

# CTRLPSB035 - 17FB187 and 17FB190 CPU Cards

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### Revision History

<b>Rev</b>		<b>Date</b>	<b>Author</b>	<b>Description</b>
0		8/01/12	T Brown	Initial release
0.1		3/31/15	T Brown/J Ghofulpo	Modified FB187 Process
0.2		8/08/17	T Brown/J Ghofulpo/K Jones/J Palmer	Modified FB187 & FB190 Process
0.3		4/6/18	JJP	Added field info – recording p/n & s/n

#### 1. PURPOSE

The purpose of this product service bulletin is to provide detail on the FB187 and FB190 CPU cards that are available on General Electric Off-Highway Vehicle AC Drive systems. This bulletin will provide detail on these cards as well as describe the process for downloading new software, configuring the cards, and downloading data from the cards.

#### 2. DOCUMENTS REQUIRED / RECOMMENDED

None

#### 3. DEFINITIONS

- 17FB187 – System CPU card. Can be used as a DSC, PSC or TCI function
- 17FB190 – Traction Motor Controller (TMC) card
- DSC – Drive System Controller
- Invertex I – GE AC Control System that uses a 17FL375B3 or earlier or a 17FL386D1 or earlier ICP panel.
- Invertex Ie – GE AC Control System that uses a 17FL375C1 or newer or a 17FL386E1 or newer ICP panel. Contains FB187 System CPU, FB190 Inverter CPUs and FB173Bx card.
- Invertex II – GE AC Control System that uses a 17FL453 or 17FL454 DSC panel.
- Invertex Iie – GE AC Control System that uses a 17FL489 DSC Panel
- PSC – Propulsion System Controller
- TCI – Truck Control Interface
- OS – Operating System
- Download - the process of transferring new software TO the CPU card or (in the context of the Console), the process of retrieving data (events, stats, etc.) FROM the CPU card to a USB drive.
- USB drive – A flash based USB thumb drive, formatted to FAT32 for Windows

#### 4. SPECIAL TOOLS & PROCESSES REQUIRED

- USB Flash Drive with adequate empty Space
- 2-Pin Jumper (AMP A266242-ND) - For Primary OS loading
- RS-232 DB-9 Serial Cable
- RJ45 Ethernet Cord (optional)

#### 5. POSSIBLE SYSTEMS AFFECTED

All GE AC drive systems utilizing a 17KG527, 17KG531, 17KG535, 17KG537, 17KG543, 17KG550 or 17KG551 model control cabinets.

#### 6. TIMING OF INTRODUCTION

Shipment of the 17FB187 and 17FB190 cards began in the summer of 2012.

#### 7. DESCRIPTION

##### 7.1. System CPU – 17FB187

The 17FB187 System CPU is the main controller in the GE AC Drive system. The FB187 card contains numerous improvements over the 17FB144/147/174 CPU cards. A faster processor, additional memory, as well as new peripherals have been added. The FB187 contains Ethernet and CAN network support as well as USB ports.

##### 7.2. Battery Backed RAM

Battery Backed RAM has been completely eliminated from the 17FB187 CPU Card. The only purpose of the 3.6Vdc battery on the card is to maintain the internal clock when the control power is removed. The battery is no longer hot-replaceable. Data will not be lost when the battery is changed as it is stored on the internal disk. On battery replacement, the clock will need to be reset via the DID panel, PTU or Console.

##### 7.3. Inverter CPU – 17FB190

The 17FB190 Inverter CPU is the Traction Motor Controller for the GE AC Drive systems. Typically, there are two 17FB190 cards per system. The FB190 also has a faster processor, more memory, and additional I/O capability, such as Ethernet and USB.

## 8. COMPATIBILITY

### 8.1. Hardware

The new CPU boards are backward compatible with all GE AC Drive systems that were originally supplied with 17FL375 or 17FL386 Invertex I Electronic Control Panels. The following tables detail the exact compatibility requirements:

New Card	Panel	Old Card	Slot	Function
<b>17FB187</b>	17FL375	17FB147	3	PSC
	17FL375	17FB174	3	PSC
	17FL375	17FB144	7	TCI
	17FL375	17FB174	7	TCI
	17FL386	17FB174	3	PSC
	17FL386	17FB174	7	TCI
<b>17FB190</b>	17FL375	17FB172	11 and 12	Inv 1 and Inv 2
	17FL375	17FB179	11 and 12	Inv 1 and Inv 2
	17FL386	17FB179	11 and 12	Inv1 and Inv 2

Note: The 17FB187 and 17FB190 are **NOT** compatible in 17FL320, 17FL349 or 17FL373 panels running in 17KG498 control groups.

### 8.2. Software

For a 17FB187 or a 17FB190 CPU card to be used as a replacement card in any of the above configurations, the **existing** cards in the panel must be running the V24 (or later) software baseline. Note: As of the release of this PSB, V27 is the latest Invertex I production release.

Note that the FB187 and FB190 themselves do NOT run V24 (or later) software. They require new software that is distributed separately via the GE Support Central software repository website.

### 8.3. Card Mix & Backward Compatibility

Each card is independently compatible for the Function being replaced. Therefore, there are NO restrictions on the make-up of an updated FL375 or FL386 panel. For example, a new FB187 can run in the PSC slot with an existing FB174 TCI. A new FB190 can run with FB174 PSC's, or with a FB179 in the other inverter slot. ALL possible combinations of FB144/147/172/174/179/187/190's are supported within FL375 or FL386 panels.

9. FACEPLATES

Faceplates are required on FB187 and/or FB190 CPU cards used in 17FL453, 17FL454 or 17FL489 Invertex II panels. The card numbering identifier (F) is being used to properly identify cards that were shipped with a faceplate. FB187 and/or FB190 CPU cards used in 17FL375 or 17FL386 panels are supplied without a faceplate, but with the necessary extractor ears to secure them in these panels.

For example, a 17FB187A5 card is a typical FB style card. It contains extractor ears and is used in 17FL375 or 17FL386 panels.

The "F" version of the card, 17FB187A5F means that it was shipped with a faceplate installed. The underlying electronic card is exactly the same. The only difference is one has a faceplate added while the other one has extractor ears installed.

Each card style can be directly ordered, or a kit will also be available to convert a base card to the "F" faceplate version.

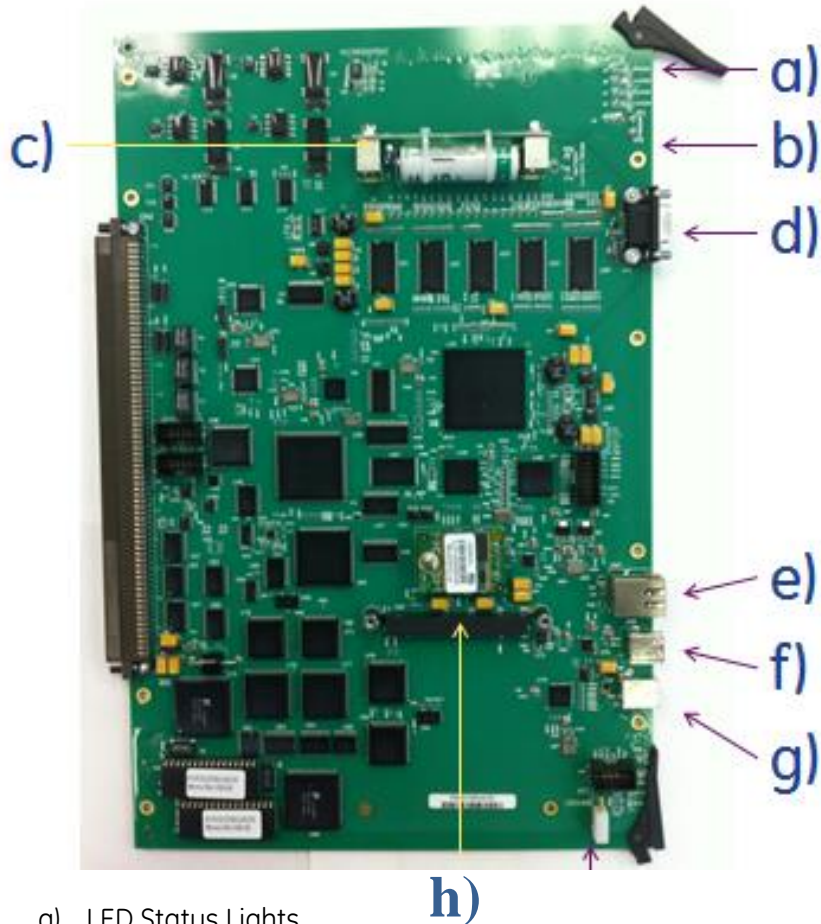
<b>17FL375 or 17FL386 Version</b>	<b>17FL453, 17FL454 or 17FL489 Version</b>
17FB187Ax	17FB187AxF
17FB190Ax	17FB190AxF

Where X is the rev #.

## 10. CARD LAYOUT

### 10.1. FB187

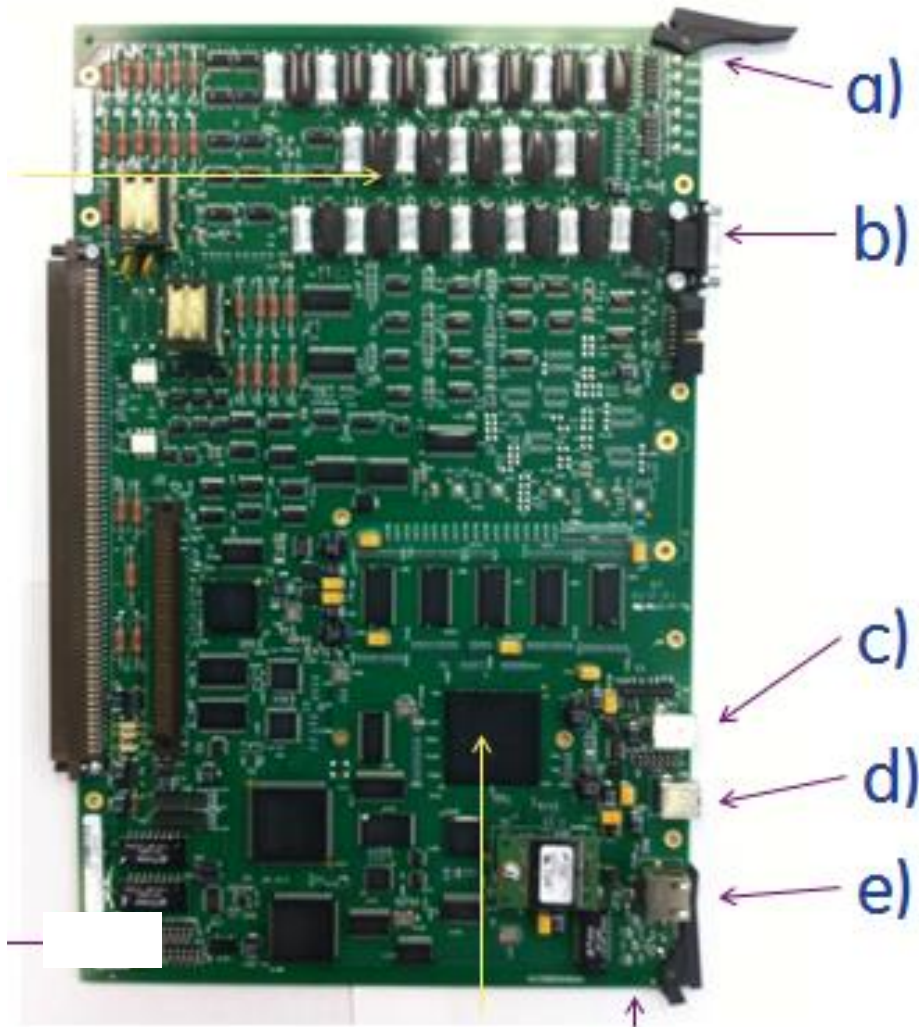
The picture below shows key elements of the 17FB187 System CPU Card



- a) LED Status Lights
- b) Download Pins (TP1/TP2)
- c) 3.6Vdc backup battery. (clock only)
- d) Diagnostic RS-232 DB9 Serial Port – Provides access to the debug console.  
Communication parameters (115200-8-n-1-none)
- e) Diagnostic RJ45 Ethernet port. (IP address = 192.168.0.1 for PSC or DSC, 192.168.0.2 for TCI) Provides for Telnet, FTP or wPTU Toolbox Connectivity
- f) Diagnostic USB Flash Drive Port
- g) Diagnostic USB PC port
- h) PC104+ Expansion Slot

10.2. FB190

The picture below shows key elements of the 17FB190 Inverter CPU card.



- a) Extractor Ears
- b) Diagnostic RS-232 DB9 Serial port (9600-8-n-1-none)
- c) Diagnostic USB PC port
- d) Diagnostic USB Flash Drive Port
- e) Diagnostic RJ45 Ethernet Port

## 11. CARD LEDS

### 11.1. FB190 LEDS

The 17FB190 TMC CPU card contains 5 LED's on the front edge of the card that give specific information relating to the status of the software and hardware.

#### 11.1.1. Bottom 4 LEDs

**POWER (Red)** – indicates that the card has 5v power. This LED should be solidly illuminated during operation.

- **NOTE:** for **17FB190Ax** cards, the card's silk screen legend identifies this LED as **"RESET"**

**STATUS 2 (Yellow)** – used during the downloading process, and, following application software launch, to identify a detected impending shutdown condition

**STATUS 1 (Green)** – Indicates that the Application software is loaded and running. This LED should illuminate solidly after initial boot-up, unless an impending shutdown condition is being detected (in which case the **Yellow STATUS\_1** LED will instead be illuminated)

**RESET (Red)** – this LED will flash during initial power-on and then remain off.

- **NOTE:** for **17FB190Ax** cards, the card's silk screen legend identifies this LED as **"POWER"**

#### 11.1.2. Top LED

**DONE (RED)** – this LED indicates that the Field Programmable Gate Array (FPGA) is programmed and application software is launched.

### 11.2. FB187 LEDS

The 17FB187 System CPU card contains 6 Status LED's on the front edge of the card that give specific information relating to the status of the software and hardware.

#### 11.2.1. Top 4 LEDs

**STATUS 1 (GREEN)**

**STATUS 2 (RED)**

**STATUS 3 (RED)**

**STATUS 4 (RED)**

The 4 status lights have different meanings depending on the hardware and software situation. They are described below.

### 11.2.2. Bottom 2 LEDs

**POWER [RED]** – – indicates that the card has 5v power. This LED should be solidly illuminated during operation.

**RESET [RED]** – Indicates that the CPU is in RESET. This LED should illuminate momentarily when power is first applied, and then remain off during operation.

### 11.2.3. Normal Card Boot-up

The normal card power-up sequence will be as follows:

- a) All OFF – Initial power-up
- b) STATUS 4 (Bottom) RED ON – Primary Operating System loading
- c) STATUS 3 and 4 ON – searching for USB disk on card edge
- d) All Lights ON – Operating System ready, Checking disk
- e) Bottom two (Power & Reset) RED LED's + STATUS 1 GREEN LED solidly illuminated – Checking Application
- f) All lights ON – Application Configuring
- g) Rotating Red Lights – Configuration Complete
- h) Rotating Red + Green Solid, red LED below green LED solid – Main application software launch complete, secondary tasks launching.
- i) Rotating Red + Green Solid – Application software launch complete.

### 11.2.4. Normal Operation

After normal card boot-up (above), during normal card operation the STATUS 1 Green LED will be solidly illuminated, while the STATUS2, STATUS 3, & STATUS 4 Red LED's will be cycling one at a time in a circular or rotating fashion. This action indicates that the card is booted and application software is running normally.

See the section on saving data to a USB drive for details about the LED sequence that is displayed when a data download occurs.

### 11.3. Abnormal Conditions

The LEDs have special patterns if an abnormal condition occurs.

#### 11.3.1. All 4 STATUS LEDs flashing

If all 4 LED's are flashing at a high rate after the boot-up sequence, this indicates that the application software is loaded, but the software is not configured. Please follow the configuration steps described elsewhere in this document.

### 11.3.2. 3 RED STATUS LEDs rotating, but the Green STATUS 1 LED off

If the 3 Red LED's are rotating similar to the normal condition, but the Green LED is OFF, this is an indication that the software is configured as a *generic* FB187 and needs to be properly configured for the truck it is on. The FB187 leaves the GE factory in this *generic* configuration state.

## 11.4. LEDs - Downloading Sequences

### 11.4.1. Updating the Operating System AND Application

- a) STATUS 3 and 4 (Bottom) RED LED's on – Jumper accepted and download process beginning.
- b) STATUS 4 (Bottom) RED LED flashing – Saving data and configuration to flash drive.
- c) STATUS 3 and 4 (Bottom) RED LED's solidly illuminated – Formatting disk and installing operating system.
- d) STATUS 2, 3, and 4 (Bottom) RED LED's solidly ILLUMINATED – Copying applications to disk.
- e) STATUS 2, 3, and 4 (Bottom) RED LED's flashing – Restoring data and configuration.
- f) All STATUS LED's solidly illuminated – Copying complete.
- g) STATUS 2, 3, and 4 RED LED's off and STATUS 1 Green LED flashing – Update process complete, remove thumb drive and cycle power to card.

### 11.4.2. Updating the Application ONLY via the programming pins-jumper method

**This is not recommended – use the Console to download application software. This section is provided for reference only.**

- a) STATUS 3 and 4 (Bottom) RED LED's solidly illuminated – Jumper accepted and download process beginning
- b) STATUS 2, 3, and 4 (Bottom) RED LED's solidly illuminated – Mounting the thumb drive
- c) STATUS 3 and 4 (Bottom) RED LED's flashing – Performing a checksum on the new software
- d) STATUS 2, 3, and 4 (Bottom) RED LED's flashing – Copying application software from Thumb drive to FB187
- e) When copying is complete, the LED sequence follows the normal boot-up sequence

## 12. SETUP AND CONFIGURING

### 12.1. 17FB190

Inverter CPU cards are configured via the PSC or DSC at system boot-up. No additional configuration is necessary by the user.

### 12.2. 17FB187

FB187 system CPU cards leave the GE factory, whether installed in a FL panel, or as a renewal part, with a base set of software loaded. At the OEM factory, distributor, or mine site, these cards need to be configured for the panel, slot, and truck type that they are operating in. Card configuration is done via the console.

### 12.3. Setup Using the Console

1. Using the methods described in this document for connecting to an FB187 debug Console, open a console window and login.
2. At the OHV-xxx> prompt type "setup".
3. The user will then be prompted with a set of questions. Questions may vary depending on the answers selected. At a minimum, the user will need to pick a Panel type and a Truck type. For example: the first question may look like this:

```
--- CPU / Panel Type? ---  
1: TCI (FL375/FL386 - Slot 7)  
2: PSC (FL375/FL386 - Slot 3)  
3: DSC (FL453)  
4: DSC (FL454)
```

The user should select the type of panel and function for which the FB187 is being setup for. For example, to choose a PSC in a FL386 panel the, user would type 2 (followed by enter) in the example above. The user will then be presented with additional questions. One question will be to choose a specific Truck type. The list of trucks that is presented will depend on the user's login permissions. For example:

```
---- Truck Model? ---  
1: truck type 1  
2: truck type 2  
3: truck type 3
```

Depending on the users' choice, additional questions may appear, such as "Is this a High-altitude application?" At the end of this process, the user will be prompted to cycle power to the control panel. The FB187 will then boot into the requested setup.

### 12.3.1. Configuration Using the Console

After the card has been properly setup, the user can then choose to modify mine specific configuration options. This is similar to using the wPTU Toolbox's configuration utility which allowed the user to set things such as mine specific speed limits for a FB174 card.

- 1) Using the methods described in this document for connecting to an FB187 debug Console, open a console window and login.
- 2) At the OHV-xxx> prompt type "config."
- 3) The user will then be presented with a list of possible configuration screens. For example:

```
Config: Use arrows to select item, enter to change value
        s to save to thumb drive, l to load from thumb drive, space to exit
OEM Options (1)
-> [11.000] - MPH OEM Speed Option 1 [1,50]
    [25.000] - MPH OEM Speed Option 2 [1,50]
    [2100.000] - Engine OEM Speed Option [500,3000]
    [5.000] - Dump Body Up Speed Limit [0,20]
    [15.000] - Dump Body Up Speed Limit (With Override) [5,20]
    [1] - Dump Body Up Retard enable at Max Speed [0,1]
    [0] - External OEM Accel Inhibit Input Enabled [0,1]
    [0] - RTD Wireless card installed [0,1]
OEM Options (2)
[2] - Axle Box Sensor Type [0,2]
      0=None
      2=Digital
[0] - Control Group Pressure Sensor Present [0,1]
[1] - RP1 Holdin Strategy [0,2]
      0=None
      1=RETARD
      2=READY
[0.000] - Engine Warm-up Mode Option [0,2]
```

- 4) To view or edit options from one of the screens, use the up and down arrows to select the item to be changed. Press enter, and the bottom of the screen will show "Enter new value: >". Type the new value, and press enter. On a successful change, the bottom of the screen will show "MineOptions written Ok."
- 5) The current configuration can be saved to a USB thumb drive by pressing 's'. Enter the directory name, followed by enter. On a successful save, the bottom of the screen will show "Files copied Ok".
- 6) To load a configuration from the USB thumb drive, press 'l' (lower case L). Select the directory from the menu, and press enter. The user will be prompted to cycle power to the control group for the changes to take effect.
- 7) Press space to exit the configuration screen.

The user should verify the settings on all of the screens. When finished modifying the configuration parameters, cycle power to the control group. The FB187 is now setup and configured for operation.

### 13. SAVING DATA TO A USB DRIVE

The downloading process takes advantage of the speed of the new connection types available and is streamlined from previous systems. There are 3 ways to initiate a data dump of the cards stored data (Events, Stats, configuration...): directly at the card edge, via the DID, and via the Console.

#### 13.1. Directly at the Card Edge

To initiate a Data Dump, insert a flash drive with sufficient space. Jumper the program pins (TP1 and TP2).

The STATUS LED's will begin flashing indicating that files are being written to the flash drive. When complete, the STATUS 1 GREEN LED will flash for 5 seconds and then the STATUS LED's will resume their normal sequencing. Once the LED's resume their normal sequencing, it is safe to remove the flash drive from the 187 card.

Note 4: This method works for all possible configurations of a FB187: TCI, PSC or DSC.

Note 5: Removing the Flash drive while the STATUS LEDS are flashing may cause corruption to the files on the flash drive.

#### 13.2. Via the DID Panel

The DID panel method works for downloading an FB187 acting as a TCI or a DSC. It does NOT work for gathering data from a PSC – FB187. The card edge or console methods must be used in this case.

To initiate a Data dump from the DID panel, insert a flash drive with sufficient space and press the following DID keys:

1. Press the F4 – MENU key
2. Press the F2 – INFO Menu key
3. Press the F3 – Data Menu Key
4. Press the F2 – Dump Data Key
5. Press “F2 – ALL” or “F3 – Quick” key to initiate generation and download of the files.  
The quick download skips downloading the datapack files.

The DID will indicate the progress of the download. When it says complete, the flash drive may be removed. The LEDs will also flash as described in the “via the card edge” method above.

#### 13.3. Via the Console

To initiate a Data dump from the Console, insert a flash drive with sufficient space. Log in to the Console (as described in the Console section) and type the following:

```
download
```

or

download quick

for a quick download without datapacks.

The download progress will be displayed on the screen of the Console, and the LEDs will flash as described below. When the download is complete, "Complete OK" will be displayed, such as in the following example:

**Percent complete: 100.00 (6497019/6497019) Complete OK**

#### 13.4. LED - Downloading Sequence

When a download is initiated, the LED light sequence will be as follows:

1. Normal (STATUS 2, 3 and 4 RED LED's cycling, STATUS 1 GREEN LED solidly illuminated)
2. All four STATUS LED's solidly illuminated – Download pins being jumpered
3. One RED LED flashing Red light – File Copy in process
4. STATUS 1 GREEN LED Flashing (5 seconds only) – Copy process complete – okay to remove flash drive
5. Normal (STATUS 2, 3 and 4 RED LED's cycling, STATUS 1 GREEN LED solidly illuminated)

#### 13.5. Downloaded Information

All of these methods will result in a directory being created on the Flash drive or PC's hard drive with the truck number, controller, data and time.

For example, a directory entitled 345\_psc\_20150311-144548 indicates that the PSC files were downloaded on March 11, 2015 at 14:45.48 from truck # 345. Within this directory, there will be the following subdirectories:

- a) **Autorec** – This directory will contain system recordings for specific cases if the system is configured to perform such recordings. This directory is typically empty.
- b) **Cdlog** – This directory will contain Continuous Datalogger Files. These files are only downloaded to the flash drive if requested. This directory is typically empty.
- c) **Datapacks** – This directory contains time stamped CSV files for each event that has logged. For example, file 20120430-072134.458-Ev650-Log.csv is the file that was saved for event 650 that logged on April 30<sup>th</sup>, 2012 at 07:21:34.45 in the morning. These files can be viewed in Excel or other CSV viewers.
- d) **Events** – This directory will contain an "events.csv" file that contains a historical listing of every event that has logged on the truck.
- e) **Gedata** – This directory is for special circumstances. This directory is typically empty.

- f) **Rec** – This directory would contain any data recordings that were taken. Typically, this directory will be empty.
- g) **Stats** – This directory will contain the statistical files, serial, counter and profile stats in both CSV format and in the raw UPL format. This directory will also contain a tripdata.csv file that summaries the haul cycles seen on the truck.
- h) **System** – This directory will contain files that describe the setup, configuration, and state of the truck.

## 14. DOWNLOADING SOFTWARE

The Latest Software can be obtained through the GE supportcentral web site. (supportcentral.ge.com)

### On the Internet

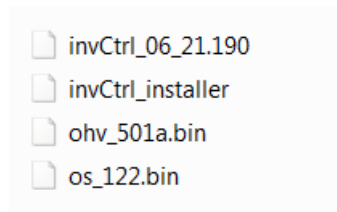
On the Internet, login to the supportcentral site and download the wPTU, Invertex 1 and Invertex Ie/II installation files. Run the installs on your PC.

Note: Example below is for wPTU 10.1, V5 and V27. Other Releases will be similar.

### Creating Installation Thumb Drive(s)

#### 1. Application / OS Load Disk

- a) After installing the wPTU 10.1 Main Install, the files located at **C:\GETrans\wPTU\_10-1\sw\Ver\_501a\OsDisk187** should be copied to a spare Flash Drive and labeled "V501 Application/OS Load Disk".

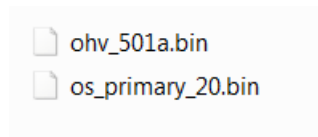


This USB disk is then used to update the following software:

- the FB187 Operating System to version 1.22 and the application software to version 5.01a
- the FB190 Application Software to Version 6.21

#### 2. Primary OS Load Disk

After installing wPTU 10.1, the files located at **C:\GETrans\wPTU\_10-1\sw\Ver\_501a\PriOsDisk187** should be copied to a spare Flash Drive and labeled "V501 FB187 Primary OS Load Disk".

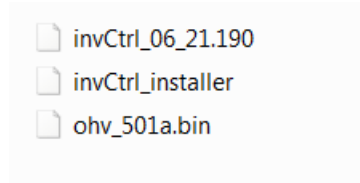


This USB disk is then used to update the FB187 Primary Operating System to version 20.

Note: a Jumper is required to be installed prior to starting the Primary load process. There should only be one file starting with "os\_" in the main directory of this disk: os\_primary\_20.bin.

### 3. Application Load Disk

After installing wPTU 10.1, the files located at **C:\GETrans\wPTU\_10-1\sw\Ver\_501a\AppDisk** should be copied to a spare Flash Drive and labeled “**V501 Application Load Disk**”.



This USB disk is then used to update the FB187or FB190 Application Software only.

Note: This thumb drive is only used if updating trucks that were part of the V500a field test. If no trucks at your location were involved in the field test, this thumb drive does not need to be created

#### 14.1. 17FB190 – Inverter CPU Card

To update the 17FB190 Inverter CPU’s software, the following procedure is used:

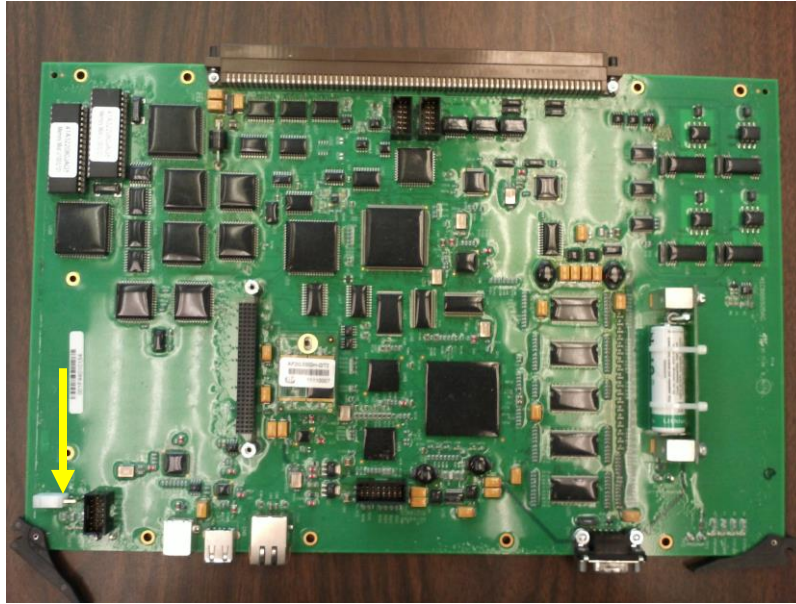
On the Truck

- a) With the Battery switch and Key switch ON, open the low voltage side of the GE control group and turn off the CPS switch. Verify that power is removed from the GE control panel by looking at the power LED on the FB190 and confirming that it is unlit.
- b) Insert the Thumb Drive labeled “**Application/OS Load Disk**” into the Front USB port of the 17FB190 card being programmed.
- c) Turn on the CPS switch. The FB190 will boot up and check the thumb drive for new software. If found it will copy the software from the thumb drive to the 190 card. The **Yellow** Status LED at the bottom of the card will flash for 5 seconds indicating that a copy is in progress.
- d) At the conclusion of the copy, the **Yellow** LED will remain solid as the FB190 card launches the new software. The top **RED** “done” light will illuminate when the software is running, and the Bottom **Yellow** LED will turn off, and the **Green** LED will light indicating successful completion of the update.
- e) The thumb drive can now be removed.
- f) Repeat Steps a-e for the remaining FB190 card.

## 14.2. 17FB187 System CPU Card

### 14.2.1. Loading Both the Operating System and the OHV Application

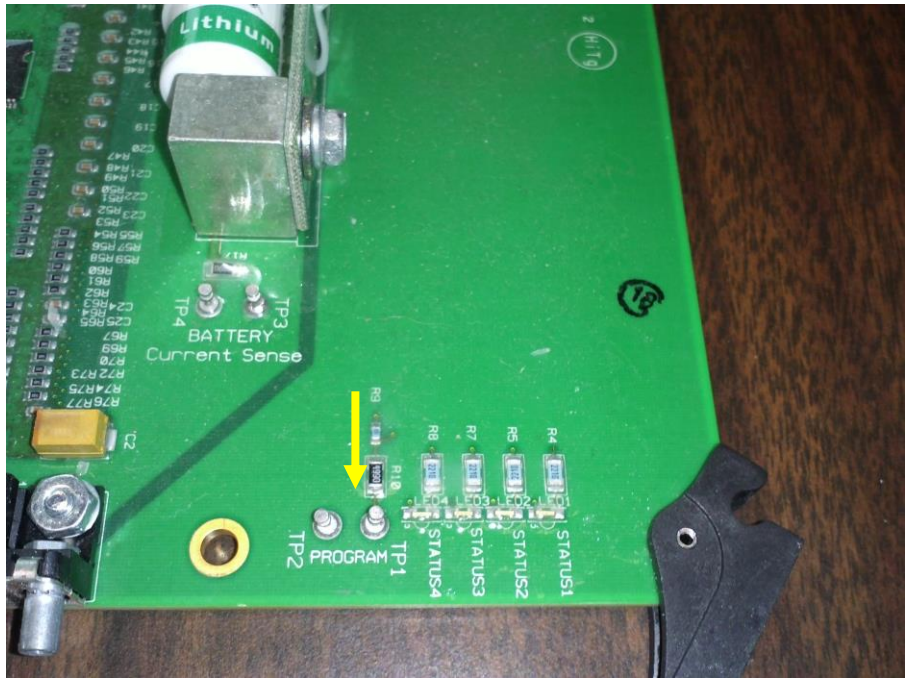
- a) With the Battery switch and Key switch ON, open the low voltage side of the GE control group and turn off the CPS switch. Verify that power is removed from the GE control panel by looking at the power LED on the FB187 and confirming that it is unlit.



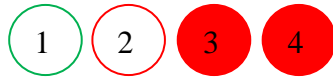
- b) Insert the flash drive marked: "V5 Application/OS Load Disk" into the front edge USB connector of the FB187 card that is being programmed.



- c) Jumper the **PROGRAM** (TP1/TP2) pins on the top edge of the FB187 card and turn on the CPS switch. (A Car Key or screwdriver works well)



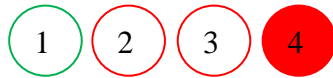
- d) When the bottom 2 **RED** LED's, STATUS 3 and STATUS 4, are **solidly illuminated** (after approximately two seconds), you can remove the jumper.



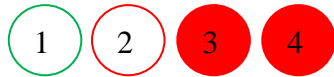
If these two LED's do not illuminate or the LEDs progress to the cycling pattern, the jumper was not recognized. Turn off control power, ensure the jumper is making solid connection, and try again.

- e) The FB187 card will boot up and check for new software on the flash drive. If it is found, it will begin the update process.

The STATUS 4 light will blink as data is being backed up to the USB flash drive.



- f) The FB187 will format the FB187's onboard disk and copy the operating system from the USB flash drive to the onboard disk. The STATUS 3 and STATUS 4 RED LED's are solidly illuminated at this time.



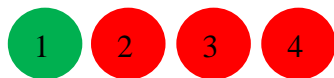
- g) The FB187 will then copy the OHV application to the FB187. At this point, STATUS 2, 3, and 4 LEDs are lit.



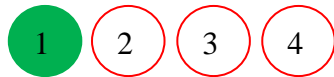
- h) The STATUS 2, 3, and 4 LEDs will blink as data is being restored from the USB flash drive.



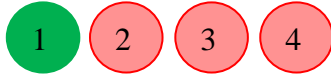
- i) All four LEDs will be lit as the install is being finalized.



- j) The STATUS 1 LED will blink when the install is **complete**.



- k) Turn off the CPS switch
- l) Remove the flash Drive
- m) Turn on the CPS switch. Wait for the FB187 to boot up. Note that the system will take several seconds longer than a normal startup as the internal disk is partitioned.
- n) When the system has progressed to the cycling pattern (STATUS 1 LED lit green and STATUS 2, 3, and 4 Red LEDs rotating), it is okay to progress to loading the FB187 primary operating system.



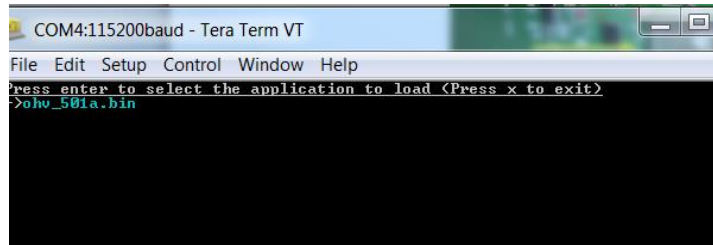
## 14.2.2. Load Application Only

- o) Insert the flash drive marked: “Application Load Disk” into the front edge USB connector of the FB187 card that is being programmed.



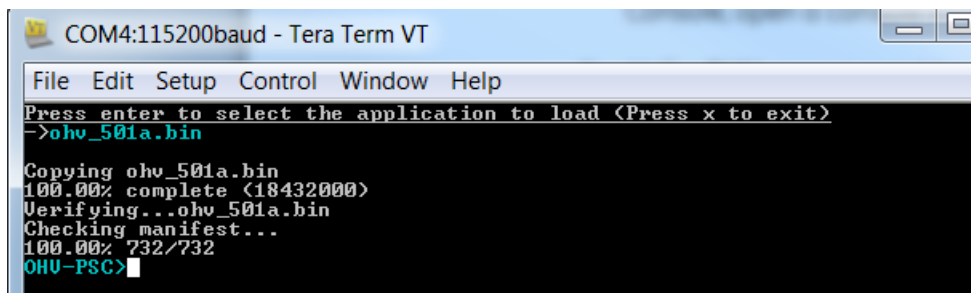
- p) Using the methods described in the CTRLPSB035 for connecting to an FB187 debug Console, open a console window and login.
- q) At the **OHV-xxx>** prompt type “**load\_app**”

OHV-DSC>load\_apps

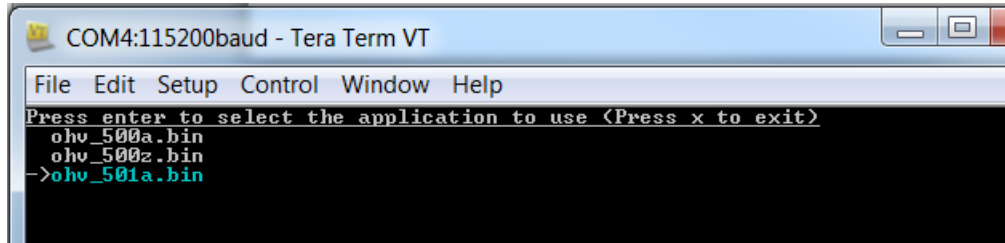


The screen will show the available software versions on the Thumb Drive.  
ohv\_501a.bin should be highlighted.

- r) Press “**ENTER**” to select the ohv\_501a.bin file. The file will be copied from the Thumb Drive to the FB187 card. After the Copy, the file will be verified. When the **OHV-xxx>** prompt returns, the copy is complete.



- s) At the **OHV-xxx>** prompt, type **“change\_app”**. This command will show the available application versions residing on the FB187 card.

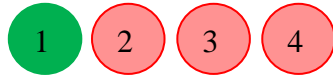


```
COM4:115200baud - Tera Term VT
File Edit Setup Control Window Help
Press enter to select the application to use <Press x to exit>
ohv_500a.bin
ohv_500z.bin
->ohv_501a.bin
```

Arrow down and select ohv\_501a.bin and press **“ENTER”**

The FB187 card will re-boot and launch Version 5.01a

- t) When the system has progressed to the cycling pattern (STATUS 1 LED lit green and STATUS 2, 3, and 4 Red LEDs rotating), login to the debug console and verify the software version running is 5.01a. by using the **“ver”** command



### 14.2.3. Load 17FB187 Primary Operating System

**WARNING! The upgrade to the primary operating system can render the FB187 card unusable if power is removed during upgrade. Be sure to follow the instructions carefully.**

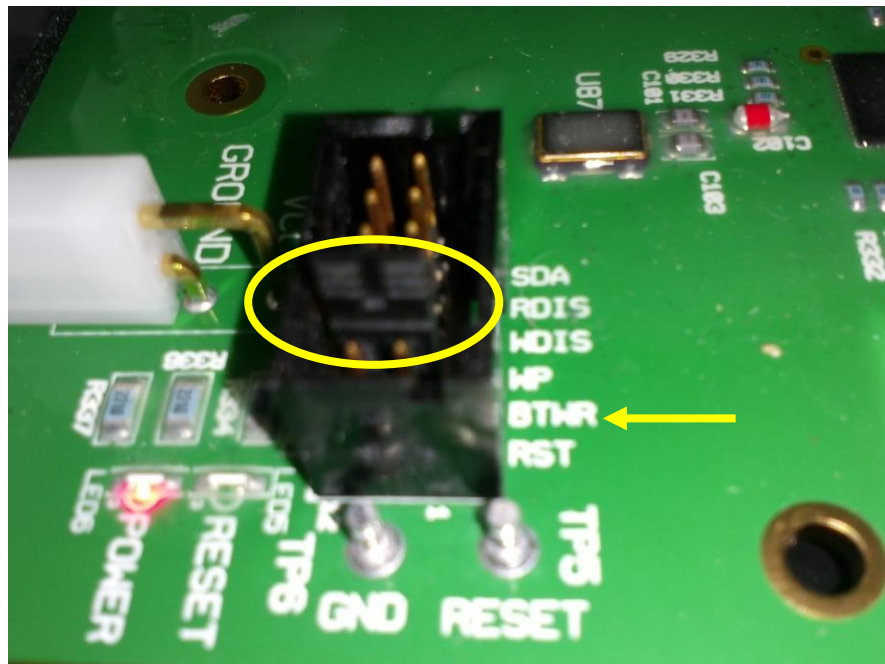
Refer also to the procedures for Downloading Software to the 17FB187 card detailed in the "Primary OS" section of the Control Product Service Bulletin, CTRLPSB035 (Section 15).

The primary operating system (OS) is the boot software which starts the card from power up. This software is different than the normal operating system software (OS) in that it should rarely change. Primary OS software release 1.20 decreases the time needed for the card to start up, and must be loaded after loading the secondary OS (os\_1.22.bin) and a OHV application.

- a) Start the engine and make sure that the truck's battery is adequately charged.  
**WARNING! Once the programming sequence is started, do not power off the system.** Removing power during card programming can potentially "brick" the card by having no image or a partial boot image programmed on the onboard flash, rendering the card unbootable.

If this occurs, **the card needs to be sent back to the factory to be recovered**

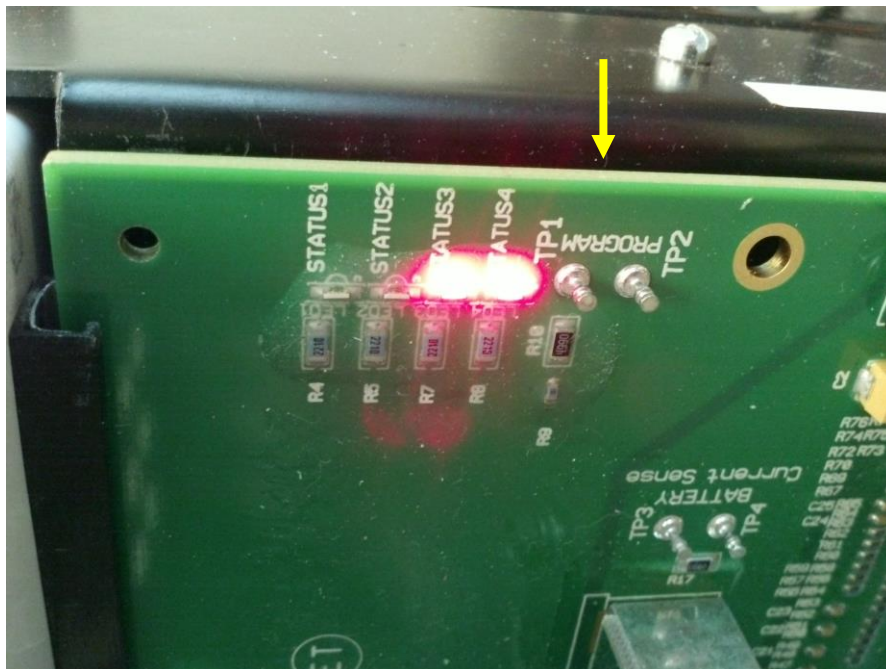
- u) Power off the system via the CPS switch.
- v) If desired, a laptop can be connected to the serial port on the FB187 to monitor the boot programming process via a terminal program. Reference the "Console" section of this document for details as to how to set up the terminal software.
- w) Open the Panel door, or loosen the Faceplate screws. Using Proper Static Protection, pull the 17FB187 to be programmed from the panel.
- x) Place a jumper on the **BTWR** pins next to the header. This allows the boot flash to be written to.



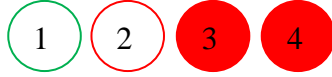
- y) Re-install the FB187 card into the Panel.
- z) Insert a flash drive named "V5 FB187 Primary OS Load Disk" into the USB slot.



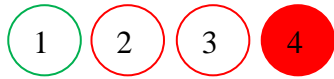
- b) Short the **PROGRAM** pins, (TP1 and TP2) located near the four status LEDs with a Key or screwdriver. **Turn on** the CPS switch and wait until LED 3 and LED 4 light. Then Remove the short.



aa) The status 3 and 4 LEDs will light up **RED** during the initial primary boot while looking for the external USB drive. If this sequence progresses to the status 1 or status 2 LEDs being lit as well, the program pins (TP1 and TP2) were not detected as being jumped, the software is not present on the USB drive, or the USB drive was not detected. The system will continue to boot as normal. Check the drive and test pins, power down the system, and power the system back up to retry the programming process.



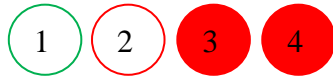
bb) The status 4 LED will light up during the initial setup and testing of files needed for reprogramming the onboard boot flash with the primary OS software. This will happen quickly and may not be visible to the person updating the software.



If the serial port is connected, output similar to the following will be seen:

```
***
*** GE - 17FB187 Primary OS/IFS
***
ifs_version 20
ifs_date 2014-12-04
[mount_root_ifs]Jumper enabled
Unable to access /dev/hd1t6
[mount_usb]Mounting /dev/hd1t11 as /dos
[load_os]Found /dos/os_primary_20.bin, installing OS on internal flash disk
[load_os]Loading OS software...
slay: Unable to find process 'devf-generic'
/OS/petwdog ok
/OS/devf-generic ok
/OS/flashctl ok
/tmp/primary.ifs ok
Copy is ok
Starting flash driver
/dev/fs0 ok
Array Info
Total : 0x00800000 100%
Chip Size : 0x00800000 100%
Unit Size : 0x00010000 0%
```

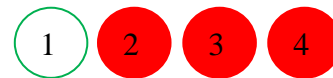
cc) The status 3 and 4 LEDs will be lit **RED** while the boot flash is being erased. This will take about 1 minute and 20 seconds. This is the critical point where power must not be removed from the FB187.



As the erase progresses, the serial connection will show:

```
Erasing flash
Erasing device /dev/fs0
.....
```

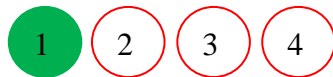
dd) The status 2, 3, and 4 LEDs will be lit **RED** while the boot flash is being programmed. This will take about 2 minutes and 10 seconds, (3:30 total time including the erase).



The serial connection will show:

```
Reflashing
cp: Copying /tmp/primary.ifs to /dev/fs0
69.33% (5680/8192 Kbytes, 64 kb/s)
```

ee) After programming has completed, the status 1 LED will flash **green**.



The serial connection will show:

```
cp: Copying /tmp/primary.ifs to /dev/fs0
100.00% (8192/8192 Kbytes, 64 kb/s)
Checksum results
2465778327 8388608 primary.ifs
2465778327 8388608 /dev/fs0
Done! Turn off power, remove programming jumpers and flash drive.
System can then be powered up normally.
```

ff) If programming is not successful, the status 4 LED (bottom red LED) will flash. Make sure the BTWR jumper is installed, the correct disk is in the USB slot, and try



The serial connection may show a message similar to the following:

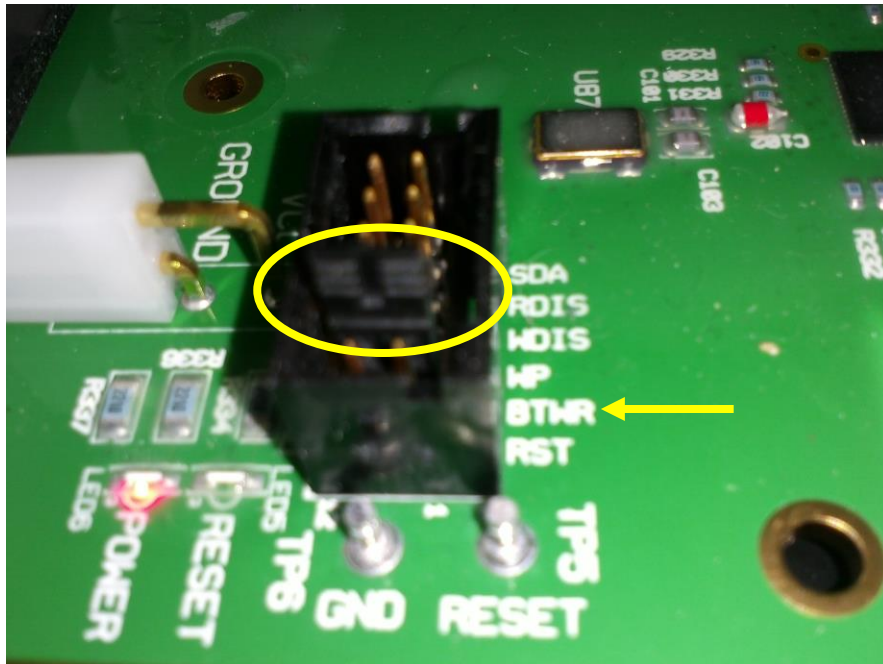
```
(devf t1::f3s_flash_probe:270) Unable to properly identify any flash devices  
/dev/fs0 missing  
An error occurred during reprogramming.
```

WARNING! This OS binary updates the primary OS on this card.  
A power loss during reprogramming will render the card  
inoperable and will require factory reprogramming to restore  
functionality.

To reprogram the card, put a jumper on the  
BTWR pins to enable writing to the onboard flash.

Note: (only 1 jumper is needed to the BTWR pins)

- gg) **Remove** the thumb drive from the FB187 card.
- hh) **Power off** the system and remove the FB187 card
- ii) **Remove** the BTWR jumper and re-insert the card.



- jj) Power on the system.

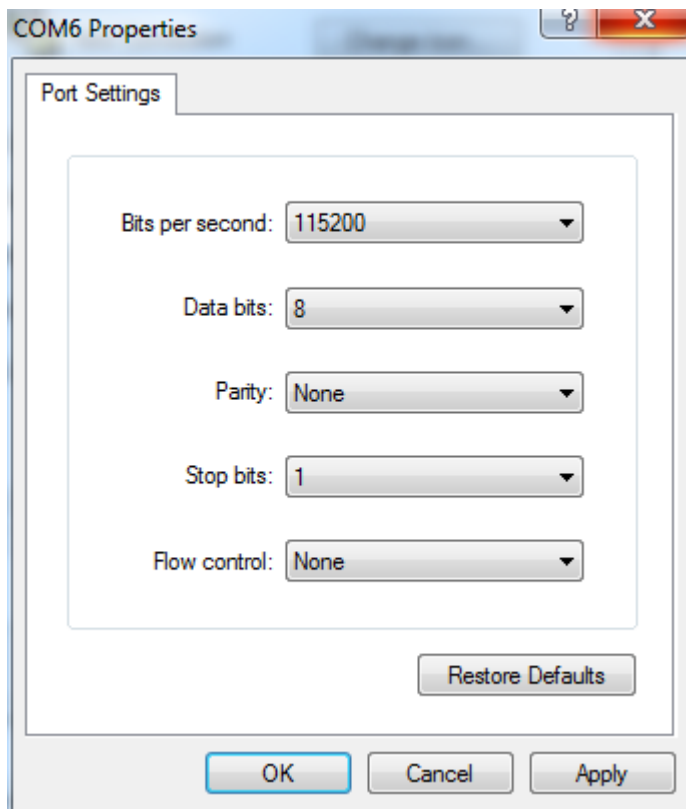
## 15. CONSOLE

Although the wPTU Toolbox is still intended to be the primary way to interface with the drive system CPU cards, a debug Console program is available. This program is part of the FB187 card's application software. This console is intended to be a basic way to interface with the FB187 if wPTU Toolbox software is not available on the user's PC. It gives the user, via a serial or Ethernet interface, a way to perform basic card functions, from setup and configuration, to checking software versions and/or displaying analog values.

The Console application can be accessed via either an RS-232 serial connection, an Ethernet connection, or a wireless connection (if wireless is installed).

### 15.1. RS-232 Serial Connection

To connect via a RS-232 serial connection, a serial cable is connected from the PC to the front edge DB9 on the FB187 card. Any RS-232 terminal software such as Hyperterm, ProComm, or PuTTY can be used. The communication parameters should be setup as follows:



Note that the COM Port number selected depends upon the setup of your PC.

## 15.2. Ethernet Connection

To connect to the Console via an Ethernet connection, a standard Ethernet cord (RJ45 to RJ45) is required. Connect from the PC's Ethernet port to one of the locations listed below. The RJ45 port that is chosen will dictate the IP address to use.

<b>Panel</b>	<b>Slot</b>	<b>Function</b>	<b>Card - RJ45 location</b>	<b>IP address</b>
FL375 or 386	3	PSC	FB187 - Front Edge	192.168.0.1
FL375 or 386	7	TCI	FB187 - Front Edge	192.168.0.2
FL453 or 454	2	DSC	FB187 - Front Edge	192.168.0.1
FL453 or 454	6	DSC	FB191 - Switch 1	192.168.1.1
FL453 or 454	6	DSC	FB191 - Switch 2	192.168.2.1
FL453 or 454	cab	DSC	Operators CAB (if present)	192.168.3.1
FL453 or 454	n/a	DSC	Wireless (if present)	192.168.4.1

Note: Your PC should be set to obtain an IP address automatically. A DHCP server is running on the FB187 and will issue an IP address to your PC.

Note: Login names and Passwords are supplied by GE in a separate document.

After connecting the Ethernet cord and determining which IP address to use, start a "Telnet" session. Telnet is a network utility that is typically bundled with Microsoft Windows or other communication packages. On Windows XP and below simply go to the START menu, then in the RUN... window type "telnet 192.168.x.x" where the x.x is the specific port that you wish to connect to.

If a login prompt appears, your connection is successful.

### 15.3. Common Console Commands

ai	View Analog Inputs
ao	View Analog Outputs
change_app	Change the currently selected sw application version
config	Configures the truck (Mine Options)
di, di a, or di b	View Digital I/O On FL453/454 panels, di a shows 1 <sup>st</sup> FB104 card, and di b shows 2 <sup>nd</sup>
faultlog	Show the Fault History
faults	Display the Active Faults
help	Display the available commands
list_apps	List the available software application versions installed on the FB187
reset_all	Reset all Active Faults
setup	Setup the truck - (panel type, Truck type)
ver	Shows Software Version Information for the system

### 16. WPTU TOOLBOX CONNECTIVITY

The wPTU Toolbox Version 7.0 which includes the new Invertex Ie and Invertex II downloading and configuration tool also has additional communication methods available to it. The wPTU toolbox will determine which communication means is present and begin to communicate over that method.

- RS-232 Serial port in CAB
- RJ45 Ethernet port – Front Edge of FB187
- RJ45 Ethernet Port – in CAB (if present)
- Wireless Network – If present

### 17. WIRELESS CONNECTIVITY (IF EQUIPPED)

If the wireless option is added, your PC can connect to the wireless network of the individual truck that you wish to communicate with. The PC must be within range of the truck. The maximum range will depend on environmental factors at your location.

Set your PC to scan for available wireless networks. The SSID of the GE network will be "GEOHVxx", where xx is the truck number. Choose to connect the desired Truck's network. Once your PC has been assigned an IP address by the FB187, you will be able to use the wPTU via wireless or connect to a console session via telnet over the wireless network.

18. IF CARDS ARE REMOVED

Please record the following information when removing a suspect « BAD » card, and returning for analysis:

- A) FL Panel part & serial #'s
- B) Original slot location of "suspect" card.
- C) Was card swapped with another card, where from, findings from card swap
- D) Was card re-configured or have OS system re-loaded (EX: from **Ver 5.50a to 5.54b**)
- E) Datapacks
- F) Operator/Driver comments
- G) Fill out TSI completely, picture too - if applicable