DIN-DN
DeviceNet, CANopen Extender, NEMA box	WRC-CANX-NEM-DN
DeviceNet, CANopen Extender, Fiber Optic, NEMA box, multi-mode fiber	WRC-CANR-DF-DN
DeviceNet, CANopen Extender, Fiber Optic, NEMA box, single-mode fiber	WRC-CANR-DF-SM

The following components can be used with a WRC-CANR CAN-Bus Extender for replacements or spare parts, or as complementary devices as a part of your DeviceNet system.

Part	WRC P/N	Equivalent Mfr. Part Number
• CANX-NEM Cable	n/a	Various manufacturers' Mini-Style Connector
		Examples:
		Cable assy. w/ male threads, male pins: Turck RSM 570-*M/630 ("trunk line") Turck RSM 571-*M/630 ("drop line")
• DIN rail (1 meter)	WRC 50022	Phoenix Contact NS 35/7,5 0801733 (2 m) Allen-Bradley 199-DR1 (1 m)
• Terminating resistor	RM121DN	121Ω,1%, metal film, axial lead resistor

WRC also provides discrete and analog I/O signal conditioning and multiplexing on DeviceNet, as well as communication gateways.

7. Troubleshooting

This section identifies some of the common problem observed when commissioning or operating a CANR-DF Extender.

Problem:

DeviceNet devices will not communicate on the network

Module Status LED is solid Green

Network Status LEDs are flashing Green at ½ second intervals

Meaning

No transmissions have been received by the CANX for 0.5 seconds.

Possible Solutions:

1. Network cables are broken or disconnected.
2. Network is not properly terminated.
3. All devices have stopped trying to communicate on the network.
4. Power has been lost on the B Side subnetwork.

Problem:

DeviceNet devices will not communicate on the network

Module Status LED is solid Green

Network Status LEDs are flashing Green quickly

Meaning

The CANR is in autobaud and is waiting for a valid message to fix its baud rate.

Possible Solutions:

1. Network cables are broken or disconnected.
2. Network is not properly terminated.
3. All devices have stopped trying to communicate on the network.

Problem:

Some messages are missed on network.

Module Status LED is solid Green

NSA and NSB LEDs are flashing Red

Meaning

Internal CAN buffers are full. Network has more traffic than it can handle.

Possible Solutions:

1. Reduce the scan rate from the Master.
2. Reduce the COS frequency on I/O devices.
3. Decrease the assembly sizes of I/O connections.
4. Recalculate the network traffic and bandwidth without the CANX.

Problem:

Some messages are missed on network.

Module Status LED is flashing Red

Meaning

Internal AMT buffers are full. Network has more traffic than it can handle.

Possible Solutions:

1. Reduce the scan rate from the Master.
2. Reduce the COS frequency on I/O devices.
3. Decrease the assembly sizes of I/O connections.
4. Recalculate the network traffic and bandwidth without the CANX.

Problem:

        Device will not communicate on the network
        Module Status LED is solid Green
        Network Status LED is flashing Green

Possible Solutions:

1. CANR does not see CAN messages on the network.
2. Network does not have a terminating resistor. Add a 121 ohm resistor across the CAN_H and CAN_L signals at the first and last nodes.
3. Network cable is broken or disconnected.
4. Network cable is miswired.

Problem:

        Device will not communicate on the network
        DGN is solid red or off

Possible Solutions:

1. Fiber Link is broken or not connected
2. Reterminate, Replace or Reconnect the optical fiber.

8.   Summary of Changes to Series IV from Rev 2 and Series III

To facilitate implementation of the new Series III CANR products for customers that are currently users of the CANR Revision 2.xx products, this section summarizes the product changes from Rev 2 to Series 3.

8.1. DIP Switch Baud Rate Settings

Several new options exist for setting the baud rate on the CANR Series IV.

- Like the Series III, the Series IV has an 8-position DIP switch block. All 8 switches are defined and used.

- The Series IV unit is compatible with all CANopen baud rates. These baud rates are fixed by setting the 8 position dip switch to the appropriate configuration.

- See Section 4.3 for details.

8.2. Terminating Resistors

The Series IV has an on-board terminating resistor on the CAN connection that can be selectively included or excluded from the network circuit. With jumpers W1, the CANR puts a 121-ohm resistor across the CAN_H and CAN_L lines on sub-network side A. See Section 4.5.2 and Table 4-8 for the location of this jumper.

8.3. Operation and Functionality

The Rev 2 version CANR required one Type 1 and one Type 2 unit per connection. The Series III and IV products now make no differentiation – there is only one design. Therefore, you do not need to be concerned with "matching pairs".

Important: **The Series III and IV products are not backwards compatible with the previous versions**.

You cannot implement a network which consists of a Revision 2 product on one end of the fiber and a Series III or IV on the other end. The same is true with networks with a Series III on one end and a Series IV on the other: **this will not perform**.

8.4. 2.2km Multimode Fiber Link and Diagnostics (WRC-CANR-DF-DN)

The WRC-CANDF-DN Series III and IV have the following fiber serial link improvements:

- Extends your applications for up to 2.2km at any CAN baud rate.

  o This significantly increases opportunities for mining, tank farm, remote out-buildings, and other similar applications.

- Additional diagnostics:

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- o A "heartbeat" feature has been added to the fiber link on Series III and IV WRC-CANR-DF-DN units. A heartbeat message is generated between the 2 CANR units when no CAN activity is present for approximately 0.5 sec, allowing each unit to confirm the status of the link.

- o The NSB LED indicates the health of the fiber connection for both normal traffic and the heartbeat.

8.5. 12km Single-mode Fiber Link and Diagnostics (WRC-CANR-DF-SM)

The WRC-CANR-DF-SM Series IV can be used with single-mode fiber optic cable and has the following fiber serial link characteristics:

- Extends your applications for up to 12km at any CAN baud rate.

  - o This significantly increases opportunities for applications requiring longer range network extension than can be accomplished using single mode fiber.

- Additional diagnostics:

  - o As with the mulitmode fiber, a "heartbeat" feature has been added to the fiber link on WRC-CANR-DF-SM Series IV units. A heartbeat message is generated between the 2 CANR units when no CAN activity is present for approximately 0.5 sec, allowing each unit to confirm the status of the link.

  - o The NSB LED indicates the health of the fiber connection for both normal traffic and the heartbeat.

8.6. Enhanced CAN Support

The CANR now supports CAN 2.0 Part B, as well as Part A. It also can operate up to 1M Baud and with CANopen baud rates. (See factory for details.)

8.7. Field Programmable Updates

The CANR Series III and IV units have their programs held in flash memory, which can be updated in the field. Contact the factory for details.