

**MIT**

***AEVIT Primary Controller***  
**RPV-GDRS1105**

**&**

***GOLD Series Secondary Controller***  
**RPV-GDRS1105/GS**

***2006 Ford Escape***



<b>Table of Contents</b>	
<b>AEVIT Primary Controller RPV-GDRS1105</b>	<b>1</b>
Overview	1
System Layout: DARPA Equipment	2
System Components	3
Information Center	3
Drive Modules	4
Steering Servomotor	6
Gas & Brake Servomotor	7
Electrical Connections	8
Drive Modules	8
Power Ports	8
Strain Relief Cable Clamps	9
Vehicle Harness	9
Operating Specifications	10
Operation	11
AEVIT Driving Controls	11
Engaging and Disengaging the Steering Servomotor	11
Engaging AEVIT Steering Controls	12
Initial Boot-Up	13
Initial Boot-Down	13
How to Interface with your Embedded Controller	13
AEVIT CAN Bus	15
<b>GOLD Series Secondary Controller RPV-GDRS1105/GS</b>	<b>19</b>
Overview & System Layout	19
LCD Touchpad	20
Touchpad Operation	21
Vehicle Connections - 2006 Ford Escape	24
Auxiliary Functions	27
SPST Universal Applications	28
SPDT Universal Applications	29
DPDT Universal Applications	30
Calibration Mode	31
Programming	31
Troubleshooting	33
GOLD Series Serial Port Protocol	34
Auxiliary Components	37
AMS (AEVIT Mounting System)	37
Emergency Stop Module	38
AUXBAT	38
System Layout	38
Initial Charging	39
Charging the Auxiliary Battery	39
Testing Procedures	39
Service Requirements	41
System Schematics	42
Park Brake	43
Operation	45
Power Kit	46
APPENDIX 1	47

# ★ **AEVIT Primary Controller**

## ★ **Overview**

This AEVIT system has been adapted to control the gas/brake and steering functions of your vehicle. The input to the system is a single 0-5 VDC signal from an embedded controller or DAC for gas/brake and a second signal for steering. The system contains (2) close loop servomotors each with (3) discrete feedback channels, (1) digital and (2) analog, that communicate motor position back to the drive modules or motor amplifiers.

There are (2) Drive Modules in the system, (1) for each servomotor. Each drive module contains (4) microprocessors that share data through a CAN bus. The microprocessors are grouped in (2) pairs that work together to monitor the input and control the motor. The pair that has control of the motor is referred to as the primary side and the other is the backup. If either pair detects an error it can request to take over control of the motor.

System information is communicated via CAN bus to all other microprocessors in the system including the second Drive Module, the Information Center, and the Vehicle Interface Module. The Information Center is a display unit usually mounted within sight of the driver and is used to communicate motor position, change program setting in the field (if required), and provide overall system status.

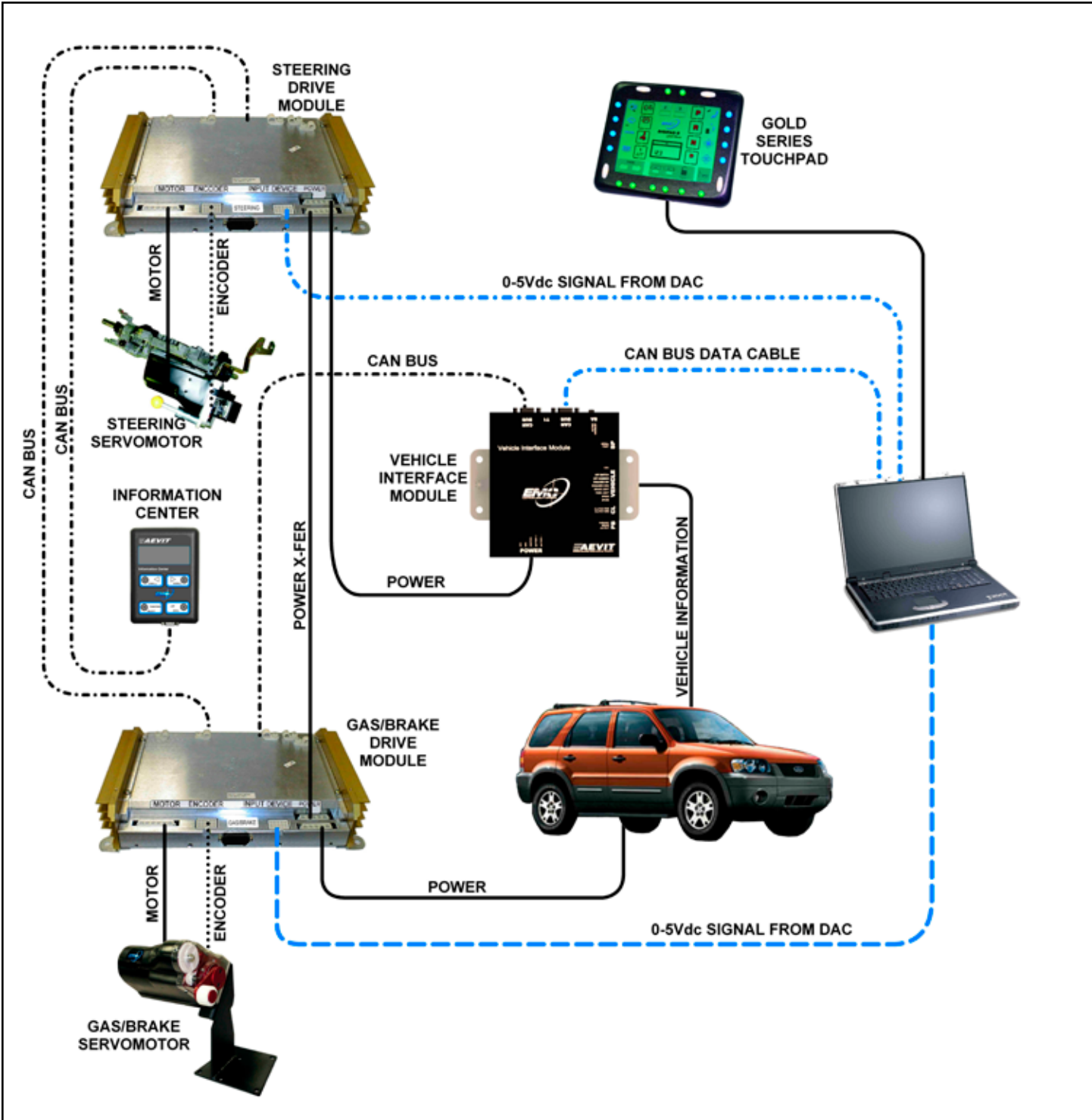
The Vehicle Interface is used to interface with all required signals from the vehicle including: coil signal from fuel injector, speed signal from wheel sensor, OEM brake signal, and steering servomotor engagement.

With this AEVIT installation there are (2) ways to control the vehicle's gas/brake and steering functions. The first is by operating the AEVIT wheel/joystick evaluator panel or EC-Series for short. The second is from a DAC or embedded controller that is capable of outputting (2) 0-5 VDC signals, one for gas/brake and the other for steering. Refer to the Operation Section for specifications on the 0-5 VDC signals.



# ★ System Layout: DARPA Equipment

This diagram has been provided to show all of the components of the AEVIT Driving System and how they connect. The following sections of this manual will explain each component and its connector ports, the purpose of the device, and how the device will interact with the vehicle's driver. Each line below represents a harness connection and is marked with the type of information it carries.





# ★ System Components

## Information Center




The Information Center is a small touchpad that provides constant information to the driver regarding the system's current status. It also supplies important calibration and diagnostic information to the installing dealer. The Information Center, or Info-Center for short, has a four line liquid crystal display.

There are four lighted, low-effort switches on the Info-Center. Each tactile switch illuminates when the vehicle lights are turned ON to provide highly visible targets during night driving.

When working with the menus of the system, you will use these four keys to SCROLL through, SELECT, and exit (ESC). Each menu has up to five pages. To view each page of the current menu, use the left and right SCROLL keys. Once you have reached the last page of a menu, you will be returned to the first page. You can travel in either direction to view all of the pages. Once you have reached a menu option that is changeable (not available in the User Menu) you may press SELECT to either change that function or enter a sub-menu. At anytime the (ESC) key will bring you back to the previous menu.

The Info-Center is equipped with two, 1/4-20 threaded studs that will mount directly to one of EMC's bracket kits. EMC strongly recommends that you utilize our fitting bracket kits to mount your AEVIT components.

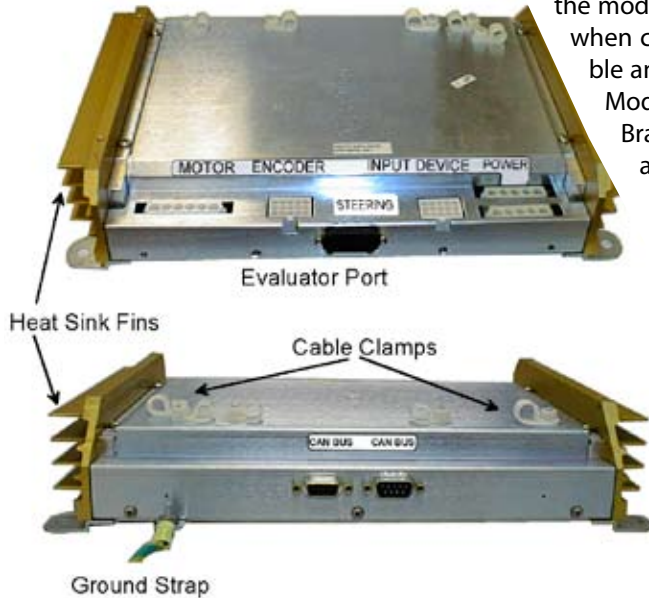
The connections on the Info-Center are simple. The CAN Bus port is the only port that will be connected to the AEVIT touchpad. The other port will be used to download diagnostic information and upload software if needed.

-  SCROLL keys are used to move around within a menu. At the end of a menu, they will also bring you back to the first screen. These keys are safe to use at all times.
-  The SELECT key performs two functions. First, to select a processor to view diagnostic info. Second, it is used to clear any diagnostic information that may be displayed during normal operation
-  The OFF key is used to boot down AEVIT after the ignition has been turned OFF.



## Drive Modules

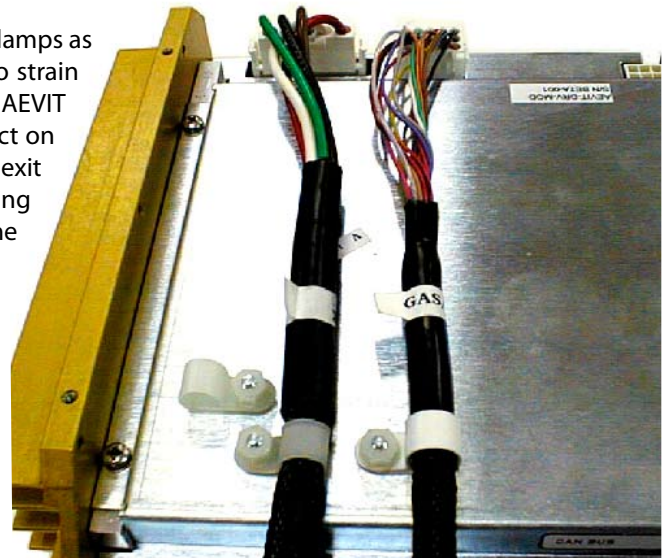
Each AEVIT Drive Module provides the power and information to the servomotors to produce the mechanical outputs for Gas & Brake and Steering. One of the greatest features of the Drive Module is its flexibility. All Drive Modules have the capability to operate the Gas & Brake system or the Steering system. (Just not at the same time.) For instance, when you plug an input device into a Drive Module, it detects that the input device is steering and is now ready to output steering information. If you unplug the Steering input device and plug in a Gas & Brake input device into the same Drive Module, it will then reconfigure itself to output Gas & Brake information. You will only need to re-calibrate the module and you are on your way. Now what does need to happen when connecting the drive modules is the steering motor power cable and the steering encoder must be connected to the same Drive Module as the Steering input device, and the same goes for Gas & Brake. Since ASC tests each system before it is shipped, we affix a label on each Drive Module indicating if it is programmed for Gas & Brake or Steering.



Each Drive Module has one MOTOR port, which sends power to the servomotor, one ENCODER port that provides servomotor positioning information, one INPUT DEVICE port that receives the user input data, and two POWER ports that help create the system's Power Bus. You will notice that the encoder and the input device connectors are the same type of connectors which have small 20 AWG wires. PLEASE HANDLE THESE CONNECTORS WITH CARE! Again remember, the steering motor power cable, steering encoder and steering input device must be connected to the Drive Module labeled STEERING.

The back side of each Drive Module has two CAN BUS connectors. These ports will bring the CAN BUS signals into each unit and send it on down the line to the next device. You will notice that there is one male and one female connection on each Drive Module. These ports are to match up to the cables coming from the Info-Center, Vehicle Interface Module, or the other Drive Module if installed.

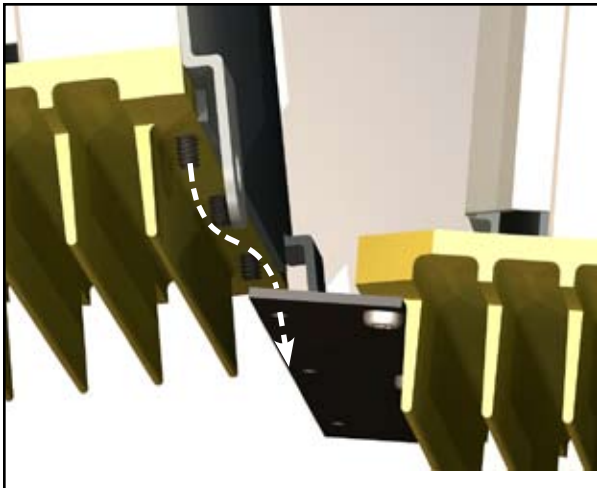
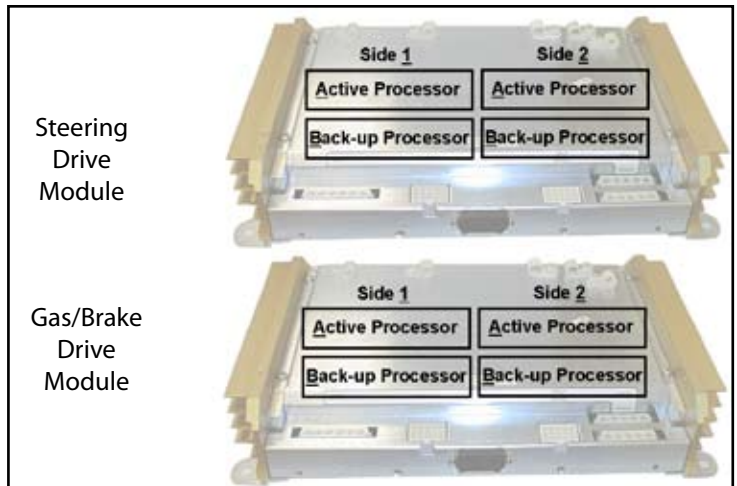
On the top of each Drive Module you will find nylon cable clamps as shown in the picture at right. These clamps will be used to strain relieve all the harnesses exiting the Drive Module as shown. AEVIT Drive Modules were designed to have all the cables connect on one end of the unit, get strain relieved to the unit and then exit out the other end. This type of design along with the latching connectors, and the protective module cover will prevent the connectors from getting knocked loose or damaged.



## Drive Modules (cont.)

The AEVIT Drive Modules are packed with multiple microprocessors, Integrated circuits, surge suppression devices, power transfer connections, and many more electronic components. All of these components when placed together in a sealed enclosure (the Drive Module housing), can generate quite a bit of heat. Then add to it that you are going to place this housing into a larger housing (a vehicle), and even more heat will be generated. This is why there are two sets of large heat sink fins on each Drive Module.

Each Drive Module has four microprocessors. The processors are divided into sides with each side having two processors called the "Active" and "Back-up" processors. The reason that four processors are used in each Drive Module is to safely allow a single processor to reset itself while the system remains in operation. Each time the system is shut down and booted up again, each primary driving control system will switch to the other side for main control. This allows for both "Active" processors in each Drive Module to have an equal amount of usage. Unless there is an event that causes both main processors to fail or not agree with the arbitration logic, the "B" or "Back-up" Processors will not be used.



One major advantage of the AEVIT drive module is its light weight. Since these modules are so light, they have the unique ability for them to mount on top of one another. With the use of drive module Joining Plates, one module can be securely attached on top of another module as shown in at left.

All Drive Modules are also equipped with an EVALUATOR PORT which will accept the AEVIT evaluator controller. Any evaluator controller can be plugged into any drive module for training. No other interface device is required. These Evaluator Ports are located at the front of each drive module, have a hard plastic cover and can be accessed through the two openings on the rear face of the AMS cover indicated in the picture at right. The hard plastic covers should only be removed to connect an EMC evaluator controller. Connecting any other device to this port could damage the unit and will not be covered under warranty.





## Steering Servomotor

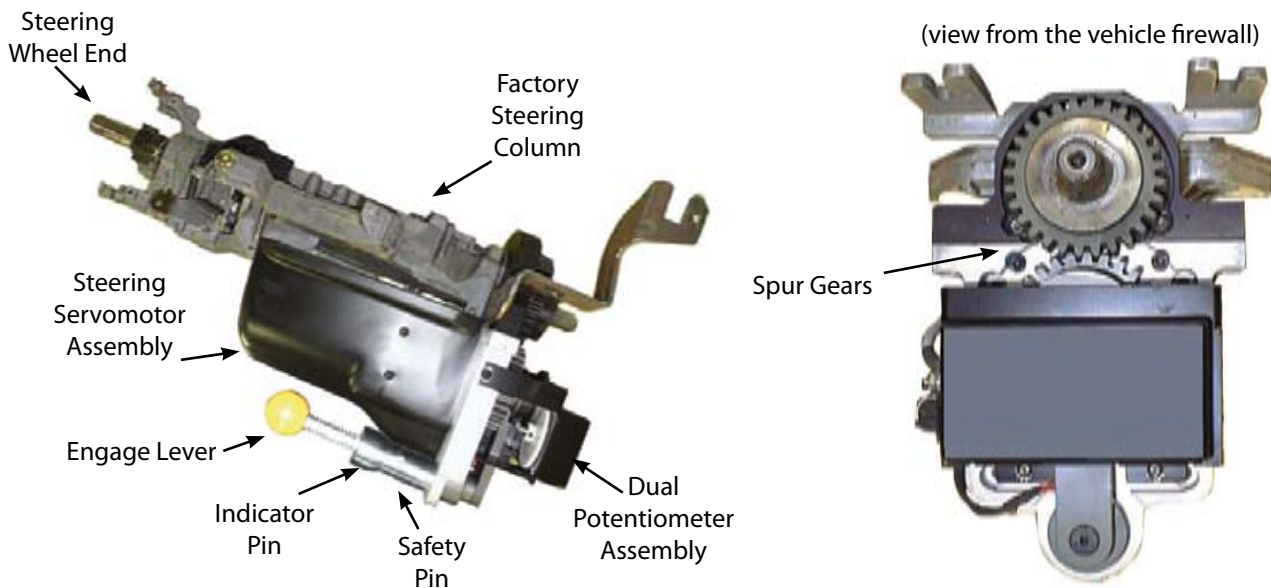
The figure below is provided to assist you in understanding the AEVIT Steering servomotor operation. Prior to the installation of your AEVIT system, the OEM steering column was modified by ASC and the Steering servomotor was mounted below the column. As you can see, a two-piece plate is used to secure the servomotor to the column assembly and a spur gear combination “links” the servomotor to the column shaft. The purpose of the two-piece plate is to provide a method for removal of the servomotor for service conducted by EMC, if necessary, without disabling the OEM steering functions of the vehicle.

The relationship between the servomotor output shaft and the steering column shaft via the spur gear combination is 1:1. Therefore, as the servomotor output shaft rotates a given displacement from center, so does the OEM steering column. Software is used to translate a given input by the user into a specific output by the servomotor. All control logic of the servomotor is contained in the Drive Module portion of the system.

The servomotor can be engaged or disengaged so that the vehicle can be driven either with the AEVIT controls (i.e. the servomotor rotates the column) or by an able-bodied individual. A lever on the underside of the servomotor is used to engage or disengage the clutch mechanism built into the servomotor assembly. When engaged or disengaged, the provided safety detent pin must be inserted.

There are two separate devices that provide information to the Drive Module as to the current position of the servomotor. One is the dual potentiometer mounted around the spur gears. This device provides two signals (“dual” potentiometer) that relate to the position of the output shaft of the motor/gearbox combination. The other is the digital resolver which is mounted to the backside of the motor and protected by the plastic motor shroud. The resolver provides a digital signal relating to the position of the motor shaft itself. Both of these devices are somewhat protected by the assembly but care should be taken when handling the column modification to prevent damage.

There are two harnesses and one single wire exiting the Steering servomotor. The MOTOR harness carries the power from the AEVIT Drive Module to the Steering servomotor. The ENCODER harness carries all of the position related information or feedback from the dual potentiometer and the resolver to the AEVIT Drive Module. The single Orange wire exiting the assembly is connected to a limit switch used to detect whether or not AEVIT is engaged. This wire must be connected to the Vehicle Interface harness during the installation of the modified steering column.





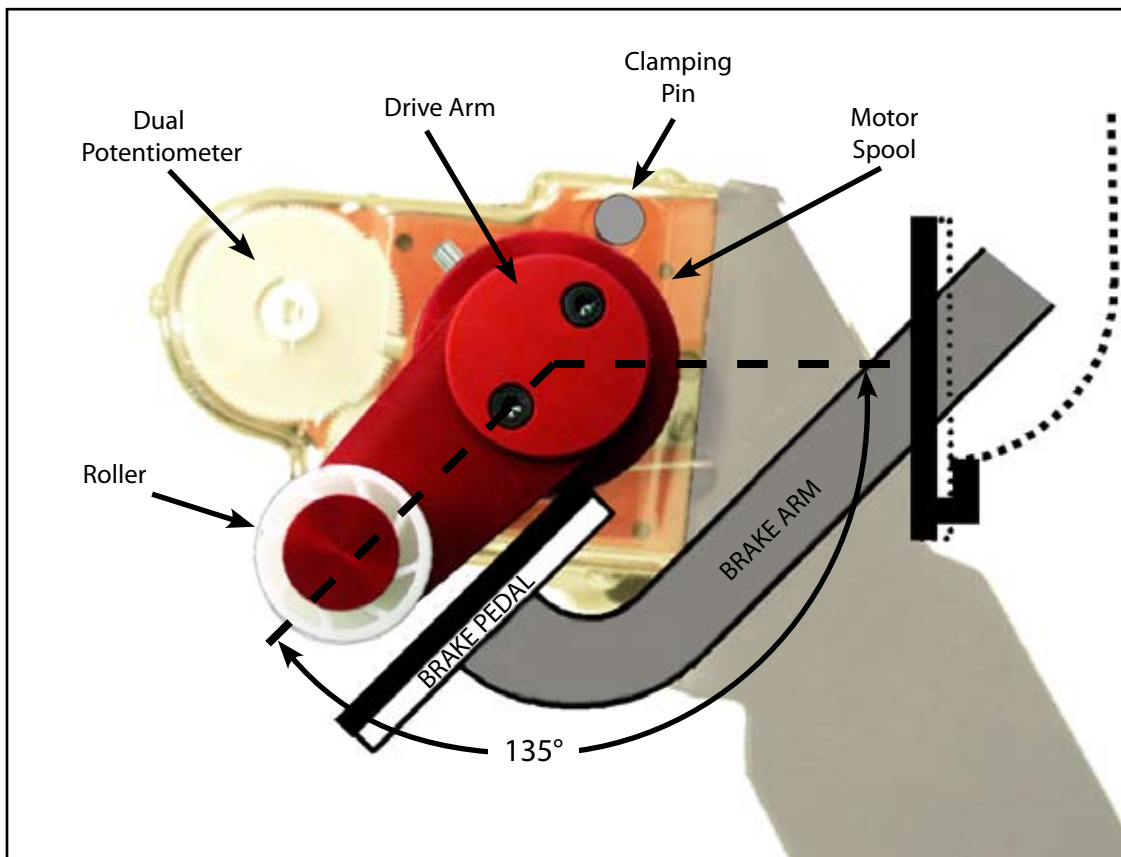
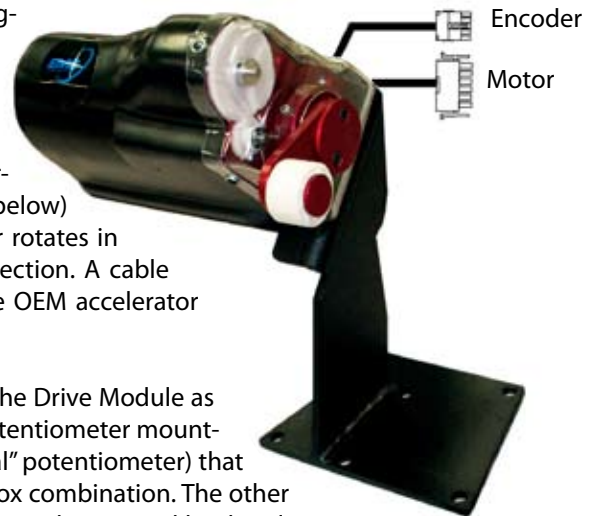
## Gas & Brake Servomotor

The servomotor assembly is attached to a mounting bracket which is installed into the vehicle. (Note: The bracket shown in the figure may differ slightly from your bracket depending on your particular vehicle application.)

The Gas & Brake servomotor rotates 135° in each direction from the null position for a total rotation of 270°. As the servomotor rotates in the Brake direction, a drive arm (shown below) is used to depress the OEM brake pedal. As the servomotor rotates in the Gas direction, the drive arm rotates in the opposite direction. A cable is wrapped around the spool of the assembly and pulls the OEM accelerator pedal.

There are two separate devices that provide information to the Drive Module as to the current position of the servomotor. One is the dual potentiometer mounted above the gearbox. This device provides two signals ("dual" potentiometer) that relate to the position of the output shaft of the motor/gearbox combination. The other is the resolver which is mounted to the backside of the motor and protected by the plastic motor shroud. The resolver provides a digital signal relating to the position of the motor shaft itself. Both of these devices are somewhat protected by the assembly but care should be taken when handling the servomotor to prevent damage.

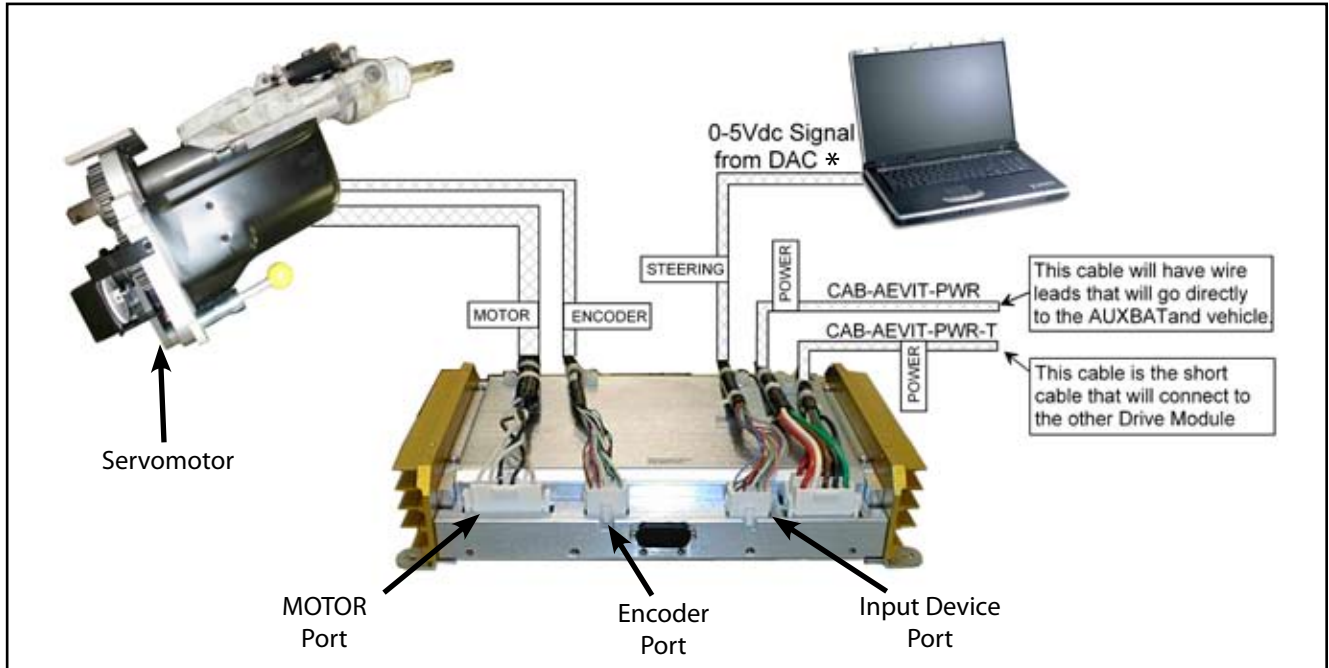
There are two electrical cables and one mechanical cable exiting the Gas & Brake servomotor assembly. The MOTOR harness carries power from the AEVIT Drive Module to the servomotor. The ENCODER harness carries all of the position related information or feedback from the potentiometer and resolver to the AEVIT Drive Module. The mechanical connection is the accelerator cable that is attached to the servomotor with a clamping pin and is routed to the Accelerator Release Mechanism.



## ★ Electrical Connections

### Drive Modules

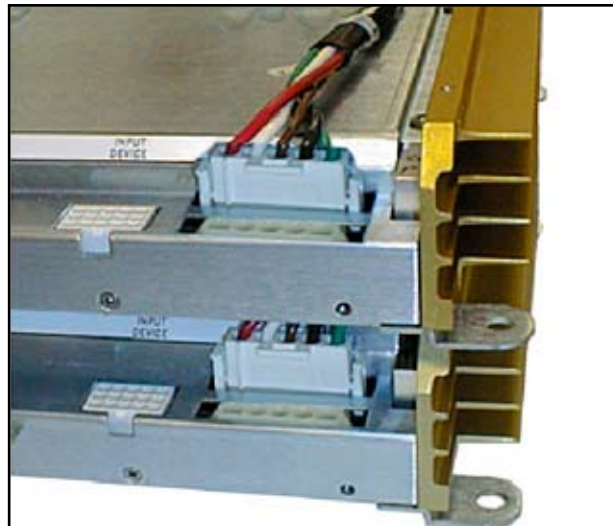
There are two harness connections that will come from each servomotor labeled "MOTOR" and "ENCODER." They will plug into the corresponding ports of their designated Drive Module.



\* This is a 0-5 Vdc signal that comes from a DAC or embedded controller

### Power Ports

There are two power ports on each Drive Module. One port is for the power feed to the Vehicle Interface Module and the other is for the incoming power to the system. A power transfer cable will be used to wire the two Drive Modules together. When installing the power transfer cable, connect one end to the rear POWER port on the Steering Drive Module and the other end to the rear POWER port on the Gas & Brake Drive Module as shown in the figure at right. If not, you will not be able to properly strain relieve the cables.



The power transfer cable will connect from the rear POWER port of one Drive Module to the rear POWER port of the other.

## ★ **Electrical Connections (cont.)**

### **Strain Relief Cable Clamps**

On the top of each Drive Module there are five plastic cable clamps that will be used to strain relieve each harness as it exits the Drive Module. Each harness is protected by a plastic loom which is sealed with adhesive wall heatshrink. The clamps are to wrap around the plastic loom, not the heatshrink, as shown in the figure at right. If installed correctly the heatshrink will not pull through the clamp, and therefore will keep all strain off the connector. The harness wires should have some slack and will not lay flat on the Drive Module. Later when the covers are installed, they will fit tight against the harnesses. This is normal.

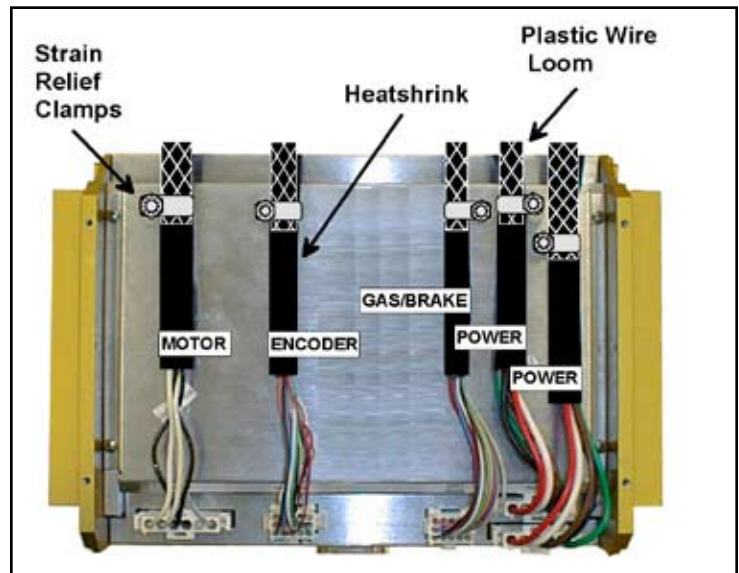
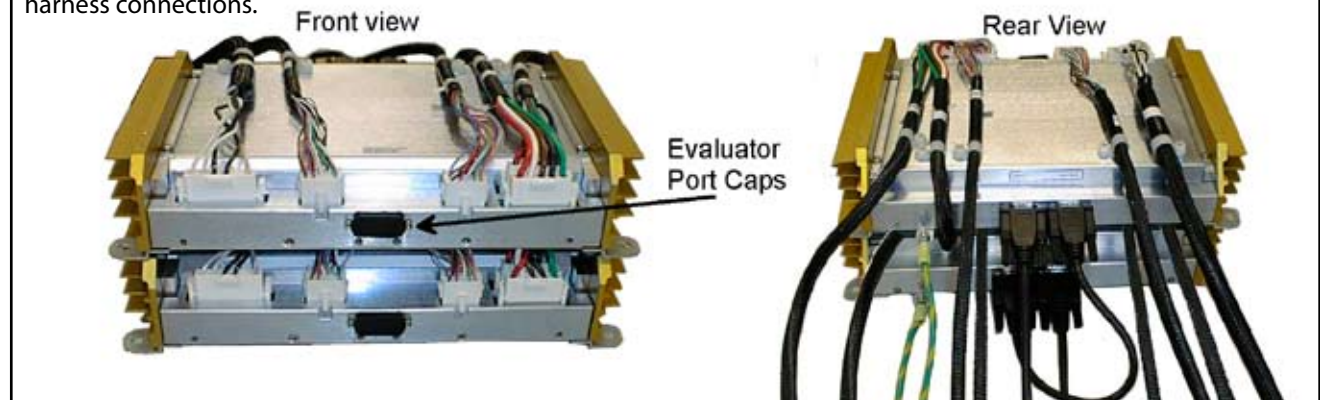


Diagram of a completed system with all Drive Module harness connections.



### **Vehicle Interface Harness**

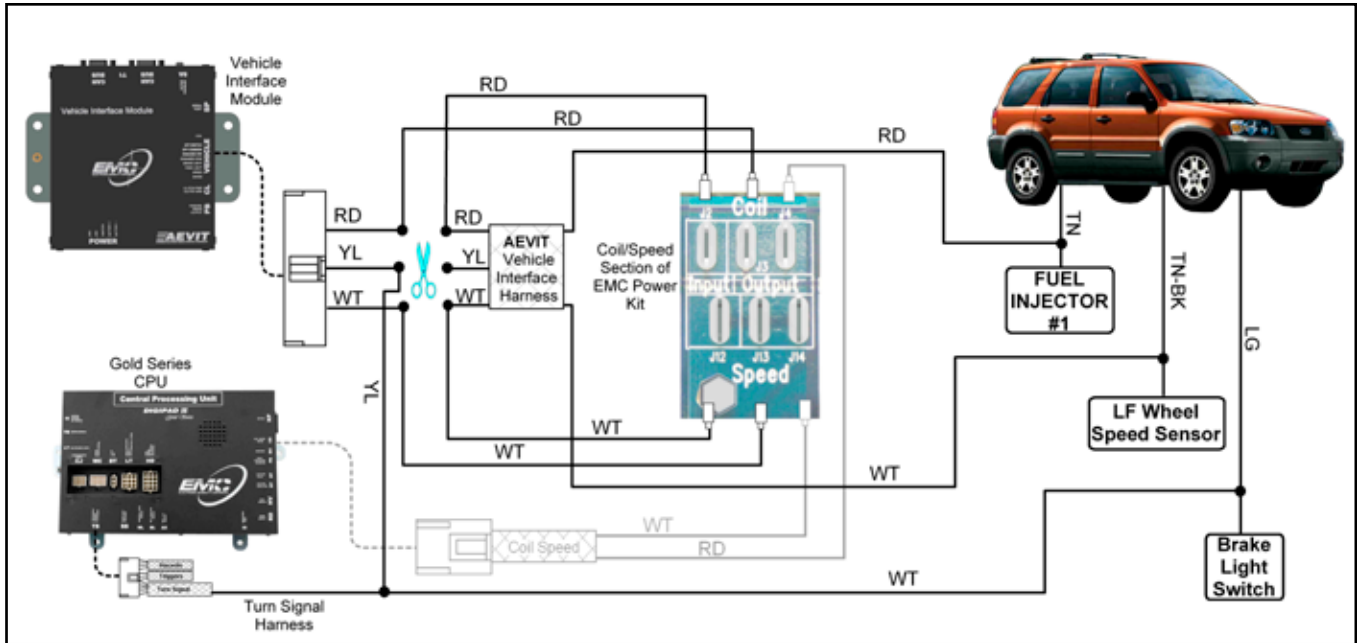
#### **Coil Sense**

The coil signal input wire is used to provide information to the AEVIT system as to whether or not the engine is running. The coil sense wire is the long Red wire in it's own loom marked "COIL". The best place to pick up the coil signal is on the negative side of an injector. Injectors are located directly on top of the engine block near the throttle body.

#### **Speed Sense**

The speed signal is used to send information to the CPU as to whether or not the vehicle is in motion. The speed sense wire is a White wire which will be connected to the speed sense circuit of the vehicle. In most cases the vehicle speed sense wire can be located in the cruise control system of the vehicle.

## Vehicle Harness (cont.)



### Brake Light

The Yellow wire of this harness must be connected to the vehicle's brake light switch which is located near the top of the brake pedal. This signal is used to detect whether or not the Gas & Brake servomotor is resting on the brake pedal. If the client accidentally shuts down the system while the Gas & Brake input device is not centered, the vehicle's brake lights might be left ON and drain the vehicle's battery. This sensing circuit will not allow AEVIT to shut down if the brake lights are sensed.

**For this Gold Series application, the Yellow wire has been soldered into the White wire, pin 6 of the Turn Signal harness.**

## Operating Specifications

Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +125°C
Operation RH	5% - 100% Non-Condensing
Storage RH	0% - 100% Non-Condensing
Recommended Supply Voltage	+8.0Vdc to +14.8Vdc (two separate supplies required)
Tolerant Supply Voltage	+8.0Vdc to +16.0Vdc (two separate supplies required)
Typical Current Draw	<5.0A per Drive Module
Maximum Current Draw	18.5A per Drive Module
Coil Pulse Input	Optically Isolated Input
Speed Pulse Input	Variable Frequency/Amplitude, 2.5V threshold
ESD Susceptibility	Tested to comply with EN6100-4-2 and SAE J1113/13
RF Field Immunity	Tested to comply with EN6100-4-3 and SAE J1113/21

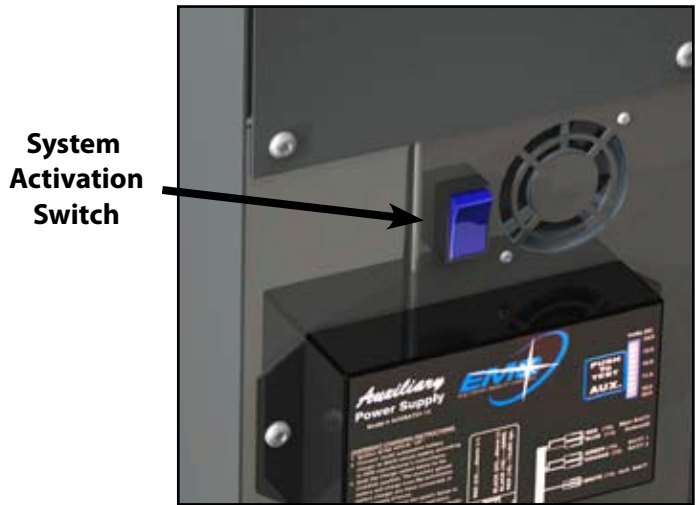


## ★ Operation

### AEVIT Driving Controls

#### System Activation

The AEVIT Primary Driving Control System has a system activation switch that can be shut off so the AEVIT will not boot up when the vehicle is started. It is a **blue lighted switch** on the front of the AEVIT Mounting System (AMS). The switch should be in the OFF position when using the OEM gas/brake and steering controls. When the switch is on, the AEVIT system will boot up when the ignition is turned on.



### Engaging and Disengaging the Steering Servomotor

The steering servomotor has a mechanical engagement to the OEM steering column. The servomotor should be disengaged when the vehicle is driven with the OEM steering wheel and engaged when driven in AEVIT mode. The vehicle was shipped with the servomotor disengaged from the steering column. The following instructions provide detailed steps on how to properly engage and disengage the servomotor.

**WARNING:**  
THE SERVOMOTOR CAN BE ENGAGED 360° TO THE RIGHT AND TO THE LEFT OF OEM CENTER. IF THIS HAPPENS THE SERVOMOTOR CAN HIT A MECHANICAL END STOP ON THE OEM STEERING COLUMN AND AEVIT WILL PRODUCE AN ERROR. BE SURE THE OEM STEERING WHEEL AND TIRES ARE STRAIGHT AHEAD CENTER BEFORE ENGAGING THE SERVOMOTOR.

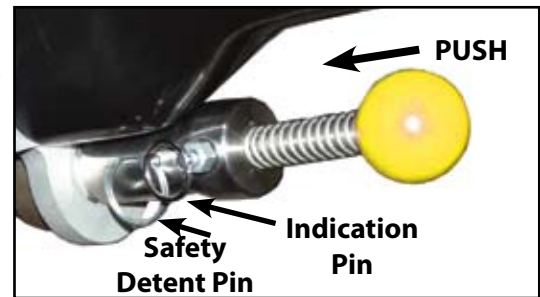
**WARNING:**  
THE ENGINE MUST BE RUNNING TO ENGAGE OR DISENGAGE THE STEERING SERVOMOTOR  
Do not attempt to engage or disengage the steering servomotor unless the engine is running. Without power assist, the lever can be damaged due to excessive loading on the gear pair. If the lever becomes difficult to move, do not force the it, contact the EMC Service Department for assistance.

## Engaging and Disengaging the Steering Servomotor (cont.)

### “Disengaging” AEVIT Steering Controls

“Disengaging” - Mechanically disconnecting the AEVIT steering servomotor from contact with the vehicle’s steering column, thus allowing the steering function of the vehicle to be operated by the OEM controls. This operation is performed when a person is preparing to drive the adapted vehicle using the OEM steering controls.

- STEP 1:** Ensure that the vehicle tires and OEM steering wheel are centered. If they are not, start the vehicle, boot-up the AEVIT system, center the tires and wheel, and then boot-down the system.
- STEP 2:** With the ignition turned OFF, locate and disable the blue System Activation switch on the front face of the AMS.
- STEP 3:** Turn ON the ignition and start the vehicle.
- STEP 4:** The engage lever has two pins. The larger pin is the Safety Detent Pin and can be completely removed. The smaller pin is the Indicator Pin which is spring-loaded and captive. Reach down and pull the Safety Detent Pin out of the Engage Lever.
- STEP 5:** Apply a very small amount of pressure to the engage knob and Pull on the Indicator Pin out about a 1/4". The knob is spring loaded, so you should feel some resistance. Continue to **push in** the engage knob until you feel the Indicator Pin lock in place.
- STEP 6:** Replace the Safety Detent Pin in the Engage Lever. Do NOT operate the vehicle without the Safety Detent Pin installed. If this pin is removed and lost, contact EMC Service to get a replacement.



### “Engaging” AEVIT Steering Controls

“Engaging” - Mechanically connecting the AEVIT servomotor to the vehicle’s steering column, thus allowing the steering function of the vehicle to be operated by the AEVIT input device. This operation is performed after a person has driven the vehicle using the OEM controls and is reactivating the AEVIT controls. It is always a good idea to have the vehicle returned to AEVIT control after an individual has used the vehicle with the OEM controls.

- STEP 1:** Turn the vehicle’s ignition ON and start the engine.
- STEP 2:** Enable the blue System Activation switch on the front face of the AMS.
- STEP 3:** Using the factory steering wheel, position the vehicle’s tires so that they are pointing straight ahead.
- STEP 4:** From the applicable Home Page, (**see page 13**) scroll once to the Revisions Page, second to the Full Steering Pos Page, and scroll a third time to get to the Zoom Steering Pos page. Turn the wheel input device left and/or right until the arrows are aligned under the second “E” in the word steering. This indicates that the OEM wheel and wheel input device are aligned.
- STEP 5:** Reach down and pull the Safety Detent Pin out of the Engage Lever.
- STEP 6:** Apply a very small amount of pressure to the engage knob and pull out the Indicator Pin about a 1/4". You will feel the knob release and spring up about a 1/4".
- STEP 7:** Continue to apply a small amount of pressure and move the OEM steering wheel left and right (no more than 5°-10°) until you feel the Engage Lever lock in place. Ensure that the Indicator Pin is also locked in place.
- STEP 8:** Replace the Safety Detent Pin in the Engage Lever. Do NOT operate AEVIT without the Safety Detent Pin installed. If this pin is removed and lost, contact EMC Service to get a replacement.

## WARNING:

Do NOT operate AEVIT without the steering servomotor safety pin installed.

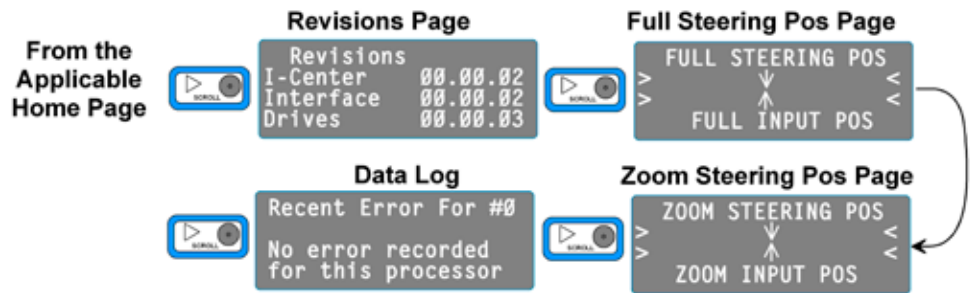
## Initial Boot-Up

### To start and operate the DARPA equipment for the first time:

1. Be sure the blue System Activation switch on the front face of the AMS is on.
2. Be sure the steering servomotor is engaged.
3. Be sure that one of the YELLOW buttons on the EC controller is de pressed so the system will boot up using the wheel and joystick controls.
4. Turn ON the ignition and START the vehicle
5. The Information Center will show either of the following Home Pages, depending on whether your re-motely operated autonomous contoller is based on absolute position or rate control.



### Steering Alignment (see page 12)



## Initial Boot-Down

### To shut down the system:

1. Be sure the vehicle is in PARK
2. Turn OFF the vehicle
3. Be sure that the EC gas/brake joystick is the “null” position and not pulled in the brake direction. This will cause the gas/brake servomotor to apply the OEM brake pedal and prevent AEVIT from shutting down. This can also happen if the signal from the DAC or embedded controller is too low causing the servomotor to apply the OEM pedal.
4. Shut OFF the system by pressing “OFF” on the Information Center or let the system time out and shut off automatically after 60 seconds.

## How to Interface With your Embedded Controller

The AEVIT system is looking for a 0-5 VDC signal from a DAC or embedded controller to operate the gas/brake and steering servomotors. Each Drive Module has a 12 foot long, (3) conductor cable connected to it. The steering and gas/brake signals will require (2) separate 0-5 VDC signals. **See APPENDIX 1, page 47 for schematics.** The wires and functions are:

Steering		Gas/Brake	
RED	+5 VDC	RED	+5Vdc
WHITE	Signal	YELLOW	Signal
BLACK	Ground	BLACK	Ground

## WARNING:

**BLACK SIGNAL GROUNDS ARE ISOLATED AND SHOULD NEVER BE CONNECTED TOGETHER. THE SIGNAL WIRES MUST BE REFERENCED TO THEIR CORRESPONDING GROUND WIRES ONLY. FAILURE TO ISOLATE GROUNDS WILL AFFECT THE PERFORMANCE OF THE E-STOP MODULE DETAILED ON PAGE 37.**

**How to Interface With your Embedded Controller (cont.)**

Below is a table with the recommended voltages for both the gas/brake and steering signals.

Gas/Brake Signal	Voltage
Full Gas	3.7 VDC
Full Brake	0.4 VDC
Center	2.5 VDC
Steering Signal	
Full Left	0.6 VDC
Full Right	4.4 VDC
Hold (No Movement)	2.4 VDC

**WARNING:**  
THERE IS A HYSTERESIS BUILT INTO THE SYSTEM BETWEEN THE NULL POSITION (2.5 Vdc) AND THE ACTIVATION OF THE ACCELERATOR AND THE ACTIVATION OF THE BRAKE.

**WARNING:**  
IF THE GAS/BRAKE SIGNAL GOES OUT OF RANGE, THE SYSTEM WILL AUTOMATICALLY APPLY THE BRAKE BY ROTATING THE GAS/BRAKE SERVO MOTOR IN THE BRAKE DIRECTION.

**WARNING:**  
IF THE STEERING SIGNALS GOES OUT OF RANGE, THE SERVO MOTOR WILL HOLD IT'S LAST KNOWN POSITION AND WAIT UNTIL THE SIGNAL COMES BACK INTO RANGE.

**WARNING:**  
IF EITHER SIGNAL GOES OUT OF RANGE THE SYSTEM WILL CAUSE AN AUDIBLE ALARM AND SHOW THE ERROR ON THE INFORMATION CENTER. WHEN THE SIGNAL IS CORRECTED THE SCREEN WILL SHOW "WARNING" FOR (10) SECONDS THAN SHOW "OK". THIS INDICATES THE SYSTEM IS WORKING PROPERLY.

The other interface is the AEVIT EC-Series Evaluator Console. This can be used to operate the vehicle with the AEVIT controls during testing. Once the vehicle is started and AEVIT is booted, you can take over control of AEVIT servomotors by depressing either of the yellow buttons at the top of the controller. **We recommend that the Evaluator Console wheel be centered while under autonomous control so that when either yellow button is pushed for manual override, the OEM steering wheel will center.**

**WARNING:**  
THE AEVIT SYSTEM WILL TRACK TO THE POSITION OF THE EVALUATOR CONSOLE AS SOON AS EITHER YELLOW BUTTON IS PUSHED. THE OEM STEERING WHEEL AND THE OEM GAS AND BRAKE PEDALS CAN CHANGE POSITION SUDDENLY!



## ★ AEVIT CAN Bus

### Background

There is an additional CAN cable attached to the system that can be connected to a CAN bus board. The following is detailed information about the AEVIT CAN bus.

This is a clip of the structures that are used for the CAN messages 400-40A are sent every 10ms and contain almost all of the system information. The variable names in the structures describe the data available. Messages 420-42A are errors and are sent only if there is an error. No data that is on the CAN is used for control, only information, so there is no way to control the vehicle via CAN.

Baud is 500K. All messages are sent with standard identifiers. The connector is a semi standard 9-pin D connector that is compatible with this board and is what was used in development <http://www.ixxat.de/english/produkte/canprod/interf/ipc-i320pci.shtml>

Message id 400 - 407

```
typedef struct{
    unsigned long id;
    unsigned char dlc;
    unsigned char status; //Bits 0-3 = type; Bit4=active; Bit5=ind error, Bit6=shared error,
    Bit7=Running
    unsigned int encoder;
    unsigned int input; //Bits 0-10 Input Data, Bit11=Request Inactive (Warning),
    Bit12=pbrake request, Bit13=ClutchRequest
                                //Bit 14=Eval Connected, Bit 15 = Eval Active
    unsigned int data;
    unsigned char command;
}drive_msg_obj;
```

Message id 408

```
typedef struct{
    unsigned long id;
    unsigned char dlc;
    unsigned char status; //Bit0 = present, Bit1=booted, Bit2=coil pulses, Bit3=brakelight,
                                //Bit4 = parkinglight, Bit5=engaged, Bit6=Off_
    switch, Bit7=ignition
    unsigned char speed; //Scaled speed signal in mph
    unsigned char status2; //Bit0 = throttle clutch engaged;
    unsigned int int_data1;
    unsigned char bat1_voltage;
    unsigned char bat2_voltage;
    // unsigned int int_data2;
    unsigned char command;
}interface_msg_obj;
```

Message id 408

```
typedef struct{
    unsigned long id;
    unsigned char dlc;
    unsigned char command;
    unsigned int int_data1;
    unsigned int int_data2;
    unsigned char char_data;
    unsigned char drive;
    unsigned char status; //Bit0 = present, Bit1 = booted, Bit2=test_mode, Bit3=unused
                                //Bit4 = Request steering side 1 primary
                                //Bit5 = Request steering side 2 primary
```

## ★ AEVIT CAN Bus (pg.2)

```

//Bit6 = Request GB side 1 primary
//Bit7 = Request GB side 2 primary

}icenter_msg_obj;

Message id 40A
typedef struct{
    unsigned long id;
    unsigned char dlc;
    unsigned char status; //Bit0 = present, Bit1=, Bit2=, Bit3=,
                        //Bit4 = , Bit5=, Bit6=, Bit7=

    unsigned int x_accel;
    unsigned int y_accel;
    unsigned int int_data;
    unsigned char command;
}logger_msg_obj;

Messages 420-42A
typedef struct{
    unsigned long id;
    unsigned char dlc;
    unsigned char error_type;
    unsigned char error_hour_lo;
    unsigned char error_hour_hi;
    unsigned char error_minute;
    unsigned char error_count;
    unsigned char drive_type;
    unsigned char status; //Bit0 = 1-New (unlogged), 0-Old Error
    unsigned char unused2;
}error_msg_obj;

```

## Sample Drive Module Data Stream

509000 407 92 00 02 FE 21 E2 00 00

509000:

A counter that the program keeps and it is updated every 10 ms, every time it gets a message

407:

This is the message id. ALL of the messages that are sent out every 10 ms start out with 40. The last digit is the drive number 0-3 = steering 4-7 = gas/brake. (drive 7, gas/brake safety processor.)

92: 1001 0010

Bits 0-3 are the input device type

Eval Selected	0	
Gas/Brake Lever	2	(input device currently connected)
Gas/Brake Joystick	4	
Steering Joystick	6	
Steering Wheel	8	
Not Used	9	
Not Connected	10	

Bit 4 tells whether the drive is active, 0= Not Active 1= Active

Bits 5 & 6 will be set if either drive was indicating an error.

Bit 7 will be set if the drive is alive and sending messages.

00: 0000 0000

Bits 0-7 is the low byte of encoder (shown as 0)

## ★ **AEVIT CAN Bus (pg.3)**

02: 0000 0010

Bits 8-15 is the high byte of encoder (shown as  $2 * 256 = 512$  center or null position)

FE: 1111 1110

Bits 0-7 is the low byte of input (shown as 254)

21: 0010 0001

0= No Request 1= Requesting

Bits 8-10 is the high byte of input (shown as  $(1 * 256) + 254 = 510$ )

\*\*\*TOP (5) BITS MUST BE MASKED TO READ THE INPUT CORRECTLY\*\*\*

Bit 11 tells whether the drive has been requested to be inactive (warning)

Bit 12 tells whether a request has been made to activate the park brake

Bit 13 tells whether the drive is requesting to be engaged

Bit 14 tells whether the Eval Panel is connected

Bit 15 tells whether the Eval Panel is active

E2: 1110 0010

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

00: 0000 0000

Bits 8-15 is the high byte of generic integer data – otherwise meaningless

00: 0000 0000

Bits 0-7 is the command value. An example would be if you switched to the drive temperature screen the drives would send a “command” that they were sending temperature and the data bytes would contain the raw temperature data.

## **Sample Vehicle Interface Data Stream**

509000 408 87 57 01 E0 00 88 88 00

509000:

A counter that the program keeps and it is updated every 10 ms, every time it gets a message

408:

This is the message id. ALL of the messages that are sent out every 10 ms start out with 40. The last digit identifies it as the vehicle interface.

87: 1000 0111

0 = Not Active, 1 = Active

Bit 0 detects whether it is present or not

Bit 1 detects whether it is booted

Bit 2 detects a valid coil pulse

Bit 3 detects brake lights

Bit 4 detects park lights

Bit 5 detects steering servo engaged

Bit 6 detects remote “OFF” switch

Bit 7 detects ignition

57: 0101 0111

Bits 0-7 is the scaled speed in MPH (shown as 87 MPH)

01: 0000 0001

Bit 0 detects whether or not throttle clutch is engaged

## ★ AEVIT CAN Bus (pg.4)

E0: 1110 0000

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

00: 0000 0000

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

88: 1000 1000

Bits 0-7 is the scaled battery 1 voltage. (shown as 136 or 13.6 VDC)

88: 1000 1000

Bits 0-7 is the scaled battery 2 voltage. (shown as 136 or 13.6 VDC)

00: 0000 0000

Bits 0-7 is the command value. An example would be if you switched to the drive temperature screen the drives would send a “command” that they were sending temperature and the data bytes would contain the raw temperature data.

## Sample Information Center Data Stream

509000 409 00 21 43 FF FF 03 FF 03

509000:

A counter that the program keeps and it is updated every 10 ms, every time it gets a message

409:

This is the message id. ALL of the messages that are sent out every 10 ms start out with 40. The last digit identifies it as the vehicle interface.

00: 0000 0000

Bits 0-7 is the command value

21: 0010 0001

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

43: 0100 0011

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

FF: 1111 1111

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

FF: 1111 1111

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

03: 0000 0011

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

FF: 1111 1111

Bits 0-7 is the low byte of generic integer data – otherwise meaningless

03: 0000 0011

0 = Not Active, 1 = Active

Bit 0 detects whether it is present or not

Bit 1 detects whether it is booted

Bit 2 detects whether in test mode

Bit 3 unused

Bit 4 detects request for steering side 1 primary

Bit 5 detects request for steering side 2 primary

Bit 6 detects request for gas/brake 1 primary

Bit 7 detects request for gas/brake 2 primary



# ★ GOLD Series Secondary Controller RPV-GDRS1105-GS

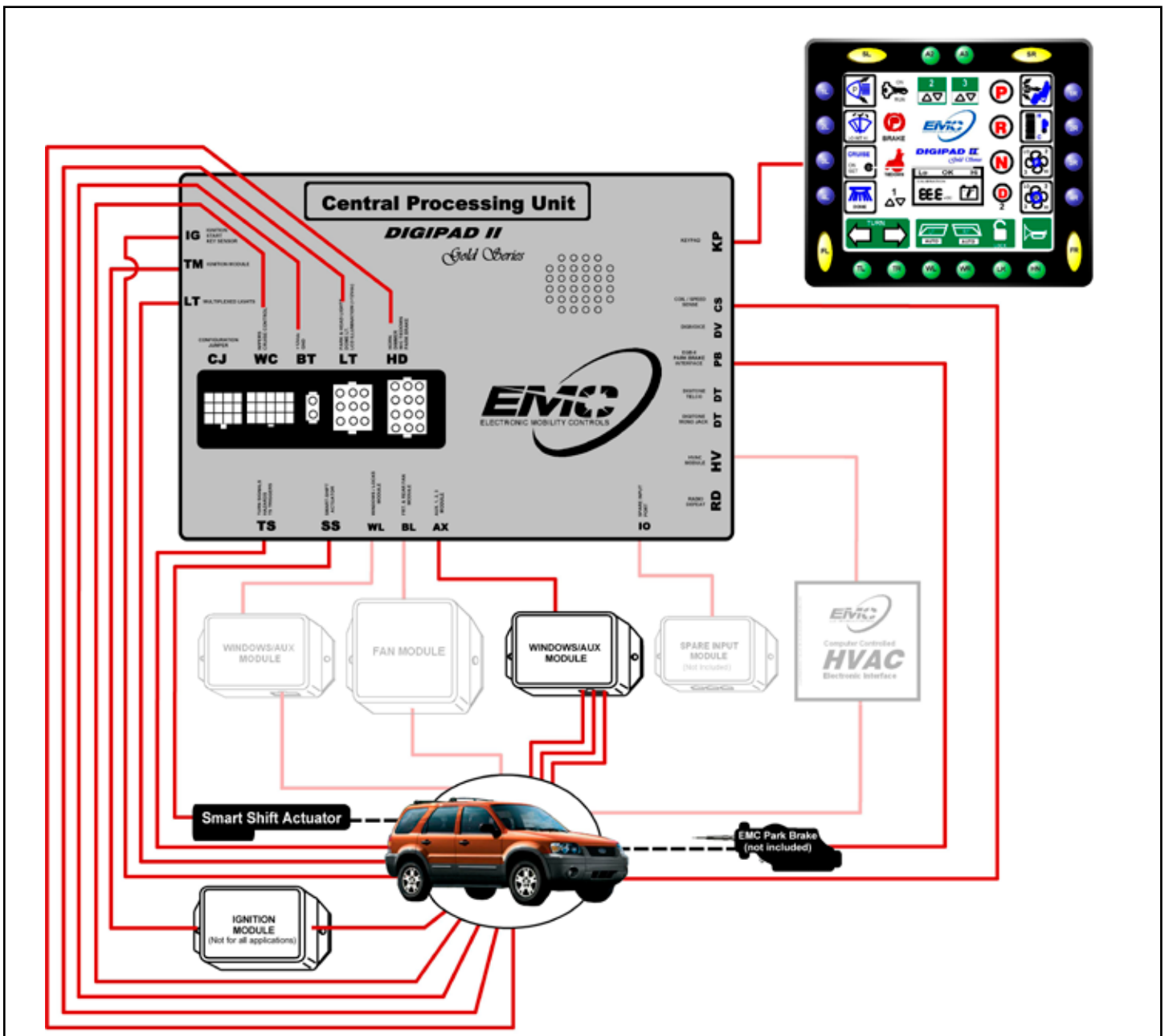
## ★ Overview

This system has been adapted to control the specified secondary functions of your vehicle. These would include: ignition, lights, wipers, turn signals and (3) auxiliary functions. (see pgs. 27-30)

There are (2) ways to interface with the secondary functions. The first is by operating the touchpad buttons and the second is via software commands through the communication port on the touchpad. See the programming section for details on the ASCII based protocol for communicating with the Gold Series Secondary Controller.

## ★ System Layout: GOLD Series

This diagram has been provided to show all of the components of the AEVIT Driving System and how they connect. The following sections of this manual will explain each component, it's connector ports and the purpose of the device. Each line below represents a harness connection.



## ★ LCD Touchpad

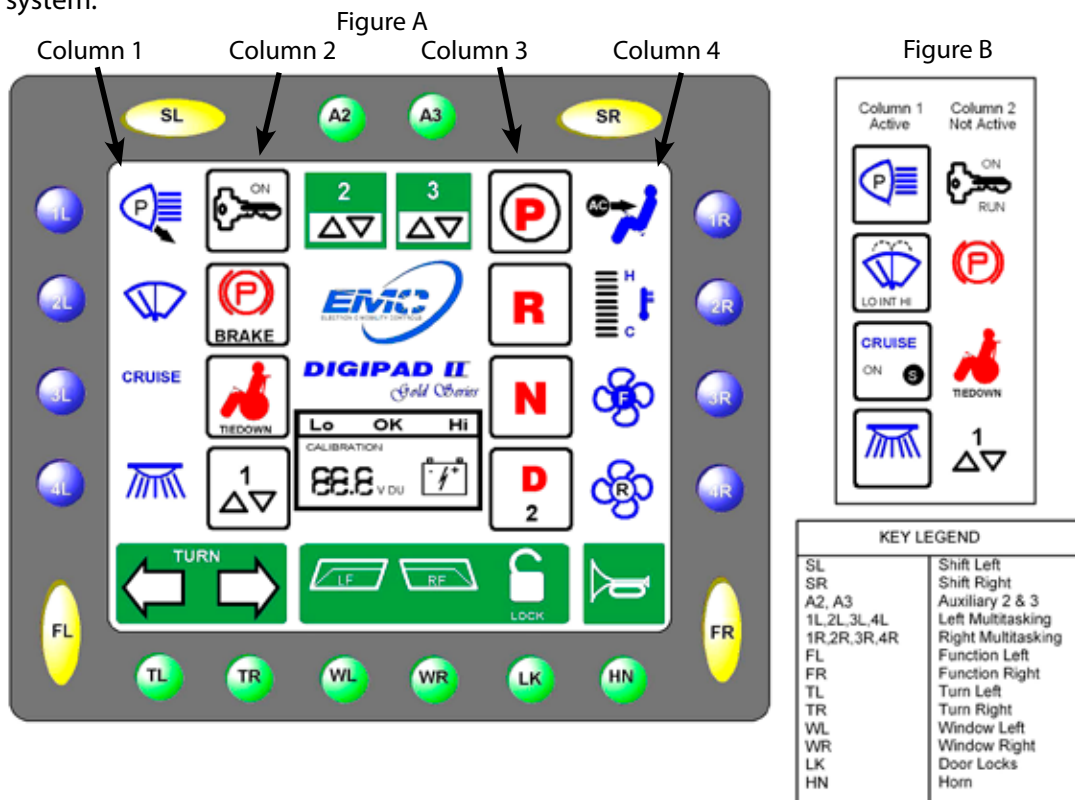
The LCD, or liquid crystal display, touchpad is the touch-button interface to all functions controlled by the Gold Series console. The glass screen utilizes universal icons to identify each function and its current status. Review Figure 1 below to familiarize yourself with the general layout. You can see that the buttons outside of the glass view screen are coded with number/letter designators, which are defined in the legend key to the right of the figure. Keep in mind that these designators are used throughout this manual, so refer to Figure A whenever necessary.

**WARNING:**  
**The glass LCD screen is not a touch screen. Do not, for any reason, strike on the glass as damage not covered under warranty may result!**

The tactile switches surrounding the LCD screen are lighted for easy identification during night driving conditions. These buttons are also color coded according to function. The GREEN buttons are used to operate those functions, identified either above or below each button, that are active at all times (Note: the A2 and A3 functions can be programmed so that they are inoperable when the ignition is on). The BLUE colored buttons are used to operate either one of two possible functions identified to the right or left of the switches. The WHITE oval buttons at the top are used to sequence the Active Column of functions and the WHITE oval buttons at the bottom are considered "wild card" functions. The "wild card" functions, FL and FR change depending upon which Column of icons is active.

As mentioned, the BLUE colored buttons can operate one of two functions. Which function is active is determined by which Column of icons on the LCD screen are highlighted with boxes around each icon. In Figure A, Columns 2 and 3 are active. During normal operation, with the Ignition on and the vehicle transmission in DRIVE, the Columns will automatically shift after five seconds to activate the outermost functions. This is to prevent inadvertent operation of the ignition and shift functions while driving, as well as to facilitate quick access to the most commonly used functions. To manually change the active Column of functions, use the two WHITE oval SL and SR keys. Figure B illustrates more clearly the choice of functions according to Column selection.

A status window is located in the center of the LCD screen. This is used to display voltage of the main vehicle battery during normal usage. It is also used to identify the current software revision and to assist in the programming of the system.



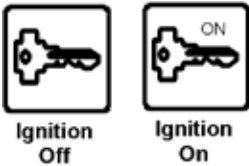
## ★ Touchpad Operation

### Status Window



The Status Window is located in the center of the Gold Series LCD console. During normal operation mode the window will display the current status of the primary vehicle battery. This feature provides an exact reading of battery voltage, which allows the user to monitor and detect any problems with the charging circuit of the vehicle. The primary function of the status window is programming and calibration. The programming functions and calibration processes are discussed in detail in the Programming and Calibration section of this manual.

### Ignition



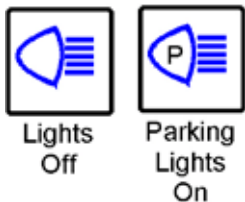
With Column 2 active, the 1L key activates the vehicle's ignition circuits. By depressing and releasing the 1L button once, the ignition will be turned on. To start the engine, depress and hold the FL key for approximately one second. The RUN icon will illuminate when a coil pulse is detected. To turn the engine and ignition off, depress and hold the 1L key for approximately one second.



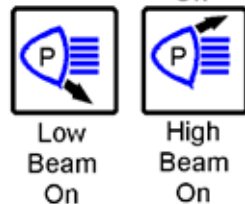
The OEM ignition switch has been disconnected so the Gold Series will work properly. The OEM key must remain in the ignition switch at all times, otherwise, the Theft Deterrent system will not allow ignition.

**WARNING:**  
NEVER REMOVE THE VEHICLE KEY FROM THE IGNITION SWITCH, OTHERWISE THE THEFT DETERRENT SYSTEM WILL NOT ALLOW IGNITION.

### Parklights & Headlights



With Column 1 active, the 1L key activates the parking lights, vehicle dash lights and will illuminate all devices that are controllable by the factory dash light dimmer switch. The second time the 1L key is depressed the headlights will illuminate. With the headlights on and Column 1 active, the FL (Function Left) key is used to toggle the low and high beams. Depressing 1L again will turn off all lights. The CPU will retain the last state of the headlights in memory if the vehicle ignition or lights are turned off.



The Keypad is illuminated by a LCD backlight. This LCD will illuminate whenever the vehicle parking lights are activated. When the unit wakes up from sleep mode the LCD will illuminate for 90 seconds. When the ignition is turned off, again the LCD will illuminate for 90 seconds, to assist the operator in exiting the vehicle.

There are three programming options for the Headlights function. The default option allows the user to turn the headlights on and off manually from the touchpad. The second option automatically turns the headlights on when the wipers are turned on. The third option automatically turns on the headlights when the ignition is turned on. For all options, the headlights must be manually turned off.

## ★ Touchpad Operation (cont.)

### Windshield Wipers & Wash



Wipers  
Off



Int  
Wipers  
On



Lo  
Wipers  
On



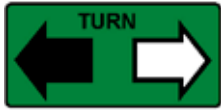
High  
Wipers  
On



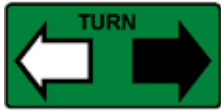
Washer  
On

With Column 1 active, the 2L key controls all wiper and washer functions. By depressing and releasing the 2L key, the Intermittent wiper speed will be activated with a preset 5-second delay between wiper cycles. The preset delay for Intermittent wipers is not adjustable. Depressing and releasing the 2L key a second time will activate the Low wiper speed. Depressing and releasing the 2L key a third time, will activate the High wiper speed. Depressing and releasing the 2L key a fourth time will turn off all wiper functions. A unique feature with the Wiper Wash system is that it can be activated by depressing and holding the 2L key for 2-3 seconds. This Wiper Wash can be accessed regardless of current wiper speed. If the 2L key is depressed and held for 2-3 seconds while the wipers are off, then released, the wash and intermittent wipers will activate momentarily then shut off.

### Turn Signals & Hazards



Left Turn Signal On



Right Turn Signal On

The turn signal circuit is activated by the TL and TR keys. Depressing and releasing the TL key will activate the left turn signal. Depressing and releasing the TR key will activate the right turn signal. Each turn signal utilizes a timed circuit and will remain on until the TL or TR key is depressed or until the circuit times out. The timed circuit will reset if the brake pedal is depressed while turn signals are on. The length of the Turn Signal Delay is adjustable in programming from 5 to 30 seconds. Hazard lights are activated by depressing and holding either of the turn signal keys until both the left and right turn signal indicators are illuminated. To cancel the hazard lights, press either of the turn signal keys. The hazard lights will operate even if the ignition of the vehicle is off.

### Smart-Shift



Park



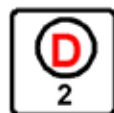
Reverse



Neutral



Drive



Drive 2

With Column 3 active and brake pedal depressed, the 1R, 2R, 3R, & 4R keys will operate the Smart-Shift functions. Smart-Shift incorporates positional feedback as well as fully automatic positioning of the actuator in any of 5 gear selector choices. When the corresponding key is depressed and released, the Smart-Shift will move the transmission to the selected gear, stop automatically and illuminate the display. You will have a circle around the gear letter to indicate the current position of the transmission. One of the exciting new features of the Gold Series is that it uses positional feedback to move the Smart-Shift actuator automatically to the selected position without continually holding the key. This will allow someone to shift gears with just a single touch of a key as long as the brake pedal is depressed. No more missed gears or waiting in traffic for the actuator to slowly move. The Smart-Shift travels from Park to Drive in approximately 1.3 seconds.

With Column 3 active, the FR key accesses Drive 2 or low gear. The vehicle's automatic transmission, as of late 1980's, will not allow the transmission to shift into this extremely low gear until the vehicle is under 6-10 mph. If the FR key is selected above these speeds, the vehicle will not shift into Drive 2. A typical application of the low gear selection is if the operator of the vehicle is traveling and decides that the grade is extremely long and steep or that the road conditions require a lower gear. The operator only needs to depress and release the FR key and the Smart-Shift will automatically switch to low gear. Do remember that the vehicle speed must be below 6-10 mph, depending on vehicle type, before the Drive 2 will be engaged. Drive 2 may not be accessible by some models of the Ford Econoline.

As a safety feature, the Gold Series will sound the horn if you try and shut down the vehicle without the transmission in Park. Always ensure that the vehicle is in Park (a circle is around the "P") before trying to shut the vehicle down.

## ★ Touchpad Operation (cont.)

### Auxiliary Functions

The Gold Series has three programmable Auxiliary Functions. (see pgs. 27-30)



Auxiliary  
Function  
1



Auxiliary  
Function  
2



Auxiliary  
Function  
3

### Electric Park Brake & Brake Light Indicator



Brake  
Off



Brake  
Applied

With Column 2 active, the 2L key will manually engage and disengage the EMC Electric Parking Brake. Whenever the ignition of the vehicle is off the function will act in a timed, latching mode, toggling between parking brake on and parking brake off. Whenever the ignition switch of the vehicle is on, the function will act in a latching mode by applying the parking brake whenever the switch is held for (1) second or more. Pushing the button again will release the Park Brake. The icon however provides no indication of the current state of the Parking Brake. The OEM parking brake indicator will provide this feedback. What the BRAKE segment will indicate is whether or not the brake lights are on. For AEVIT Gas & Brake users this will indicate if the gas/brake servo is resting on the factory brake pedal, which will cause the vehicle battery to drain due to the brake light remaining on.



## ★ Vehicle Connections - 2006 Ford Escape

### Main Circuit Breaker

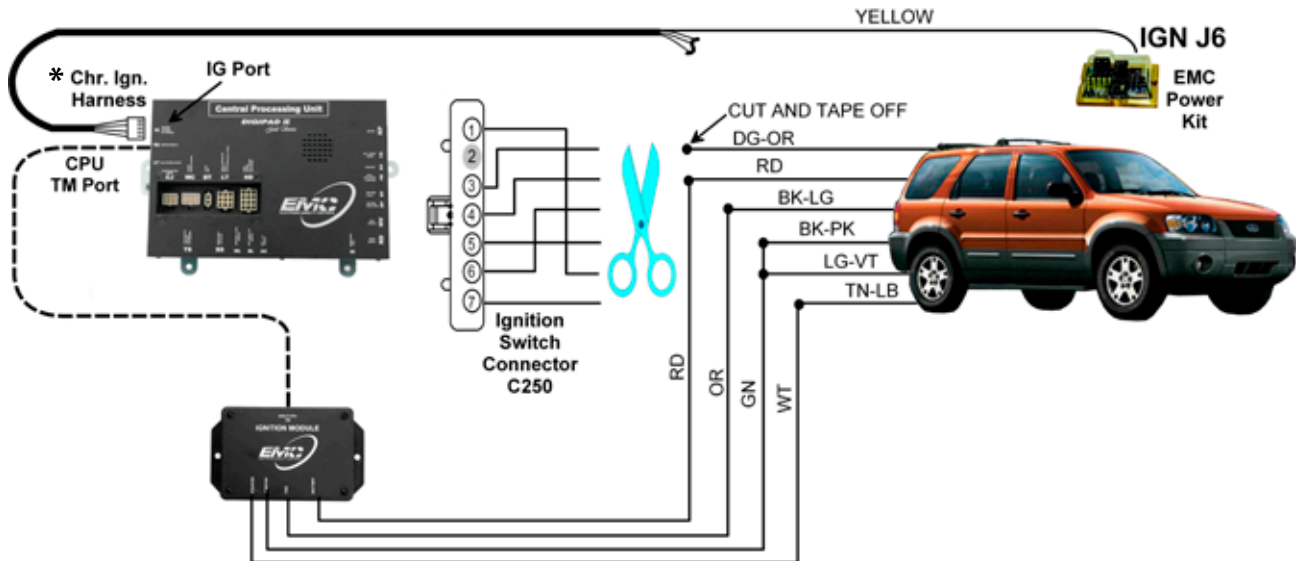
The vehicle is equipped with a main circuit breaker that supplies power to the GOLD Series. The circuit breaker is located under the hood next to the positive side of the battery. The GOLD Series draws up to 60 mA even when the system goes to "sleep" so when the vehicle is not in use for several days trip the circuit breaker so the battery does not go dead.

### WARNING:

**THE GOLD SERIES WILL COME UP IN "RESET" MODE WHENEVER THE POWER IS DISCONNECTED AND RE-APPLIED. SAFETY FEATURES INCLUDE AUTOMATIC ACTIVATION OF IGNITION, LIGHTS, AND WIPERS IF A RESET EVENT OCCURS. SIMPLY USE THE TOUCHPAD TO TURN OFF THESE FUNCTIONS.**



### ★ Wire Harness Installation- Ignition



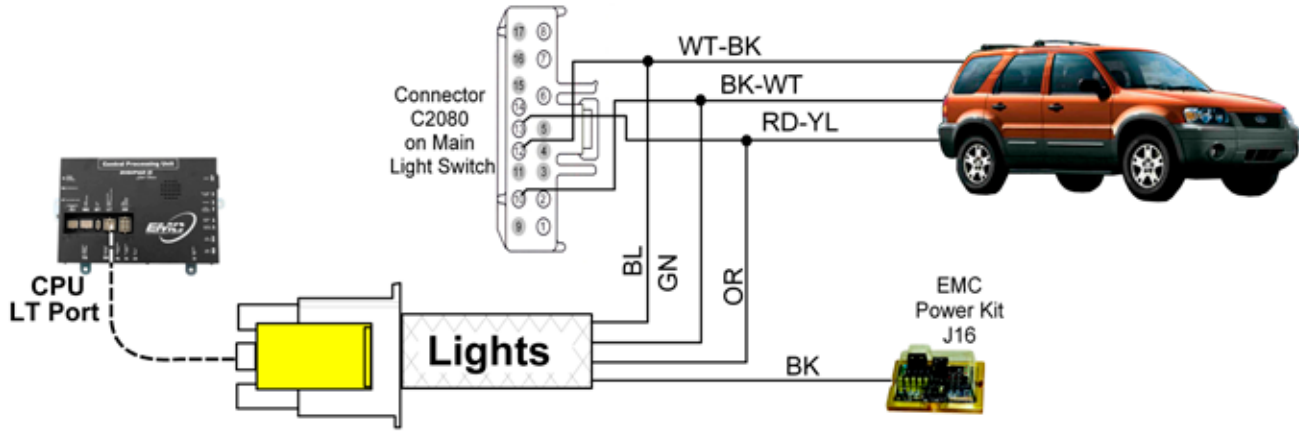
PIN #	HARNESS WIRE COLOR	VEHICLE WIRE COLOR	VEHICLE CONNECTOR #, PIN #	FUNCTION
1	WHITE	TN-LB	C250, 7	START
2	GREEN	LG-VT & BK-PK	C250, 1 & 5	IG CIRCUIT
3	ORANGE	BK-LG	C250, 6	ACC
5	RED	RD	C250, 4	12Vdc HOT

**NOTES:** Cut and tape off Pin 3, DG-OR on OEM connector C250 to prevent shorting.

OEM key must remain in the tumbler and immobilizer.

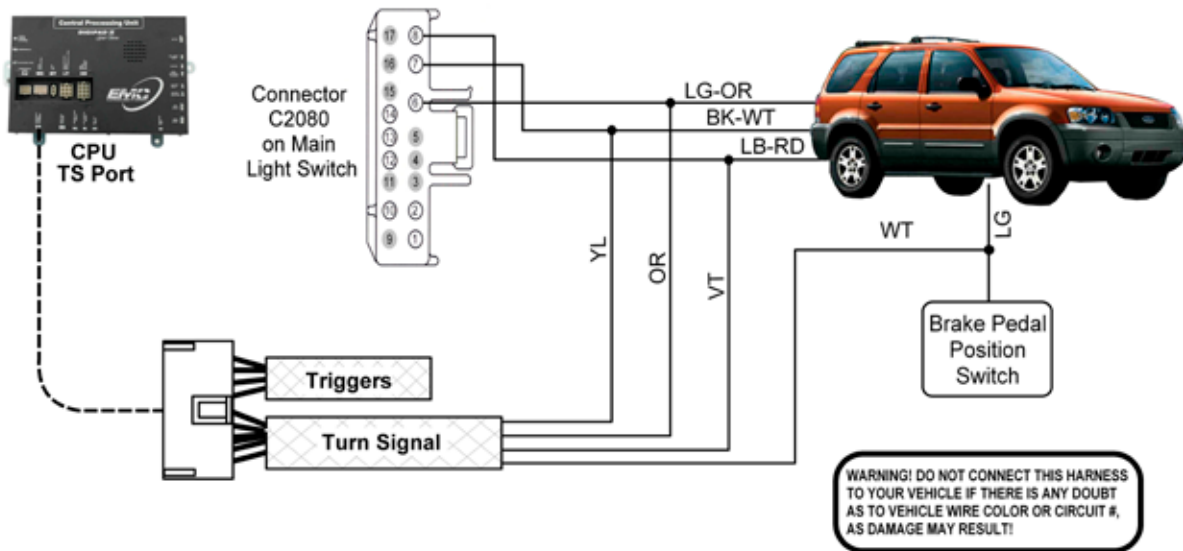
\* Plug the Chr. ignition harness into the IG port of the Gold CPU and connect the YELLOW wire in this harness to IGN J6 in the EMC Power Kit. The other wires are not used.

## ★ Wire Harness Installation- Lights



PIN #	HARNESS WIRE COLOR	VEHICLE WIRE COLOR	VEHICLE CONNECTOR #, PIN #	FUNCTION
2	BLUE	WT-BK	C2080, PIN 12	PARK NO
3	GREEN	BK-WT	C2080, PIN 10	HEAD & PARK COM
7	BLACK	+12Vdc	EMC Power Kit J16	Touchpad Backlight
8	ORANGE	RD-YL	C2080, PIN 13	HEAD NO

## ★ Wire Harness Installation- Turn Signals & Hazards

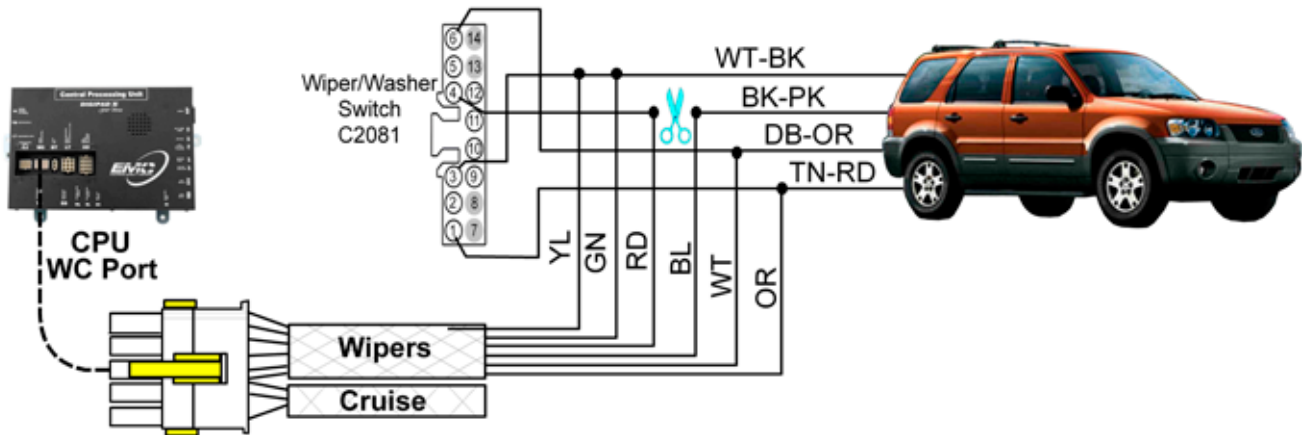


PIN #	HARNESS WIRE COLOR	VEHICLE WIRE COLOR	VEHICLE CONNECTOR #, PIN #	FUNCTION
1	VIOLET	LB-RD	C2080, PIN 8	LEFT FRONT
2	ORANGE	LG-OR	C2080, PIN 6	RIGHT FRONT
5	YELLOW	BK-WT	C2080, PIN 7	FLASHER
6	WHITE	LG	BPPS, PIN 1	BRAKE LIGHT

### **WARNING:**

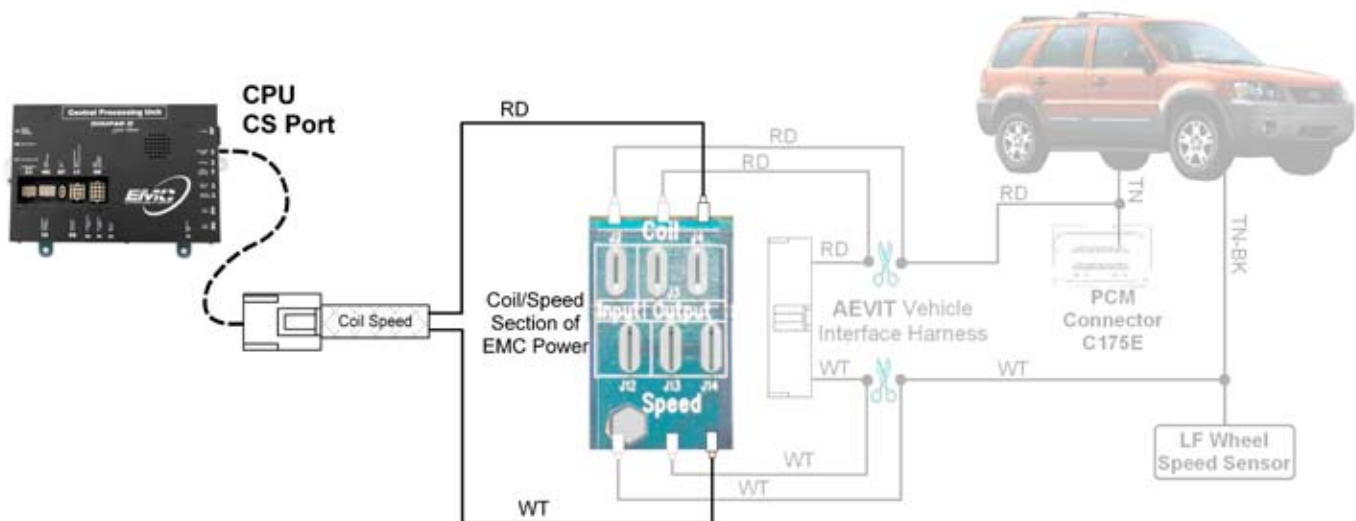
**When routing wires, be certain to avoid areas that could cause these wires to chafe!**

## ★ Wire Harness Installation- Wipers



PIN #	HARNESS WIRE COLOR	VEHICLE WIRE COLOR	VEHICLE CONNECTOR #, PIN #	FUNCTION
5	WHITE	DB-OR	C2081, 6	WIPER HI
11	ORANGE	TN-RD	C2081, 1	WIPER/WASH NO
12	BLUE	BK-PK (VS)	C2081, 4	WIPER LO COM
13	RED	BK-PK (SS)	C2081, 4	WIPER LO NC
14	YELLOW	WT-BK	C2081, 3	WIPER LO NO
15	GREEN	WT-BK	C2081, 3	WIPER HI/WASH COM

## ★ Wire Harness Installation- Coil & Speed Signal



PIN #	HARNESS WIRE COLOR	VEHICLE WIRE COLOR	VEHICLE CONNECTOR #, PIN #	FUNCTION
1	RED	TN	C175E, PIN 2	COIL SENSE
2	WHITE	TN-BK	LF WSS, PIN 1	SPEED SENSE

NOTE: The **table** above indicates the vehicle wires that are used for the coil and speed signals. The coil/speed **harness**, however, is connected directly to the EMC Power Kit as indicated. The coil and speed **signals** are acquired as indicated in the diagram. (see pgs 9 & 10 for more information).

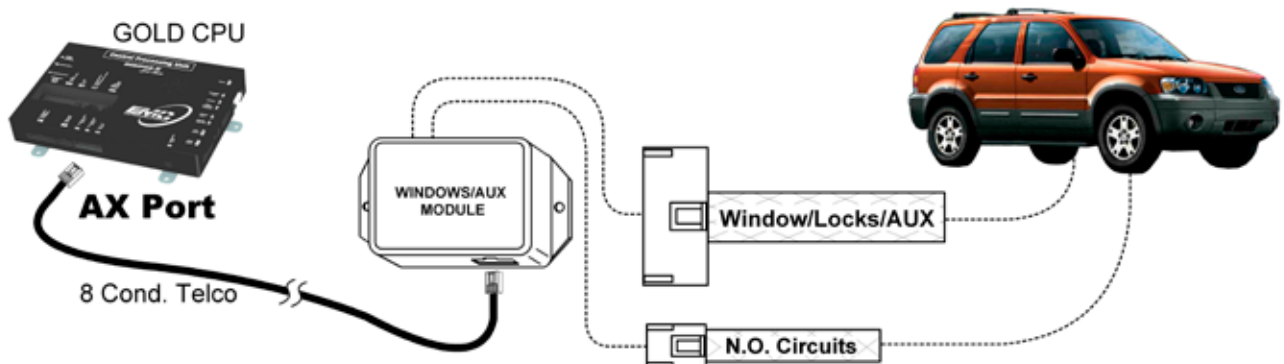
## ★ Auxiliary Functions

The Auxiliary functions can be used to momentarily switch any SPST, SPDT power reversing, or DPDT polarity reversing, motor or actuator up to 10 amps. It can also operate any SPST latching function.

**WARNING:**  
**DO NOT PLUG THE TELCO INTO THE AUXILIARY MODULE UNTIL PROGRAMMING IS COMPLETED OR DAMAGE COULD RESULT!**

All Auxiliary functions are wired through one of the Windows/Locks/AUX wire harnesses and one of the N.O. Circuit harnesses. The Windows/Locks/AUX harness plugs directly into a Windows/AUX Interface Module, which connects to the CPU's AX port via an 8-conductor telco cord. Below you will find general information on applications and wiring charts.

Make sure that you know what kind of motor/actuator you are installing (i.e. DPDT or SPDT). If you have any doubt, call EMC for assistance. These functions can be ignition interlocked. See the Programming and Calibration section for more information.



Auxiliary Function 1



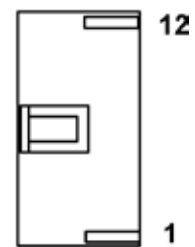
Auxiliary Function 2



Auxiliary Function 3

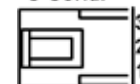
PIN #	HARNESS WIRE COLOR	FUNCTION
1	VIOLET	AUX1 Function "A" N.C.
2	YELLOW	AUX1 Function "A" COM
3	ORANGE	AUX1 Function "B" N.C.
4	GREEN	AUX2 Function "B" COM.
5	RED	AUX2 Function "A" N.C.
6	BLACK	AUX2 Function "A" COM
7	BLUE	AUX2 Function "B" COM
8	WHITE	AUX2 Function "B" N.C.
9	VIOLET	AUX3 Function "A" N.C.
10	WHITE	AUX3 Function "A" COM
11	GREEN	AUX3 Function "B" COM
12	BLACK	AUX3 Function "B" N.C.

12 conductor LEOCO



PIN #	HARNESS WIRE COLOR	FUNCTION
1	GREEN	AUX 1 N.O.
2	WHITE	AUX 2 N.O.
3	BLACK	AUX 3 N.O.

LEOCO 3 Cond.

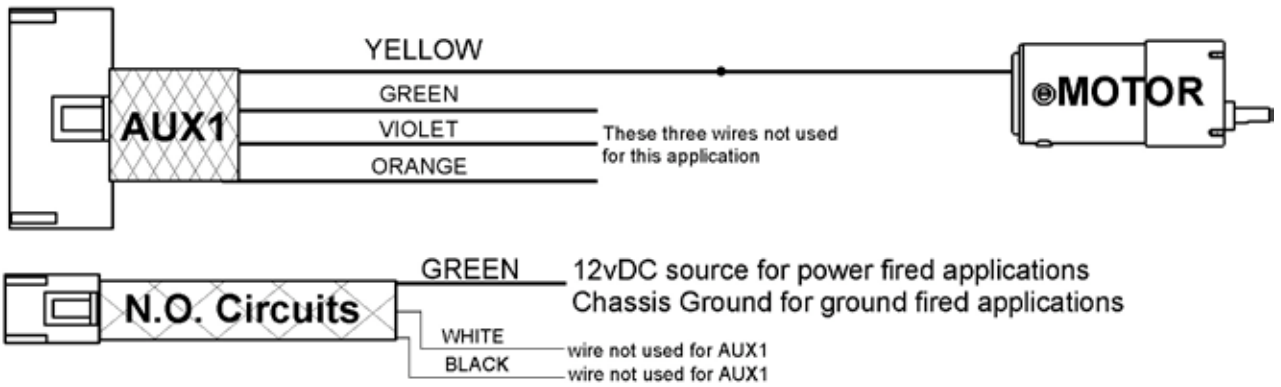


## SPST Universal Applications

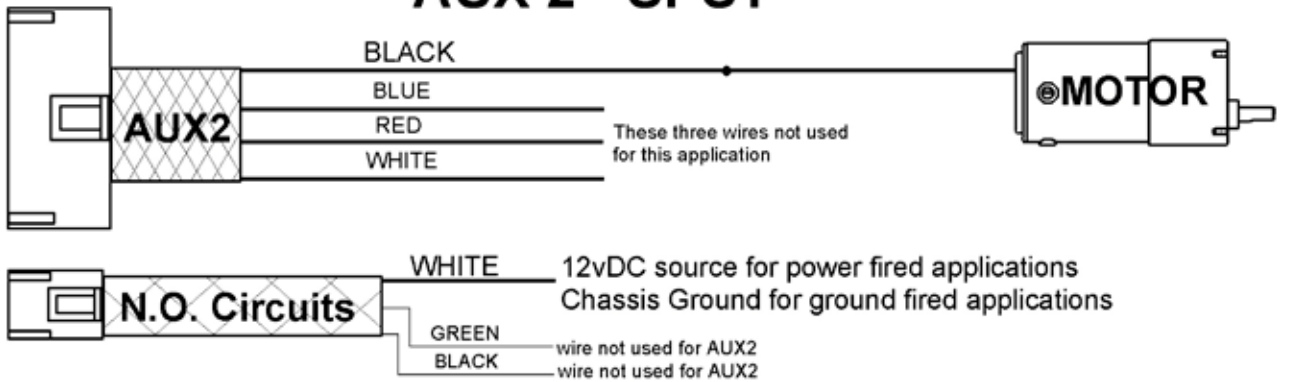
In all SPST applications, connect the Function "A" COM wire to the device leads (i.e. motor, solenoid, etc.). In ground fired applications, connect the N.O. Circuits harness wire to chassis ground. In 12Vdc fired applications, connect the N.O. Circuits harness wire to a fused (20A Max.) 12Vdc source. Refer to the chart on the preceding page for more details.

**Complete the Programming & Calibration section of this manual before activating any auxiliary device, or damage could result! Be sure to tape off all unused wires to prevent shorting.**

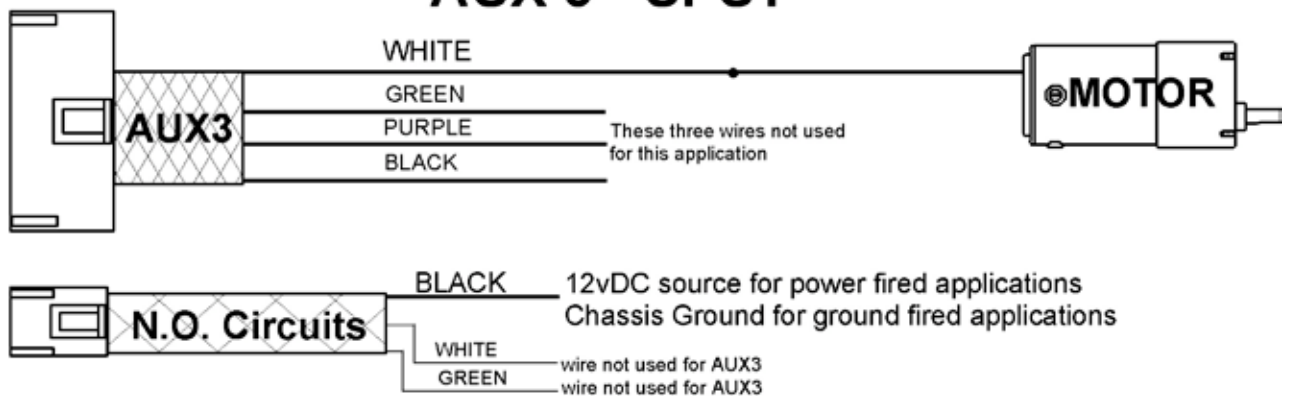
### AUX 1 - SPST



### AUX 2 - SPST



### AUX 3 - SPST

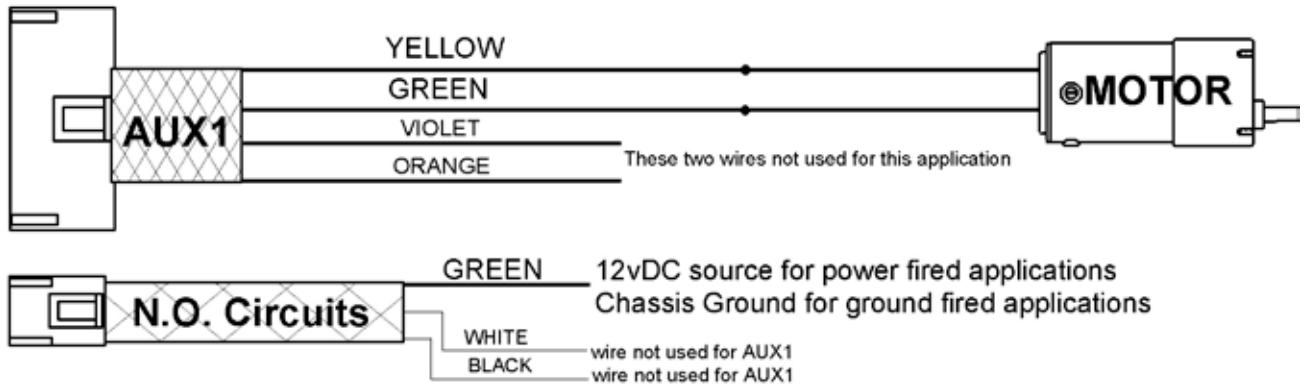




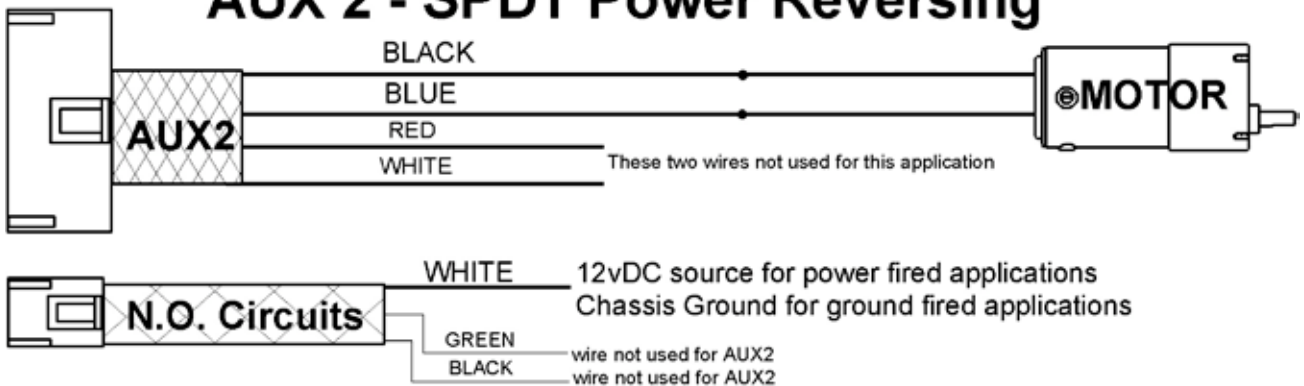
**SPDT Universal Applications**

In all SPDT applications, connect the AUX harness wires to the device leads (i.e. motor) as shown below. In ground fired applications, connect the N.O. Circuits harness wire to chassis ground. In 12Vdc fired applications, connect the N.O. Circuits harness wire to a fused (20A Max.) 12Vdc source. Refer to the chart on the preceding page and the diagram below for details. Complete the Programming & Calibration section of this manual before applying power to any auxiliary device, or damage could result! Be sure to tape off all unused wires to prevent shorting.

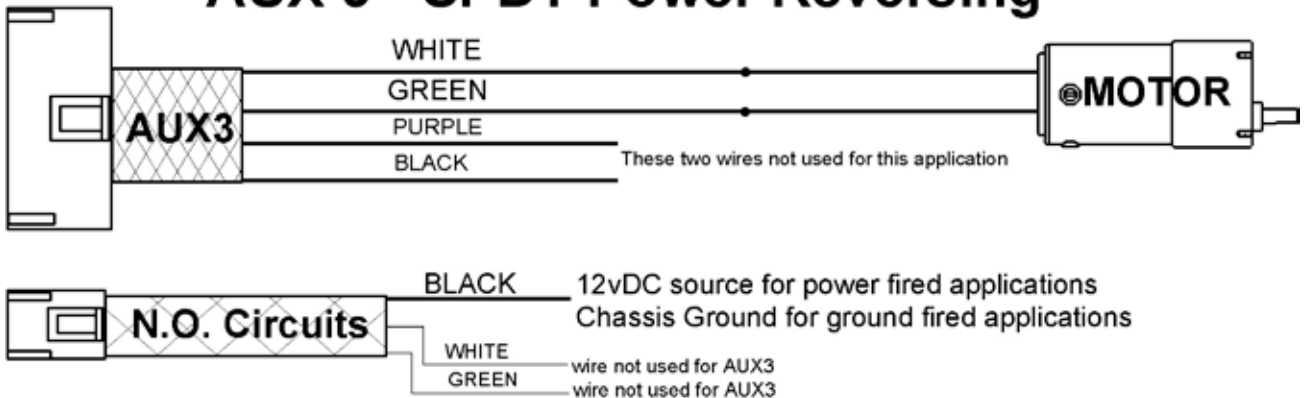
### AUX 1 - SPDT Power Reversing



### AUX 2 - SPDT Power Reversing



### AUX 3 - SPDT Power Reversing

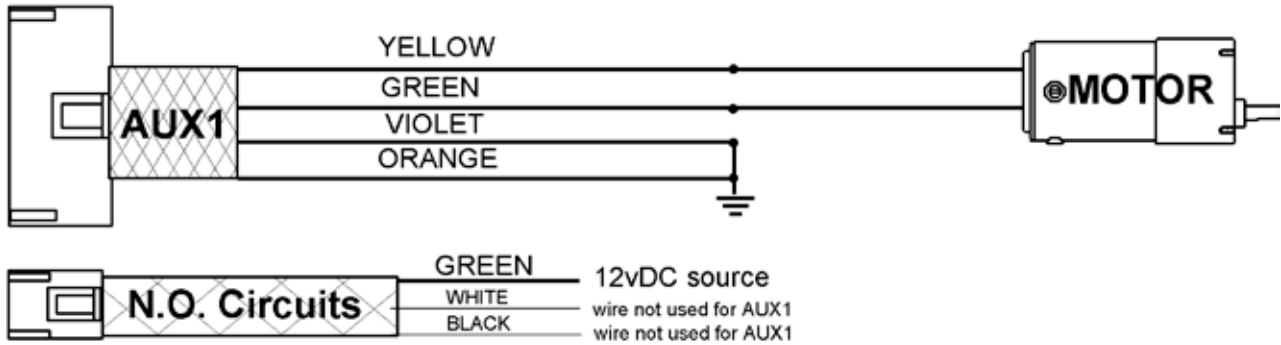


## DPDT Universal Applications

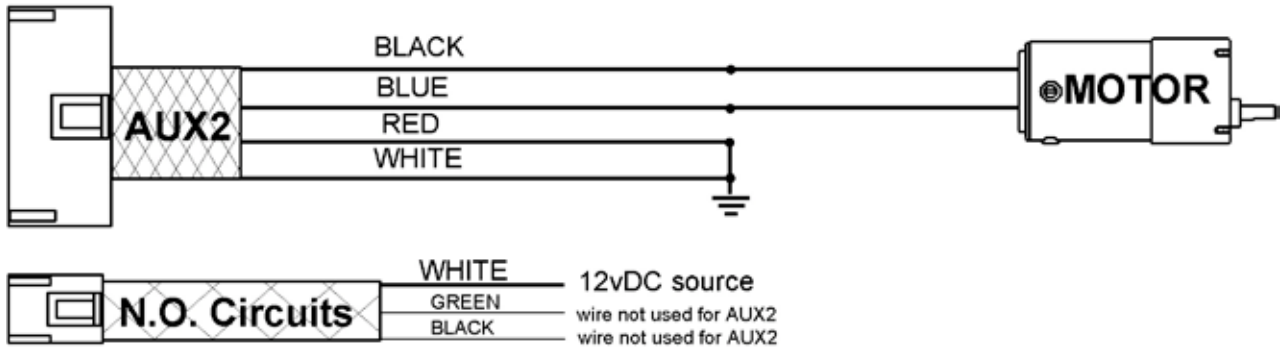
In all DPDT applications, connect the AUX harness wires to the device leads (i.e. motor) according to the diagram below. In all applications, connect the N.O. Circuits harness wires to a fused (20A Max.) 12Vdc source. In all applications, connect the AUX harness wires to chassis ground according to the diagram below. Refer to the preceding chart and the diagrams below for further details. **Complete the Programming & Calibration section of this manual before applying power to any auxiliary device, or damage could result!**

**WARNING:**  
**DO NOT WIRE ANY POLARITY REVERSING APPLICATION IN PARALLEL WITH ANOTHER TOGGLE SWITCH OR DAMAGE NOT COVERED BY THE MANUFACTURER WILL RESULT!**

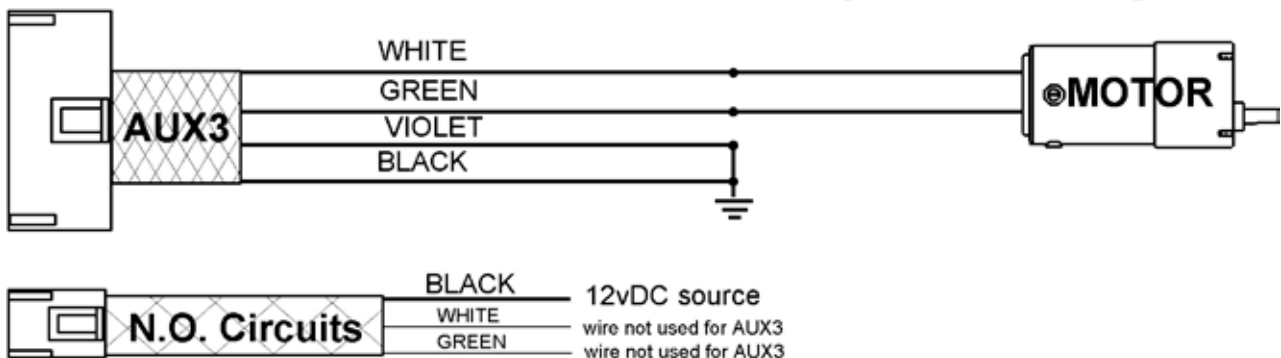
### AUX 1 - DPDT Polarity Reversing



### AUX 2 - DPDT Polarity Reversing



### AUX 3 - DPDT Polarity Reversing



# ★ Calibration Mode

## ★ Programming

Calibration mode is accessed by depressing and holding the SL and SR keys until the LCD goes blank and then **immediately releasing both keys**. The CALIBRATION segment will illuminate in the status window, and the numerical display will show “----”. Once the calibration mode is accessed, all programming can be performed without leaving the calibration mode. Simply access each function by the step-by-step directions in this section. When you have completed entering all adjustments, exit calibration by depressing and holding the SL and SR keys again until the status window returns to primary battery indication. Any of the programming functions can be changed at any time, as long as the console has primary power supplied.

## Smart-Shift

**The Smart Shift has been completely installed and should not require further calibration. The information below is provided as a reference only.**

- Step 1:** Plug the Smart Shift cable into the SS port on the GOLD Series CPU.
- Step 2:** Ensure the ignition is on, the vehicle is in park, and the brake is applied and the LCD is in calibration mode.
- Step 3:** If the actuator was not attached to the transmission cable during the actuator's installation, you will need to adjust the actuator position to meet the transmission cable. Use the WL (Left Window) and WR (Right Window) keys to position the Smart-Shift actuator until it reaches the vehicle transmission cable or until the transmission reaches the desired position.
- Step 4:** Depress and hold the multifunction key on the LCD console that corresponds to the current transmission position. (For the attachment of the transmission cable, the corresponding gear is PARK.)
- Step 5:** Momentarily depress and release either of the WL or WR keys. The display will read the current position of the actuator, and a circle will appear around the letter of the selected gear.
- Step 6:** Once the actuator is set, the TL and TR keys are used to fine tune the actuator if needed. To fine tune the actuator, depress and hold the multifunction key that corresponds the gear to be tuned. Use the TL and TR keys to move the indication in the status window up or down in one degree increments. The actuator will not physically move until the multifunction key is released. Once the key is released the actuator will move to the new setting and will be stored in memory. Be sure to record the final actuator position in the spaces provided at the end of this procedure.
- Step 7:** Repeat steps 4 through 7 for each of the transmission positions.

### Actuator Position Values

1R = PARK	actuator position	<u>198</u>
2R = REVERSE	actuator position	<u>152</u>
3R = NEUTRAL	actuator position	<u>124</u>
4R = DRIVE	actuator position	<u>102</u>
FR = DRIVE 2	actuator position	<u>78</u>

## Headlight Options

- Step 1:** While in calibration mode, depress and hold the 2L to access the Headlights Options.
- Step 2:** While holding the 2L key, use the TL and TR keys to select the desired option. Settings will be saved upon release of 2L key.
  - 0 = Manual operation of headlights only
  - 1 = Headlights on with Wipers
  - 2 = Headlights on with Ignition

**NOTE:** For all options, the headlights must be manually turned off from the touchpad.

## ★ Programming (cont.)

### Turn Signal Time Delay

The Turn Signal Time Delay default setting is 10 seconds, designated as 010.

- Step 1:** Depress and hold the LK (Locks) key to access the time delay setting for Turn Signals. The delay time in seconds will appear in the status display window. This is the time that the turn signal functions will remain operational after the brake pedal is released.
- Step 2:** The delay time can be adjusted between 5 and 30 seconds by pressing the TL (Left Turn) and TR (Right Turn) buttons.
- Step 3:** Settings will be saved upon release of the LK (Locks) key.

### Start Security Code

The Start Security Code default setting is off, or 000.

- Step 1:** Press and hold the 1L button. A box will appear around the Ignition icon and a number designator, either 0 or 1 will appear in the display window. If the number 000 is selected, no start code will be required to start the engine. If the number 1 is selected, a security start code will be required to start the engine.
- Step 2:** Use the TL and TR buttons to toggle between these two options. The number designator will change accordingly. (Note: If the optional security code is selected, the security code required to start the engine is as follows: Start (FL), Left Turn (TL), Right Turn (TR), Left Turn (TL). Once this code is entered, subsequent depression of the Start button will energize the starter.

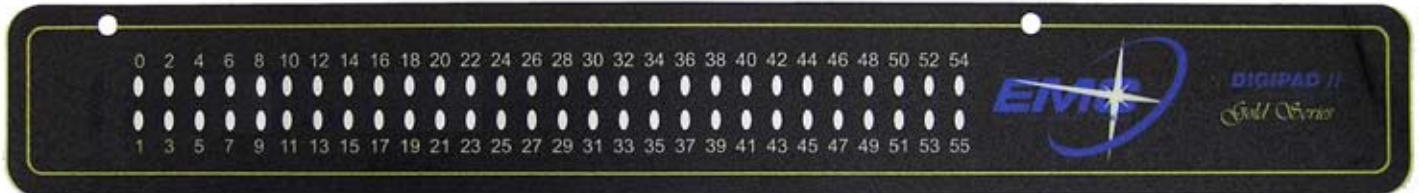
### Auxiliary Functions

- Step 1:** Depress and hold the blue 4L key to access the **Auxiliary 1 Function**. This key needs to be held depressed during this calibration. The status window will indicate a number between 0-5. These numbers represent the current relay mode.
- Step 2:** Use the TL and TR key to scroll to the desired relay output.
- 0 = Momentary SPST relay output, without ignition interlock
  - 1 = Momentary SPST relay output, with ignition interlock
  - 2 = Momentary SPDT and DPDT relay output, without ignition interlock
  - 3 = Momentary SPDT and DPDT relay output, with ignition interlock
  - 4 = Latching SPST relay output, without ignition interlock
  - 5 = Latching SPST relay output, with ignition interlock
- Step 3:** Settings will be saved upon release of 4L key.
- Step 4:** Repeat steps 1 through 3, using the keys listed below, to program **Auxiliary 2 & 3 Functions**.
- A2 = Auxiliary 2
  - A3 = Auxiliary 3

# ★ Troubleshooting

## ★ CPU Indication Panel

The GOLD Series CPU is equipped with an Indication Panel to assist you in troubleshooting the system. Below is a list of the functions that correspond to the numbered LED's on the Indication Panel. Each LED illuminates when the corresponding circuit trigger is functioning. The LEDs will only illuminate when the circuit is latched or held on.



Function	LED #	Function	LED #
AUX3 off	0	NOT USED	F=24; G&C=23*
AUX3 on	1	WIPERS INT & LO	25
AUX2 off	2	WIPERS HI	26
AUX2 on	3	HEADLIGHTS	27
AUX1 off	4	PARKING LIGHTS	28
AUX1 on	5	PARK BRAKE on	29
NOT USED	6	DIMMER	30
NOT USED	7	TIE DOWN on	31
NOT USED	8	TIE DOWN off	32
NOT USED	9	PARK BRAKE off	33
NOT USED	10	HORN	34
NOT USED	11	WASHER	35
LOCKS off	12	NOT USED	36
LOCKS on	13	STARTER	37
RIGHT WINDOW DOWN	14	NOT USED	38
RIGHT WINDOW UP	15	AC CLUTCH	39
LEFT WINDOW DOWN	16	IGNITION on	40
LEFT WINDOW UP	17	NOT USED	41
SHIFT EXTEND	18	NOT USED	42
SHIFT RETRACT	19	NOT USED	43
RIGHT TURN	20	*C = Chrysler Minivan F= Ford Windstar & Econoline G=G-Van or Venture	
LEFT TURN	21		
HAZARD	20,21,22		
NOT USED			



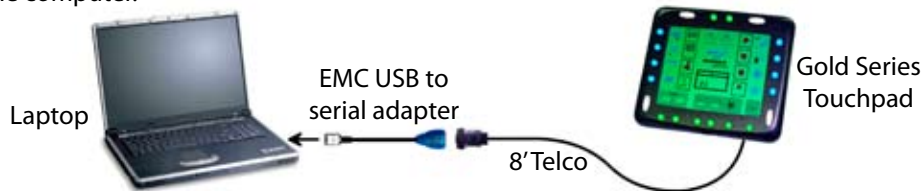
## ★ GOLD Series Serial Port Protocol

**Connecting to the Gold Series:** EMC has provided all the connections required to interface to the serial port on the Gold Series touchpad. There is a 8-cond, RJ-45 telco cable already connected to the Gold Series touchpad and label "GS-Serial". This is standard RS-232 protocol with the following pinout:

Pin	Function
1	Ground
2	Ground
3	Ground
4	TXD
5	RXD
6	Ground
7	Ground
8	Ground

Most modern laptops do not have the standard DB9 COM port so you must use a USB to Serial adapter. EMC has provided one for you but you **MUST** install the software from the disk provided with the adapter before it can be used. Typically the software will utilize either COM 3 or COM 4.

In order to test the serial protocol, hook up the 8-cond cable to the RJ-45 to DB9 adapter and connect the DB9 to the USB to Serial adapter provided. If you are using an older laptop or a desktop PC you can connect the DB9 directly to the COM port on the back of the computer.



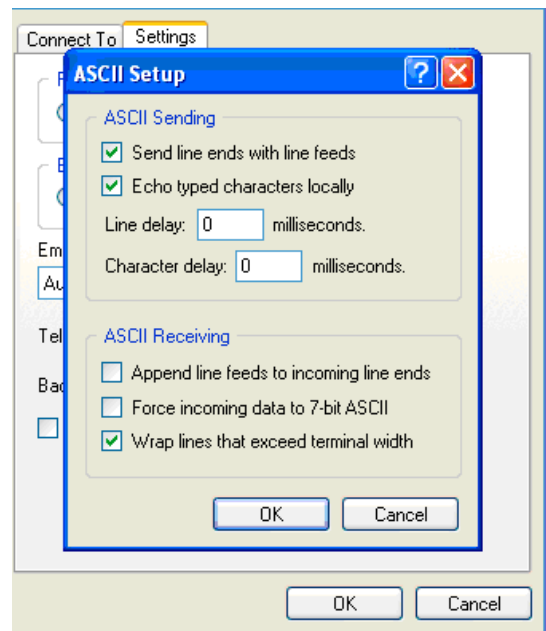
This section describes how to use the serial port interface to access any function of the GOLD Series that can be accessed by the keypad during normal operation. For simplicity the serial port is made to mimic the keyboard. This allows the same interface for all vehicles and leaves all of the vehicle programming intact.

### Serial Port Setup:

- Baud Rate: 19200
- Parity: none
- Data bits: 8
- Stop bits: 1
- Flow control: none
- Buffer Size: 1024

### Microsoft Hyper Terminal Settings:

All the commands can be tested using Hyper Terminal. Once the connection has been set up, it will be helpful to change the properties so the text is echoed on the monitor. From the Hyper Terminal main screen, click on File>Properties>Settings and click on ASCII Setup and set as indicated at right.



All functions are assigned a device number. Each time a key is pressed on the keyboard, accessed through this interface or another input device the specified device advances to the next state. The serial port is accessed each time through the internal software loop which is continuously running and being interrupted by higher priority interrupts. The loop is serviced approximately every 20ms unless the processor is busy. Commands are left in the buffer until the current command is processed. **ONLY ONE** command is serviced each time through the loop. When the system boots up it will send the following string out the serial port:

**EMC Digipad Gold Version v98.0  
Processor initializations complete.**

## ★ Gold Series Serial Port Protocol (cont.)

### Command String

- Overview: The command string is an ASCII character string in the format of "X P1 P2 P3 <return=(0x0d)>" where X is the command and P1-P3 are parameters. Multiple whitespace characters are ignored. Back space & control characters are not supported. Not all parameters are tested for validity but invalid states will be set to a default state, usually off.
- Maximum length: 12 char (before return char)
- Commands:
  - S – Set – Advances device to next state or specified state, device dependant. P2 & P3 are optional parameters that are used for some devices as indicated in the device section.
    - Returns: '\*' if command was accepted, '!' if command is not recognized or the command length is exceeded.
    - Example: "S 20 <return>" advances the front fan to the next speed
  - Q – Queries selected device
    - Returns: "D P1 P2" if command was accepted where P1 is the device requested and P2 is the current state of the device, '!' if command is not recognized or the command length is exceeded.
    - Example: "Q 5 1<return>" returns "D 5 1<return (CR,LF)>" if ignition is ON, or "D 5 0<return (CR,LF)>" if ignition is OFF.
  - W – Wake Up – Used to wake unit that is in powerdown
    - Returns 'A' immediately (does not require a return) if no command string is in progress.
    - Background: When the system has sat for more than 2 minutes without a keypress or serial port input and all of the relays are off it will go into a low power mode of operation. During this time all clocks are stopped so the serial port is also disabled. Once approximately every 0.5 sec a hardware clock on the board will interrupt the CPU and wake it. During this time the serial buffer is sampled to see if a serial character has been received. When the system is in powerdown mode the screen will alternate between a star and the battery icon indicating low power. Each time the screen changes the unit wakes up to sample the input.
    - Usage: The best way to wake the system up if it is unresponsive due to power down is to send 1024 bytes of 'W's and wait for the system to respond with 'A'. This will invalidate any partial command strings and with the baud rate of 19200 it will insure continuous data for longer than the 0.5+ sec sampling time but it will not overflow receive buffer. When a 'W' is at the start of a command it will not start a new command string so the serial port can be polled until the system stops sending 'A's. This feature can be tested using Hyper Terminal's send text file.

### Devices:

#### Headlights:

1

- Function: Off --> Parking Lights --> Headlights --> Off
- States: Off – 0, Parking – 1, Headlights – 2
- Parameters: P1 – Device
- Notes: Other programming options can change headlight state in the background such as on with wipers or on with ignition.

#### Wipers:

2

- Function: Off --> Intermittent --> Low --> High --> Off
- States: Off – 0, Intermittent – 1, Low – 2 High – 3
- Parameters: P1 – Device
- Notes:

#### Ignition:

5

- Function: Determined by P2
- States: Off – 0, On – 1
- Parameters: P1 – Device, P2 - State
- Notes: Ensure shifter is in park

#### Parking Brake:

6

- Function: Determined by P2
- States: Off – 0, Apply Brake – 1, Release Brake – 2
- Parameters: P1 – Device, P2 – State, P3 – Time in 1/10 sec.
- Notes: Use extreme caution – Brake can be applied while moving. If time is set to 0, function will stay on until canceled. Sending a new state will cancel a previous state.

## ★ Gold Series Serial Port Protocol (cont.)

<b>Auxiliary 1</b>	<b>8</b>
<b>Auxiliary 3</b>	<b>11</b>
<b>Auxiliary 2</b>	<b>12</b>
• Function:	Determined by P2
• States:	Off – 0, Relay 1 On, Relay 2 Off– 1, Relay 2 On, Relay 1 Off – 2
• Parameters:	P1 – Device, P2 – State, P3 – Unused
• Notes:	Can be used in polarity reversing applications or as 4 individual channels for on/off control.
<b>Left Turn Signal:</b>	<b>9</b>
<b>Right Turn Signal:</b>	<b>10</b>
• Function:	Determined by P2
• States:	Off – 0, Left Turn – 1, Right Turn – 2, Hazards – 3
• Parameters:	P1 – Device, P2 – State, P3 – Time in seconds
• Notes:	If time is set to 0, function will stay on until canceled. Sending a new state will cancel a previous state.
<b>Query Shift Pos:</b>	<b>13</b>
<b>Shift To P:</b>	<b>13</b>
<b>Shift To R:</b>	<b>14</b>
<b>Shift To N:</b>	<b>15</b>
<b>Shift To D:</b>	<b>16</b>
<b>Shift To D2:</b>	<b>17</b>
• Function:	Shift to designated position
• States:	Unknown (between gears) – 0, P – 1, R – 2, N – 4, D – 8, D2 – 16
• Parameters:	P1 – Device
• Notes:	Brake (Brakelight) must be active while actuator is moving. If shifter starts to a position and the brakelight is removed the actuator will stop. Shift position must be queried using device 13. Each position is represented by a bit in the returned state as shown above. It is possible (although not usually desirable) to have multiple shift positions programmed to the same location. For example if D & D2 were both programmed to the same state a query to location 13 would return 24 (Both bits set). Device will return a "*" indicating that the command was accepted even if the shift did not complete.
<b>Brakelight Status:</b>	<b>14 (Query Only)</b>
• Function:	Returns the status of the brake light.
• States:	Brake light is ON – 0, Brake Light is OFF – 1
• Parameters:	P1 – Device
• Notes:	Reverse Logic
<b>Starter:</b>	<b>26 (Query "Engine Running" Only)</b>
• Function:	Set Not Implemented – Use remote start
• States:	Engine Off – 0, Engine Running – 1
• Parameters:	P1 – Device
• Notes:	Use the remote start device to start the car, this allows the cranking go be monitored during the start. When this device is queried it returns a 1 if coil pulses are sensed (more than 1 pulse every 2 seconds) and a 0 if they are not.
<b>Starter:</b>	<b>28</b>
• Function:	Perform Start Sequence
• States:	Always returns 0
• Parameters:	P1 – Device
• Notes:	Performs all required functions to start the car. Car MUST be in park or command will return! Brake light must be off or command will return ! Brake light must remain off until the ignition is turned on ( <b>Command: S 5 1</b> ). The remote start will time off in 15 min unless the ignition is turned on. The key icon will have the "ON" symbol once this is done and a query to device 5 will return a 1. This command will not return the "*" confirmation until the start sequence is complete. The starter will try 3 times increasing the crank time each time. A "*" will be returned even if the vehicle does not start so device 26 should be polled to determine if engine is running.

## ★ Auxiliary Components

### AMS (AEVIT Mounting System)

The AEVIT Mounting System (AMS) was designed to house the various AEVIT components in one central location. The AEVIT components that will mount into the AMS are shown below in exploded and assembled views below.



- A- AEVIT Drive Module(s)
- B- AEVIT Vehicle Interface Module
- C- Gold Series CPU
- D- Power Kit
- E- AUXBAT01 Controller
- F- Datalogger

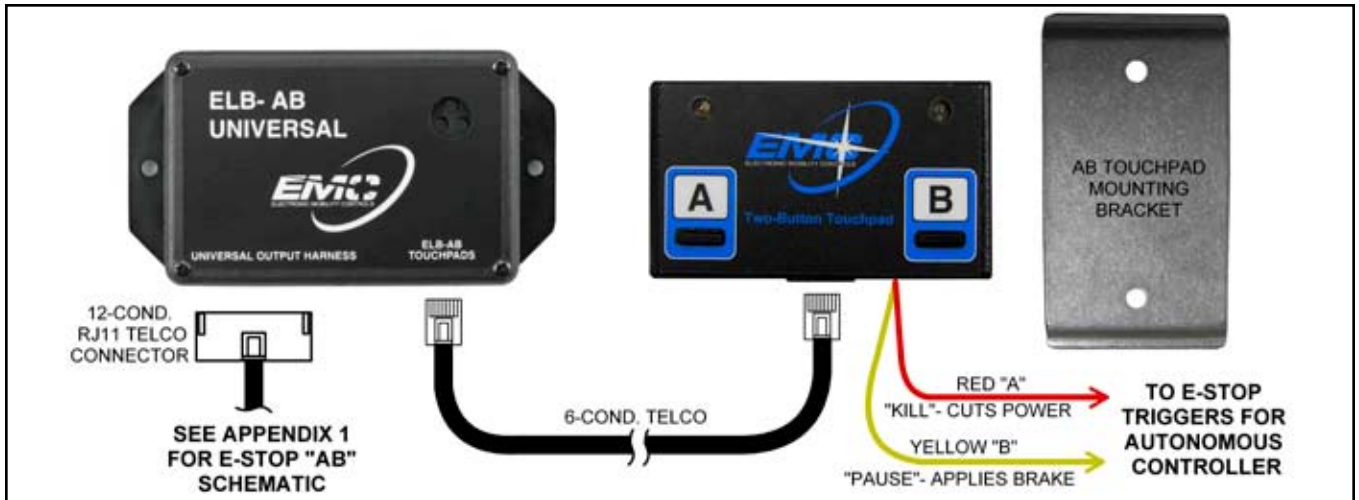


To remove the AMS cover, simply remove the (6) screws as indicated above

## Emergency Stop Module

ASC has installed an Emergency Stop Module and AB touchpad that will allow the vehicle ignition to be shut off and the AEVIT Gas/Brake servomotor to go to the brake position. The **RED** and **YELLOW** wires exiting the AB touchpad provide external **DIO** triggers for the vehicle shut-off and application of brake by the AEVIT Gas/Brake servomotor.

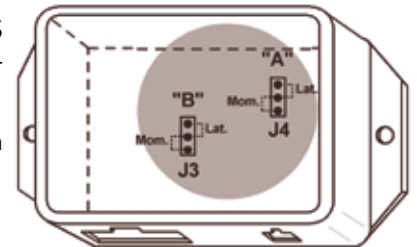
**"KILL" -Vehicle Ignition Shut Off** - Each time the **RED** wire is connected to CHASSIS GROUND with a momentary contact closure (function A), the power is shut off to the GOLD Series system and the vehicle engine will turn off. The GOLD Series will come up in "Reset" mode when the **RED** wire is connected to ground again.



**\* WARNING:**  
**IF THE GROUND WIRES FROM THE INPUT CABLES ARE NOT ISOLATED, THE STEERING SERVOMOTOR CAN ROTATE WHEN THE AEVIT G/B TRIGGER FUNCTION OF THE EMERGENCY STOP MODULE IS ACTIVATED.**

**"PAUSE" - Emergency Stop** - Each time the **YELLOW** wire is connected to CHASSIS GROUND with a momentary contact closure (function B), the AEVIT Gas/Brake servomotor rotates to the brake position and applies the brake.

**NOTE:** The Emergency Stop Module is programmed for latching operation but can be changed to momentary by removing the cover and switching the jumpers.



## \* Auxiliary Components (cont.)

### AUXBAT

The AUXBAT01-12 Auxiliary Battery System provides backup operating power to all EMC primary driving controls in the event of total factory battery and alternator failure. All EMC primary driving controls require the AUXBAT01-12 or AUXBAT02-12 for backup power.

The AUXBAT backup battery system was designed with a focus on both reliability and safety. The AUXBAT systems offer the redundancy of dual output circuits, (which we call BATT1 & BATT2) and dual sensing circuits to monitor the power levels of the main vehicle and back-up batteries. The AUXBAT charging circuit for the Auxiliary Battery Pack is completely isolated from the vehicle's charging circuits, thus eliminating the possibility of damage to the battery pack due to OEM equipment failures. When the vehicle's engine is running, the AUXBAT power supply continually monitors and charges the AUXBAT Battery Pack, maintaining the internal backup battery at its peak performance level.



## ★ Auxiliary Components (cont.)

The AUXBAT system provides visual and audible warnings when either the main or backup battery voltage is below a normal and safe operating level. When the system is operating at a normal level, the output on BATT1 & BATT2 is equal to main vehicle battery. If the AUXBAT senses that the main vehicle battery falls below a normal level, the system instantly and automatically switches the output of BATT2 from the main vehicle battery to the AUXBAT Battery Pack. Now the EMC primary driving controls have two separate inputs of power at their disposal, main vehicle battery and the Auxiliary Battery Pack. When this occurs, the indicator on the dash will flash and the audible alarms will sound on the AUXBAT, and possibly the EMC primary driving controls, to signal to the operator that the vehicle's battery and charging circuits need to be checked. To silence the AUXBAT alarms, simply turn the vehicle's ignition off, check the complete system for proper voltage levels, and repair as needed. If the AUXBAT alarm sounds, the vehicle is to be maneuvered to a safe stopping point and the EMC certified dealer contacted for assistance. Do not attempt to operate the vehicle with any EMC alarm sounding!

### Initial Charging

The AUXBAT01-12 system contains electronic charging and sensing circuits that automatically activate whenever the vehicle engine and charging circuits are running. This allows the internal Battery Pack to be maintained at peak voltage and readiness should it ever be called upon for backup power. The normal operational mode of the system is when the S1 switch is in the RUN position.

In order to activate the constant voltage, regulated, internal charging circuits of the AUXBAT system without turning on the ignition of the vehicle, the S1 switch must be moved to the CHARGE position. The switch is recessed, as shown at right, into the AUXBAT chassis. Simply use a small electronic screwdriver to gently slide the switch to the CHARGE position.



### Charging the Auxiliary Battery

**WARNING:**  
**DO NOT TURN ON THE IGNITION OR START THE VEHICLE DURING CHARGING!**

The AUXBAT01-12 system was shipped to you with the battery pack in a nominally discharged state. This battery pack must be fully charged prior to testing or placing the vehicle into operation. After all wiring connections are complete, slide the S1 switch to the CHARGE position. The battery pack will charge off the internal charging circuits utilizing the main vehicle battery as its power source. Observe the voltage scale on the AUXBAT Power Supply Module. The main vehicle battery voltage will most likely drop below 13V DC, so you will need to connect a battery charger to the main battery with a trickle charge of no more than a 2AMP peak. Doing this before the charging begins will ensure that the unit will be charged. Charging of the AUXBAT Battery Pack will require 6-8 hours of charge time. You will be able to monitor the AUXBAT Battery Pack voltage by depressing and holding the PUSH TO TEST switch.

When charged, the AUXBAT Battery Pack voltage should read 13.0 - 13.5 VDC. If an external battery charger was used, remove it, and slide the S1 switch back to the RUN position using a small electronic screwdriver. The auxiliary battery pack is now ready to test.

### Testing Procedures

**Before testing or diagnosing any problems with the AUXBAT02-12 System, always completely charge the internal battery cell as outlined and explained in Section 4. Refer to the diagrams in sections 7 and follow the steps below in the order they appear. Do Not skip any steps or jump ahead. This is very important!**

## Testing Procedures (cont.)

**STEP 1:** With the ignition of the vehicle OFF, slide the charge switch on the Auxiliary Power Supply Module to the CHARGE position. Do not turn on the ignition or start the vehicle. The dash mounted LED will flash and the voltage indicator on the Auxiliary Power Supply Module will display the main battery voltage. It should indicate between 11.5 - 13VDC.

- \* If the main battery voltage is less than 11.5 V DC, charge the main battery before proceeding.
- \* If the main battery voltage does not indicate any voltage, check the S1 switch for complete engagement in the CHARGE position. If the S1 switch is OK, check the fusible link T3 for continuity to main battery at the connection and by probing into the J3 connector.
- \* If all the above tests are OK, and the indicator still does not indicate any voltage, contact EMC Service.

**STEP 2:** Push and hold the TEST button. The voltage indicator on the power supply module will display the auxiliary battery voltage. It should indicate between 13.0 - 13.5VDC.

- \* If the auxiliary battery voltage is less than 13.0 VDC, charge before proceeding.
- \* If the auxiliary battery voltage does not indicate any voltage, check the S1 switch for complete engagement in the CHARGE position. If the S1 switch is OK, check the J2 for continuity to GROUND. If OK, check circuit breaker, CB 1 on battery pack and make sure it is in the SET position. If OK, check the auxiliary battery voltage at the connection by probing both of the J1 connectors. You should read internal battery voltage on Both WHITE wires.
- \* If all the above tests are OK, and the indicator still does not indicate any voltage, contact EMC Service.

**STEP 3:** Slide the charge switch on the Auxiliary Power Supply Module to the RUN position. The voltage indicator and dash mounted LED should shut off.

**STEP 4:** Turn on the ignition and start the vehicle. The alarm will sound and the annunciator flash for a few seconds and then shut off. This is normal. The voltage indicator on the power supply module will display the main battery voltage. It should indicate between 12.5 - 14.5V DC. This will indicate that the alternator is charging! Make certain that the factory alternator light on the dash is not on.

- \* If the Main Battery voltage is less than 12.5V DC, check alternator circuit before proceeding.
- \* If there is no indication of Main Battery voltage, check the S1 switch for complete engagement in the "RUN" position.
- \* If the Alternator light is on, check all wire connections to the T1 Overvoltage relay. The BLUE wire from the J3 harness supplies 12V DC to the RED wire of the relay coil when the engine is running and the alternator voltage is less than 18V DC. The WHITE wire is the ground for the relay coil. Therefore, when the relay activates, the alternator "Field" wire is reconnected to the alternator. If the relay does not activate, the alternator light on the dash will be on indicating the alternator is not charging.

**STEP 5:** Push and hold the TEST button. The voltage indicator on the power supply module will display the auxiliary battery voltage which should indicate between 13.0 - 14V dc. The voltage indicator may drop approximately 0.5V DC, or one LED bar, and possibly turn on the alarm. This is normal. When you release the TEST button, the alarm will turn off within a few seconds. This test isolates the auxiliary battery from the charging circuits of AUXBAT and subjects the battery pack module to an internal load test.

**STEP 6:** With the engine running, slide the charge switch on the Auxiliary Power Supply Module to the CHARGE position. Observe that the alarm sounds and the annunciator flashes. Now, slide the charge switch on the Auxiliary Power Supply Module back to the RUN position and the alarms will stop.

**STEP 7:** With the engine running, pull the 50 Amp circuit breaker on the battery pack. Observe that the alarm will sound and the annunciator will flash. Push down to SET the circuit breaker and the alarms and the annunciator will stop.

**STEP 8:** With the engine running, unplug the J3 harness connector. By doing this you are removing main vehicle battery from the EMC Primary Driving Controls. Observe the following. First, the AUXBAT alarms are sounding and the annunciator is flashing. Second, the AEVIT Information Center will display that a Low Battery error. Third, when the TEST button on the AUXBAT Power Supply Module is depressed, auxiliary battery voltage will be displayed. Fourth, if the "overvoltage protection relay" was installed, the OEM charging light should be illuminated. Do not leave the J3 connector unplugged for longer than about a minute. If you do, the auxiliary battery may require additional charging before continuing.

## Testing Procedures (cont.)

**STEP 9:** Reconnect the J3 harness and the AUXBAT alarms should cease after approximately the same time you had the harness disconnected. The delay in AUXBAT alarms turning off is because the internal charging circuits are restoring the auxiliary battery to safe operating levels before turning off the alarms. The AEVIT alarm will continue to sound. You will need to depress the SELECT key to clear the error from the screen and re-boot the system.

**STEP 10:** Once the testing is complete it will be necessary to seal the 3 connectors exiting the AUXBAT power supply with the supplied 1" heatshrink. Cut the heatshrink into 3 pieces at least 3 1/2" in length. With the vehicle completely shut down, disconnect the J1, J3 & J4 harness connectors. Inspect each wire and pin to ensure that they are securely inserted in the connector housing. Slide one piece of heatshrink over one end of each connection, reconnect and heatshrink to a snug fit. This will provide an extra level of safety against these connections vibrating loose. If at anytime during this test procedure you encounter any discrepancy of operation, stop and contact the EMC Service Department for assistance.

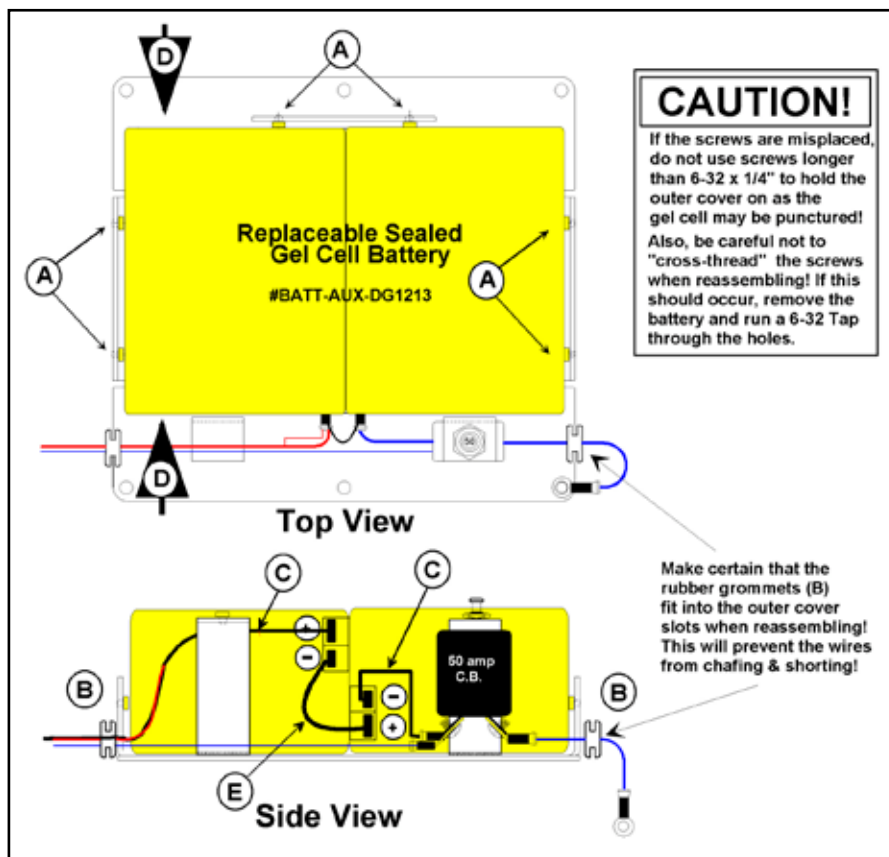
## Service Requirements

The AUXBAT Battery Pack Module has a 12Vdc gel cell battery pack. Based on the severity of use and number of discharge cycles, the internal gel cell battery will likely have a life expectancy of approximately 24 months. If replacement is required as determined by EMC Service, follow the instructions below for replacing the gel cell battery. This is the only service that can be performed to this system outside of the EMC Service Center. Only EMC Certified Dealers may replace the gel cell battery.

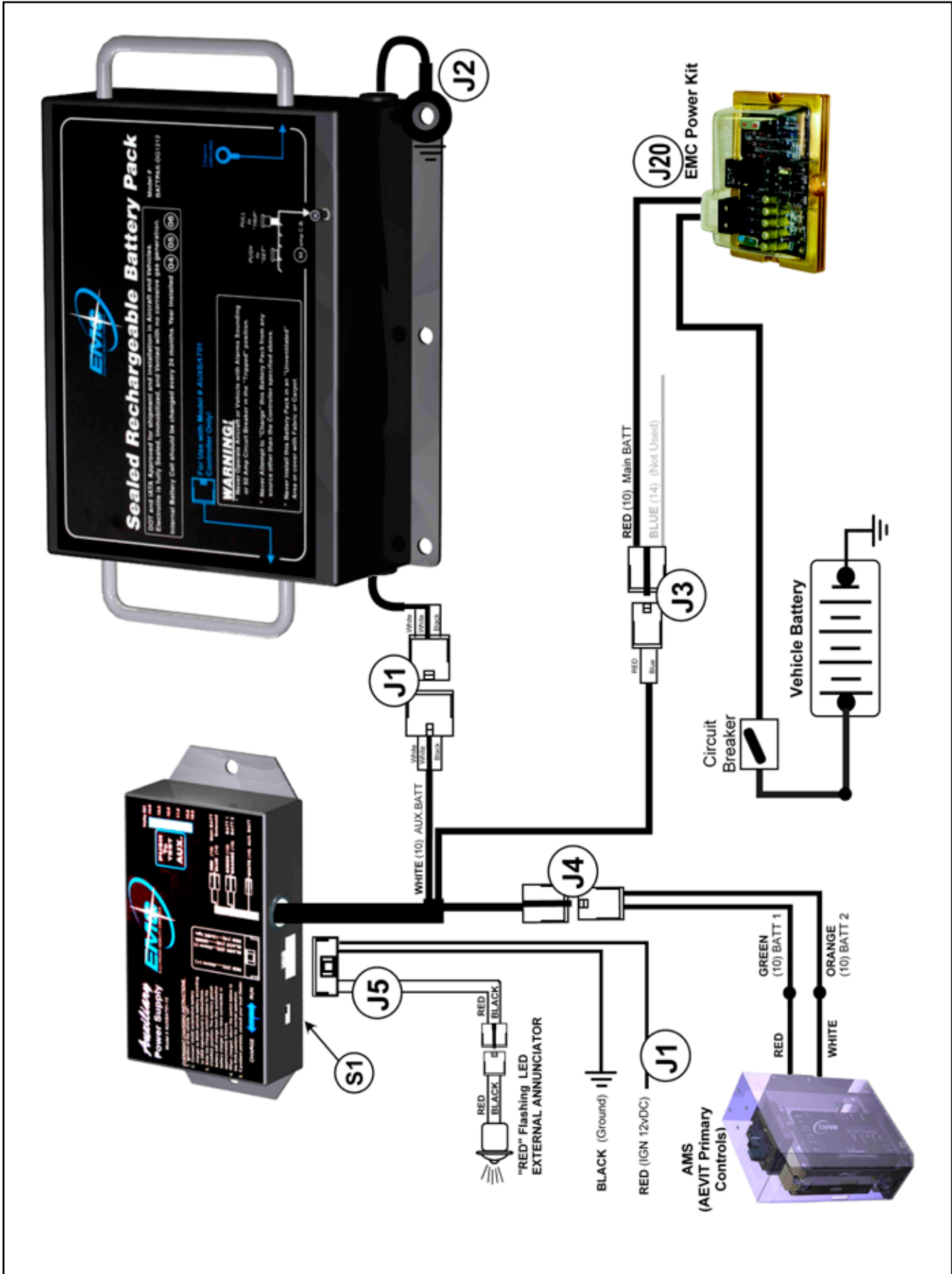
Remove the AUXBAT battery pack from the vehicle and place on a clean flat workspace. Remove the six, 6-32 x 1/4" screws and lock-washers (A) from the sides of the outside aluminum cover, and then carefully lift the cover off the lower chassis. The two rubber grommets (B) will slide off the bottom edge of the cover as it is removed. Carefully disconnect the two main wires (C) with spade terminals from the battery pack. Notice that the positive post is a 1/4" wide terminal and the negative post is a 3/16" wide terminal. Your old battery may be a single cell battery that will be replaced with two smaller batteries with a higher current rating.

Grasp the old gel cell(s) with your thumb and index finger at two side points (D) and lift the gel cell(s) out of the lower case. Insert the two new gel cells in the reverse procedure being careful to fully insert the spade terminals on the post of the battery as shown in the side view below. The two replacement cells will come with a small jumper (E) that must be inserted as shown below to connect the two batteries in series. Reinstall the cover with the six screws and washers. If the screws are misplaced do not use screws longer than 6-32 x 1/4" to hold the outer cover on, as the gel cell may be punctured!

Before the AUXBAT can be put back into service, follow the tests listed in both the INITIAL CHARGING and TESTING PROCEDURES sections of this manual.



**System Schematic**



## ★ Auxiliary Components (cont.)

### Park Brake

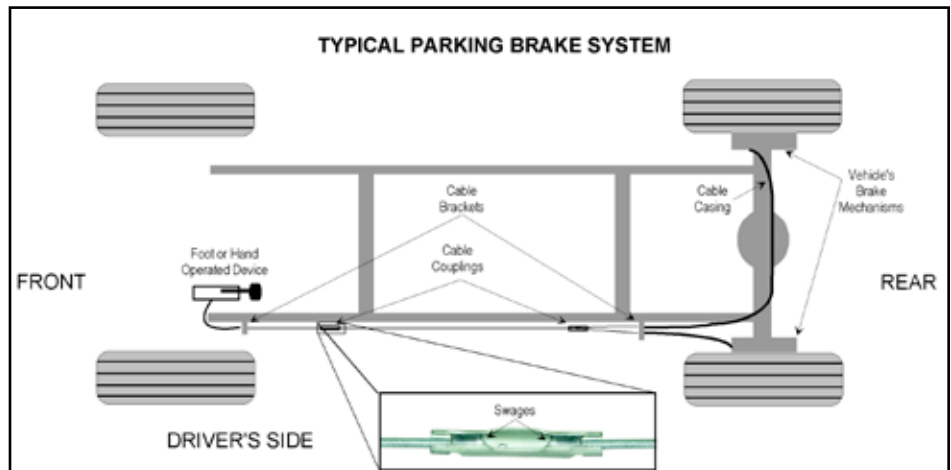
The EMC Electric Park Brake is designed to replace the factory manual park brake lever and to act as a safety feature for AEVIT Gas & Brake systems. For this application, the unit has been mounted on the floor of the vehicle under the passenger's seat.

### Factory Park Brake Systems

All factory park brake systems operate in the same manner. Basically, they consist of three components:

- \* **The brake mechanism itself contained in the rear wheel assembly of the vehicle**
- \* **The cabling and brackets linking the brake mechanism to the lever**
- \* **The foot or hand activation lever**

Typically there is one park brake cable exiting each rear wheel that engages the factory park brake mechanism. Each cable is routed to a single junction bracket. From the junction bracket, a single cable routes to the factory park brake lever. For the purpose of this installation, we are not concerned with the brake mechanism. The EMC Electric Park Brake acts only as an interface to the factory braking system; it does not alter it in any way. The only portion of the factory park brake system of concern is the cabling and support brackets.



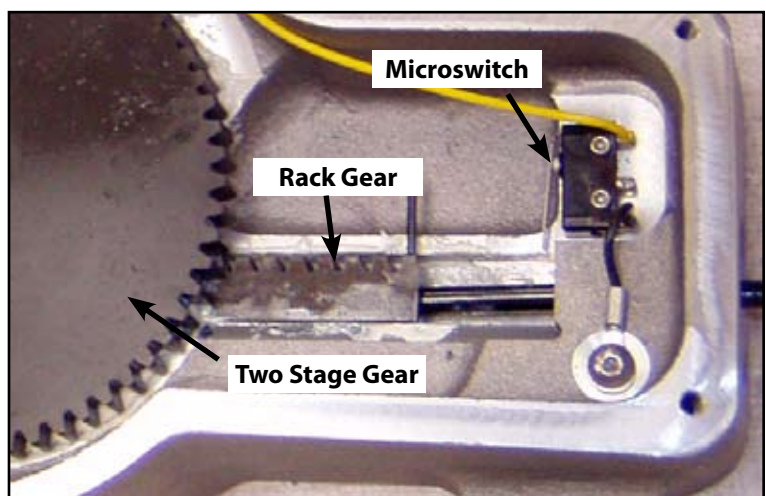
## The Electric Park Brake Assembly & How It Works

### Activation: How it Works

Internally, the Electric Park Brake mechanism transmits the force of the motor with the use of a Rack Assembly driven by a two-stage gear. This gear is used to create the mechanical advantage necessary to produce a pull force sufficient to apply the OEM rear brakes. Attached to the Rack Assembly is a cable that connects directly to the OEM park brake cable.

### Dash Indicator Light

To further simulate the OEM park brake function, a small limit switch is incorporated into the design so that the OEM indicator light remains operational. This switch is precisely adjusted at the EMC factory so that once the Electric Park Brake is initiated, the indicator light will illuminate. The indicator light will remain illuminated until the park brake is completely released.





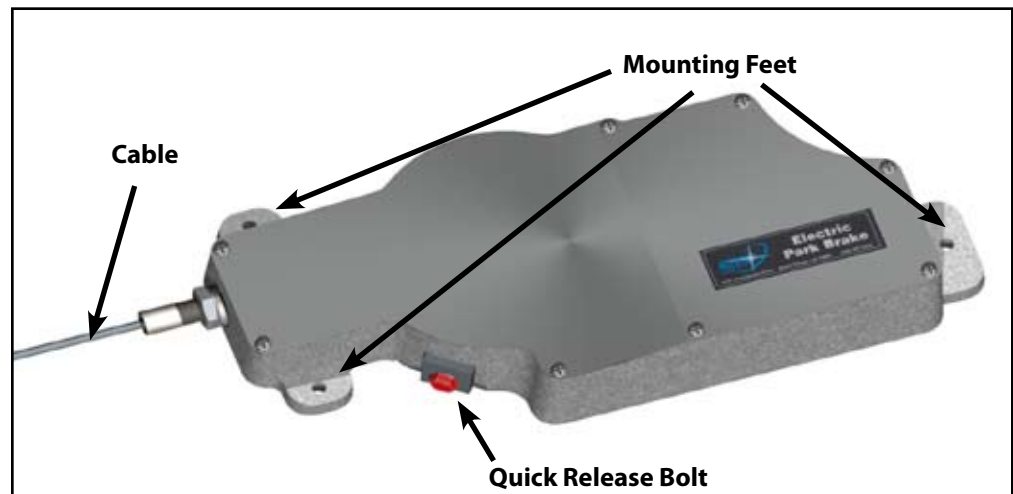
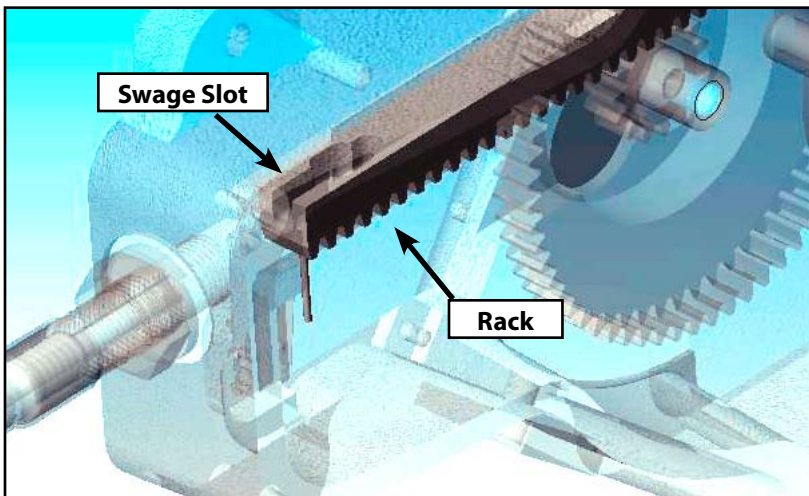
## ★ Auxiliary Components (cont.)

### Park Brake (cont.)

#### Mechanical Release

In the unlikely event that the Electric Park Brake motor fails and latches on and cannot be released by the activation switch, a mechanical quick release feature is available. There is a red bolt located on the side of the housing that can be loosened to release the parking brake.

The Electric Park Brake is a universal device and can be activated in a variety of ways ranging from a basic toggle switch to an AEVIT Joystick.



#### Electrical Connections for All Vehicles

The Electric Park Brake uses a DPDT (double pole/double throw) or polarity reversing type motor. There are three wires that exit the rear of the EMC Electric Park Brake. The BROWN and GREEN wires are the power wires for the motor, and the YELLOW wire is used to supply ground to the factory park brake indicator light when the Electric Park Brake is activated.

When you removed the factory park brake lever, there was a single wire connector that should have been attached to the lever. The Electric Park Brake's YELLOW wire is to be connected to this wire. To test to make sure you have the correct factory wire, connect it to ground and the factory park brake icon should illuminate with the ignition on.

**WARNING:**  
The YELLOW wire in the Park Brake Harness is used to trigger the OEM dash illumination circuit. DO NOT CONNECT IT TO 12Vdc OR CHASSIS GROUND!

## ★ Auxiliary Components (cont.)

### Park Brake (cont.)

#### Operation

The Electric Park Brake operates from the Gold Series touchpad by pressing the 2L key with column #2 active. The engagement of the Park Brake will depend on the state of the vehicle's ignition.

**Ignition OFF** – The console will send power to the Park Brake for (5) seconds to either set or release it by pressing and releasing the 2L key. If the brake was previously set it will release it.

**Ignition ON** – To set the Park Brake, press and hold the 2L for (2) second then release the button. The console will send power to the Park Brake for (5) seconds to set it. To release it, simply press and release the 2L button. This is done to conform with FMVSS #135 and so the Park Brake will not set inadvertently if someone bumps the button.

#### Service Requirements

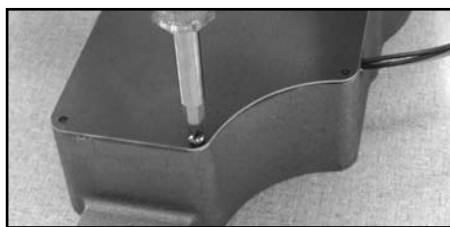
The Electric Park Brake requires routine service. The unit should be serviced after the first 6 months or 6,000 miles, and every 12 months or 12,000 miles there after. Service requirements include the following:

1. Check all of the connectors to ensure they are securely fastened.
2. Check all functions to ensure that they are operating properly according to the Operation section appropriate for the Electric Park Brake application.
3. If an AEVIT Gas & Brake System is installed, ensure that the Electric Park Brake is operating properly from the AEVIT controller. Refer to the AEVIT Installation manual for further details.
4. Ensure the Electric Park Brake is securely mounted.
5. Inspect the wire harness to ensure that it is properly routed and is not damaged in any way. Also check the routing of the OEM park brake cable to ensure that it can not be damaged by the front tire, or is hanging below the frame.
6. Set and release the Electric Park Brake several times. Remember, the actuator has the capability to thermal limit. If the unit ceases to operate, simply release the switch and let the unit cool for approximately one minute.
7. Check the tension on the cable. Refer to the cable installation section for instructions on installing the OEM cable.
8. Check that the OEM park brake indicator light is functioning properly.
9. With the Electric Park Brake set, ensure that the vehicle remains stationary in accordance with FMVSS 571.105, S5.2.1.
10. Remove the cover of the housing and inspect the inside of the unit for signs of damage.

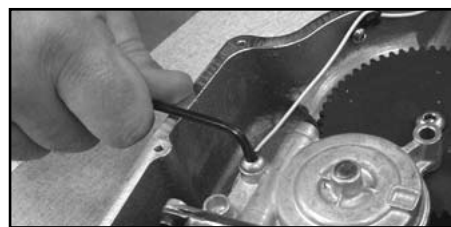
#### Cable Replacement



**Step 1:** Remove the park brake assembly from the vehicle. Use a 1/2" socket and ratchet to loosen the red quick release bolt.



**Step 2:** Remove the philips head screws holding the cover in place. Remove the cover.



**Step 3:** Remove the two mounting screws holding the motor in place.



**Step 4:** Remove the mounting screw and the gear.



**Step 5:** Remove the rack from the chassis, then remove the old cable. Thread the new cable through the chassis and place the swage into the rack.

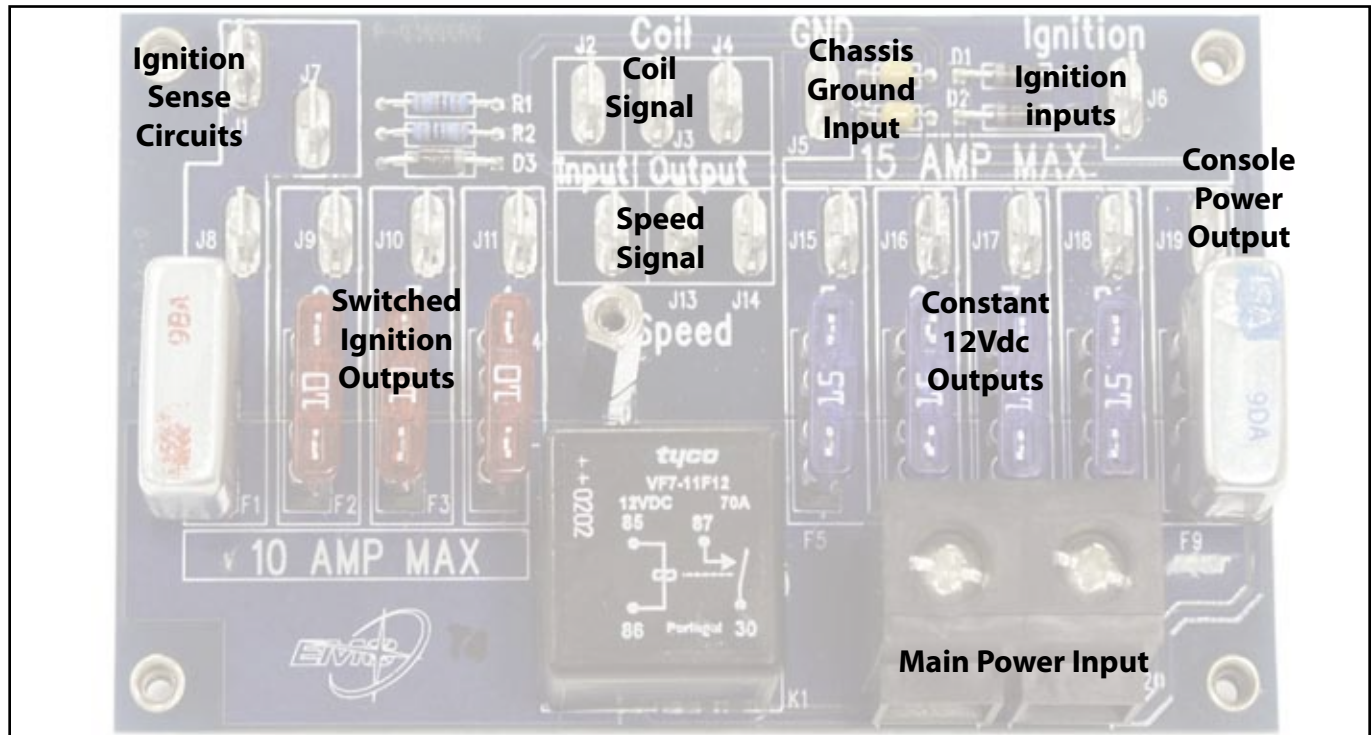
**Step 6:** Re-assemble the Electric Park Brake assembly by reversing the previous 5 steps..

## ★ Auxiliary Components (cont.)

### Power Kit

The EMC Power Kit is designed to simplify the adaptive equipment conversion process by providing a central power distribution point inside of the vehicle. The kit contains all of the necessary hardware and circuitry to safely transfer power from the battery to multiple, fused 12Vdc constant hot and 12Vdc switched ignition outputs. This is particularly useful to the installer when complex electronic driving controls are utilized.

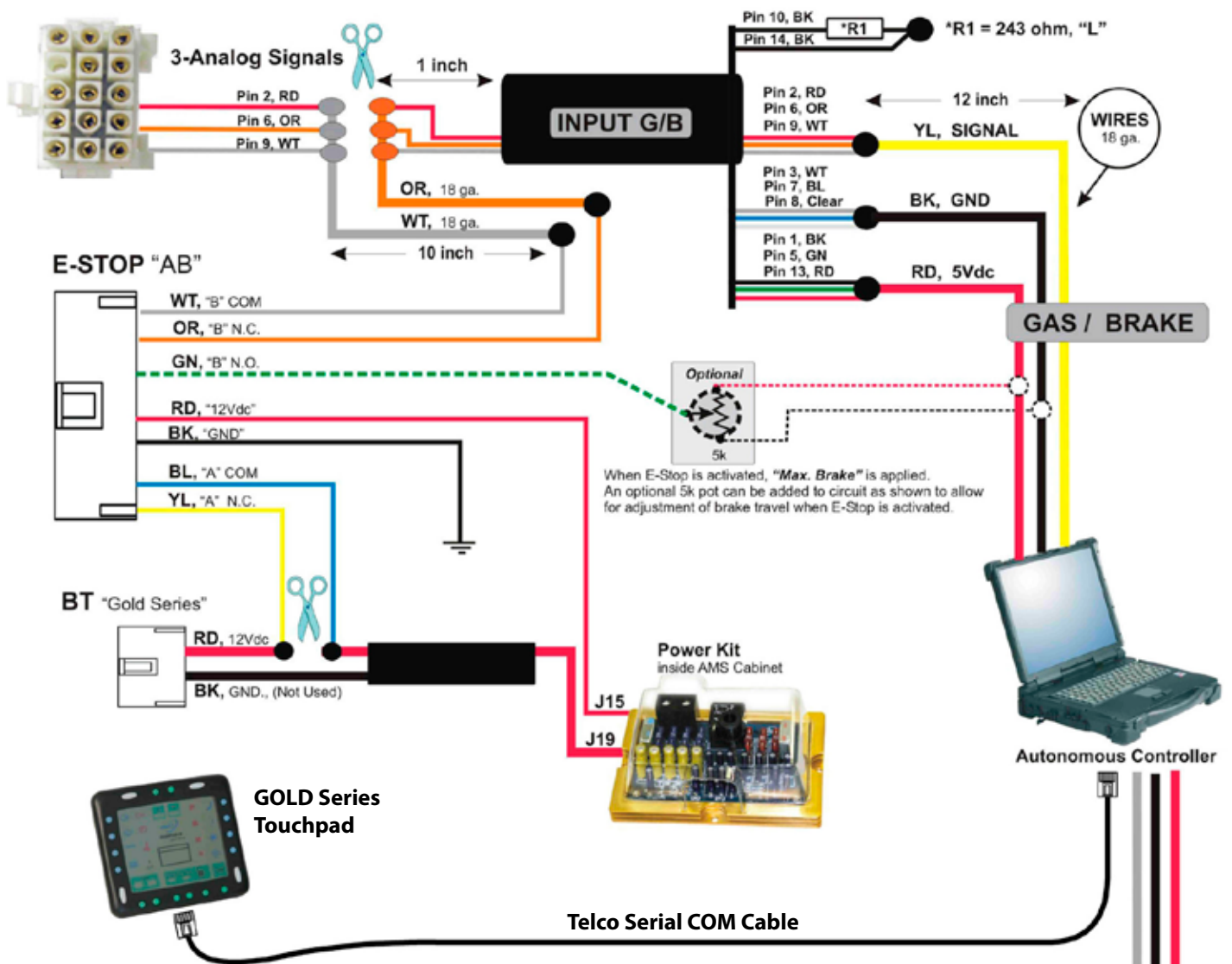
The Power Kit consists of two main components, the circuit board assembly and the circuit breaker assembly. The 100-amp circuit breaker protects the circuit board of the Power Kit from electrical surges. This component is designed to mount directly to the negative battery post. Power is connected from the positive battery post to one terminal of the circuit breaker via a 4 AWG wire.



Function	Location	AWG	Connection
Ignition Sense	J1	14-16	AUXBAT, Red wire in the J5 harness
	J7	14-16	AEVIT, Brown wire in the Drive Module Harness
	J8	14-16	
Coil Signal	J2	14-16	COIL INPUT
	J3	14-16	COIL OUTPUT
	J4	14-16	COIL OUTPUT
Speed Signal	J12	14-16	SPEED INPUT
	J13	14-16	SPEED OUTPUT
	J14	14-16	SPEED OUTPUT
Chassis Ground	J5	14-16	Ground point that can support a 5A load
Ignition Input	J6	14-16	Switched Ignition
Console Power Output	J19	10-12	Gold Series Power
Constant 12Vdc Outputs	J15-J18	10-12	Equipment requiring continuous power and a load of no more than 15A
Switched Ignition Outputs	J9-J11	14-16	Equipment requiring switched ignition input and a load of no more than 10A
Main Power Input	J20(R)	4	Wire from circuit breaker assembly, "AUX"
	J20(L)	10	AUXBAT, Red wire in the J3 harness (fusible link not needed)

# ★ APPENDIX 1

## Autonomous Gas/Brake Input Cable Schematic



## Autonomous Steering Input Cable Schematic

