



CANBus Product Line

USERS MANUAL

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SUMMER 2006
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1.0 GENERAL INFORMATION

- 1.1 OEM Controls, the industry leader of electro-mechanical joystick controls and electronic control systems introduces its family of CAN Bus multiplexing electronic control modules. Utilizing over 20 years of experience in the design and manufacturing of microprocessor-based electronic systems as well as listening to the "wish lists" of our customers, OEM Controls has developed the state-of-the-art, environmentally hardened and economical solution for electronic control in the mobile equipment industry. The CANbus line of products offers the highest level of quality and functionality in the industry today with;
- On-machine adjustability and troubleshooting– no external device or computer needed.
 - Short-circuit, over-voltage and reverse-polarity protection.
 - Compact and economical–modules spread out to where they are needed Instead of running more cable.
 - Versatile– factory programmable I/O designation (input vs. output, sink vs. source).
 - 4 channel current regulation on one module.
 - High output resolution for precise function control.
- 1.2 This document will serve the User of this equipment as a Manual of Operations, thereby allowing the proper installation and use of the CANBus system that has been designed for the application at hand. The information covered will be generic in nature so as to define the standardly available hardware. Documentation for the application specific functionality of this control system can be obtained by contacting the manufacturer of this equipment.

2.0 CANBus SYSTEM COMPONENTS

2.1 Input Modules

2.1.1 OCI-1 : Master Input Module

2.1.1.1 The OCI-1 is the core of the OEM CANBus control system. It is the module that serves as the home for the application software that determines how each module interacts with the machine it is installed on. The OCI-1 also allows the operator to make active adjustments as well as monitor the operation of the entire control system through use of the LCD information panel and membrane keypad.

2.1.2 OCI-2 : Slave Input Module

2.1.2.1 The OCI-2 is a secondary or “slave” module for the OEM CANBus control system. The primary purpose for the OCI-2 is remote, analog and/or digital, inputs with a few low current outputs. .

2.1.3 OCI-3 : Multi Axis Joystick Input Module

2.1.3.1 The OCI-3 is a secondary or “slave” module for the OEM CANBus control system. The primary purpose for the OCI-3 is remote, analog and/or digital, inputs with a few low current outputs. It is designed to mount directly to the JS8 family of joystick products but can be mounted and utilized separately.

2.1.4 OCI-4 : Single Axis Controller Input Module

2.1.4.1 The OCI-4 is a secondary or “slave” module for the OEM CANBus control system. The primary purpose for the OCI-4 is remote, analog and/or digital, inputs. It is designed to mount directly to the MS7 type joystick product.

2.2 Output Modules

2.2.1 OCO-1 : Standard Resolution PWM Output Module

2.2.1.1 The OCO-1 is a secondary or “slave” module for the OEM CANBus control system. The primary purpose for the OCO-1 is remote, analog and/or digital, outputs with few inputs. This module provides standard PWM, up to 3 Amp, outputs.

2.2.2 OCO-2 : Hi Resolution / Current Source Output Module

2.2.2.1 The OCO-2 is a secondary or “slave” module for the OEM CANBus control system. The primary purpose for the OCO-2 is remote, analog and/or digital, outputs with few inputs. This module provides high current and current regulated PWM, up to 5 Amp, outputs

2.2.3 OCO-3 : Ratiometric (Danfoss) Output Module

2.2.3.1 The OCO-3 is a secondary or “slave” module for the OEM CANBus control system. The primary purpose for the OCO-3 is remote, analog and/or digital, outputs with few inputs. This module provides ratiometric PWM outputs

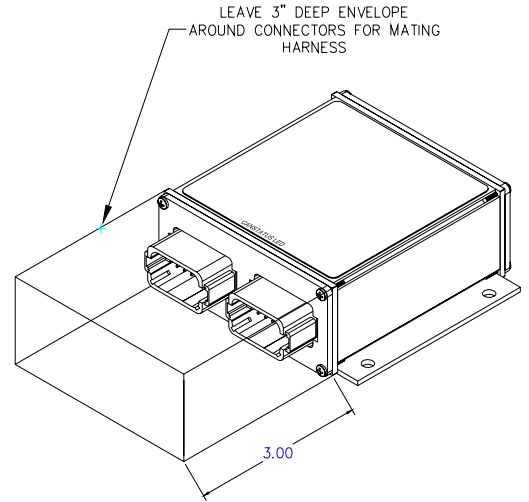
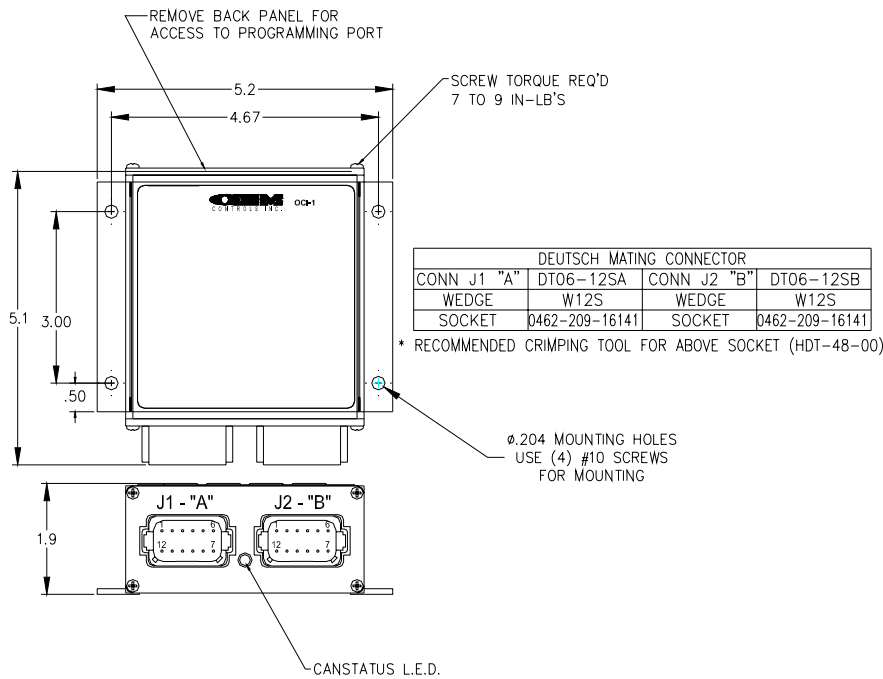
2.3 Displays

2.3.1 OCD-2 : 320 x 240 Graphical User Interface

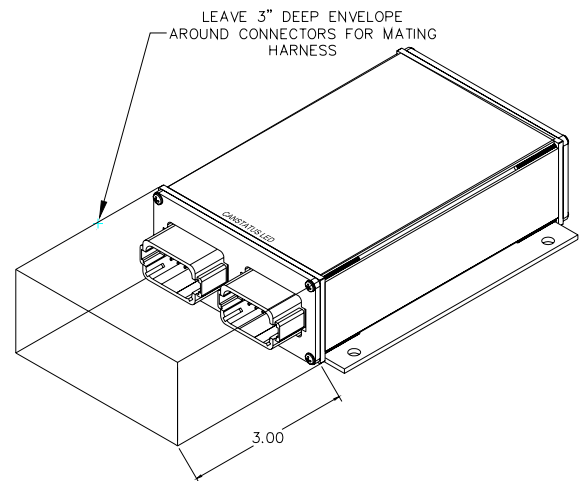
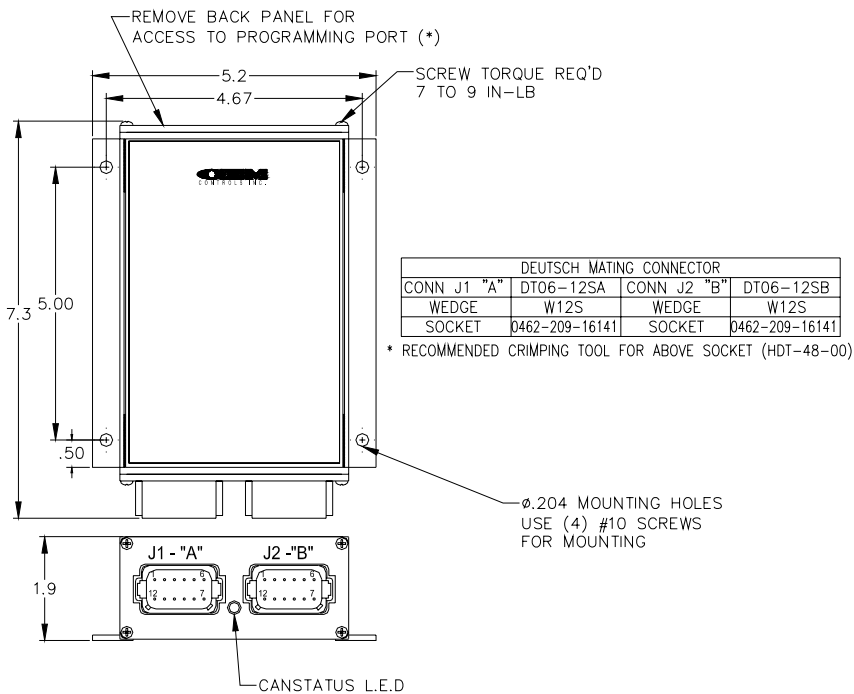
2.3.1.1 The OCD-2 is a secondary or “slave” module for the OEM CANBus control system. This display module is monochrome with backlighting and transfective screen for exceptional viewing in daylight. The primary purpose for the OCD-2 is graphical display of machine functions and operational information and has remote, analog and/or digital, inputs with a few low current outputs

3.0 Mechanical Installation

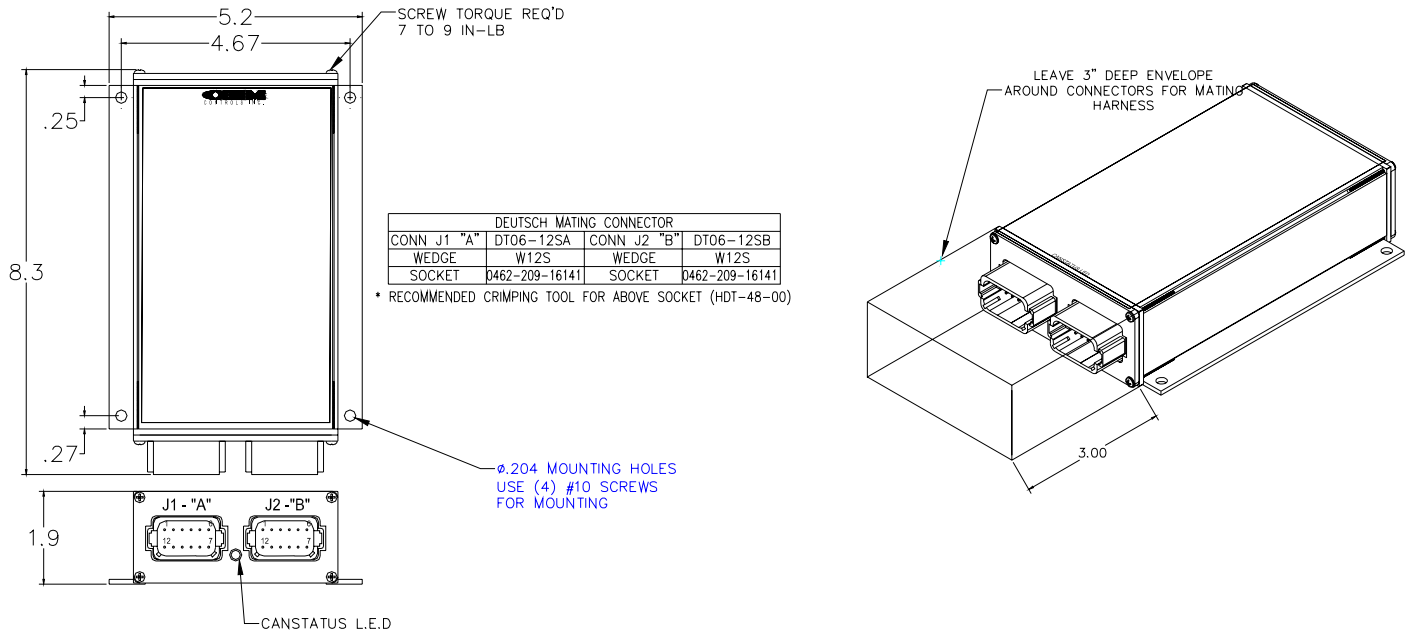
3.1 OCI-1, OCI-2 (and similar)



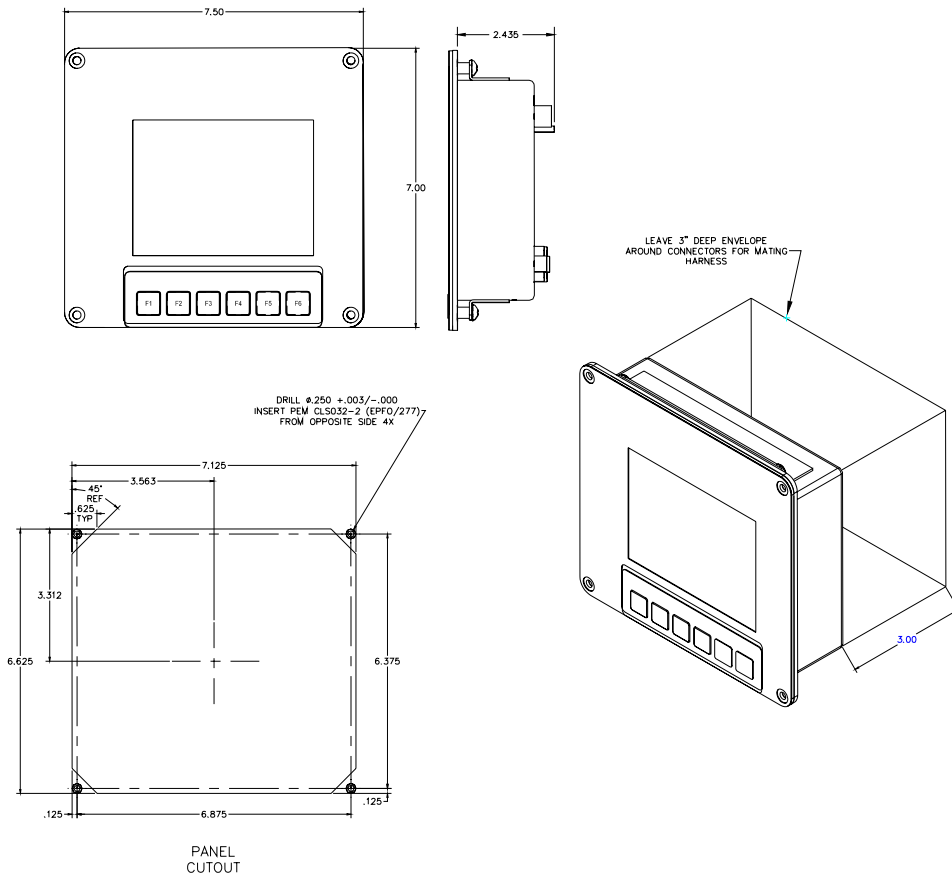
3.2 OCO-1 (and similar)



3.3 OCO-2 (and similar)

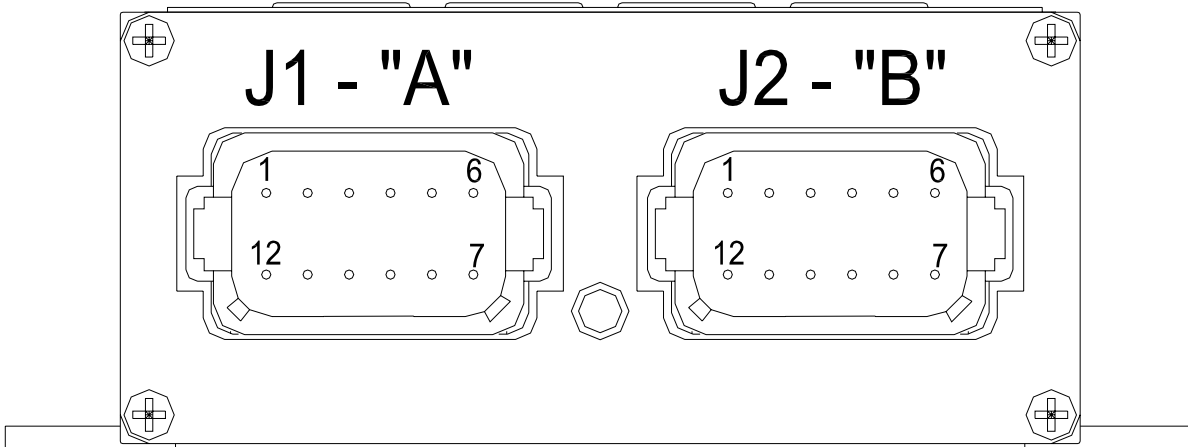


3.4 OCD-2 (and similar)



Electrical Installation

4.1 Connector Layout (All Modules)



4.1.1 Connector Information (Deutsch Part Numbers)

Connector "A" mates with

- Deutsch DT06-12SA (Grey)
- W12S Wedge (1 pc)
- 0462-209-16141 Sockets (up to 12 pieces)
- 114017 Seal Plug (for unused connections)

Connector "B" mates with

- Deutsch DT06-12SB (Black)
- W12S Wedge (1 pc)
- 0462-209-16141 Sockets (up to 12 pieces)
- 114017 Seal Plug (for unused connections)

4.2 Power Supply

4.2.1 Typical Supply Voltage : 8-32 VDC

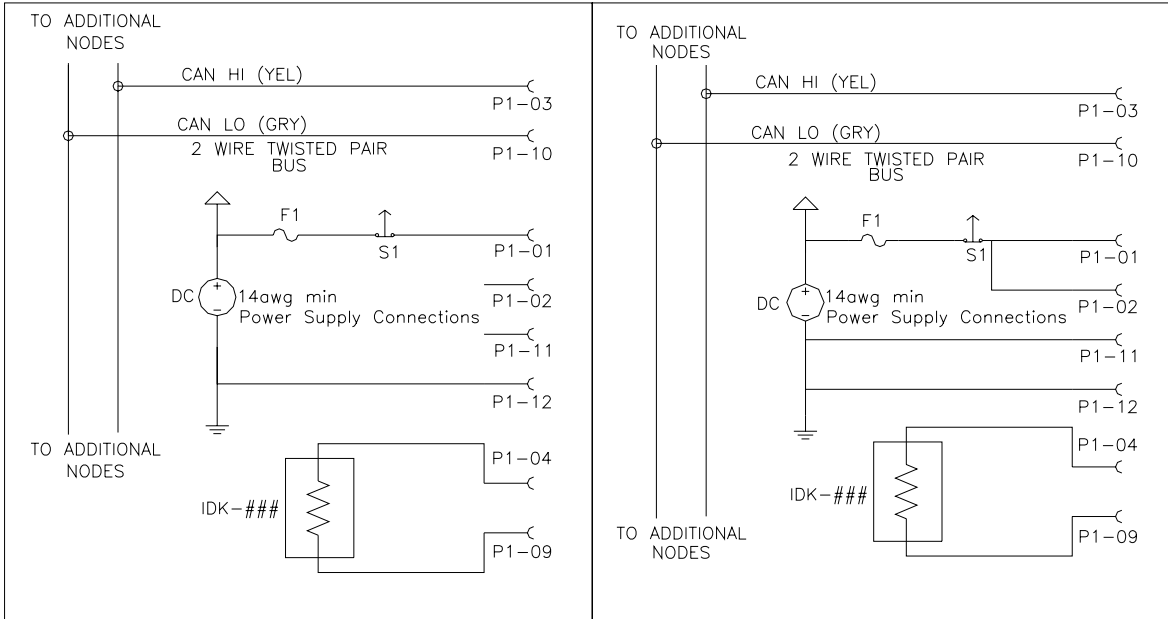
4.2.2 Protection: The OCI Modules are protected for the following adverse conditions and can withstand these conditions without any permanent damage to the module.

- 4.2.2.1 Reverse polarity: The VBat and Ground terminals can be swapped without the possibility of permanent module damage.
- 4.2.2.2 Short Circuit: Any Input or Output from the Module can be shorted to VBat or Ground without the possibility of permanent module damage.
- 4.2.2.3 Over voltage: The module is able to withstand Transient Voltage levels per IEC specification 61000-4-5:1995

4.3 Standard Connections

INPUT MODULES (OCI)

OUTPUT MODULES (OCO)



P1 MATES WITH J1
P2 MATES WITH J2

CONSULT I/O SHEET
FOR YOUR SPECIFIC
APPLICATION MAP

4.4 Input-Output (I-O) Connections

4.4.1 The I-O configuration for your application is controlled by the Application Software loaded into each CANBus module used in your system. Consult the I-O sheet associated with your application for your specific connection. Contact OEM Controls for the I-O Sheet that maps your application.

5.0 CANBus Module Placement/System Wiring

Your CANBus system modules are all interconnected by means of Two Wires - CANH (CAN High) and CANL (CAN Low) - plus the addition of a common shield wire. It is **Important** to the operation of your CANBus system that the recommended module placement and system wiring be followed very closely. **Improperly placed/wired CANBus modules may result in an inoperable system.** It is important to carefully map out how you will route the CANH and CANL signals from module to module so as not to compromise the signal integrity because this information makes its way from one point to another on your application.

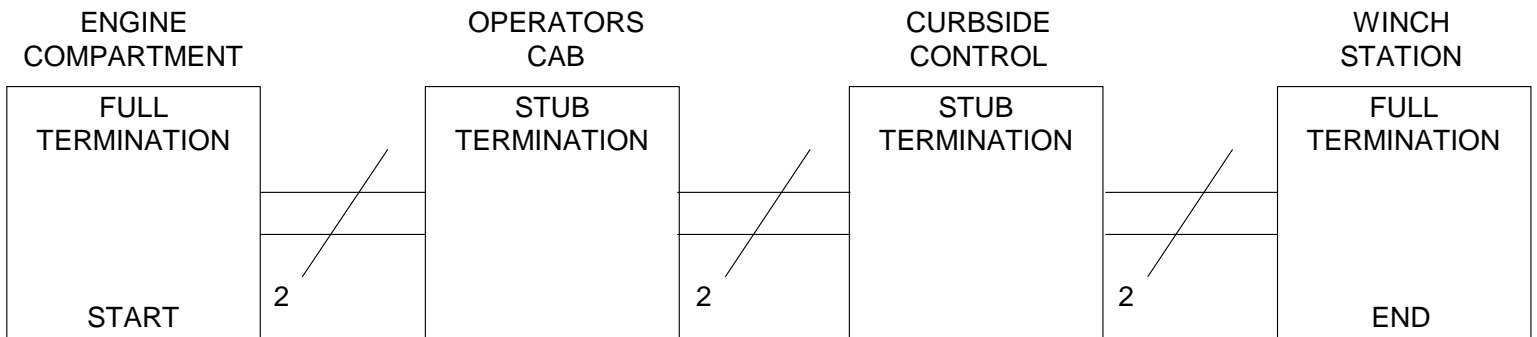
Different Types of Modules

As received, the CANBus modules you have been supplied with have been configured to be wired in a specific order based on your application.

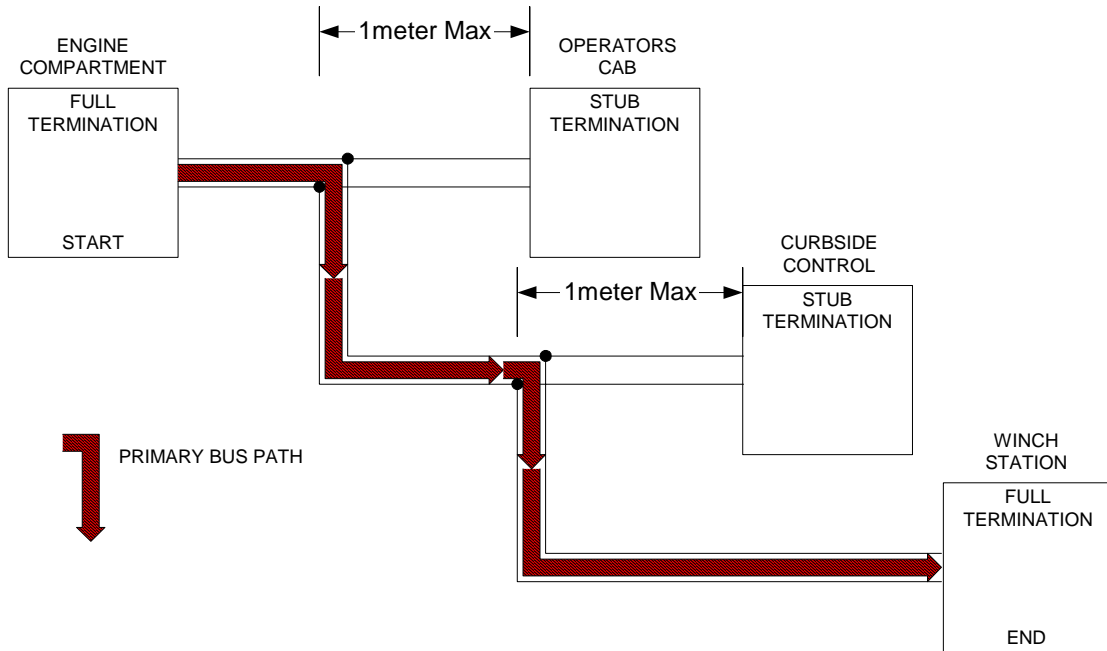
There are two types of modules your system could possibly use.

Full Termination : This is a CANBus module that has been placed at the start or at the end of a BUS line

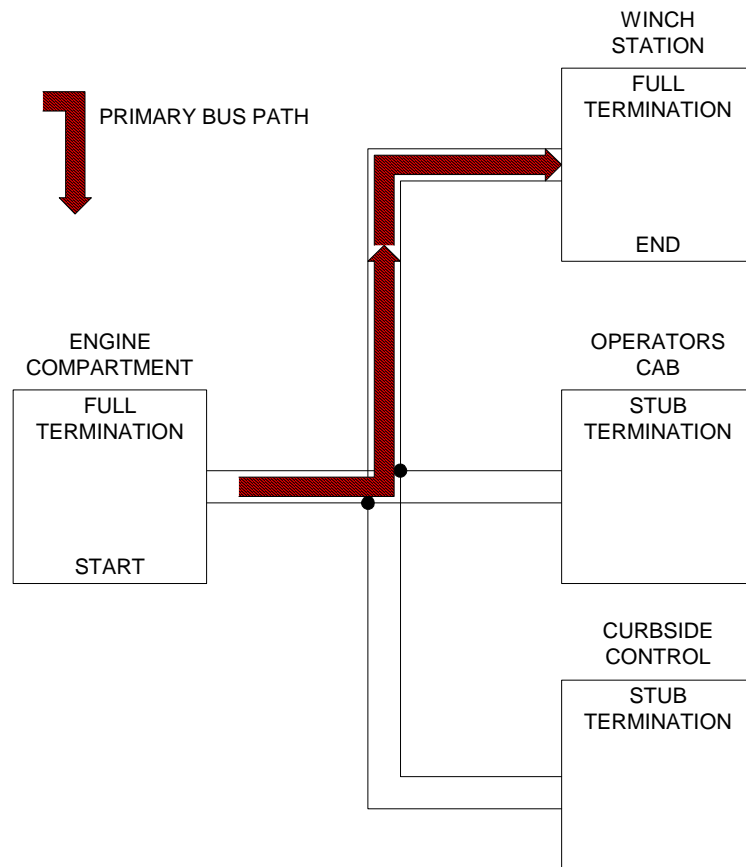
Stub Termination : This is a CANBus module that has been placed in between the modules with full termination.



Correct Cable Wiring



Incorrect Cable Wiring



J1939 “Y” Connectors

OEM recommends the use of Deutsch DT series connectors manufactured for the specific purpose of CANBus communication.



J-1939/11 3-WIRE SYSTEM

Receptacle

- DT04-3P-P007 Receptacle, “Y” Connector
- DT04-3P-E008 Receptacle, Grey, w/Shrink Boot Adapter
- DT04-3P-EE01 Receptacle, Black, w/Shrink Boot Adapter

Plug

- DT06-3S-E008 Plug, Grey, w/Shrink Boot Adapter
- DT06-3S-EP11 Plug, Black, w/Shrink Boot Adapter
- DT06-3S-P032 Plug, Black, w/Shrink Tubing Adapter, Single Piece

Wedge Lock

- W3P-1939 Wedge Lock, Blue
- W3S Wedge Lock, Orange
- W3S-P012 Wedge Lock, Green
- W3S-1939 Wedge Lock, Blue
- W3S-1939-P012 Wedge Lock, Blue

Pins/Sockets

- 0460-202-1631 Pin, Size 16, Gold
- 1060-16-0144 Pin, Size 16, Gold, Stamped & Formed
- 0460-247-1631 Pin, Size 16, Extended
- 0462-201-1631 Socket, Size 16, Gold
- 1062-16-0144 Socket, Size 16, Gold, Stamped & Formed
- 0462-221-1631 Socket, Size 16, Extended

CANBus Cable Assembly

OEM recommends running **Twisted Shielded Pair** cable between Modules, wired to the J1939 3 pin connector as follows;

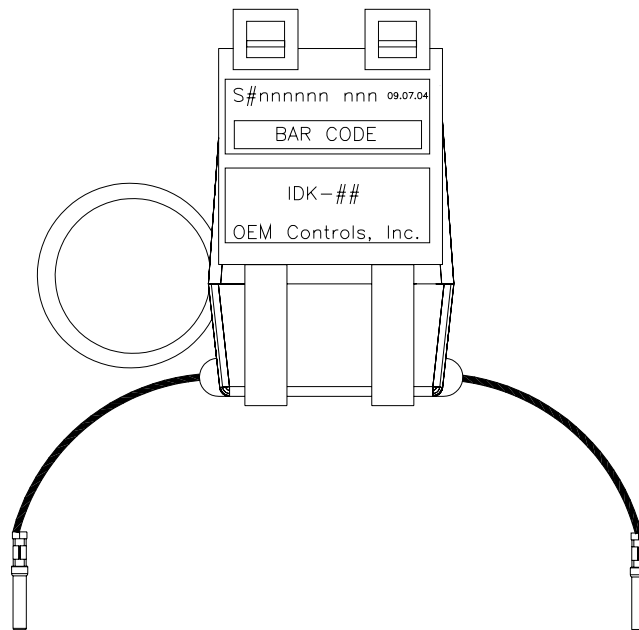
PIN	FUNCTION	WIRE COLOR
A	CAN(H)	YELLOW
B	CAN(L)	GRAY OR GREEN
C	SHIELD	BRAIDED STRAND

6.0 Identification Key

Each module in the CANBus system is assigned a unique **Node Identifier** that is registered in the Master module (most commonly the OCI-1) to perform a specific function for the system as a whole. The CANBus system relies on an external resistive identification key which is connected to the mating connectors of all Modules in the system (except the Master Module, which always has a “00” identifier) This will allow you to plug a new replacement module into the same location and have the system operational without initializing the new module.

Systems where multiple modules of the same type may be used (e.g.,more than one OCI-2) must use a unique Identification Key for each module. For example, the first OCI-2 may use IDK-00 and the second OCI-2 may use IDK-01, but they are not allowed to both use the same ID Key.

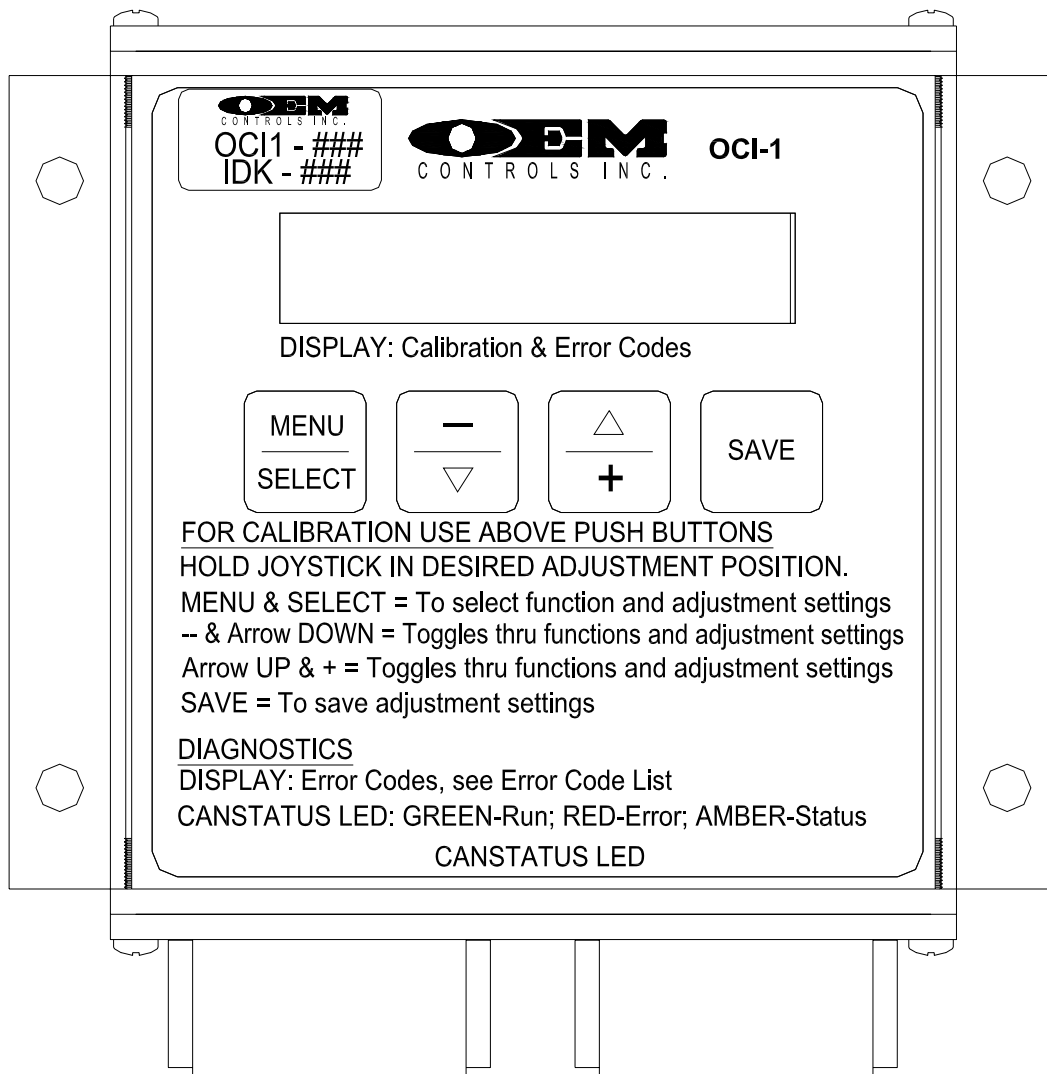
Consult the I-O sheet associated with your application for your specific Identification Key assignments. Contact OEM Controls for the I-O Sheet that maps your application.



7.0 Human Machine Interface (HMI)

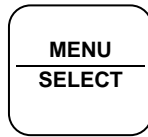
The OCI-1 has an integrated multi segment , two line display with membrane keys that allow it to be used as the main interface to system controls and adjustments. The Human Machine Interface (referred to as the HMI) will serve as your window into the application software to allow the operator to monitor/adjust the following information;

- Active Function Being Used
- Part Number and Serial Number
- Restore the Factory Default Settings
- Output Calibrations (Thresh,Max,Ramp.etc)
- I-O Status
- CANBus Status



7.1 User Interface Keys

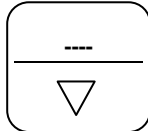
7.1.1



7.1.1.1 <MENU> enters a new menu screen and/or

7.1.1.2 <SELECT>s the flashing item.

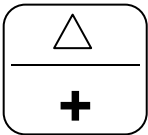
7.1.2



7.1.2.1 <MINUS> decreases an adjustable parameter such as ramp time.

7.1.2.2 <DOWN> selects the previous item in the current menu's list.

7.1.3



7.1.3.1 <PLUS> increases an adjustable parameter.

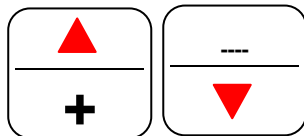
7.1.3.2 <UP> selects the next item in the current menu's list.

7.1.4



7.1.4.1 <SAVE> saves the new data to EEPROM (permanent memory storage).

Simultaneously pressing <UP> and <DOWN> will reset the HMI to menu screen 0.



POR menu [Menu Screen 0]

RUN MODE: NORMAL FUNCTIONS OFF

RUN: DRIVE FWD Fn1A 50.5 %

Part Number and Serial Number

PN: OCI1-103.000 SN: 000000001

Restore Factory Defaults

RESTORE DEFAULTS PRESS SELECT

RESTORE DEFAULTS

“PRESS SELECT” is blinking.

The above three screens are in the MAIN menu. Use <UP> and <DOWN> to select one for viewing. Press <MENU> to go to the following screen.

Top Level selection menu

ADJUST CAN BUS IO TEST MAIN

CAN BUS IO TEST MAIN

“ADJUST” is blinking

Use <UP> and <DOWN> to select one of the menu choices (which will be flashing) and then press <MENU> to go there.

Press <EXIT> to return to menu screen 0.

JS Controller adjustment menus

```
DRIVE FWD THRESH
Fn1A 25.5 %
```

[menu screen 10]

```
                THRESH
Fn1A 25.5 %
```

“DRIVE FWD” is blinking

```
DRIVE FWD THRESH
Fn1A 25.5 %
```

[menu screen 11]

```
DRIVE FWD
Fn1A 25.5 %
```

“THRESH” is blinking

```
DRIVE FWD THRESH
Fn1A 25.5 %
```

[menu screen 12]

```
DRIVE FWD THRESH
Fn1A          %
```

“the adjustable parameter” is blinking

The HMI will enter menu screen 10 if all joystick channels are OFF (for static adjust).

The HMI will enter menu screen 11 if one or more channels are ON, with the most recently moved joystick’s function selected.

The HMI remembers the function (channel and direction) and the adjustment that was most recently made for ease of use. On initially powering the OCI-1, channel 1 direction A Threshold is selected.

Use <UP> and <DOWN> to select a flashing item. Use <SELECT> to select it and go to the next menu screen. Use <SAVE> / <EXIT> to save an adjustment and return to the previous menu screen.

Use <PLUS> and <MINUS> to adjust a parameter. Note – there are customer specified limits to every adjustment

I/O Test menus

```
AI 10 11 12 V
9.99 9.99 9.99
```

```
Di11 12 13 14 15
1 1 1 0 0
```

```
Do35 36 37 38 39
1 1 1 1 0
```

```
VDD POWER SUPPLY
12.34 Volts
```

```
PWM 11 PWM 12
45.5 % 100.0 %
```

These four screens are in the IO TEST menu. Pressing <MENU> will cycle through them. When in a given screen, such as AI, use the <UP> and <DOWN> keys to scroll through all of the system's input or output signals.

Press <EXIT> to return to the top level menu screen.

CANBus menus

```
OCI-1 BRAIN
ID 0 OPERATING
```

```
OCO-1 MAIN BANK
ID 102 OPERATING
```

```
OCO-1 AUX BANK
ID 103 OPERATING
```

```
OCI-1 BUCKET JS
ID 64 NO DATA
```

There is one display screen for each CANopen module in the system.

The first line is a 16-character string (put in by the application engineer) that identifies the product type and additional information.

The second line shows the CANopen Node ID and the bus status which is one of –

-OPERATING	normal operation per CiA spec.
-STOPPED	stopped per CiA spec
-PRE-OP	pre-operational (just powered up) per CiA spec
-RESET	just performed a power-on reset per CiA spec
-NO DATA	the module is not communicating

Restore Factory Defaults

RESTORE DEFAULTS
PRESS SELECT

RESTORE DEFAULTS

“PRESS SELECT” is blinking.

RESTORE DEFAULTS
YES or NO ?

RESTORE DEFAULTS
YES or NO ?

“NO” is blinking.

Use the <UP> and <DOWN> keys to select YES if you wish to actually restore all adjustments to their factory default settings. Then press <SELECT>

If “YES” was selected, you will see the following animated screen.

RESTORING NOW !
...

RESTORING NOW !
.....

After this is finished, the HMI will return to menu screen 0.

8.0 CANBus LED Operation (Based on CiA 303 Specification)

Each OEM Controls CAN Module has a BI-Color status LED, usually located between the Deutsch connectors. This LED provides easy verification that the CANopen bus is OK, and also allows easy system troubleshooting by illuminating Red, Green, or Amber (Red and Green on at the same time).

In many cases, the BI-color LED will indicate two bits of information. For example, if the GREEN led is on continuously, but the RED led is doing a “double flash”, this means that the can module is in the operational state, but that a node guard error has occurred.

INDICATION	GREEN LED FUNCTIONALITY (RUN MODE ERRORS) “NMT”	RED LED FUNCTIONALITY (BUS ERRORS)	YELLOW LED FUNCTIONALITY (APPLICATION SOFTWARE)
OFF	N/A (BRIEFLY AT POWER UP }	NO ERRORS	N/A
BLINK a continuous on/off series, .2 sec ON and .2 sec OFF	PREOPERATIONAL STATE	CONFIGURATION ERROR	TDL MODE (SEE SECTION 9)
ON	OPERATIONAL STATE	"BUS OFF" ERROR CAUSED BY >255 MESSAGE ERRORS	N/A
SINGLE FLASH a .2 sec ON followed by 1 sec OFF	STOPPED STATE	"REDUCED BUS" ERROR CAUSED BY >96 MESSAGE ERRORS	N/A
DOUBLE FLASH .2 sec On, .2 sec Off, .2 sec On followed by 1 sec Off	N/A	NODE GUARD EVENT HAS OCCURRED	N/A
ALTERNATING	GREEN AND RED - REFERENCE ABOVE RESULTS FOR EACH COLOR	RED AND GREEN - REFERENCE ABOVE RESULTS FOR EACH COLOR	YELLOW AND RED - INCORRECT FIRMWARE IN "CPU B" (DUAL CPU MODULES ONLY)

-When a module is first powered up, it enters the **pre-operational** state, with a green blink indication. If there are no CANopen messages within 5 seconds, the module switches to **stopped**, with red ON indication.

-One module, usually the OCI-1 “brain”, is also the NMT master (per CiA Standard 301). As long as this module, and one additional module are detected on the CANopen bus, the system automatically enters the **operational** state.

-At any time, if a module is powered on (for example, re-started) it will be automatically set to **operational** by the NMT master.

-
- During normal operation, if no CANopen messages are received within 75 milliseconds, the module enters “failsafe operation” and turns off all of its local outputs. After 1 second, the module enters the **stopped** state with red ON indication.

 - The OCI-1 provides additional bus information for each CAN module.

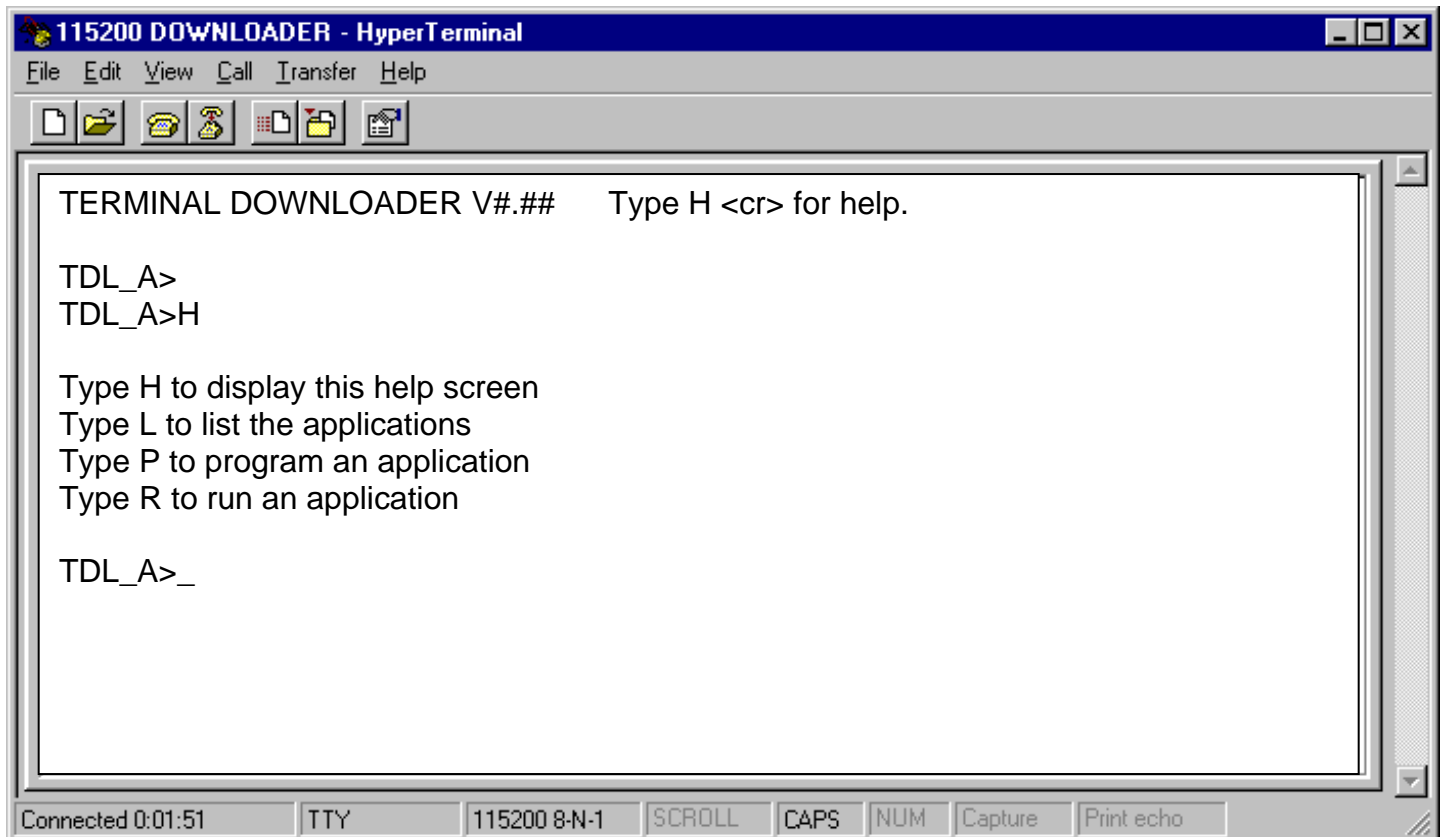
 - The CiA Standard 301 specifies four states – the 3 above plus **initializing** which occurs at power on reset. The OEM CAN modules automatically transition to **pre-operational** after reset, per the CiA 301 spec.

9.0 Downloading Application Software with TDL

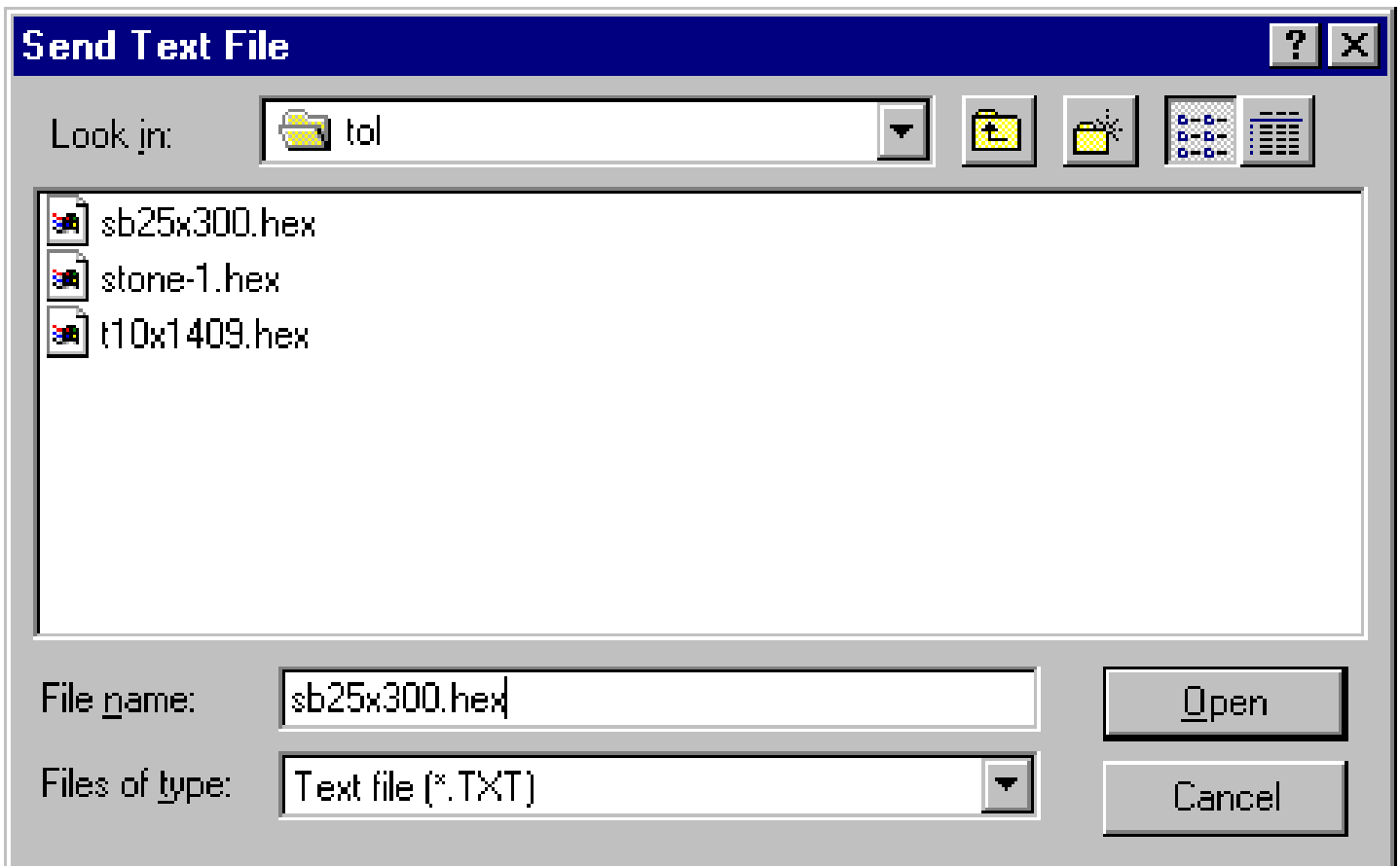
The Terminal Downloader (TDL) is a feature in your OEM Controls, Inc. product that allows you to program (download) new or revised software applications. All that you need is a computer with a serial port and a cable. If you are using Microsoft Windows, the “Hyper Terminal” program may be used to download a new application.

Quick Start Instructions (For Advanced Users)

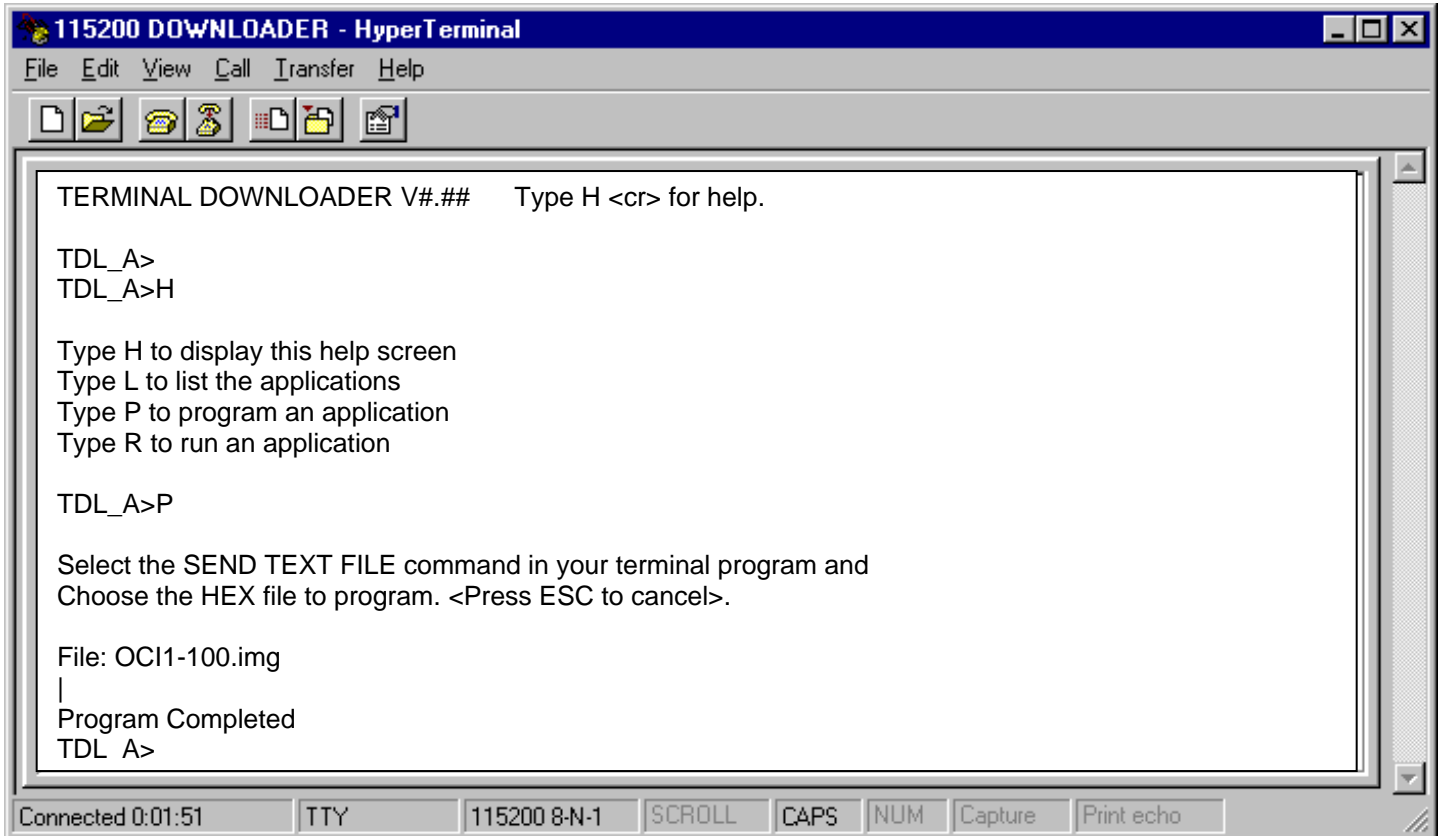
1. Connect the cable to the product's Optimizer connector and to the PC's serial port.
2. Turn on the product's power supply.
3. Start your Terminal program at 115,200 baud.
4. Press the ENTER key several times until you see the Terminal program's cursor to a new line. (The cursor is a blinking underline prompt)
5. Initialize TDL to access the CPU you need to query or download information to. Most hardware will only require you to access CPU-A in order to query or download software. Some hardware (those modules with current regulation) may require you to access CPU-B in order to query or download software.
 - I. **CPU-A Access**
 - A. Press ENTER <cr> several times for auto-baudrate switch
 - B. Type “OEM” to access CPU-A
 - i. This will not be displayed on the screen
 - C. Press ENTER <cr> several times for auto-baudrate switch
 - D. The terminal downloader prompt for CPU-A will now be displayed and the CAN led will be blinking yellow.
 - i. TDL_A>



- E. You will see a welcome message and prompt. You can type an **H** (and press ENTER) for help as shown here:
- F. Type a **P** to program the new software application. The TDL will prompt you to choose a file to download.
- G. Then, from the Terminal program's menu select "Transfer" and "Text File" and pick the new software's file – it will have a .HEX file extension. Click the **OPEN** button.



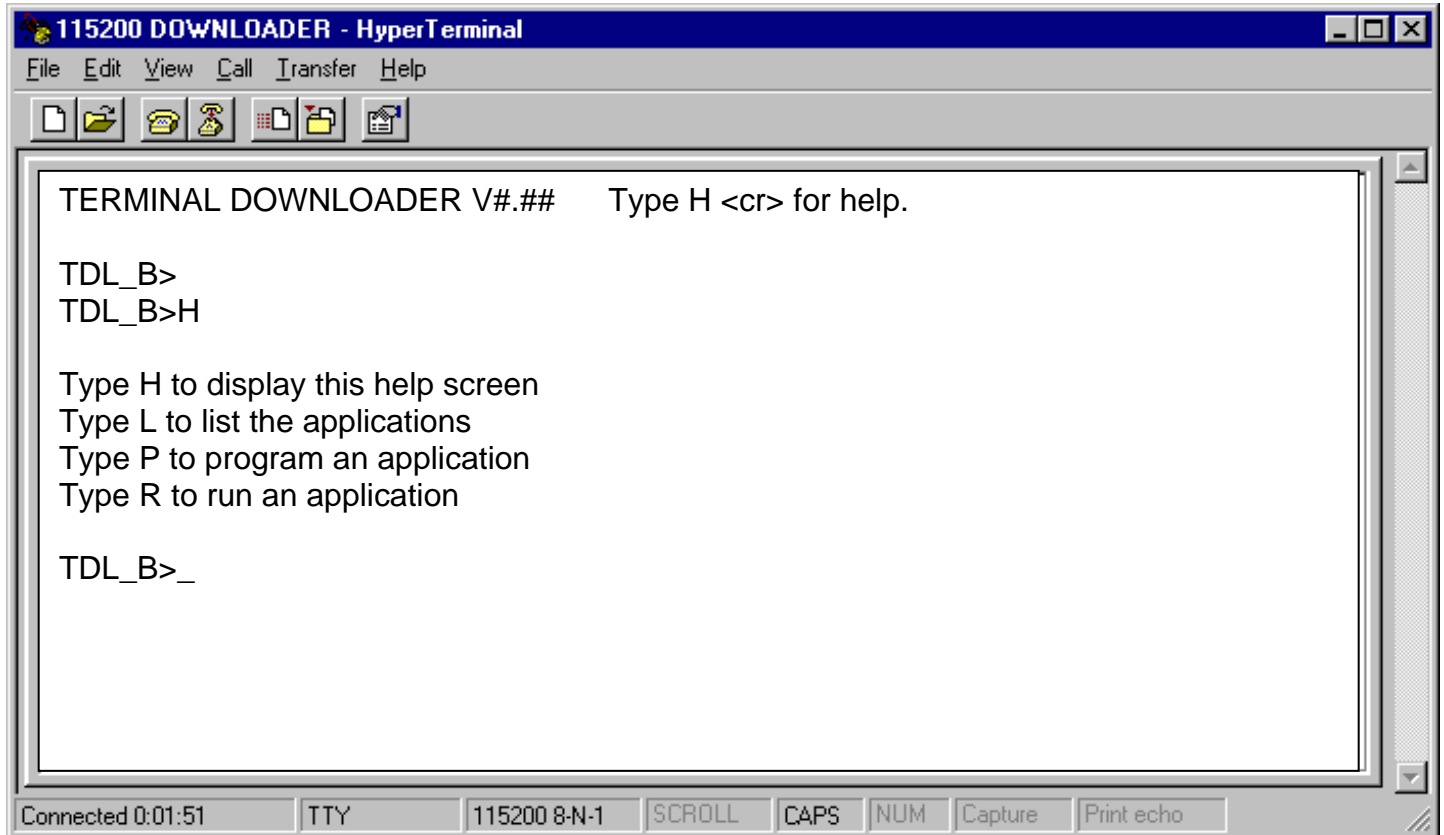
- H. The new application software is now being downloaded. A “Spinner” activity indicator spins for awhile (usually for about 20-30 seconds) and then a “Program completed.” message is displayed.



- I. Type an **X** to exit from the TDL. Your new application automatically starts running.

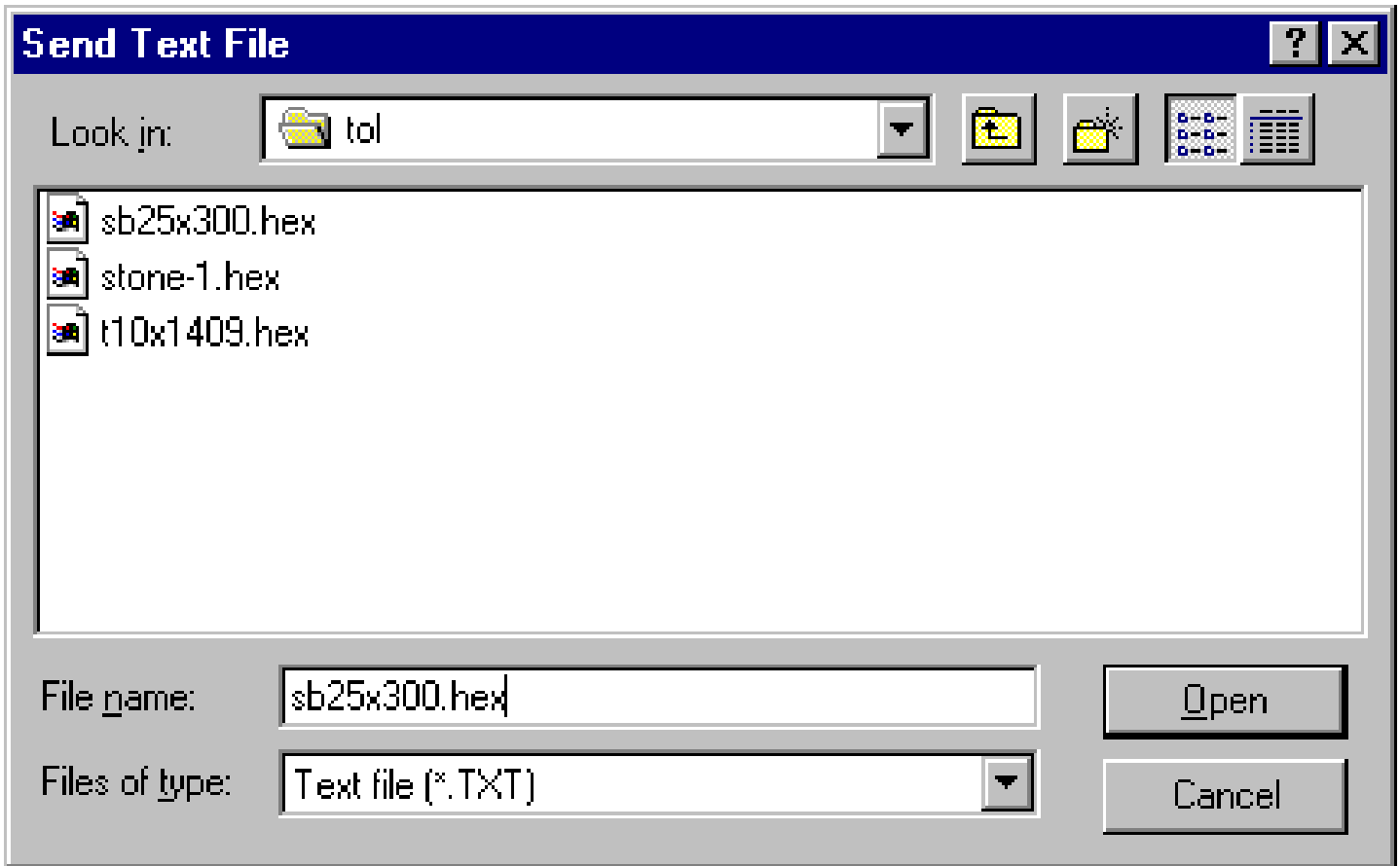
II. CPU-B Access

- A. Type X to make sure you have exited from TDL_A
- B. Press ENTER <cr> several times for auto-baudrate switch
- C. Type "CPUB" to access CPU-B
 - i. This will not be displayed on the screen
- D. Press ENTER <cr> several times for auto-baudrate switch
- E. The terminal downloader prompt for CPU-B will now be displayed and the CAN led will be blinking yellow.
 - i. TDL_B>

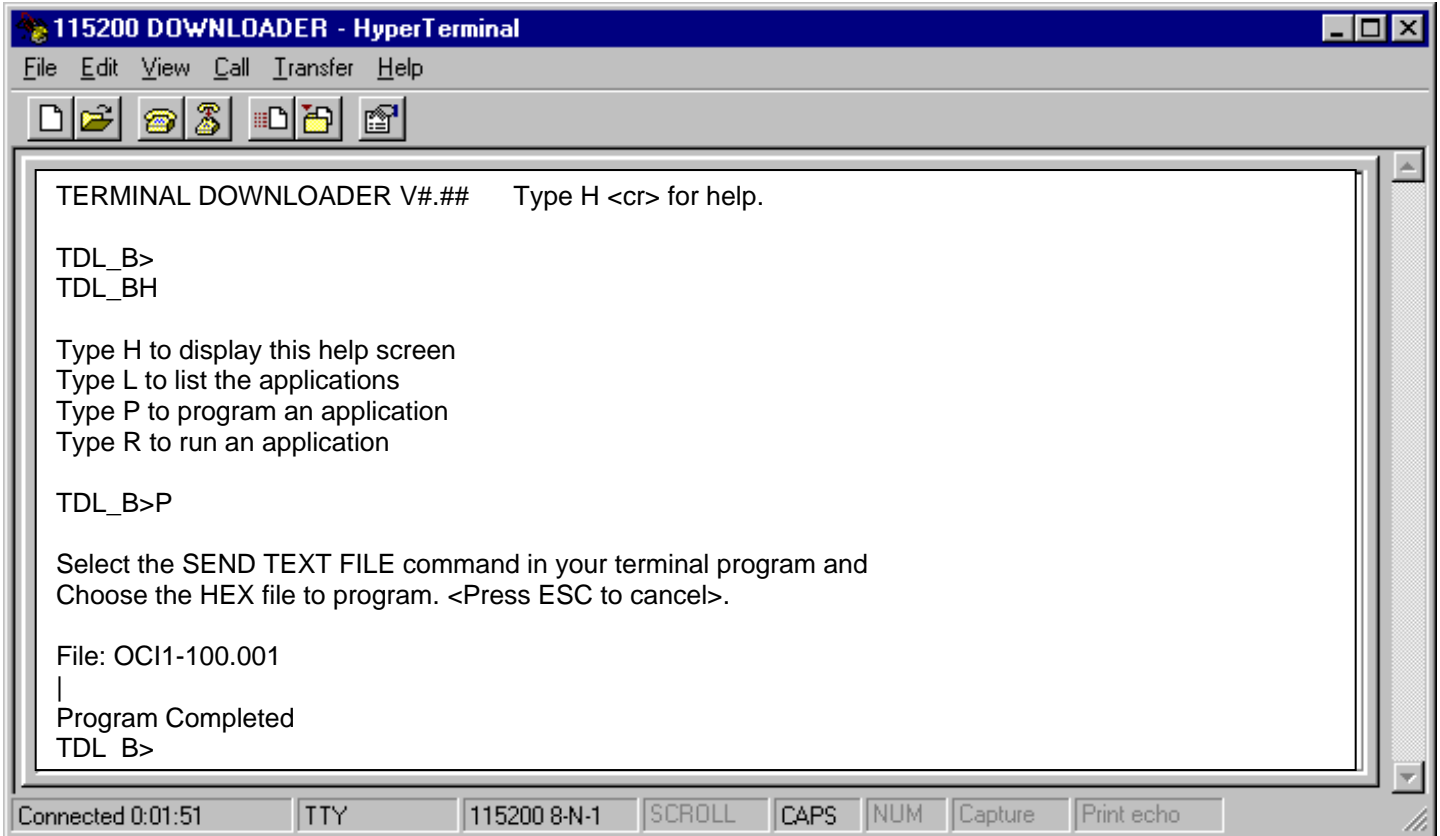


- F. You will see a welcome message and prompt. You can type an **H** (and press ENTER) for help as shown here:
- G. Type a **P** to program the new software application. The TDL will prompt you to choose a file to download.

- H. Then, from the Terminal program's menu select "Transfer" and "Text File" and pick the new software's file – it will have a .HEX file extension. Click the **OPEN** button.



- I. The new application software is now being downloaded. A "Spinner" activity indicator spins for awhile (usually for about 20-30 seconds) and then a "Program completed." message is displayed.



- J. Type an **X** to exit from the TDL. Your new application automatically starts running.

Detailed Instructions (For Layperson Users)

A serial (COM) port on your computer is used to communicate with the CANBus module using standard RS-232 levels. Either the 9600 baud rate or the 115,200 baud rate speed may be used (115,200 baud is recommended as it is 12 times faster). The additional serial port settings are:

- 8 data bits
- no parity
- 1 stop bit
- no flow control

Any terminal program may be used – the terminal program must support transfer of plain ASCII text without any hardware or software flow control. All versions of Microsoft Windows come with a standard terminal program called Hyper Terminal that may be used (see the following section for instructions on setting up Hyper Terminal).

The serial (COM) port is connected to the product's Optimizer plug with a special cable (available from OEM Controls Inc.). One end has a standard "9-pin D" connector. The other end has a 4 or 5 pin Optimizer connector. Only 3 signals are used (TxD RxD and signal ground). Available cable (part numbers) are:

- EPWH/883 with 4-pin square connector, plugs directly into the product
- EPWH/960 with 5-pin round connector, plugs into the system connector

The Terminal Downloader (TDL) feature has five commands –

- H** help – displays a list of the commands
- L** list – displays information about the product's software and hardware
- P** program – downloads a new software application to the product
- R** run – verifies the application and then runs it
- X** exit – leaves the TDL and runs the product's application software

Normally, you will only need to use the **P** and **X** commands. The commands are not case sensitive (you may type them in upper or lower case).

If you type the **P** command and then decide not to program (download) an application, you can press the ESC (escape) key to cancel this command.

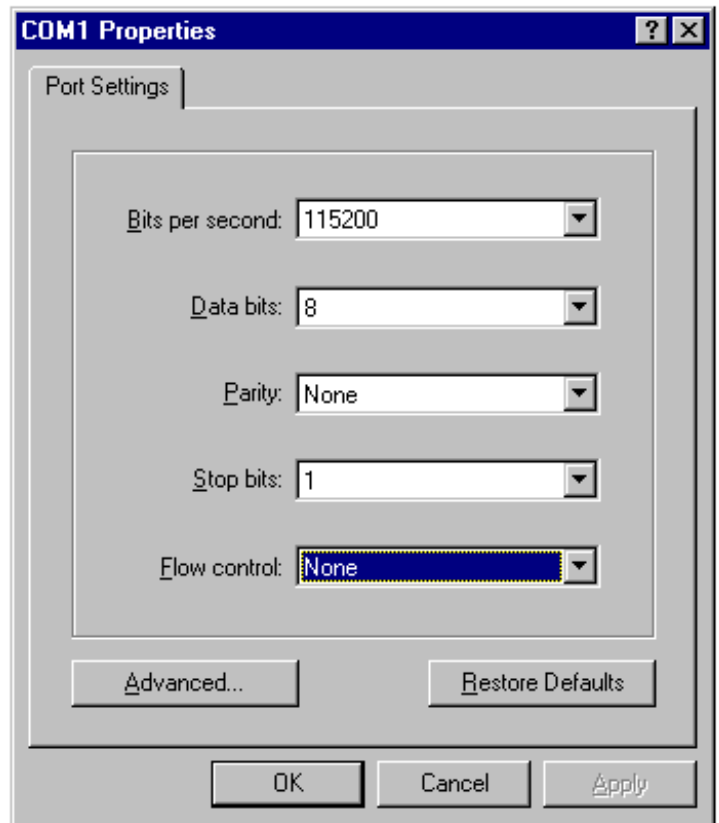
The Terminal Downloader (TDL) feature performs several behind-the-scene checks to make sure that the downloaded application is correct and proper for the product. If any problems are detected, the TDL will inform you. Refer to the Troubleshooting section of this manual for additional information.

Setting Up Hyper Terminal

The Microsoft Windows program “Hyper Terminal” can be found in the START menu – it is usually in one of these locations:

- Start –> Programs –> Accessories –> Communications (Win2000 WinXP)
- Start –> Programs –> Accessories (Win95 Win98 WinME)

1. Start Hyper Terminal and then choose “Properties” from the FILE menu.
2. In the Properties window (shown below-left) choose Direct to Com 1 in the “Connect using:” box (you may also use any other available COM port, such as Com 2).



3. Click on the “Configure” button. The COM1 Properties window (shown above-right) is displayed. Set all five options –

Bits per second:	115200
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	None

 Then click on the Apply button, and then the OK button – this closes the COM1 Properties window. Finally, click on the OK button in the Properties window.

4. In the FILE menu, choose “Save As” This allows you to create a shortcut on your desktop. Type in a descriptive name such as “115200 TDL” and click on the OK button.

From now on, you just click on the desktop shortcut icon to start using Hyper Terminal with the Terminal Downloader.


A note to Microsoft Windows 2000 users – the standard version of Hyper Terminal shipped with Win2000 is very slow when using a COM port. You may want to obtain and install an updated version called “Hyper Terminal Private Edition” – it is available from the program manufacturer’s web site <http://www.hilgraeve.com>

A note about File Types – the products application is contained in a text file (as Motorola S-Records) with a .HEX extension. Applications sent from OEM Controls Inc. via email are always compressed into a .ZIP file. The .ZIP file may contain one or more applications. You may use a program such as WinZip to “unzip” the .HEX files. WinZip is available from the program manufacturer’s web site <http://www.winzip.com>

5. Troubleshooting

- a. If you are unable to communicate with the product.
 - i. Make sure the product is powered on.
 - ii. Check the cable connections on the computer and the product.
 - iii. Is the cable plugged into the correct COM port (there may be several)?
 - iv. Is the cable plugged into the Optimizer port (some products have other 4-pin connectors used for other features)?
 - v. Check the Terminal program’s settings, especially the baud rate.
 - vi. Check the computer’s BIOS settings (make sure the COM port is enabled).
 - vii. Try re-starting (rebooting) the computer.
 - viii. Try re-starting the product (by turning its power OFF and ON)
- b. If you cannot run the product’s application (the product is “stuck” in the TDL mode).
 - i. In normal operation, your OEM Controls, Inc. product always runs its application software. However, several things could happen during programming (downloading) that will prevent the application from running.
 - ii. The Terminal Downloader (TDL) performs several checks during programming, and if problems are found (see the 3 bullets below) then the TDL will not allow the application to run, and will stay in TDL mode.
- c. Determining if the product is in TDL mode:
 - i. Many of the OEM Controls Inc. products have diagnostic LEDs (such as “input” “cpu” and “output”) that blink sequentially during normal operation. When the product is using the TDL feature, the LEDs blink slowly together (they’re all ON or all OFF).

- d. Programming (downloading) is interrupted before it is completed:
 - i. This could happen if there was a power failure (either the product lost power or the computer lost power), or if the computer crashed, or if the cable became disconnected. Because only part of the application was programmed, it is not able to run.
 - ii. Action – repeat the **P** command to download the entire application.
- e. An incorrect application was downloaded:
 - i. Each application is designed to operate on a specific product (such as an SB20X, an MRC10X, etc). Every product has a “device type” which the TDL verifies with the software device type.
 - ii. Also, each product is manufactured with specific hardware options (for example: 12V operation, tachometer input, diode-clamped outputs, etc) – this is the “sub type”. The TDL also verifies that the product and software sub type matches.
 - iii. Customers having more than one product could mistakenly download the wrong file. Below is an example of what happens when the wrong application was programmed.
 - iv. If incorrect software is downloaded into CPU A, the OCM-1 will not "boot" into normal operation. It will power up in TDL_A mode with a yellow blinking CAN led.
 - 1. To FIX - download the correct software into CPU A.
 - v. If incorrect software is downloaded into CPU B, the OCM-1 will not "boot into normal operation. It will power up with the CANopen communication "stopped" and a "red-yellow" sequence blinking on the CAN led.
 - 1. The LCD will display this message:
 - a. MISSING SOFTWARE ON CPU B
 - 2. To FIX - download the correct software into CPU B.
- f. "Incorrect Software" can be many things:
 - i. mixed up the HEX files for CPU A and B
 - ii. downloaded the wrong HEX file (say for a DMR30 application)
 - iii. incompatible revisions of OCO-2"A" and OCO-2"B" software
- g. The application's HEX file is damaged.
 - i. Software applications are provided by OEM Controls Inc. to the customer via a computer file (which has a .HEX extension). The file may be sent by email, in a .ZIP archive, or on a floppy disk or by some other means. The customer may also copy or transport this file between computers. It is possible for the HEX file to be damaged or corrupted.
 - ii. After downloading any application, the TDL always computes a checksum to verify the program's integrity. If the checksum is incorrect, the application will not run, and the TDL will display a message.
 - iii. Action
 - 1. try downloading this file again (in case there was just a computer glitch) and if this fails, contact OEM Controls Inc. for a new copy of the HEX file.

 **WARNING** – it is the customer’s responsibility to download the correct application to the product. . **Incorrect application software installed in any CANBus module could result in injury or death to the equipment operator or bystanders.** Similar applications may appear to function (for example there may be European and USA versions, or different revision levels) but the Terminal Downloader (TDL) is not able to determine if the correct application was downloaded. If you have any questions about the correct application software for your product, please contact OEM Controls, Inc

10.0 Specifications

Inputs

- Analog (Voltage) Inputs (Can also be factory configured for sinking or sourcing digital inputs)
 - 11 Bit Input Option (0-10vdc)
 - Resolution= 11 Bits– Each input is capable of commanding an output channel with 2,000 discrete output levels
- Digital Inputs can be factory configured for Sinking or Sourcing operation

Outputs

- Current regulated 3 Amp PWM or Digital sourcing outputs
 - Current regulated to $\pm 5\%$ for system voltage variation of $\pm 25\%$ and valve resistance increase of 0 to 50%
- Proportional Outputs can be calibrated for two separate PWM frequencies
 - Outputs 1 through 4 calibrated with PWM frequency A
 - Outputs 5 through 8 calibrated with PWM frequency B
- 11 bit resolution - Each output is capable of providing 2,000 discrete output levels
- PWM frequency range: 60-250 Hz or 33-250 Hz(If OCO-2 Module)
- Proportional PWM or digital sourcing 3 Amp.
 - 14 bit resolution - Each PWM output is capable of providing 20,000 discrete output levels

Human Machine Interface

- LCD Display
 - 2 lines @ 16 characters for system operation and error codes
 - Low temperature display
- Membrane Keypad (4 buttons) for calibration– Intuitive menu system works in conjunction with LCD display which allows the operator to choose between the following parameters
 - Calibration and Adjustment
 - CAN Bus system state
 - Application state
 - Software Information
 - IO Status Indication

Communication

- Standard Protocol CANopen

Future/Optional Protocol

- J1939

Environment

- Temp:-40 - +70C operating
- Protection: High performance silicone conformal coating
- Module sealed and tested to IP-65 or greater

EMC Compliance

- Radiated Immunity:
EN 61000-4-3:1995, 30V/m
- ESD:
IEC 61000-4-2:1995
- Electrical Fast Transient:
IEC 61000-4-4:1994
- Surge Immunity:
IEC61000-4-5:1995
- Conducted Immunity:
IEC 61000-4-6:1996
- Radiated Emissions:
EN 55011:1998, Class B
- Radiated Emissions:
EN 55022:1998, Class B

Firmware

- Upgradeable via the RS232 port

User Notes :

User Notes :

11.0 Document Revision History

- 11.1 Rev A*10-25-05
 - 11.1.1 Initial Release
- 11.2 Rev B*05-08-06
 - 11.2.1 Revised Status LED functionality per ECN#15390
- 11.3 Rev C*07-12-06
 - 11.3.1 Revised TDL instruction to include procedure for downloading CPU on Current Regulated products per ECN#16560



WARNING: It is the purchaser's responsibility to determine the suitability of any OEM Controls product for an intended application, and to insure that it is installed and guarded in accordance with all federal, state, local and private safety and health regulations, codes and standards.

Due to the unlimited variety of machines, vehicles and equipment on which our controls are used, and the numerous standards which are frequently the subject of varying interpretation, it is impossible for OEM Controls personnel to provide expert advice regarding the suitability of a given controller for a specific application. The flexibility of our products allows us to offer thousands of custom configurations. We can advise you of the various features that are available and you can examine models to see what meets your needs. We believe our customers' engineering departments should be the qualified experts in their own product field. If the product will be used in a safety critical application, the customer must undertake appropriate testing and evaluation to prevent injury to the ultimate user.

Should you have any questions or if any of the above warning is unclear, please contact OEM Controls at 10 Controls Drive, Shelton, CT 06484, FAX: 203.929.3867, TEL: 203.929.8431.



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