

MEDALLION

INSTRUMENTATION

SERVICE MANUAL

**For the Spartan Motors RV Chassis
using the MMDC-A system**

5/05/05

Rev. A

SYSTEM OPERATION	4
GAUGES	4
ANNUNCIATOR.....	4
INFORMATION CENTER (INFO CENTER).....	5
INSTRUMENTATION POWER ON DIAGNOSTICS	5
ANNUNCIATOR	5
GAUGES.....	5
INFO CENTER.....	5
FUNCTION OVERVIEW	6
FUEL SENDER INPUT	6
CHANGING FROM ENGLISH TO METRIC	6
WAIT TO START	7
LOW COOLANT	7
ABS	7
ODOMETER OPERATION.....	7
TRIP RESET SWITCH.....	7
PARK BRAKE.....	7
RIGHT/LEFT TURN INDICATOR	8
HIGH BEAM INDICATOR.....	8
LOW AIR INDICATOR	8
DATA BUS INPUTS	8
ENG ECU NO DATA	8
TRANS ECU NO DATA.....	8
ENGINE PROTECT	8
CHECK ENGINE	8
STOP ENGINE	8
CHECK TRANS	8
BUZZER FUNCTIONS:.....	9
CHECK INFO CENTER ICON	9
TROUBLE SHOOTING GUIDE.....	10
GAUGES.....	10
ANNUNCIATOR	13
INFO CENTER	14

APPENDIX A.....	15
ANNUNCIATOR	15
ICONS.....	15
ANNUNCIATOR INPUTS/OUTPUTS	16
APPENDIX B.....	17
MMDC INPUTS	17
OUTPUTS	18
MMDC INSTALLATION GUIDELINES	19
APPENDIX C.....	20
INFO CENTER.....	20
<i>Pin out.....</i>	20
POWER UP SEQUENCE	21
SCREENS.....	21
<i>Trip Center.....</i>	21
<i>Trip Computer.....</i>	21
<i>Engine</i>	21
<i>Service.....</i>	21
APPENDIX D – DATA SOURCES	23
APPENDIX E – MATING CONNECTOR PARTS	24
APPENDIX F – INFO CENTER SCREEN MAP	25

Medallion Instrumentation for Spartan Custom Chassis

System Operation

All Medallion gauges operate by receiving digital information from an MMDC. The MMDC is the heart of the system. It is the Multiple Module Data Computer (MMDC), a small computer in a rugged package, a microprocessor-based device that extracts information from the SAE J1939/71 data bus and sensor signals (analog, digital or frequency) on the vehicle and converts them to digital information for the gauges to read. The MMDC is mounted in the front of the coach either under the dash or in the front right roadside compartment, but not more than fifteen feet of the instrumentation.

GAUGES

Each of the gauges is inherently a digital device, providing high accuracy with zero hysteresis. The use of stepper motor technology eliminates the damping fluid associated with “air core” gauges, while increasing the torque available to the needle by a factor of ten. The design variables for gauge personality are all in software. With chip encoding in our manufacturing cell, every gauge uses the same electronics hardware. The only difference is in the graphics and software. This provides unlimited flexibility for Spartan Custom Chassis Corporation.

Only four wires are needed to operate a full set of gauges: one for regulated DC voltage to power the electronics package, one for digital data bus signal, one for system ground and one for lighting. The connectors for the gauges can be attached in any order as each gauge decodes its own signal from the gauge data bus.

ANNUNCIATOR

The Light bar (Annunciator) is a microprocessor-based display capable of illuminating 24 individual ISO symbols. The Annunciator is controlled by a dedicated Digital Instrument Bus or DIB (this data bus is not the same as the gauge data bus) from the MMDC. The light bar has two outputs and three direct-wired inputs. The outputs are both active low (or called “sinking”), meaning that when the output is active it is basically a short to ground. On the Spartan chassis the output is not used. The Three direct-wired inputs are for the Turn signals and high beam indicators. The Annunciator is located on the dash panel. It contains the Icons or warning indicators that light up telling status of a function on the chassis. The attached troubleshooting guide will go through troubleshooting the system, including the Annunciator, to determine if there is a problem. The Annunciator has a built in diagnostic function, which will tell you if the Annunciator is receiving data from the MMDC. If data is lost from the MMDC for more than 45 seconds then the icon lights will begin a chase pattern warning that the Annunciator isn’t receiving data. The high beam indicator will work at any time the high beam lights are on even when the key is off. The hazard flashers (left and right turn signal) will flash when the hazards are on even with the key off. This is done with direct-wired icons, meaning that whenever 12 volts is applied to the inputs the icons will light up (as long as there is a good ground).

The Annunciator icons are controlled by the MMDC via the DIB data bus (wires 339D+/-). The two Annunciator outputs are also controlled by the MMDC, turning on and off when commanded. The Annunciator has only one connector, a 12 pin Tyco®

INFORMATION CENTER (INFO CENTER)

The Info Center is a microprocessor-based graphical display that is used to display vehicle operation, warnings, actions and trip functions. The Info Center is controlled by the same MMDC dedicated DIB data bus. The Info Center can also be used as a diagnostic tool for troubleshooting the instrumentation system and vehicle. See the Info Center operation, appendix C, for more details.

Instrumentation Power on Diagnostics

Power on test

Annunciator

When Ignition is turned on the Annunciator will flash all of the icons quickly, indicating power is applied and onboard functions check out.

After the initial test is complete, all of the icons will again turn on for three seconds for bulb check and indicate that the Annunciator is receiving data from the MMDC.

Gauges

When power is applied the gauges will sweep to the minimum scale and vibrate signifying that the gauges have powered up, after reset the gauges are ready for data.

Info Center

When power is applied the Info Center screen will illuminate with the Spartan Custom Chassis Corporation's logo then display the home screen or favorite screen (if the favorite screen is set up). See the Info Center operation section for more detail.

FUNCTION OVERVIEW

The Medallion system is capable of receiving and transmitting on SAE J1939 with the engine, transmission and ABS modules. The MMDC utilizes 9 analog channels for the Spartan system for various inputs. All MMDC input pins designated as SINK TO GND refer to the input being active when the input voltage is less than 1.5 Volts. All MMDC input pins designated as ACTIVE HIGH refer to the input being active when the input voltage is greater than 3.5 Volts. All Annunciator inputs designated as ACTIVE HIGH direct inputs refer to the input being active when the input voltage is greater than 9.0 Volts. A brief description of each input/function follows:

FUEL SENDER INPUT – The fuel sender input is a 33Ω to 240Ω float type sender. Input to pin 1 on the 24-pin connector of the MMDC.

1. Make certain that the ground signal is no more than 3Ω different from battery ground to MMDC ground pin D on the 10-pin connector.
2. Compare the ohm reading on the Info Center diagnostic screen to your ohmmeter reading at pin 1 on the 24-pin connector (disconnected from the Annunciator).
3. Compare the ohm reading on the Info Center diagnostic screen to your ohmmeter reading at the fuel sender +/- 10 ohms.
4. 33Ω = Full
5. 240Ω = Empty

When the fuel sender value goes below 25% for more than 20 seconds the “CHECK INFO CENTER” icon and the “LOW FUEL” alarm screen will activate

Table 1:

<i>Fuel Impedance</i>	<i>Percent Fuel</i>	<i>Approximate Pin Voltage</i>
<i>33Ω</i>	<i>100%</i>	<i>0.5V</i>
<i>60Ω</i>	<i>75%</i>	<i>0.9V</i>
<i>100Ω</i>	<i>50%</i>	<i>1.4V</i>
<i>150Ω</i>	<i>25%</i>	<i>1.9V</i>
<i>240Ω</i>	<i>0%</i>	<i>2.6V</i>

Changing from English to Metric - This can be done in the Info Center menu under SETUP.

1. From the home screen press “T” to Toggle to the SETUP screen.
2. Highlight the UNITS ENG and press “E”. The highlight bar will flash.
3. Press either the UP or DOWN arrow to change to MET for Metric or ENG for English units.
4. Press “E” to activate changes and stop the highlight bar from flashing.

WAIT TO START -- When a ground signal is applied to pin 3 on the 24-pin connector of the MMDC, OR J1939 message is active, the WAIT TO START icon is activated.

1. CAT ENGINE CHASSIS: When the input is grounded “WAIT TO START” will be displayed in the Info Center.
2. When the WAIT TO START is displayed, the Annunciator will also illuminate the “CHECK INFO CENTER” icon.

LOW COOLANT -- When a ground signal (from a Coolant Level Alarm module) is applied to pin 7 on the 24-pin connector of the MMDC, the LOW WATER alarm screen is activated.

ABS -- When a ground signal is NOT applied to pin 13 on the 24-pin connector of the MMDC, the ABS icon, the Info Center alarm screens and check info center icon are activated.

1. When the input is NOT grounded the ABS lamp will be illuminated.
2. This input is grounded during normal operation and the indicator lamp is not on.
3. When the ABS icon is ON, the Info Center will also display “ABS” and check info center icon are activated.

ODOMETER OPERATION – The odometer is displayed in the Speedometer or stand alone odometer. It is also displayed in the Info Center under the TRIP METERS menu. The odometer is available in either English or Metric display mode, which is controlled in the SETUP menu on the Info Center. The odometer is calculated by MMDC, utilizing the information from the engine ECU. If the Engine stops broadcasting vehicle distance traveled on the J1939 data bus, the MMDC will not increment the odometer. If the MMDC needs to be replaced, a door tag must be affixed to the coach and a new MMDC installed with zero miles.

TRIP RESET SWITCH-- When a ground signal is applied to pin 16 on the 24-pin connector of the MMDC per the following sequence the first trip odometer (displayed in the speedometer or stand alone gauge and the Info center “Trip Meter” menu) will be reset.

1. When the trip odometer is displayed in the speedometer or stand alone LCD and the trip reset switch is pressed for MORE than 3 seconds the trip odometer 1 will be reset.
2. If the trip odometer is displayed in the speedometer or stand alone LCD and the switch is pressed for LESS than 3 seconds the display will change modes to display the odometer.

NOTE: Trip meter 2 can only be reset by using the Info Center screen.

3. If the odometer is displayed in the speedometer or stand alone LCD and the TRIP switch is pressed the display will change modes to display the trip odometer.

PARK BRAKE – When a ground signal is applied to pin 20 on the 24-pin connector of the MMDC, PARK BRAKE is activated. Open circuit or more than 6volts PARK BRAKE is inactive.

1. **NEUTRAL NO BRAKE** will activate on the info center if the transmission is not in gear and the park brake is not set. The “CHECK INFO CENTER” icon on the Annunciator will also illuminate and the buzzer will sound.

RIGHT/LEFT TURN INDICATOR -- When a 9 to 16 VOLT signal is applied to pin 2 (left) or 5 (right) on the 12-pin connector of the ANNUNCIATOR, the TURN SIGNAL icon is activated.

HIGH BEAM INDICATOR -- When a 9 to 16 VOLT signal is applied to pin 3 on the 12-pin connector of the ANNUNCIATOR, the HIGH BEAM icon is activated.

LOW AIR INDICATOR -- When less than 65 psi is applied to either port 3 or 4 the Low Air icon is activated. With the icon on and the air pressure applied to BOTH ports 3 and 4 increases above 70 psi the icon and alarm will turn off.

DATA BUS INPUTS -- The MMDC system operates with data from the J1939 data bus from the engine and transmission on Pins 22(+), 23(-), and 24 Can Shield Ground on the 24 pin connector J1 on the MMDC.

ENG ECU NO DATA OVER 25 SECONDS – The Info Center will display this message if the J1939 data bus communication between the engine and MMDC is lost for more than 25 seconds.

TRANS ECU NO DATA OVER 25 SECONDS – The Info Center will display this message if the J1939 data bus communication between the transmission and MMDC is lost for more than 25 seconds.

ENGINE PROTECT - When PGN 65226 (DM1), source address = 0 (Engine) broadcasts an ENGINE PROTECT message, the ENG PROT icon will illuminate in location “P”.

CHECK ENGINE - When PGN 65226 (DM1), source address = 0 (Engine) broadcasts a CHECK ENGINE message, the CHECK ENGINE icon will illuminate in location “C”.

STOP ENGINE - When PGN 65226 (DM1), source address = 0 (Engine) broadcasts a STOP ENGINE message, the STOP ENGINE icon will illuminate in location “D”.

CHECK TRANS - When PGN 65226 (DM1), source address = 3 (Transmission) broadcasts a CHECK TRANS message, the CHECK TRANS icon will illuminate in location “H”.

Buzzer Functions:

The IP includes a multiple mode buzzer. The buzzer output at pin 12 on the MMDC 24 pin connector will drive the buzzer under the following conditions:

1. Air pressure in either brake system is less than or equal to 65 psi.
Sound to be a fast pulse. Priority 1
2. The transmission is in neutral and the park brake is not set.
Sound to be chirp pulse. Priority 2
3. The Stop Engine Lamp is illuminated.
Sound to be a fast pulse. Priority 1
4. At key on the buzzer will sound for 3 seconds.

Buzzer Output Waveform Definition

Priority 1 Fast is 50% Duty Cycle On, with 200ms Period.

Priority 2 Chirp is 10% Duty Cycle On, with a 1 second Period.

Priority 3 Constant is 100% Duty Cycle on.

Check Info Center Icon – Will be illuminated on the Annunciator to alert the driver that a message or warning is being displayed on the Information Center. The following is a list of warnings or alarms that activate the CHECK INFO CENTER icon:

- a. LOW COOLANT
- b. FUEL LEVEL Low
- f. Park set, not in gear
- h. ENG TEMP high
- l. ENG OIL Pressure low
- m. BATTERY low or high
- n. ECU ENG no data
- o. ECU TRANS no data

Trouble Shooting Guide

This guide assumes the person troubleshooting the Multiplexed Instrumentation System is capable of testing a circuit for continuity, a short circuit to power or ground, and has access to a multi-meter or Volt-Ohm meter (VOM). A test light will be of little use in diagnosing this system.

System Grounds – The MMDC receives battery direct ground. To ensure the entire instrumentation system has the same ground reference, the MMDC supplies the Annunciator Module and Gauges with its ground.

Note: As with all electronic devices, it is important for the gauge system to have a good ground with no possibility for electrical noise. Never modify the ground system for the instrumentation system.

Tip: Intermittent gauge problems are most often caused by ground problems.

Gauges

All of the gauges contain a microprocessor that gives each gauge its identity defining whether it is a speedometer, tachometer, fuel and so on. The connector on each gauge is identical, meaning that you can swap connectors between gauges to help determine if there is a harness problem or a gauge problem. Below is a detailed explanation of each pin function.

Pin ‘G’ – Backlighting

See backlighting section above

Backlighting control

The dimmer module on the dash controls the backlighting for all of the gauges. It produces a DC voltage on a voltmeter between 0 and 12 volts DC.

Pin ‘H’ – Data from MMDC

Proprietary data sent from MMDC should read between 2.2 and 7 volts when active.

Pin ‘J’ – Ground from MMDC

Must be connected to the gauge ground input on the MMDC

Pin ‘K’ – 7 volts DC

7 to ± 0.5 volts provided by MMDC

ONLY gauges and the Info Center may be connected to this line. If there is anything else, damage will occur to the system

All gauges can be tested with the diagnostic menu in the Info Center. Refer to the Sweep test in the Info Center section

1. Do the gauges self-test on start-up?

A few seconds after the ignition is first turned on all of the gauges should return to zero, and the needles should vibrate for a few seconds to show the movements are working.

A. None of the gauges self-test – The gauges have lost power or ground. (The LCD odometer should also be blank.)

1. Check for +7 V power at the gauge connector (Pin K)

If no voltage is present check the continuity of the gauge power wire from the gauge connector (Pin K) to the MMDC (10-pin connector – pin B)

Note: The gauges receive +7 volt power from the MMDC. If +12 volts are applied to the gauges permanent damage to the gauge WILL result.

2. Check for a good ground at the gauge connector (Pin J)

If no ground is present check the continuity of the gauge ground wire from the gauge connector (Pin J) to the MMDC (10-pin connector – Pin C)

B. Only one gauge does not self-test

1. If the movement that did not self-test is part of a combo gauge and the other movements in the combo gauge work, the gauge is bad and will need to be replaced.

For example: if the fuel gauge needle does not vibrate when the ignition is turned on but the other needles do, then the gauge is most likely bad.

2. If none of the movements in a gauge self-test (or an LCD display does not turn on)

Check for power and ground at the gauge connector as described in Step "A" above.

3. All of the gauges self-test properly – The power and ground to the gauges is good. Proceed to the next step.

1. Are none of the gauges working or is only one gauge not working?

C. None of the gauges are working

1. Check for loss of communication from the MMDC and engine and transmission

If the MMDC loses communication on the J1939 (engine and transmission) the Info Center will display “No ECU DATA”. After 18 seconds with no communication from the MMDC, the LCD odometer display will begin to flash. After 45 seconds with no communication from the MMDC the Annunciator Module will begin sequencing the warning lights.

Check continuity of the two communication wires between the Annunciator Module and the MMDC. The DIB (+) wire runs from the Annunciator Module (12-pin connector – pin 8) to the MMDC (10-pin connector – pin K). The DIB (-) wire also runs from the Annunciator Module (12-pin connector, pin 9) to the MMDC (10-pin connector – pin J), the continuity should be 60 Ohms with everything connected.

Check continuity of the two J1939 communication wires from the MMDC to the engine. J1939 (+) wire runs from the MMDC (24-pin connector – pin 22) to the engine connector. J1939 (-) wire runs from the MMDC (10-pin connector – pin B) to the engine connector. If you measure the resistance at the 9 pin diagnostic connector between pins C and D, it should measure 60 Ohms. If it reads 120 Ohms or open, there is a break in the J1939 harness.

2. Check for loss of communication from the MMDC to the gauges.

The gauges receive their data over a single wire (AIB) from the MMDC. This wire is in pin H of the gauge connectors and should be between 3-7 volts when data is present.

If no voltage is present check the continuity of the wire from the gauge connector (Pin H) to the MMDC (10-pin connector – pin A)

D. Only one gauge is not working

1. Check for loss of communication from the MMDC to the gauge.

The gauges receive their data over a single wire (AIB) from the MMDC. This wire is in pin H of the gauge connectors and should be between 3-7 volts. Plugging the gauge into the connector of a gauge that is working properly can also check this.

If no voltage is present check the continuity of the wire from the gauge connector (Pin H) to the MMDC (10-pin connector – pin A)

2. Check the source of the data (Refer to Appendix D)

2. Where does the gauge get its information?

The fuel gauge is driven by the MMDC from a 33-240ohm sender in the fuel tank. The wire runs from the fuel sender to the MMDC (24-pin connector – pin 1). A bad ground at the fuel sender will also cause the fuel gauge to malfunction.

The air pressure gauges receive their signal from two pressure sensors built into the MMDC. A problem with an air line or a bad pressure sensor will cause an air pressure gauge to malfunction.

The speedometer, tachometer, voltmeter, coolant temperature, oil pressure, turbo boost and transmission temperature gauges receive their display information from the MMDC. The MMDC receives display data over the SAE J1939 data bus from the engine computer, transmission computer and ABS brake system. It is rare, but not impossible, for only one message not to be broadcast on J1939. In other words, if the engine is broadcasting the speedometer and tachometer messages, it is unlikely that it would not broadcast the oil pressure message. However, if this appears to be the case please contact SPARTAN Customer Service for more assistance.

See Appendix D for more information on data sources.

If none of these steps have helped resolve a gauge issue, contact SPARTAN Customer Service for more assistance.

Annunciator

1. Do the warning lights bulb test when the ignition is first turned on?

Bulb test is a quick flash when ignition is applied, then after a short pause all of the lights come on for three seconds while the gauges reset.

A. No, none of the bulb test happens – The gauge system has a power or ground problem.

1. Check for Ignition at the Annunciator Module (12-pin connector – pin 1)

This is the main power supply for the Annunciator Module. Power is supplied from the Ignition. If +12 V is not present check the fuse and continuity of the wire from the fuse holder to the Annunciator Module.

2. Check ground for the Annunciator Module (12-pin connector – pin 12)

This is the ground for the Annunciator Module and the gauges. The ground is supplied by the MMDC (10-pin connector – pin C). If a good ground is not present check the continuity of the wire between the Annunciator Module and the MMDC.

B. Yes, the quick flash happens, but then nothing.

1. Check for +12 V at the MMDC (10-pin connector – pin E)

This is the main power for the MMDC and is supplied by a fuse in the fuse block. If +12 V is not present check the fuse and continuity of the wire from the fuse holder to the MMDC.

2. Check ground for the MMDC (10-pin connector – pin D)

This is the main ground for the MMDC and is supplied with a clean ground directly from the battery. If a good ground is not present check the continuity of the wire from the MMDC to the battery connection.

3. Check for the +12 V ignition signal at the MMDC (10-pin connector – pin F)

When the ignition switch is on this signal commands the MMDC to “wake up” and activate the gauges. If +12 V is not present check the continuity of the wire from the MMDC to the breaker.

4. Check for the DIB data bus signal at the MMDC (10-pin connector – pin 22 & 23)

This is the data bus between the Annunciator, Info Center and the MMDC. Make sure that the wires are not going anywhere else. Check for continuity between the Annunciator, Info Center and MMDC. If there is no continuity, check for a miss wire or broken terminal.

B. Yes – If the lights bulb tests when the ignition is first turned on, proceed to the next step.

If none of these steps have helped resolve a gauge issue, contact SPARTAN Customer Service for more assistance.

Info Center

1. Does the SPARTAN logo appear when the ignition is first turned on?

The Spartan Custom Chassis logo will appear momentarily when ignition is applied, then after a few seconds the display should go to the home (or Favorite screen if configured for it).

A. No, The logo does not appear, but the home menu does -- At key on press and hold the "E" button until the hidden screen appears. Highlight the Download from EEPROM line and press "E". The Spartan logo will appear.

B. No, nothing happens -- The gauge system has a power or ground problem.

1. Check for +7 V at the Info Center (6-pin connector – pin 2)

This is the main power supply for the Info Center. Power is supplied from the MMDC (10-pin connector – pin B). If +7 V is not present, check continuity of the wire 339A from the MMDC to the Info Center.

Note: The Info Center receives +7 volt power from the MMDC. If +12 volts are applied to the Info Center permanent damage to the Info Center WILL result.

2. Check for a good ground at the Info Center connector (Pin 3)

If no ground is present check the continuity of the Info Center ground wire from the Info Center connector (Pin 3) to the MMDC (10-pin connector – Pin C)

3. Check ground for the Annunciator Module (12-pin connector – pin 12)

This is the ground for the Annunciator Module and the gauges (GND3). The ground is supplied by the MMDC (10-pin connector – pin C). If a good ground is not present check the continuity of wire between the Annunciator Module, Info Center, gauges and the MMDC.

C. Yes, the logo display happens, but then nothing.

1. Check for the DIB data bus signal at the MMDC (10-pin connector – pin 22 & 23)

This is the data bus between the Annunciator, Info Center and the MMDC. Make sure that the wires are not going anywhere else. Check for continuity between the Annunciator, Info Center and MMDC. If there is no continuity, check for a miss wire or broken terminal.

If none of these steps have helped resolve a gauge issue, contact SPARTAN Customer Service for more assistance

APPENDIX A

Annunciator

	A	B	C	D	E	F	G	H	I	J	K	L
												
												
	M	N	O	P	Q	R	S	T	U	V	W	X

Icons

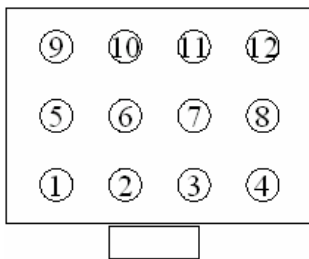
Left Turn	Location A	Green	Direct wired
Stop Engine	Location D	Red	J1939 PGN 65226
			J1939 PGN65226
Check Engine	Location C	Amber	
Check Trans	Location H	Red	J1939 PGN 65226
ABS	Location K	Amber	Direct wired
			Open circuit activates light
			Ground is from Wabco in normal operation
High Beam	Location F	Blue	Direct wired from Headlamp Module
			12vdc nominal
Low Air	Location J	Red	From Pressure transducers inside MMDC
			Activates <65psi on either transducer
			De-activates >70psi on both transducers
Engine Protect	Location P	Red	J1939
Park Brake	Location W	Red	Discrete input Pin J1-20 on MMDC
			Ground = Icon on
			>5vdc = Icon off
Right Turn	Location L	Green	Direct wired
Wait to start	Location E	Amber	J1939 PGN65252
Check Info Center	Location R	Amber	Active when warning message is present on Info Center screen
ENG BRAKE	Location V	Green	J1939 EBC1 byte 5
Cruise On	Location G	Green	Discrete wire on J1-4 on MMDC
			Ground = icon active
			>5vdc = icon off

Table 3

Annunciator Inputs/Outputs

Pin	ANNUNCIATOR	SPARTAN Designation		Specification
1	Ignition	Ignition		+12V (Ignition line)
2	Left Turn Input	Active High		+12V
3	High Beam Input	Active High		+12V
4	Not Used	Not Used		Not Used
5	Right Turn Input	Active High		+12V
6	Not Used	Not Used		Not Used
7	Can bus Shield	Shield		Impedance to ground
8	DIB+	DIB CANH		Private data bus
9	DIB-	DIB CANL		Private data bus
10	Not Used	Output		Sink to Ground
11	Not Used	Output		Sink to Ground
12	Ground	Ground		Ground

Table 4



Annunciator connector (From wire side)

APPENDIX B

MMDC Inputs

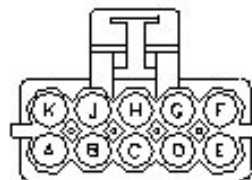
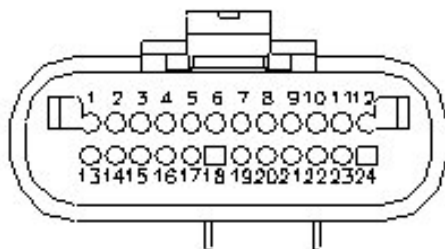
J1 - PIN#	DESCRIPTION	INPUT ACTIVE WHEN	OUTPUT
1	Fuel input	33-240 ohm	Fuel information for gauge and Low Fuel icon
3	Wait to Start	Sink to Ground	Wait to Start Icon
7	Low Water	Sink to Ground	Low Water alarm on Info Center screen when Ground
13	ABS	Active High	Antilock Brake System Icon when circuit is open
16	Trip Reset/Metric Mode	Sink to Ground	-Long press when Trip odometer is displayed in Speedo will reset Trip odometer 1
			-Short press when Trip odometer is displayed in Speedo will change the display to odometer mode
			-Short press when Odometer is displayed in Speedo will change the display to Trip odometer mode
20	Park	Sink to Ground	Park Brake Icon
22	J1939+	Data	Positive communication line with Engine/Transmission/ABS
23	J1939-	Data	Negative communication line with Engine/Transmission/ABS
24	Shield	Shield	Shield ground for J1939 communication

Table 5

Connector J2

Pin No.	MMDC-A		Specification
A	AIB_DATA	Gauge Data	AIB Data bus
B	GAUGE_PWR	Gauge Power	7V
C	Gauge Power GND	Gauge Power GND	Gauge Power GND
D	Battery GND	Battery GND	Direct to Battery GND
E	Battery	Battery Power	Direct to Battery 12V
F	Ignition	Switched Ignition	12V
G	Not Used	Output sourcing	Sourcing from battery (2amp Max)
H	Can Shield	New	New
J	DIB_CANL	New	DIB CANL
K	DIB_CANH	New	DIB CANH

Table 6



MMDC connectors

Outputs

MMDC

Pin 12 Buzzer (Active = Ground Output)

Priority 1 Alarms Sound is a Fast Pulse

- Air pressure below 65psi
- Stop Engine icon active

Priority 2 Alarms Sound is a chirp

- The vehicle is in neutral the park brake is NOT set

MMDC Installation Guidelines

To insure proper operation and reliability of the Instrument Control Unit there are some guidelines which must be followed.

1. The MMDC must be installed in such a way that the air transducers for Front and Rear Air Pressure will not be susceptible to failure due to moisture accumulating at the transducer and possibly freezing during winter weather. This can be done by:
 - a. Mounting the MMDC in a vertical position.
 - b. Mounting the MMDC in such a way, that it is the highest point in the air system so the air lines are routed up to the air transducers.
 - c. If the MMDC cannot be mounted as the highest point in the air system, the airlines require a loop in the routing. These loops should be lower than the transducers. This should keep moisture away from the transducers. The rear air line, or green primary line, is mounted in port three while the front air line, or red secondary line, is mounted in port four on the MMDC.
2. The MMDC is designed to operate in an environment that is exposed to water spray or splash. It was not intended to be submerged for any long period of time or exposed to flying debris. Do not mount the MMDC in a wheel well or near the engine exhaust.
3. The MMDC is equipped with four rubber boots, one at each corner mounting point.

CAUTION: When mounting the MMDC do not tighten the mounting bolts to the point that the boots are squeezed out from under the MMDC housing. This may cause damage to the internal electronics due to excessive vibration.

APPENDIX C

Info Center



Figure 4

Pin out

Pin	INFO CENTER	Notes	SPARTAN Designation	Specification
1	CAN HI		DIB data bus (+) from MMDC	Data bus proprietary
2	Info Center Power		From MMDC	7 Volts $\pm 1V$
3	GND		Ground	Instrument Ground
4	CAN LO		DIB data bus (-) MMDC	Data bus proprietary
5	Backlight		Dash Dimmer Control	+12V full bright

Table 6

Menu Operation

See Appendix F for Info Center screen map.

Power up sequence

The Information Center is a graphical display that is capable of displaying engine, vehicle and instrumentation system data. When the Info Center powers up it will display the Spartan Custom Chassis Corporation logo for a few seconds, this logo time is configurable from 0 to 60 seconds (default is 2 seconds). Once the logo has been displayed for the configured time the display will then show any alarms that are active on the vehicle (Low air, Low oil pressure, park set in gear, etc.). The alarms can be temporarily cleared by pressing the “E” key, if the alarm is still active after 5 minutes the Info Center will show the alarm screen again. When all of the alarms are either corrected or cleared, the Info Center will display the configurable “Favorite” screen (the default Favorite screen is Clock).

Screens

Once the Info Center has completed its power up sequence, as described above, the clock will be displayed, unless the favorite screen has been programmed to another screen. The clock will remain on the display until a button is pressed, an alarm becomes active or the ignition is turned off. See “Setting the Clock” section for information on how to set the correct time. Press the “H” button to go to the Home screen, see appendix F for the Info Center map for more detail of the Home screen. Below is a listing of the Home screen menu options:

Trip Center

- Average economy
- Instant economy
- Fuel

Trip Computer

- Odometer
- Trip odometer 1
- Trip odometer 2

Engine

- Battery
- Oil
- Engine Temperature
- Tachometer
- Speedometer
- Engine Information overview

Service

- Service screens (SPARTAN Dealer use only)*
- Password protected*

In the diagnostic screens under the “sender” option, it will show what the MMDC is seeing on all of its inputs. Please note that the screens shown in appendix F are duplicated in the Info Center twice. The first set are activation points (open, closed, grounded, 12v, etc.), the second set of screens are raw data screens for factory use. You may be asked for raw data screen information if you call in for help, but normally the I/O screens are the most informative. If the information on the sender screens does not help, press “T” to toggle out of the raw data area.



Appendix D – Data Sources

Table 7 - Gauge Data Sources

Gauge	Data Source	Location
Speedometer	Engine ECU – J1939 PGN 65265	MMDC 22 Pin Connector – Pins 22 & 23
Odometer	Engine ECU – J1939	MMDC 22 Pin Connector – Pins 22 & 23
Tachometer	Engine ECU – J1939 PGN 61444	MMDC 22 Pin Connector – Pins 22 & 23
Rear Air Pressure	Internal pressure sensor in MMDC	MMDC Port 3
Front Air Pressure	Internal pressure sensor in MMDC	MMDC Port 4
Fuel Level	33-240 Ω level sensor in fuel tank	MMDC 24 Pin Connector – Pin 1
Coolant Temperature	Engine ECU – J1939 PGN 65262	MMDC 22 Pin Connector – Pins 22 & 23
Voltmeter	Engine ECU – J1939 PGN 65271	MMDC 22 Pin Connector – Pins 22 & 23
Oil Pressure	Engine ECU – J1939 PGN 65263	MMDC 22 Pin Connector – Pins 22 & 23
Turbo Boost	Engine ECU – J1939 PGN 65270	MMDC 22 Pin Connector – Pins 22 & 23
Transmission Temperature	Transmission ECU – PGN 65272	MMDC 22 Pin Connector – Pins 22 & 23

Appendix E – Mating connector parts

10 Pin Connector		MMDC
Connector		12065425
Cavity Plug Seal		12059168
Cable Seal		12048086
Secondary Lock		12124264
Terminal		12048074

5 Pin Gauge Connector		
Connector		12162830
Terminal Part		12103881
Cavity Plug		12034413

24 Pin Connector		
Seal		12110403
Retainer		12129183
Connector Position Assurance		12110299
Strain Relief		12129858
Terminal Part		12085912
Cavity Plug		12129557

Annunciator 12 Pin		
Connector		172170-1
Terminal		171639-1

Display 6 pin		
Connector		172168-1
Terminal		171639-1

Table 8

Appendix F – Info Center Screen Map

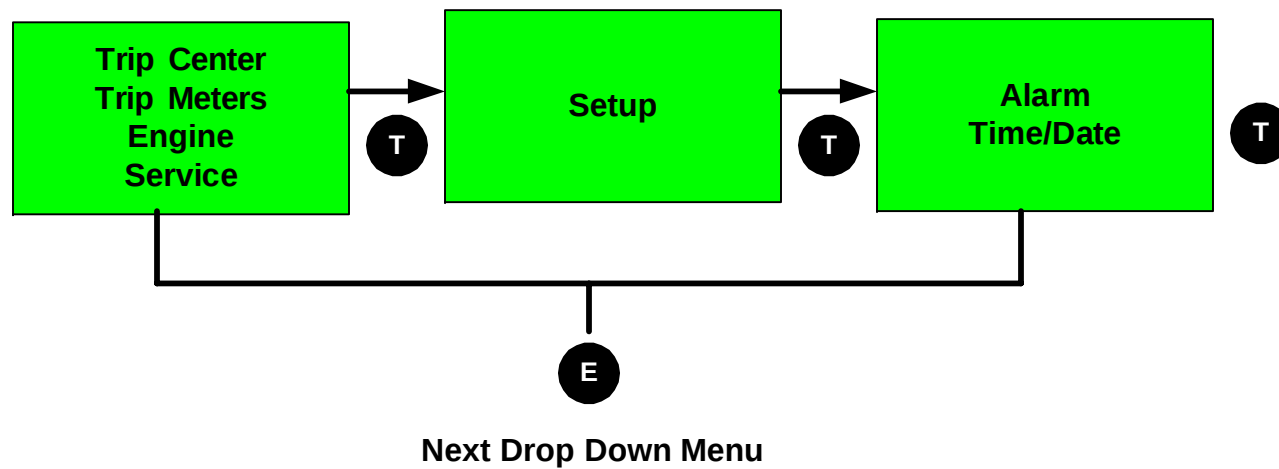
Info Center Map

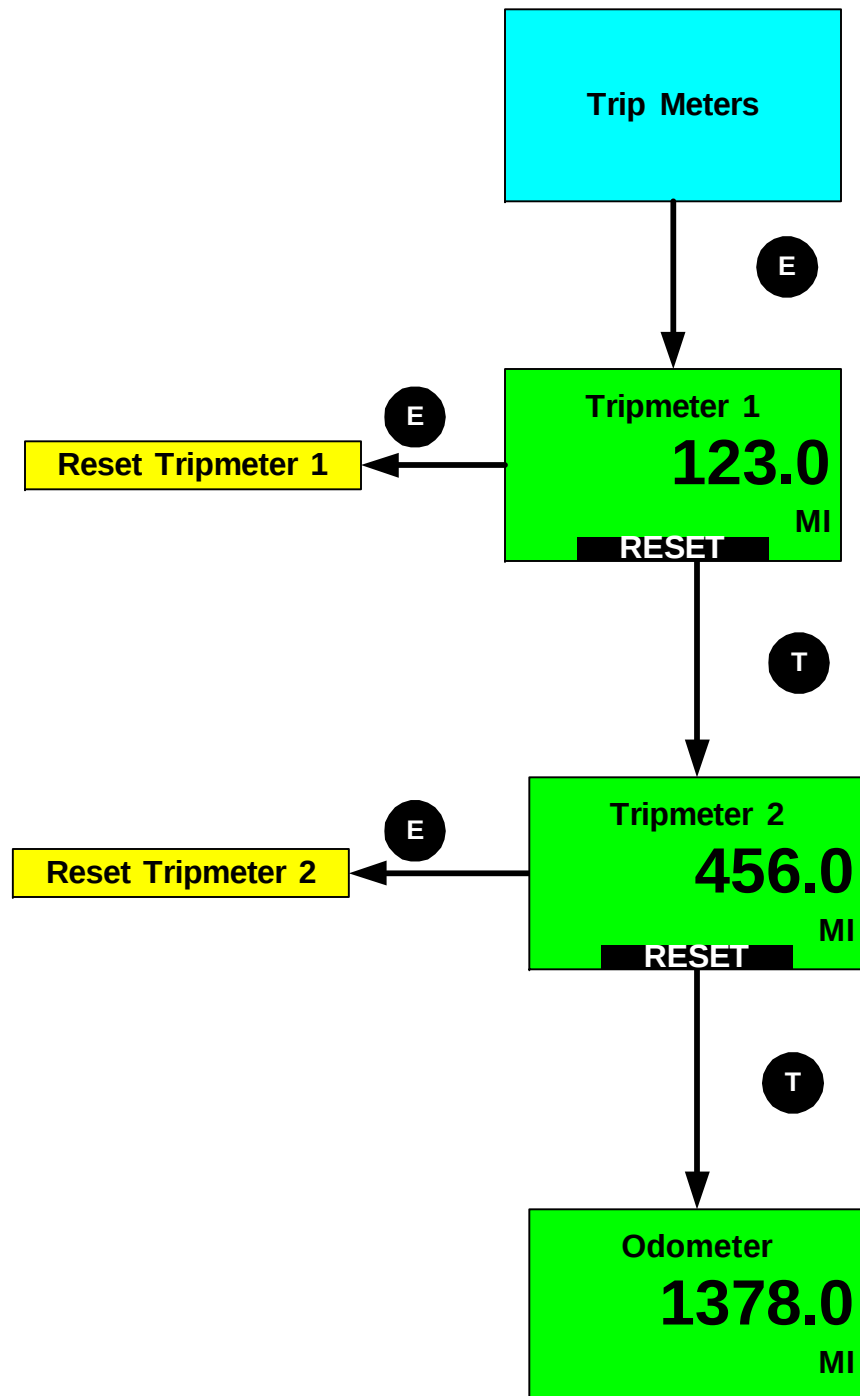
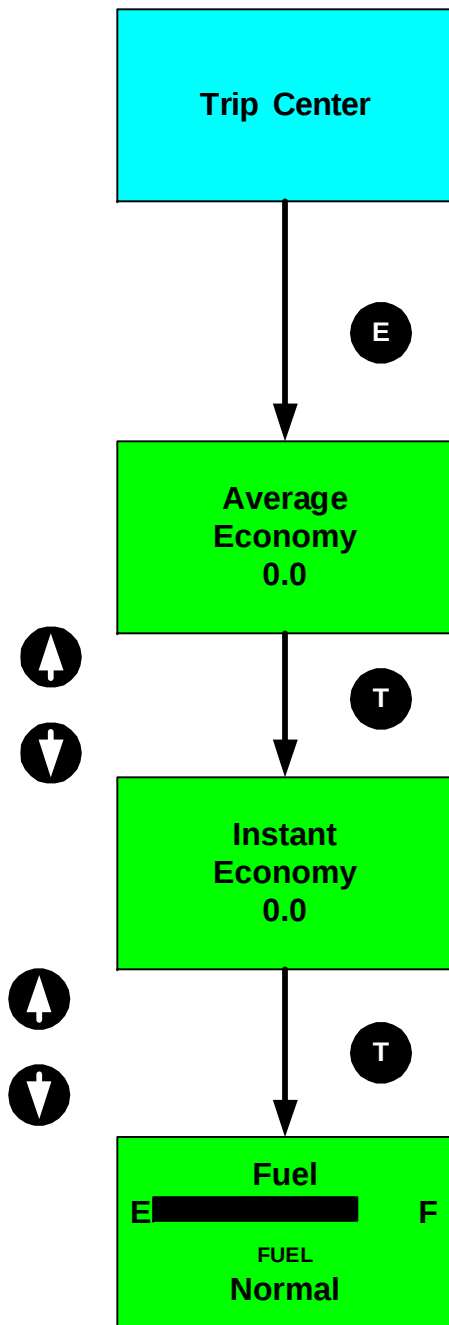
Top Level Operation

Toggle
Favorite
Screen
Home

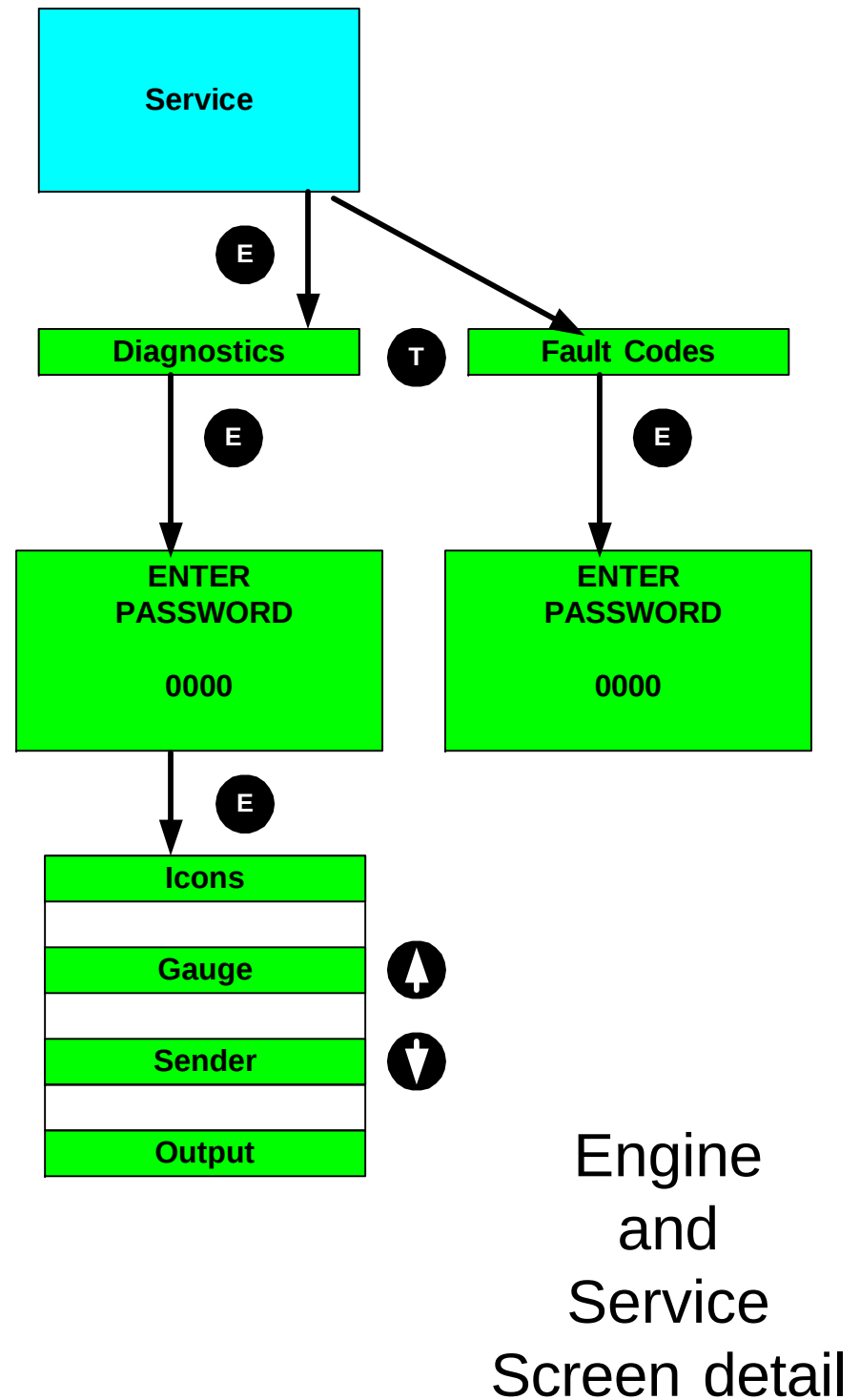
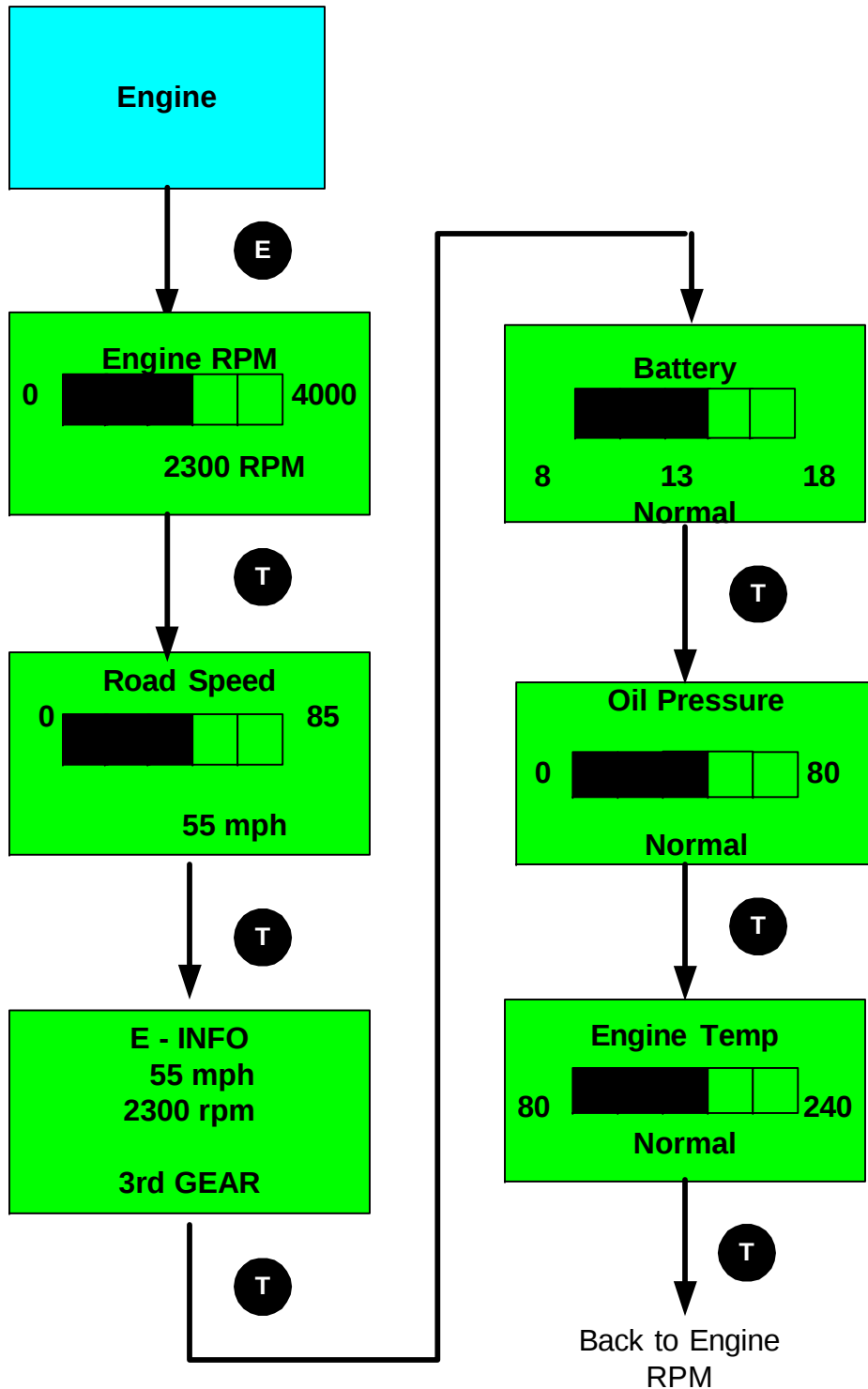


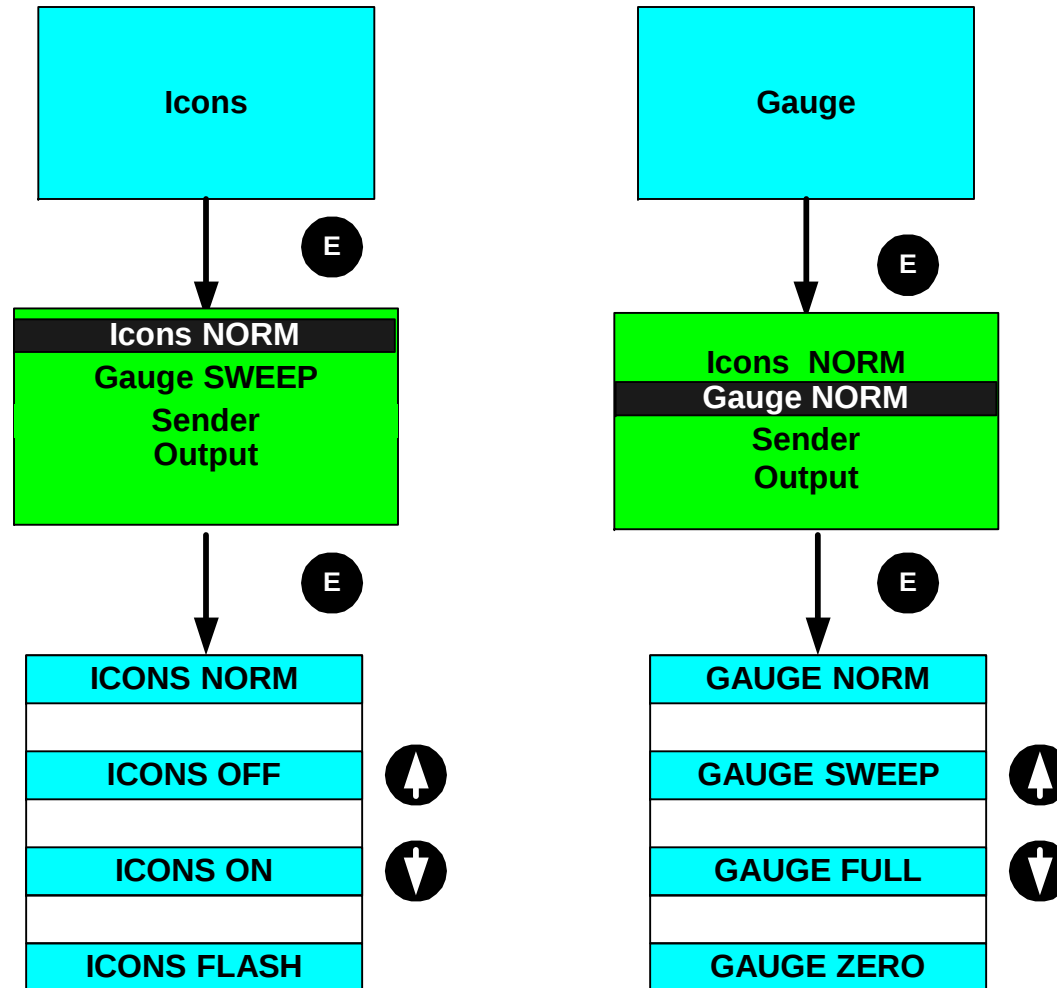
Scroll Up
Enter
Scroll Down



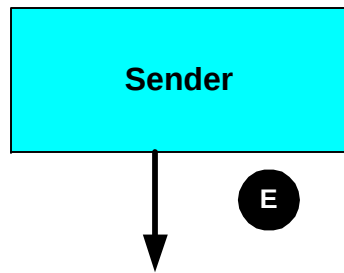


Trip Center
and
Trip Meter
screen detail





Service area
Icon and Gauge
Diagnostics



By pressing either of the arrows or Toggle buttons you can scroll through the Sender screens and troubleshoot the inputs to verify that they are correct with your measurement.

ECU vs IP
ODO DIFF
0.0 mi
0.0 mi

ENG COMP ID
CTRPL
C7
KAL52045

Fuel
Sender
74 Ohms
MMDC J1-1

ABS
INPUT
OPEN
MMDC J1-13

HR ECU ODO

155
5m / bit

BUILD INFO

8000-00504-01
Version 4.2
DATE Manufactured

LOW WATER
SWITCH
OPEN
MMDC J1-7

TRIP RESET
SWITCH
OPEN
MMDC J1-16



LR ECU ODO

1255
1/8km / bit

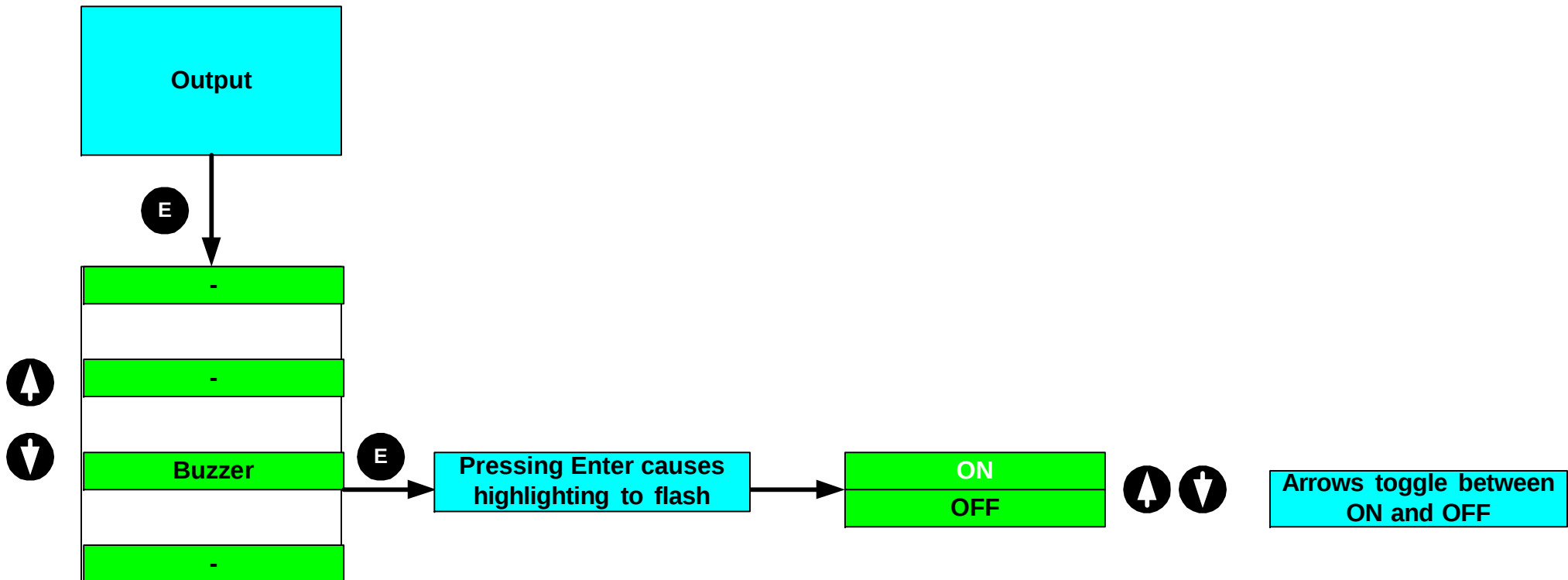
WAIT 2 START
SWITCH
OPEN
MMDC J1-3

PARK
BRAKE
OPEN
MMDC J1-20

Sender screens This area lists all of the inputs to the MMDC and the current status of each input.

Example
Screen

NOT USED	OFF
NOT USED	ON
BUZZER	OFF
NOT USED	ON



Output screen:

From this screen you can control the Buzzer output manually to test functionality

Diagnostics
Fault Codes



E

Enter
Password
0000



E



ACTIVE 0
INACTIVE 0
CLEAR

E



ENGINE	0
TRANS	0
ABS	0

E

READING
FAULTS

H to CANCEL

E

This screen shows the number of reported ACTIVE faults on J1939. Highlight the ECU that you want to read the faults from.

Once the ECU is selected, press "E" to request ACTIVE faults.

This screen shows all of the reported faults on J1939.

This screen shows the number of reported INACTIVE faults on J1939. Highlight the ECU that you want to read the faults from.

Once the ECU is selected, press "E" to request INACTIVE faults.

E



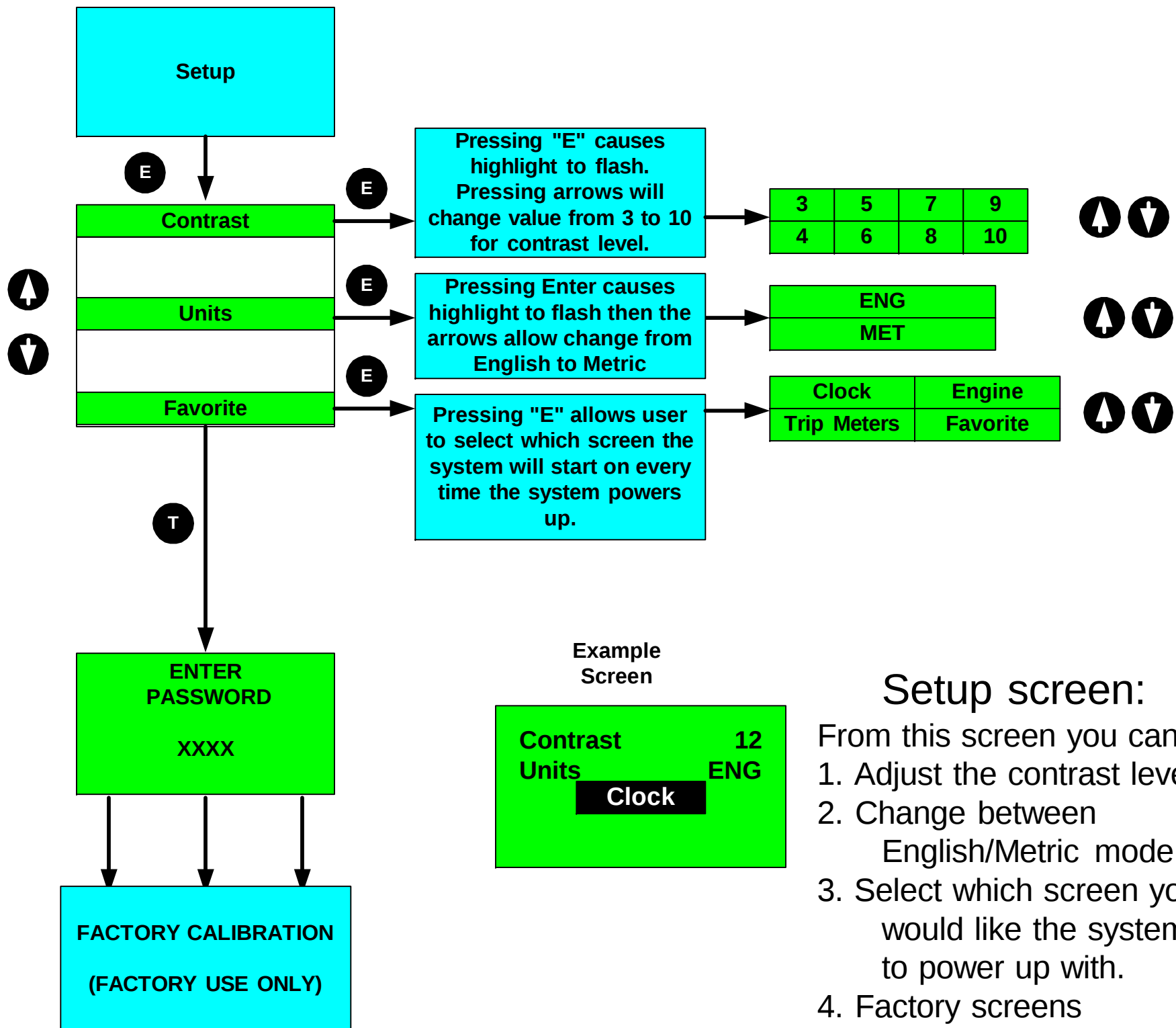
ENGINE	0
TRANS	0
ABS	0

E

READING
FAULTS

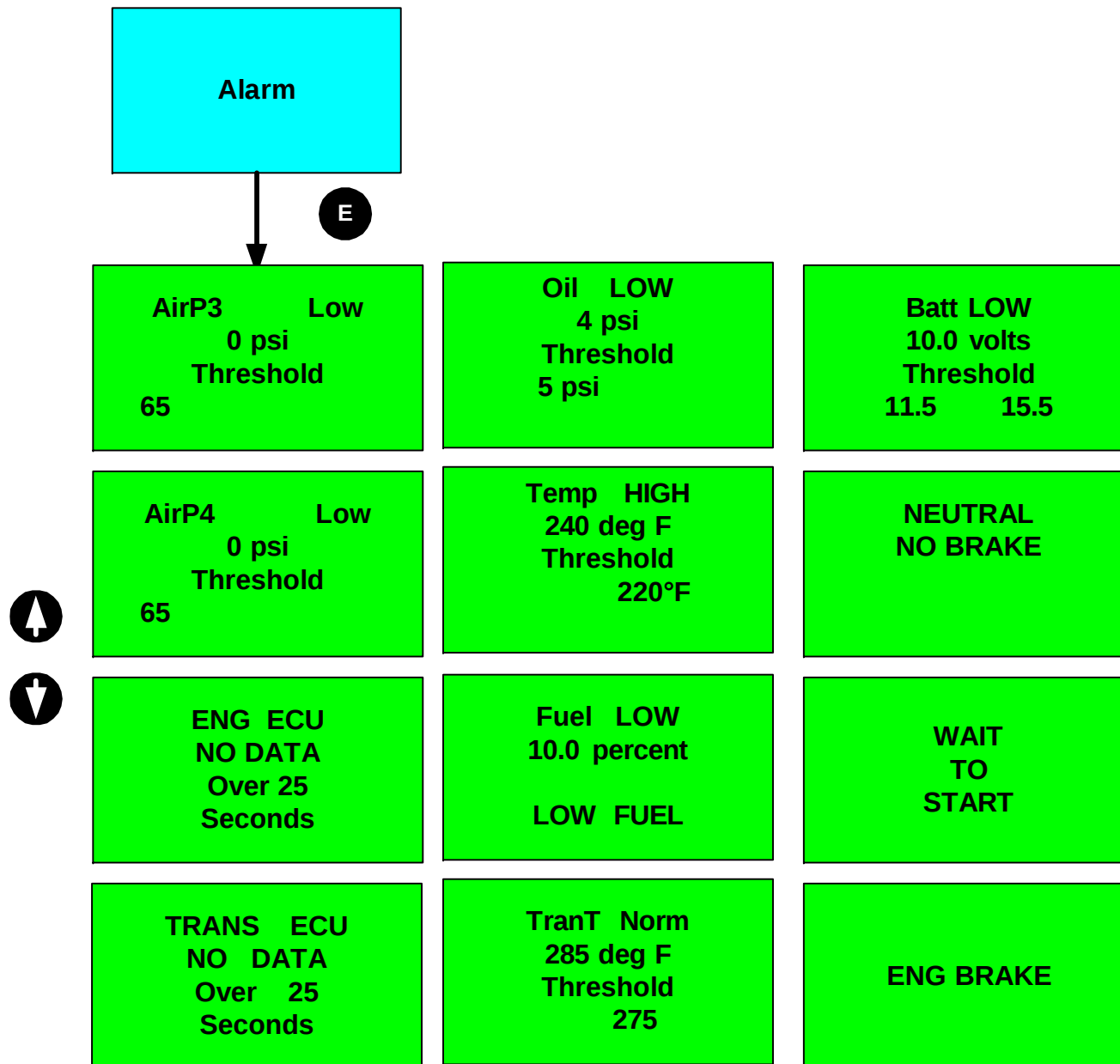
H to CANCEL

E



Setup screen:

- From this screen you can:
1. Adjust the contrast level
 2. Change between English/Metric mode.
 3. Select which screen you would like the system to power up with.
 4. Factory screens



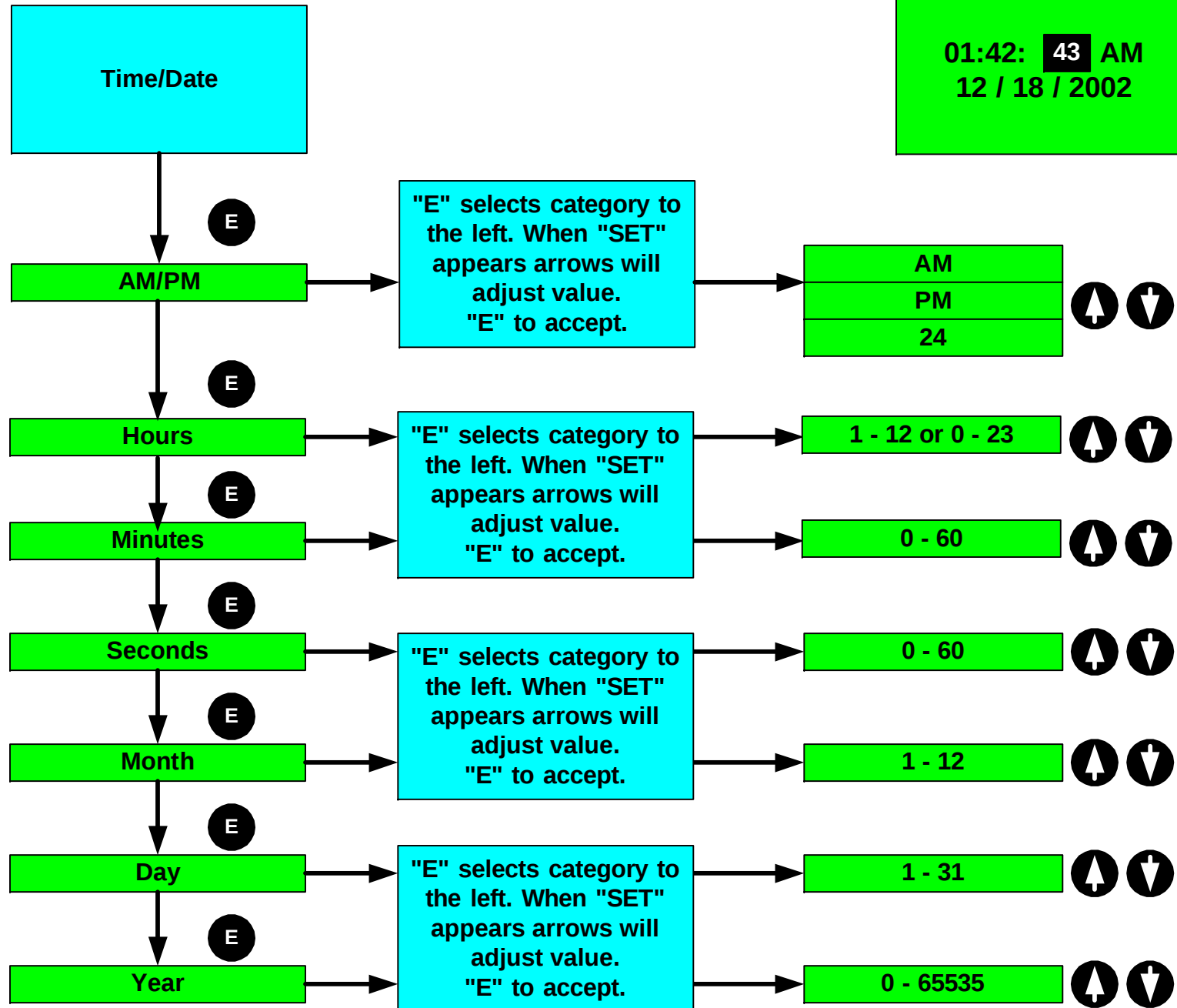
The alarm screens indicate:

1st The item in alarm state

2nd Current value

3rd The threshold that needs to be met to eliminate the alarm.

Example
Screen



Clock set screen