L90 Line Differential Relay: RS422 Line Drivers

Executive Summary

The Campus Driver's allowed L90 communications via the RS-422 interface allowing Differential Trips to be reported. Verification of Distance (10.4 miles) provided by Black Box.

*Apps note provided by Black Box

During the product development, engineering verified the operating range of the model ME485A by using wire simulators and 30,000 ft (30 - 1Kft spools) of CAT 4 AWG 24 unshielded twisted pair cable.
All model ME485A are production tested using a wire simulator set for 16,500ft (3.1 miles)
of AWG 26 cable. The 2B1Q line frequency is 84Kbps. At this frequency, 16,500 ft of AWG 26 is equal to 55,000 ft (10.4 miles) of AWG 19 cable.

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2 – WIRE MODULAR CAMPUS DRIVER

Purpose:
The purpose of this report is to confirm the operation of the 2-Wire Modular Campus Driver (Line Driver) for use with the RS 422 L90 Communications, module 7T, and to aid in the setup and configurations of the modules.

The 2-Wire Modular Campus Driver is a high-speed, short range modem that is able to operate synchronously or asynchronously – full duplex – over a single twisted pair and can attain point-to-point distances up to 10 miles (16km) at speeds up to 128 kbps.

Material:
2 X 1 2-Wire Modular Campus Driver (Line Drivers) Black Box ME485A-D48
2 X 1 Campus Driver Interface Cards Black Box RS-422- ME481C-422
Various wires and connectors

Procedure:

Step 1 – Campus Driver to UR Connections
Prepare 2 wiring harnesses according to the Campus driver specifications to provide a connection from the Campus Driver's interface card to the UR RS-422 L90 Comm. Module.

Step 2 – Connection to the Twisted-Pair Interface
The Campus Driver supports communication between two DTE devices at distances to 10 miles (19AWG) and data rates to 128 Kbps (sync) or 38.4 Kbps (asynchronous). There are two essential requirements for installing the Campus Driver:

1. These units work in pairs. Therefore, you must have one Campus Driver at each end of a twisted-pair interface.
2. To function properly, the Campus Driver needs one twisted pair of metallic wire. This twisted pair must be dry, metallic wire, between 19 and 26 AWG (the higher number gauges may limit distance). Standard dial-up telephone circuits, or leased circuits that run through signal-equalization equipment, or standard, flat modular telephone cable, are not acceptable.

The RJ-45 connector on the Campus Driver's twisted-pair interface is pre-wired for a standard telco-wiring environment.

Prepare a connection to the twisted-pair interface and provide the signal/pin relationships.
Verify the distance that the interface will operate using 19 AWG twisted pair as specified.

Step 3 – Campus Driver Configuration
Provide the software configuration for a functioning pair of Campus Driver's.

Results:

Step 1 – Campus Driver to UR Connections
2 wiring harnesses were prepared, according to the Campus driver specifications, to provide a connection from the Campus Driver's interface card to the UR RS-422 L90 Comm. module with the following signal pin relationship:

Pinouts:

The connections between the UR RS-422 and the Line Driver are all Tx to Tx and Rx to Rx. A Table of pin connections is shown below.

LINE DRIVER DB25F CONNECTOR	UR RS-422 CONNECTOR 7T
Pin # 2 Tx +	Pin # W2a Tx +
Pin # 3 Rx +	Pin # W4b Rx +
Pin # 14 Tx -	Pin # W3b Tx -
Pin # 16 Rx -	Pin # W3a Rx -
Pin # 7 Clock +	Pin # W7a Clock +
Pin # 9 Clock -	Pin # W8b Clock -
Pin # 7 Shield	Pin # W6a Shield

Step 2 – Connection to the Twisted-Pair Interface
A connection to the twisted-pair interface was provided using the following signal/pin relationships:

Pinouts:

RJ-45	Signal
1	N/C
2	N/C
3	N/C
4	Tip
5	Ring
6	N/C
7	N/C
8	N/C

Distance Verification:
***Apps note provided by Black Box**
During the product development, engineering verified the operating range of the model ME485A by using wire simulators and 30,000 ft (30 - 1Kft spools) of CAT 4 AWG 24 unshielded twisted pair cable.
All model ME485A are production tested using a wire simulator set for 16,500ft (3.1 miles)
of AWG 26 cable. The 2B1Q line frequency is 84Kbps. At this frequency, 16,500 ft of AWG 26 is equal to 55,000 ft (10.4 miles) of AWG 19 cable.

Step 3 – Campus Driver Configuration

Port Overview

Campus Driver #1

```
*       ACTIVE CONFIGURATION - Esc to MAIN MENU        *

*                                                      *

* Configuration Control:              Software        *

* DTE Rate:                           64 Kbps         *

* Data Format:                        Synchronous     *

* Clock Mode:                         Internal        *

* DSR during Local Line Loop:         Disabled        *

* Response to Remote Digital Loop:    Disabled        *

* DTE controlled Local Line Loop:     Disabled        *

* DTE controlled Remote Digital Loop: Disabled        *

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Title

Campus Driver #2

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*      SOFTWARE CONFIGURATION - Esc to MAIN MENU       *

*                                                      *

* Configuration Control:              Software        *

* DTE Rate:                           64 Kbps         *

* Data Format:                        Synchronous     *

* Clock Mode:                         Slaved to RX    *

* DSR during Local Line Loop:         Disabled        *

* Response to Remote Digital Loop:    Disabled        *

* DTE controlled Local Line Loop:     Disabled        *

* DTE controlled Remote Digital Loop: Disabled        *

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Conclusion:

The Campus Driver's allowed L90 communications via the RS-422 interface allowing all trips to be accurately reported. Verification of Distance (10.4 miles) provided by Black Box.

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