

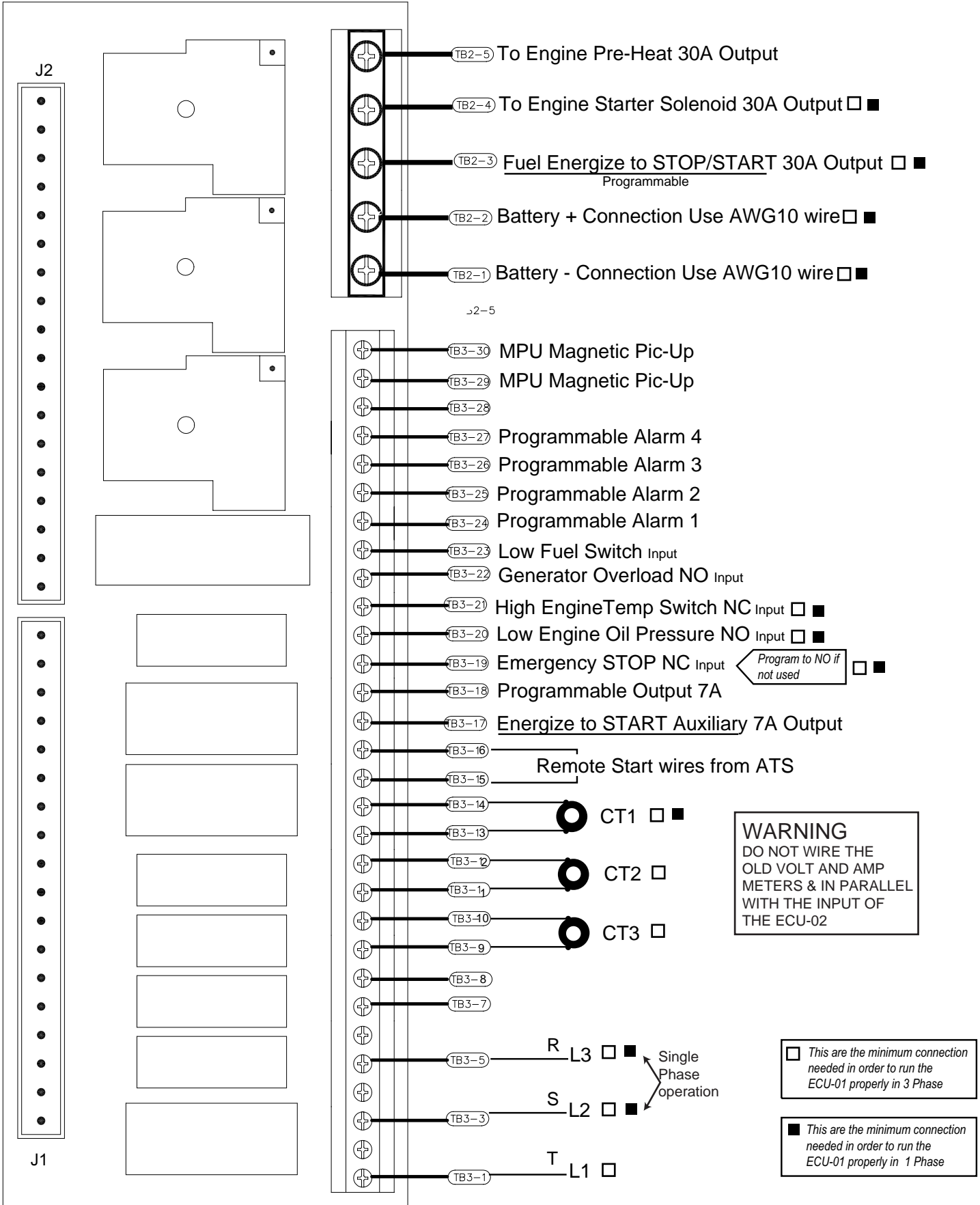
# ***ECU-02*** Ver2.0

## ***AUTOMATIC ENGINE CONTROL UNIT OPERATOR'S MANUAL MCPHERSON CONTROLS***



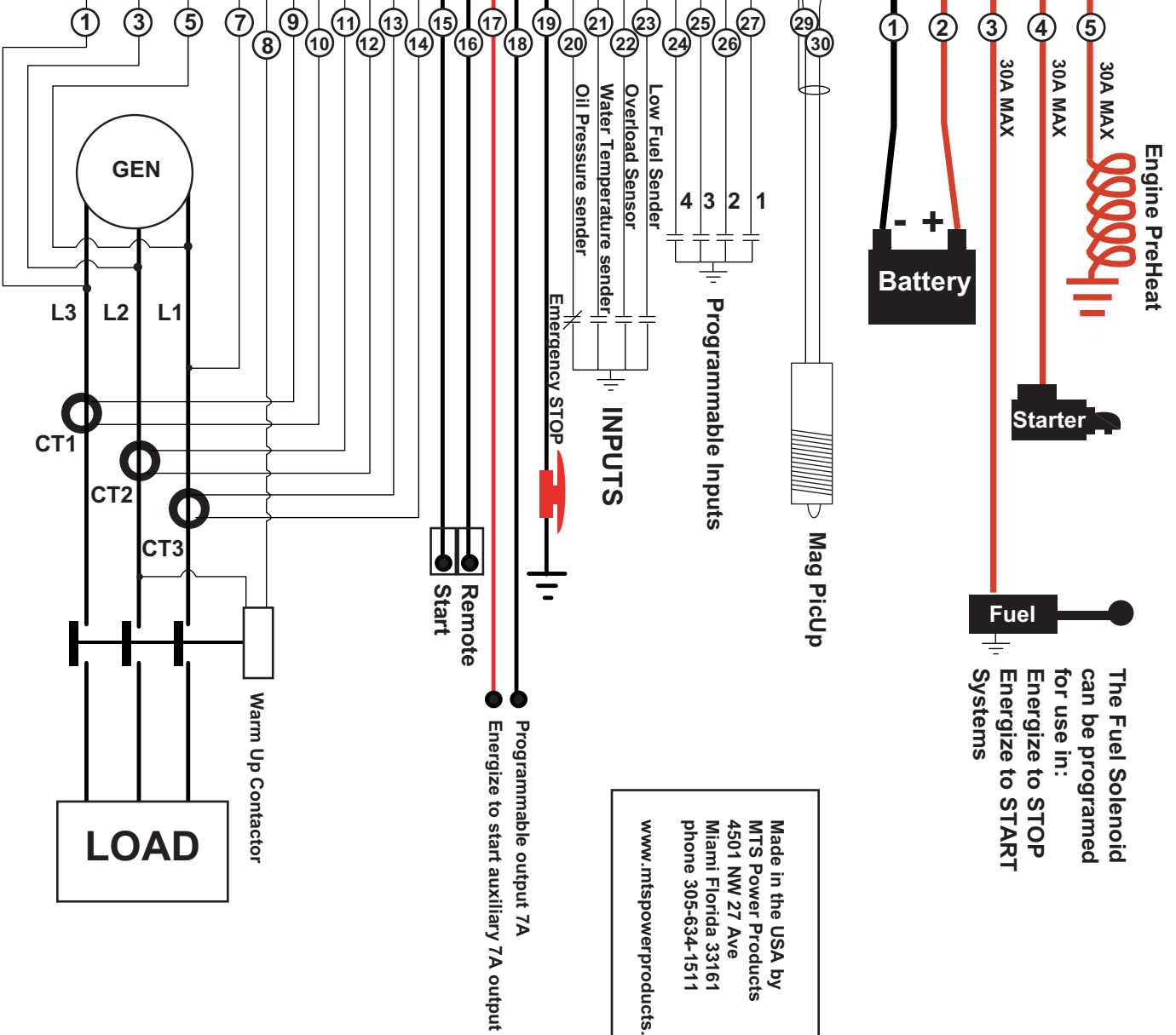
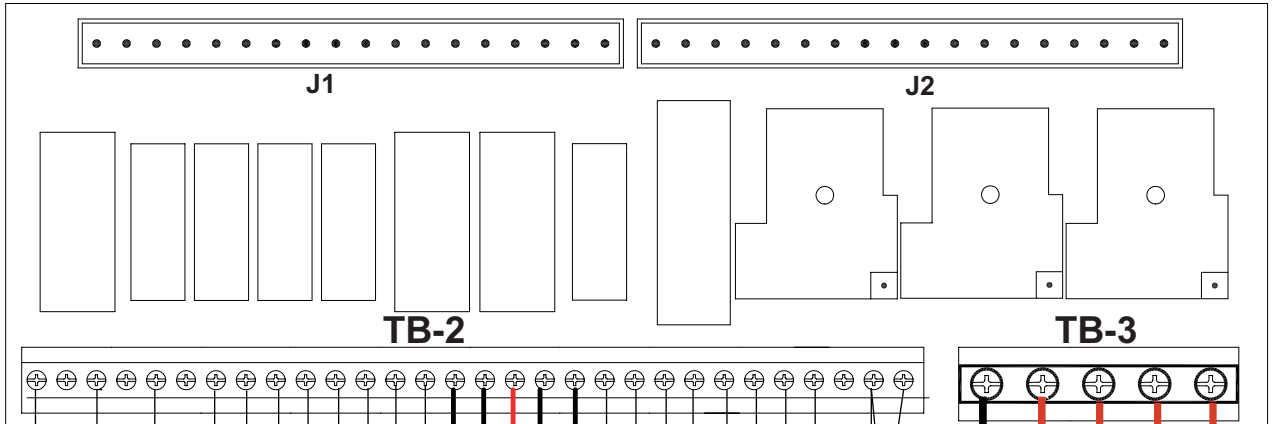
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INTERFACE UNIT LAYOUT PCB



J1 Harness to ECU-02

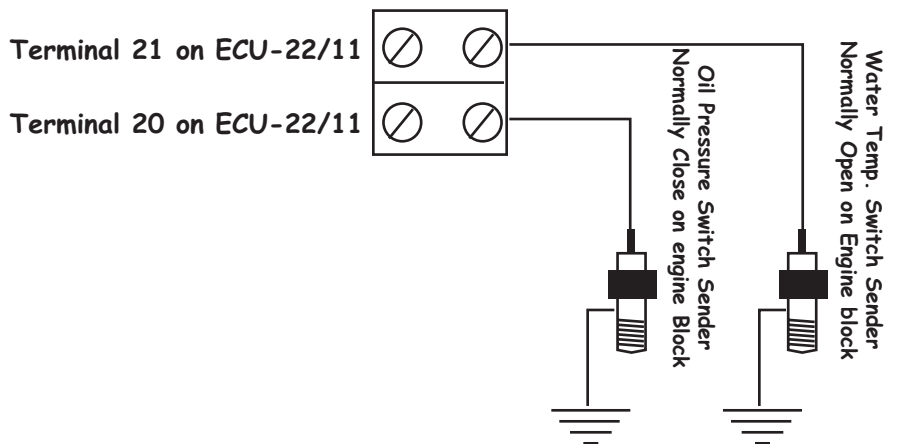
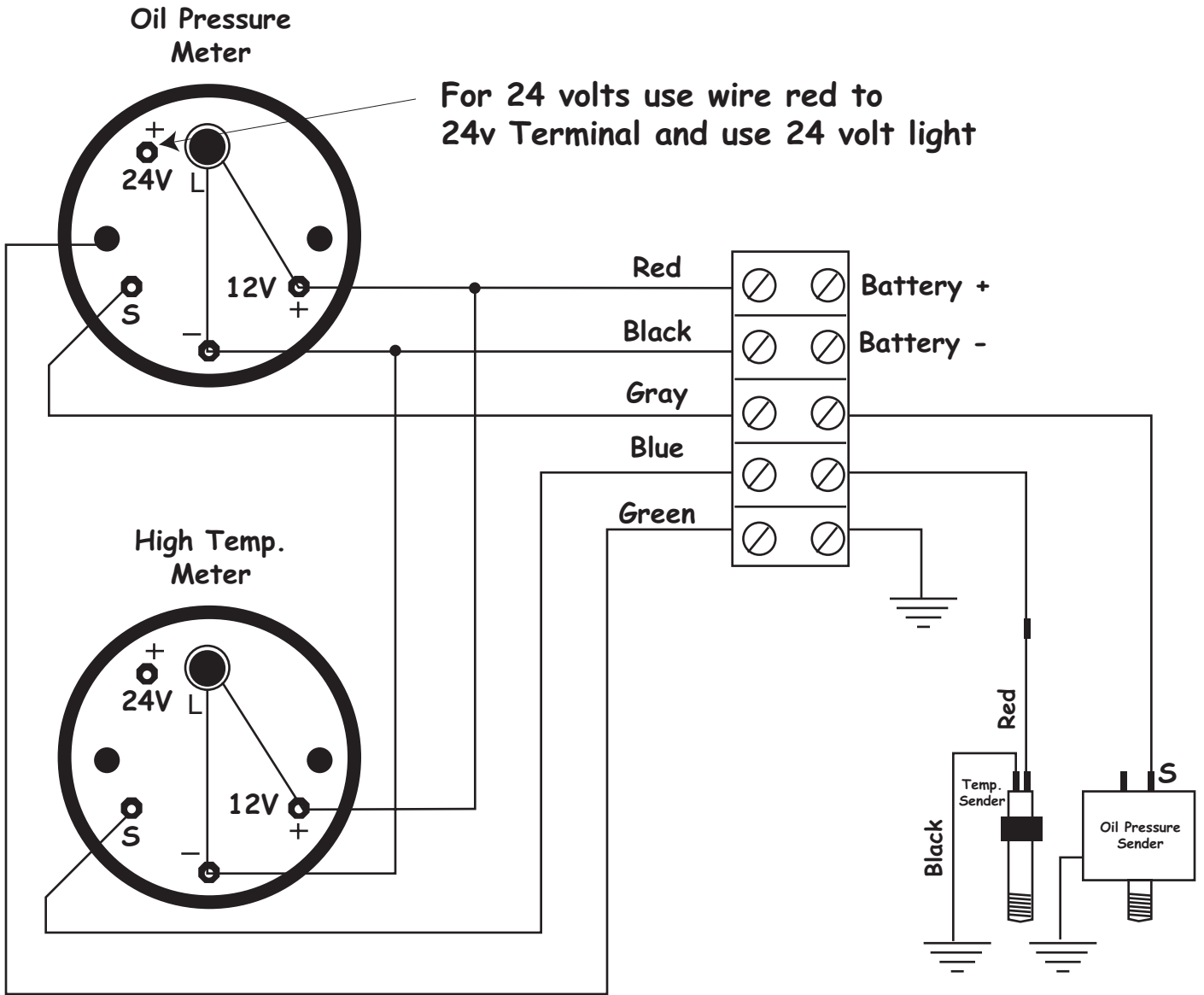
J2 Harness to ECU-02



Made in the USA by  
 MTS Power Products  
 4501 NW 27 Ave  
 Miami Florida 33161  
 phone 305-634-1511  
 www.mtspowerproducts.com

The Fuel Solenoid can be programmed for use in:  
 Energize to STOP  
 Energize to START  
 Systems

# Wiring Diagram for Oil pressure and Water Temperature Meter using the Susuki meters and senders



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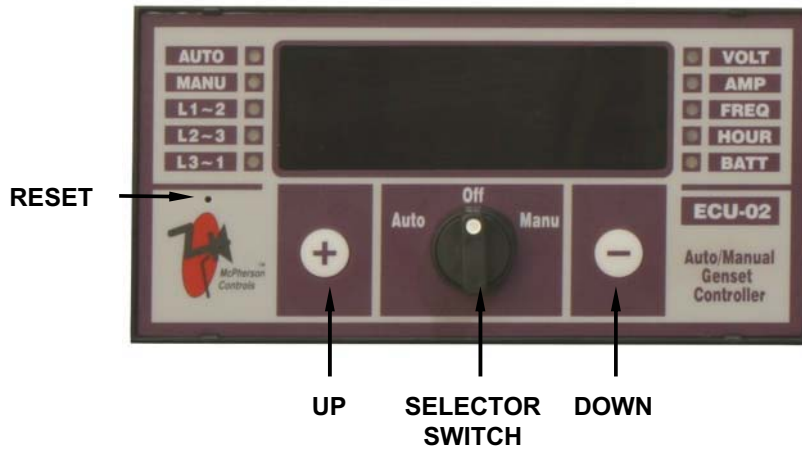
## INTRODUCTION

The **ECU-02** Generator Control module is used to start and stop a generator-set automatically. In addition to its automatic start-stop function, the module monitors any problems related to engine/generator performance and gives the operator digital readouts for all working parameters. The module will, by design, stop the engine and diagnose engine/generator failures on a large, easy-to-read 4 digit/7-segment front display panel with flashing, light emitting diodes (LED's). Remote starting is accomplished via standard, two-wire signals from any Automatic Transfer Switch or remote switch. Model ECU-02 also includes a generator overload protection.

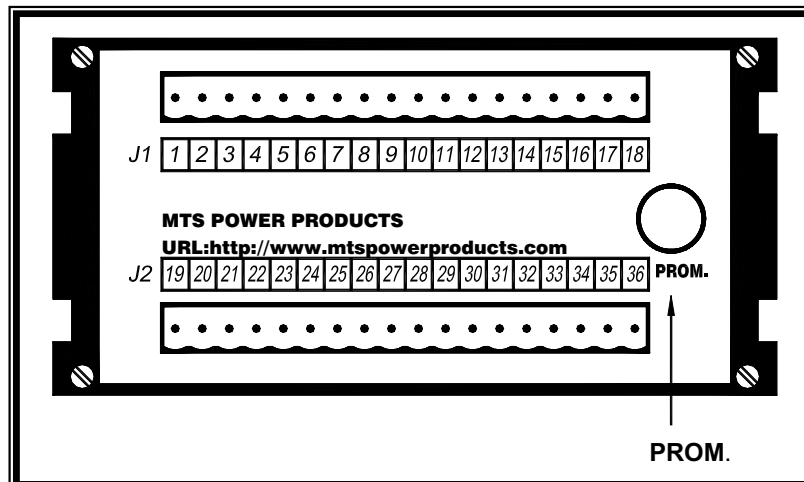
The module also features easily adjustable operational sequences, timers and alarm trips. These customizations can be programmed easily by the customer via the rear and front display panel. **These are the buttons (PROM on rear, + and - on the front).** There is no need for a PC connection and programming software. Any and all changes can be made in the field.

## 1. FRONT PANEL LAYOUT

### 1.1 FRONT PANEL LAYOUT



### 1.2 REAR PANEL LAYOUT



## 2. OPERATION

### 2.1 CONTROL

The **ECU-02** is controlled by using the front display panel **Selector Switch** (see 1.1). There are only three positions from which to choose: **AUTO, OFF and MANUAL**. The Selector Switch is the only control you need to operate the generator.

The Selector Switch is framed by two small push-buttons, - (**Down**)/+ (**Up**) (see 1.1). These buttons access more complex information, such as Voltage (**VOLT**) and Amperage (**AMP**) on each phase(**L1-2, L2-3, L3-1**), (**FREQ**) in Hertz, (**HOUR**) hour meter, (**BATT**) battery voltage, and remaining time until next service. These functions are described in greater detail in section 3.9 – 3.11.

### 2.2 AUTO MODE OF OPERATION

With the Selector Switch on the “**Automatic**” position, the **ECU-02** controls all the functions of the generator-set. The two **Remote Start Inputs** (see 1.2. terminals 15 and 16) on the **ECU-02** are monitored constantly. Once the start condition is signaled by an Automatic Transfer Switch or a remote start switch, the **ECU-02** commences the start sequence. The generator automatically is then placed on load.

#### Auto Sequence:

The flashing **AUTO LED** on the front panel (see 1.1) indicates, at a glance, that the generator-set is on stand-by and ready to start. When a **Remote Start** signal is given by the ATS, the **AUTO LED** stops flashing, indicating that the engine is on start countdown and will start.

If the engine needs **Pre-heat** and this option is selected, the **ECU-02** starts pre-heating the engine, and the corresponding relay output is energized. The front display will read “**Ph.XX**”, and the Pre-heat timer will count down the seconds on the front panel. Setting 0 (NO Pre-heat) on the programming sequence will set an automatic 5 second engine start delay before starting the engine. (The display will indicate “.05”) For additional instruction on programming, see 3.12.

**NOTE: If the Remote Start signal is removed during the Pre-heat Delay, the unit will return to a stand-by state after the Stop period.**

After the above start delays, the **Fuel Solenoid** and **Starter Motor** are energized. The display will indicate “**St.XX**”, and the Starter cranking timer will count down on the front display panel.

The engine cranks for a pre-programmed time period. Should the engine fail to start during these first cranking attempts, the starter motor disengages, and the engine goes into pre-heat again. Should this sequence go beyond the set number of start attempts, starting will be terminated, and the start fault alarm will be displayed by a flashing “**AL.00**” on the front panel.

After the engine starts, the starter motor is automatically disengaged by sensing 1, or as may as 3, different signals from the engine. These signals are: (1) a pre-set frequency ( 20% of rated frequency); (2) output voltage from the generator, and (3) oil pressure switch signal from the engine and/or the signal from the Magnetic PickUP. Any one or up to all three signals can be use to disengage the starter motor.

**NOTE: If you program the oil pressure switch to disconnect the starter, you may get a false oil pressure reading, giving you premature starter disconnect and tricking the ECU to believe the engine is running. (For example: when testing the engine with repeated starts; when the engine is cool and the crankcase oil is thick; and certain types of engines that build UP oil pressure quickly before engine start). If this is the case, remember that you have other programmable choices for disengaging the starter that are equally as effective.**

## ECU-02 Automatic Engine Control

After the starter disengages and the engine is running normally, a grace period is activated. This grace period allows oil pressure, engine speed, voltage and any other delayed Auxiliary inputs to be stabilized, before monitoring and triggering any faults (if any).

After the engine is running, the Engine **Warm UP** timer, if selected, is initiated. The Warm UP timer allows the engine to warm up and stabilize before accepting any loads. A signal is given to a **load transfer contactor** to activate and take up the load. (BE AWARE that some generators sets have no Load Contactor)

**NOTE: A load transfer output will not be initiated until the Oil Pressure, Engine Speed and alternating Voltages have risen and are all normal.**

With the return of normal power, the ATS removes the **Remote Start signal**. The load transfer contactor is the first to be de-energized, removing the load and initiating the engine **Cool Down** phase (engine with no load). The display will indicate “**CL.XX**”, and the Cool Down delay timer will count down on the front display panel.

Please be aware if your ATS also includes the above mentioned sequences. If so, then your timed sequences will run concurrently, combining the time programmed. For example, if you have a sixty second cool-down on an ATS and sixty second cool-down programmed on the **ECU-02**, your total cool-down will be 120 seconds.

To avoid this redundancy, set the ECU-01 timing delays (i.e. warm-up, cool-down) to 0 if your ATS includes these functions.

After the **Cool-Down** times out, the **Fuel Solenoid** is (de-energized or energized as the case may be) bringing the generator to a stop. The front display will indicate “**SP.XX**”, and the Stop delay timer will count down on the front panel. The ECU will reset, and the remote start LED will start flashing, indicating the generator is on standby and ready to start.

Should the Remote start signal be re-activated during the cooling down period, the set will immediately return to load.

## 2.3 MANUAL MODE OF OPERATION

Manual operation is conducted by turning the Selector Switch to Manual on the front display panel (see 1.1) The start sequence is the same as in the AUTO MODE sequence of operation (see 2.2 above). Turning the Selector Switch to OFF stops the engine after cool-down. In Manual the **MANU** LED is illuminated.

**NOTE: In manual mode of operation, the ATS will not operate the ECU-02. Remote start is disabled.**

## 2.4 OFF MODE OF OPERATION

The **OFF** position places the module into its **Stop or Reset** mode. This will clear any alarm conditions for which the triggering criteria have been removed.

If the engine is running and this position is selected, the module will automatically shut down the generator. The fuel supply will be removed and engine will be brought to a standstill. Should a **remote start signal** be present while operating in this mode, a remote start will not occur.

### 3. PROGRAMMING INSTRUCTIONS

**NOTE: Further programming and configuration must be made with the ECU-02 installed and connected to the battery.**

#### 3.1 BATTERY VOLTAGE

The **ECU-02** engine control unit automatically adjusts itself to DC12 or DC24 volts systems. When cranking, voltages drop sometimes to levels (under 6Vdc) that may render the ECU ineffective, due to a low or defective battery. Install new batteries or fix the starter. If the unit freezes because of low cranking voltage, it may be reset by: disconnecting B- from the battery for 4 seconds; or, you can simply push the reset button behind the front panel with a thin isolation tool for 1 second. (See 1.1 for front panel layout)

#### 3.2 PROGRAMMING

With the **Selector Switch on OFF**, push the button “PROM” on the rear panel of **ECU-02** for 4 seconds. The word “**Vr 2.0**” will appear on the front display for 2 seconds. This number indicates the version of the software. After that, the word “**Pro.**” will appear on the front panel for 4 seconds.

**You are now ready to start a line by line programming sequence. To advance to the next line, push the PROM button on the back panel (See 1.2).**

**Use the UP (+) and DOWN (-) buttons, to change each line’s programming parameters.**

Always push the “PROM” button to advance to next programming line or until the word “End” appears on the screen. To immediately end the programming mode, you can simply push the “PROM” button for 4 seconds at any time. The word END on the front display panel indicates a return to previous settings.

Should you make an error or desire to return to factory settings, stay in “Pro” mode and simultaneously press all 3 buttons: **UP (+)**, **DOWN (-)** and **PROM** for 4 seconds. The **ECU-02** will now **automatically program itself to factory settings** and the word “**Au.Po**” will appear on the display. (See table 3.12 for **ECU-02** factory settings.)

#### 3.3 PROGRAMMING THE HOUR METER

Turn the Selector Switch to the **OFF** position. Push the “PROM” button on the rear panel until the word “Pro” appears on the screen. Push the “**UP(+)**” key one time quickly before the word “**Pro**” disappears. The front display will read “**Ch.Hr.**,” indicating the operating hours of the gen-set. To reconcile the ECU-02 with the gen-set’s hours (For example, to set the ECU-02 at 200 hours to match a gen-set with 200 previous operating hours), push the **UP (+)** and **DOWN (-)** buttons to the number of hours desired.

After resetting the hour meter, simply push the **PROM** button again. The word “**END**” on the panel indicates that you are back to normal operating mode.

#### 3.4 SETTING THE MAGNETIC PICK-UP

Prior to setting the magnetic PICK-UP (Refer table 3.12), you must program lines 12, 13, 14, 15 and 19. Then, start the engine and run it at normal speed (50 or 60 Hz).

Next, set the LED on the front display panel next to **FREQ**, using the UP (+) and DOWN (-) buttons. When 50 or 60Hz appears on the LED, push the **PROM** button for one second, and “**Pro**” will appear. If “**FAIL**” appears, check the MPU wires and installation and try again.

The ECU-02 is now programmed with an over-speed trip, using the Magnetic Pick-Up that is dependent on the settings for line 14 (105%, 110%, 115% or 120% above rating speed), plus a 20% automatic starter motor disconnect. If any wires on the Magnetic Pick-Up break, the ECU-02 automatically shuts down the engine and shows the flashing alarm signal “AL.02” on the front screen.

### 3.5 VOLTS AND AMPS READOUT PROGRAMMING

Programming lines 2 & 7 are used for fine calibration of the VOLTS & AMPS readout. This option is used only if you have a “calibrated service meter” that you want to synchronize with the readings from the ECU-02.

For example: If the ECU reads 200 Volts but your “Calibrated Meter” reads 205 volts, you can easily add 5 volts to the ECU readout by putting the number 5 on line 2. The next time you start the generator, 5 is automatically added, reading 205 volts on the ECU.

To achieve the same synchronization for amperage AMPS, program line 7 to desired level.

### 3.6 WORKING WITH OVER 400 VOLTS INPUT (PROGRAMMING LINE 3)

It is dangerous to feed high voltage to the ECU Printed Circuit boards. The highest input voltage the ECU-02 can safely read is 400 volts. To work at over 400 volts, we have developed two clear, simple methods:

- 1) The preferred method is to connect the voltage sensing wires to the first Star, using lines **T7**, **T8 & T9** on the generator (See diagram 3.6 below). Next, set programming line 3 to “1.” The ECU-02 automatically doubles the input voltage on the display.
- 2) For generator sets which have no first Star and whose output is strictly over 400 volts, use this approach: utilize a 1 to ½ transformer (Order Part N0. PTU-03/See page 21 of manual). Feed 480 volts into the transformer input and connect the ECU to ½ voltage transformer output. Then set programming line 3 to “1.” Now, the ECU-02 automatically doubles the input voltage on the display.

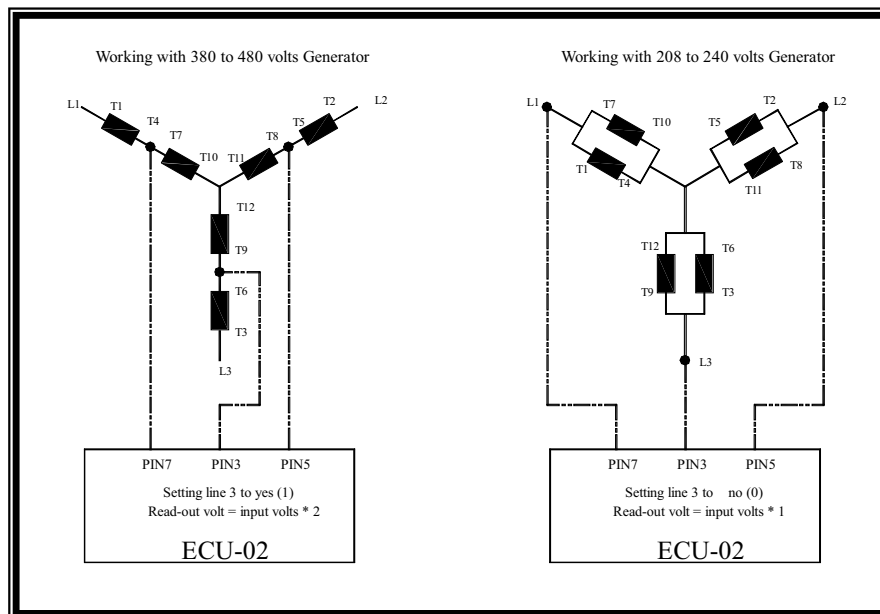


DIAGRAM 3.6

### 3.7 GENERATOR OVERLOAD PROTECTION FUNCTION

The function of the Generator overload protector is to STOP the engine if it is overworked by the customer, or if the engine goes over a given “Amps” set point established by the generator operator. This setting is easily changed, and it has adequate delays to compensate for temporary normal overloads.

**Current Transformer Connection**  
(Correct and ONLY schema for CT connection)

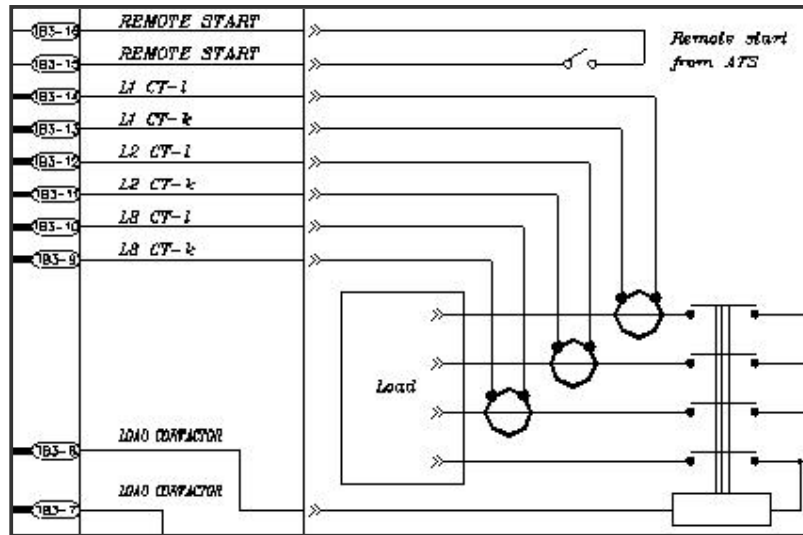


Diagram 3.7

**NOTE: Wire each CT individually into the ECU-02. Do not Daisy Chain or Ground any CT.**  
(See Diagram 3.7)

When the **ECU-02** detects a overload above the set point and this overload continues over the delay time set by **line 10**, the ECU-02 will shutdown the engine and show “**AL.07**” alarm on the front panel. To reprogram a cut-off point, go to line 9 and select a power unit needed. Programming 1 power unit into line 9 is equal to 50 Amps of load (1 power unit = 50 amps). For example, programming line 9 with 20 units represents an overload cut off current of 1000 Amps (50\*20=1000)

**NOTE: Never set line 9 to a value larger then the CT (current transformer) correctly inside the generator. For example if we are using 1000/5A CTs, line 9 can not be programmed to a value larger 20 x 50 ( 1000amps ), etc.**

### 3.8 USER DEFINED INPUTS ALARM 1 TO 4

The ECU-02 provides four alarm inputs, which can be defined by the user for any function. These alarms may be defined to provide warnings or shut-downs to the engine. Sensors can be closed or open signals, as defined by the user. To set the alarms, see programming table 3.16, lines 34 to line 42.

All four alarms/sensors are the same except for Alarm 1. This first alarm provides the user a time delay function. You can set the delay response time on alarm 1 from 0 to 99 Seconds, using programming line 36. Alarms 2, 3 and 4 respond immediately, with no delay.

### **3.9 ENGINE SERVICE INTERVAL REMINDER**

The engine service reminder is programmed into line 43 and can be set to (0 to 990 hours) hours. To program the hours between services, press the **PROM**. Button and go to line 43. Using the – **(DOWN)/+ (UP)** buttons, select the number of hours desired. Each integer represents ten hours. (For example, setting the number 2 will program a reminder of twenty hours; Setting the number 40 will program a service interval of 400 hours.) If the **HOURL** LED starts flashing, this is your reminder to give service to the generator set and, afterwards, reset the service meter. Setting the hour to 0 will not provide a maintenance reminder.

To reset the service meter, set the LED to **HOURL** by pressing the – **(DOWN)/+ (UP)** keys on the front display. Next, push the **PROM**. Button on back panel for 1 second. The ECU-02 is now reset and ready to remind you of your next engine service.

### **3.10 DISPLAY MODE SETTING**

The ECU-02 provides two display modes. The user has the option to view the entire system's operating parameters (Voltage, Amps, Frequency, Hour meter and DC Voltage) scrolled on the front display or one parameter at a time.

Programming **line 44** to 1 allows you to view the voltage, amps and frequency parameters for each phase in rotation automatically. Each parameter will show on the front display for 2 sec and change to the next. In this mode, the ECU-02 allows you to STOP the scrolling to view specific parameter for 30 seconds, by pressing the – **(DOWN) OR + (UP)** buttons. The ECU returns to automated scrolling after 30 seconds.

Programming **line 44** to 0 allows you to view the specific parameters without scrolling. You can change the display by simply pressing the – **(Down)/+ (Up) buttons**

### **3.11 ENGINE TEST AND SETUP FOR START/STOP ---- LED LAMP TEST**

When testing and/or setting up your engine with the **ECU-02** for the first time, you can override any engine STOP Commands, thus enabling you to set up engine parameters without the engine stopping every time and interrupting your work. This tool is very helpful when troubleshooting or when adjusting voltages and engine governors on a new engine. Remember; it is very important to preprogram line 24 correctly for **Energize to STOP or Energize to START** for your engine type, before using this handy tool.

Programming line 45 to 1 allows you to manual start and stop the engine by pressing the (+) key to start and (-) key to STOP. When you are using this tool all the LED's on the panel are lit, so that you may also test all the LED lamps.

When finished utilizing the Engine override function, push the **PROM**. Button one time and the word "**End**" will appear on the front display. The ECU-02 will return Line 45 to 0 automatically.

**ECU-CON RELAY MODULE**

**3.12LINE BY LINE PROGRAMMING TABLE**

<b>LINE</b>	<b>DESCRIPTION</b>	<b>VALUE</b>	<b>Factory Setting</b>
1	Is this generator operating in 3 phase or 1 phase?	0 → 3 Phase    1 → 1 Phase	<b>0</b>
2	Fine calibration of Voltage read-out (refer to chapter 3.5)	-50V ~ 50V	<b>0</b>
3	If the ECU is going to work over 400 volt? If Yes, go to chapter 3.6 and read related information.	0 → No            1 → Yes (0= volt * 1      1= volt *2)	<b>0</b>
4	Set Under Voltage by setting a number from 16 to 47. (# * 10) For example, the number 18 represent 180 volts, etc.	16 – 47 (160 – 470 V.)	<b>18 (180 V)</b>
5	Set Over Voltage by setting a number from 23 to 55. (# * 10) For example, the number 25 represent 250 volts, etc.	23 – 55 (230 – 550 V.)	<b>25 (250 V)</b>
6	Time before Generator STOPs, if there is a problem with the generator voltage output.	0 – 60 sec. ( 0 – No alarms )	<b>15</b>
7	Calibrate the AMPS read-out (refer to chapter 3.5)	-50A ~ 50A	<b>0</b>
8	Tell ECU-02 what CT (Current Transformer) is going to be installed. For example, if installing a 400/5A CT, program the number 10 into ECU-02, etc.	1 → 25/5    2 → 50/5    3 → 60/5 4 → 75/5    5 → 100/5    6 → 150/5 7 → 200/5    8 → 250/5    9 → 300/5 10 → 400/5    11 → 500/5    12 → 600/5 13 → 750/5    14 → 1000/5    15 → 1200/5 16 → 1500/5    17 → 2000/5    18 → 3000/5	<b>7</b>
9	Overload setting (refer to chapter 3.7)	1 – 60 (50 – 3000A )	<b>2(100A)</b>
10	Time before Generator STOPs if there is a problem with the generator overload.	0 – 99 sec. ( 0 – No alarms )	<b>3</b>
11	At what frequency “Hertz” will generator operate?	0 → 60 Hz            1 → 50 Hz	<b>0</b>
12	Test for Over-speed?	0 → No            1 → Yes	<b>1</b>
13	Test Over-speed using the generator output or Magnetic Pick-Up.	0 → Generator 1 → Magnetic Pick-up	<b>0</b>
14	Over-speed shutdown setting.	1 → 105%            2 → 110% 3 → 115%            4 → 120%	<b>4</b>
15	Time before Generator STOPs, if there is a problem with generator frequency output	0 – 60 sec.	<b>5</b>
16	Time to set Pre-Heat of engine	0 – 30 sec. ( 0 – No Pre-Heat )	<b>10</b>
17	Number of start attempts	1 – 9	<b>3</b>
18	Time to run the engine starter with each engine start	2 – 30 sec.	<b>6</b>
19	Remove starter by using the Magnetic Pick-up?	0 → No            1 → Yes	<b>0</b>
20	Remove starter by using engine oil pressure sensor?	0 → No            1 → Yes	<b>0</b>
21	Low oil pressure switch. Normally Open (NO) or normally close (NC).	0 → NO            1 → NC	<b>1</b>

**ECU-02 Automatic Engine Control**

22	Time before Generator STOPs, if there is a problem with low oil pressure	0 – 60 sec. ( 0 – No alarms )	<b>10</b>
23	Time to Energize to STOP the fuel solenoid	2 – 60 sec.	<b>15</b>
24	Is the STOP fuel Solenoid : Energize to STOP or Energize to START	0 → Energize to STOP 1 → Energize to START	<b>1</b>
25	Time for engine cool-down without load	0 – 60 min.	<b>0</b>
26	If a load contactor is used, time allowed for engine warm-up before connecting the LOAD	0 – 99 sec.	<b>0</b>
27	Temperature switch. Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>0</b>
28	Time before Generator STOPs, if there is a problem with engine temperature	0 – 60 sec. ( 0 – No alarms )	<b>5</b>
29	Enable or disable the alarm output (pin 18 on ECU11/22)	0 → Disable      1 → Enable	<b>0</b>
30	Emergency STOP button. Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>1</b>
31	Overload sensor. Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>0</b>
32	Low fuel sensor. Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>0</b>
33	Low Engine fuel	0 → Warning      1 → Stop	<b>0</b>
34	Alarm 1 Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>0</b>
35	Alarm 1 input	0 → Warning      1 → Stop	<b>0</b>
36	Time delay when alarm 1 input (refer to chapter 3.8)	0 – 99 sec. ( 0 – No alarms )	<b>0</b>
37	Alarm 2 Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>0</b>
38	Alarm 2 input	0 → Warning      1 → Stop	<b>0</b>
39	Alarm 3 Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>0</b>
40	Alarm 3 input	0 → Warning      1 → Stop	<b>0</b>
41	Alarm 4 Normally Open (NO) or normally closed (NC)	0 → NO          1 → NC	<b>0</b>
42	Alarm 4 input	0 → Warning      1 → Stop	<b>0</b>
43	Engine service interval reminder (refer to chapter 3.9)	0 – 99 (0 – 990 h.) (0 –No maintenance )	<b>0</b>
44	Display mode setting (refer to chapter 3.10)	0 → Fix          1 → Rotation	<b>1</b>
45	Is the generator working in TOOL mode? <b>Warning:</b> No Safety shutdowns on TOOL Mode Also LED Lamp Test (refer to chapter 3.11)	0 → NO say Normal 1 → YES, TOOL Mode	<b>0</b>

## 4. PROTECTIONS AND ALARMS

### 4.1 INFORMATION ON THE DISPLAY

The ECU-02 has a 4 digit display easily visible digital display. The 4 digit display indicates:

- ✧ Generator output voltage on each phase with the  $\bar{/}+$  buttons
- ✧ Generator output current on each phase with the  $\bar{/}+$  buttons
- ✧ Frequency
- ✧ Total running hour “Service”
- ✧ Battery voltage
- ✧ Programming parameter
- ✧ Fault alarms
- ✧ Timer count downs

Using with the **UP (+)/DOWN (-)** buttons you may select **VOLT, AMP, FREQ, HOUR** and **Battery Voltage** on the front display screen. To observe individual Voltage and Amperage on each phase, press **UP (+)** button. On a single phase system, the **UP (+)** key has no function.

**NOTE: Set system phase setting in line 1 correctly. If set incorrectly, the ECU-02 will read the wrong voltage values**

### 4.2 ALARMS

Alarms are non-critical warning conditions and do not affect the operation of the generator system. They serve to draw the operator’s attention to an undesirable condition. The warning alarm will reset automatically after the problem is fixed.

### 4.3 ENGINE STOP/SHUTDOWNS

Engine STOPS/SHUTDOWNS are latching, or final. To restart the engine, the alarm must be accepted and cleared. Turn the Selector Switch to OFF position to RESET.

After fixing the fault indicated (See Table 4.4 below), restart the generator and resume normal operation.

### 4.4 ALARMS TABLE

<b>AL 00:</b>	<b>Engine Start Failure</b>	
<b>AL 01:</b>	<b>Over Speed</b>	<b>Shut Down</b>
<b>AL 02:</b>	<b>Magnetic Pickup defective</b>	<b>Shut Down</b>
<b>AL 03:</b>	<b>Wrong Voltage</b>	<b>Shut Down</b>
<b>AL 04:</b>	<b>Low Engine Oil Pressure</b>	<b>Shut Down</b>
<b>AL 05:</b>	<b>Emergency STOP Pushed</b>	<b>Shut Down</b>
<b>AL 06:</b>	<b>High Engine Temperature</b>	<b>Shut Down</b>
<b>AL 07:</b>	<b>Generator Over Loaded</b>	<b>Shut Down</b>
<b>AL 08:</b>	<b>Low Fuel</b>	<b>Shut Down or Warning</b>
<b>AL 09:</b>	<b>Option 1</b>	<b>Shut Down or Warning</b>
<b>AL 10:</b>	<b>Option 2</b>	<b>Shut Down or Warning</b>
<b>AL 11:</b>	<b>Option 3</b>	<b>Shut Down or Warning</b>
<b>AL 12:</b>	<b>Option 4</b>	<b>Shut Down or Warning</b>
<b>AL 13:</b>	<b>Low Battery Voltage</b>	<b>Warning</b>

TABLE 4.4

## 5. INSTALLATION INSTRUCTIONS

The model **ECU-02** Module has been designed for front panel mounting. Affixing the ECU-02 to the front panel is accomplished by 2 spring loaded clips located on each side of the module.

### 5.1 PANEL CUT-OUT (ALL DIMENSIONS IN MM.)

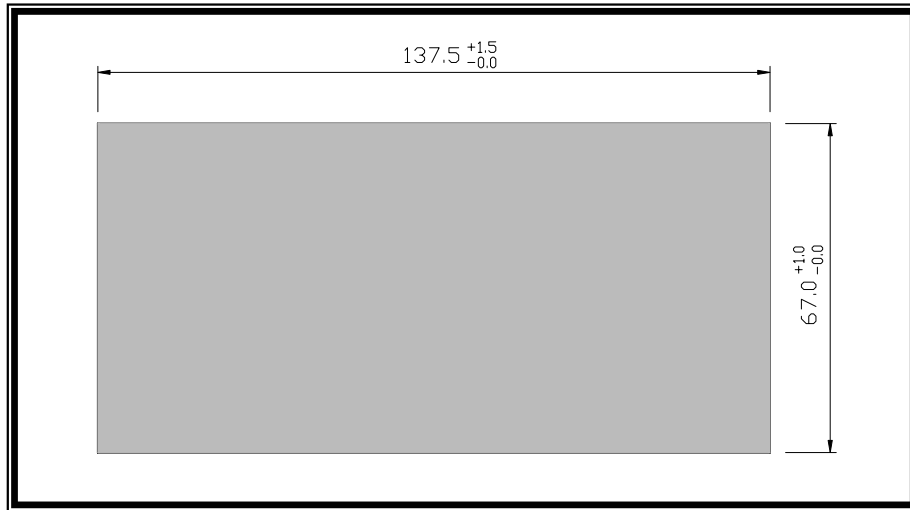


DIAGRAM 5.1

In conditions of excessive vibration, the module should be mounted on suitable anti-vibration mountings.

### 5.2 UNIT DIMENSIONS (ALL DIMENSIONS IN MM.)

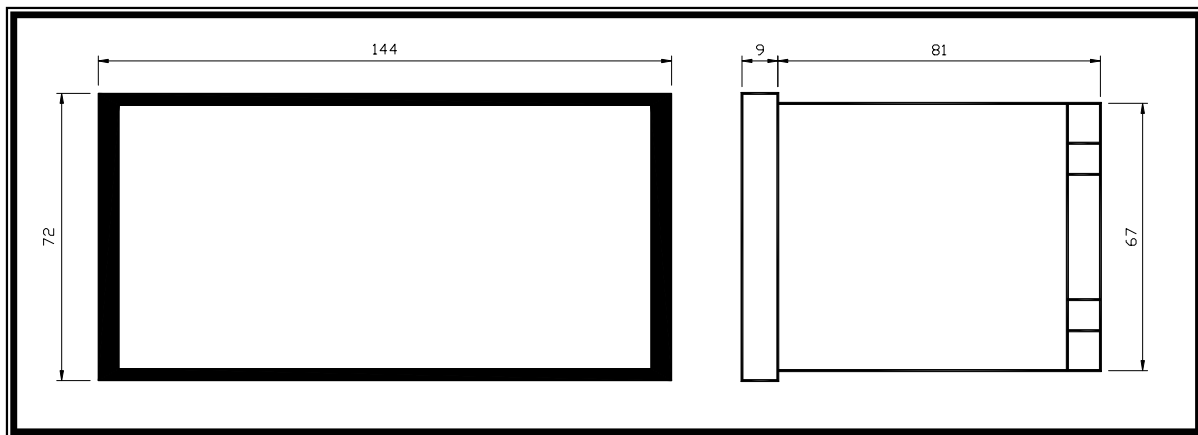


DIAGRAM 5.2

### 5.3 COOLING

The module has been designed to operate over a wide temperature range, from **-25 to +55° C**. Nevertheless, allowances should be made for temperature increases within the control panel enclosure. Care should be taken **NOT** to mount possible heat sources near the module (i.e., battery chargers), unless adequate ventilation is provided. The relative humidity inside the control panel enclosure should not exceed **85%**.

## 6. ELECTRICAL CONNECTIONS

### 6.1 CONNECTION DETAILS ON THE ECU-02

#### PLUG "J1" 18 WAY

1	Not Used	Spare
2	Not Used	Spare
3	Generator L3 sensing input.	Connect to alternator L3 output.
4	Not Used	Spare
5	Generator L2 sensing input.	Connect to alternator L2 output.
6	Not Used	Spare
7	Generator L1 sensing input.	Connect to alternator L1 output.
8	Not Used	Spare
9	CT secondary for L3	Connect to secondary of L3 monitoring CT.
10	CT secondary for L3	Connect to secondary of L3 monitoring CT
11	CT secondary for L2	Connect to secondary of L2 monitoring CT
12	CT secondary for L2	Connect to secondary of L2 monitoring CT
13	CT secondary for L1	Connect to secondary of L1 monitoring CT
14	CT secondary for L1	Connect to secondary of L1 monitoring CT
15	Remote start input	Connect to A.T.S device
16	Remote start input	Connect to A.T.S device
17	DC Plant Supply Input (-v)	System DC negative input. (Battery Negative).
18	DC Plant Supply Input (+v)	System DC positive input. (Battery Positive). Recommended fuse 2 Amp

#### PLUG "J2" 18 WAY

19	Warm up signal Output	Used to control the Warm UP contactor. Supply (-v) 2.5 Amp rated.
20	Fuel solenoid signal Output	Used to control the fuel solenoid or engine fuel control system. Supply (-v) 2.5 Amp rated.
21	Start signal Output	Used to control the Starter Motor. Supply (-v) 2.5 Amp rated.
22	Auxiliary signal Output	Energize to start. Supply (-v) 2.5 Amp rated.
23	Pre-heat signal Output	Used to control the internal Heater Supply (-v) 2.5 Amp rated.
24	Alarm signal Output	Used to control external alarm buzzer. Supply (-v) 2.5 Amp rated.
25	Emergency Stop Input	Connect to external emergency stop switch.
26	Oil Pressure Input	Connect to Oil pressure sender
27	Coolant Temperature Input	Connect to Coolant Temperature sender
28	Overload sender Input	Connect to Overload sender
29	Low fuel sender Input	Connect to fuel sender
30	Auxiliary Input 1	This is a negative switched configurable input
31	Auxiliary Input 2	This is a negative switched configurable input
32	Auxiliary Input 3	This is a negative switched configurable input
33	Auxiliary Input 4	This is a negative switched configurable input
34	Not Used	Spare
35	Magnetic Pickup Input (+v)	Connect to Magnetic Pickup device. AC signal from the magnetic pickup for speed sensing.
36	Magnetic Pickup Input (-v)	Connect to Magnetic Pickup device. AC signal from the magnetic pickup for speed sensing.

## 6.2 SPECIFICATIONS

DC Supply	9.0 to 30 V Continuous.
Alternator Input Range	15V – 380 (ph-ph) 3 Phase 3wire AC (+15%)
Alternator Input Frequency	50 – 60 Hz at rated engine speed.
Magnetic Input Range (if fitted)	+/- 2 V to70 V Peak
Magnetic Input Frequency	10,000 Hz (max) at rated engine speed.
Warm up signal Output	5 Amp DC at supply voltage.
Fuel solenoid signal Output	5 Amp DC at supply voltage.
Start signal Output	5 Amp DC at supply voltage.
Pre-heat signal Output	5 Amp DC at supply voltage.
Auxiliary signal Output	5 Amp DC at supply voltage.
Alarm signal Output	5 Amp DC at supply voltage.
Operating Temperature Range	-25 to +55°C
CT Burden	2.5VA
CT Secondary	5A

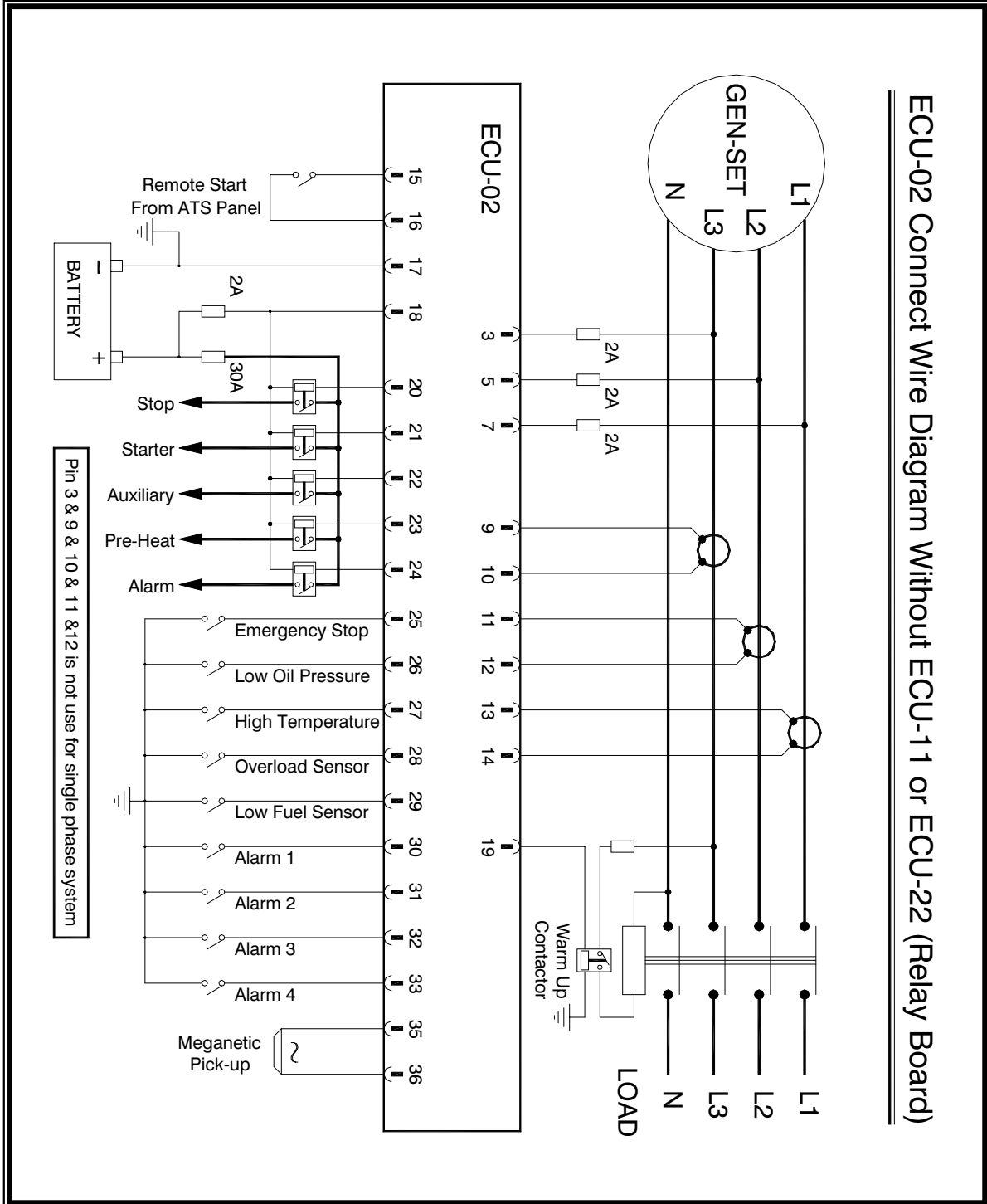
## 7. TROUBLE-SHOOTING

ECU-02 is inoperative	Check if the emergency stop is push on. Check the battery and wiring to the unit. Check Battery Volts on cranking. (not below 6v) Check the DC fuse F5 and F6
Engine Shuts Down	Check DC supply voltage is not below 6 Volts. Check that operating temperature is not above 55 °C.
Engine locks out on Emergency Stop	If the Emergency Stop Button is not used, program line 24 to NO =0 Check emergency stop switch is functioning correctly. Check Wiring is not open circuit. Check line 24 setting is correct.
Intermittent Magnetic Pick-UP sensor engine shutdown	Check magnetic pick-up is functioning correctly. Check Wiring is not open circuit. Check output voltage is not below less de 8 Volts RMS
Low Oil Pressure shutdown after engine has started	Check engine oil pressure. Check oil pressure switch/sender and wiring. Check configured polarity is correct (i.e. NO or NC).
High engine temperature shutdown after engine has started.	Check engine temperature. Check switch/sender and wiring. Check configured polarity is correct (i.e. NO or NC).
Shutdown occurs	Check switch and wiring of fault indicated on display. Check configuration of input.
Alarm occurs	Check relevant switch and wiring of fault indicated on display. Check configuration of input.
Engine fail to Start despite pre-set number of attempts	Check fuel. Check wiring of fuel solenoid. Check battery supply. Check the speed sensing signal is present on the inputs.
Continuous starting of generator when in <b>AUTO</b>	Check that the "Remote Start" input is not shorted.
Generator fails to start on receipt of Remote Start signal.	Check if engine Start Delay timer has timed out. If remote start faults, check if signal is on "Remote Start" input.
Pre-heat inoperative	Check wiring to engine heater plugs. Check that pre-heat has been selected in your program.
Starter motor inoperative	Check wiring to starter solenoid. Check starter motor. You have a 30 Amp limit

ECU-CON RELAY MODULE

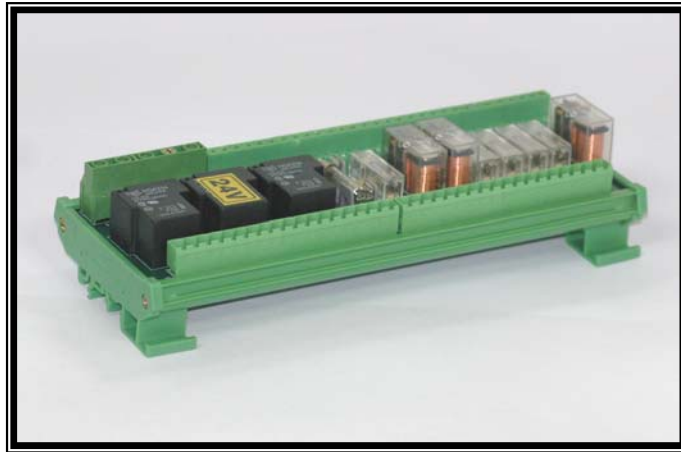
Engine runs but generator will not take load	Check if warm up timer has timed out. Check warm up has been selected in your configuration.
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**8. TYPICAL WIRING DIAGRAM FOR ECU-02.**  
**NO RELAY BOARD IS SHOWN ON THIS DIAGRAM**



# ***ECU-11(12V) & ECU-22(24V)***

**RELAY MODULE AND HARNESS**  
For Quick Installation of ECU



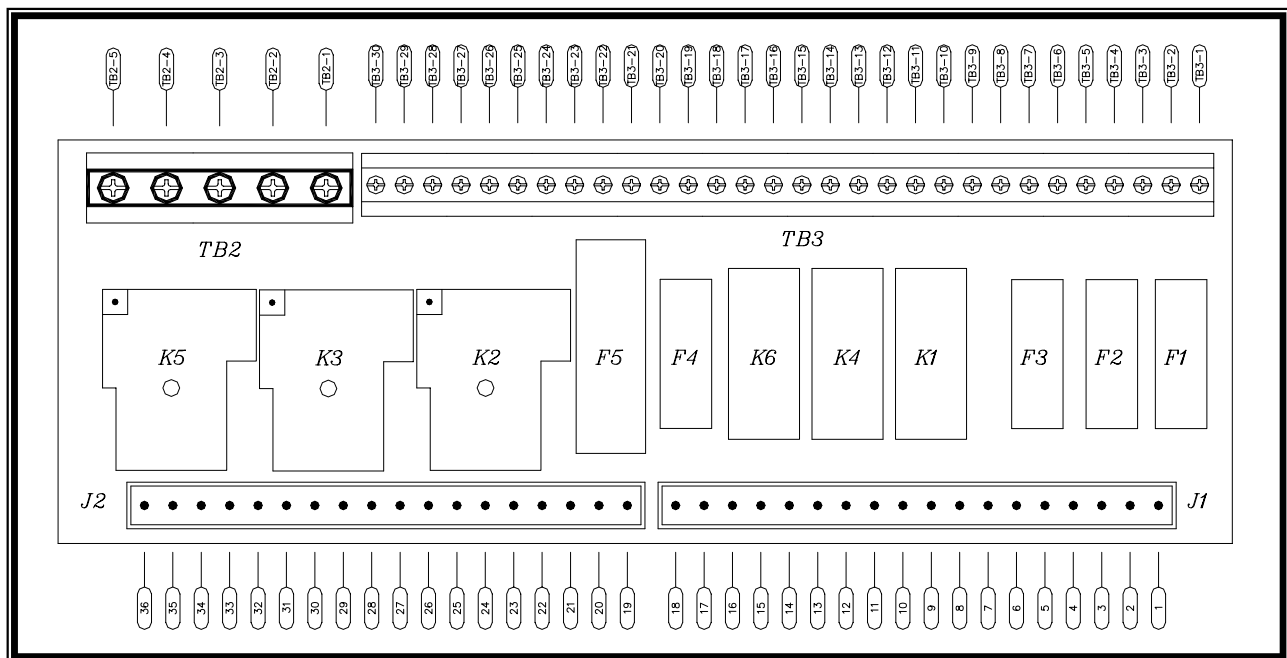
**McPherson Controls**  
4501 NW 27 Ave  
Miami, Florida 33142  
Ph 305-634-1511  
Fax 305-634-1461  
[www.mtspowerproducts.com](http://www.mtspowerproducts.com)

## ECU-11(12V) & ECU-22(24V) RELAY MODULE OPERATOR'S MANUAL

### 1. INTRODUCTION

The Relay Module is the interface between the automatic engine control module ECU-02 and the generator. The ECU-11 & ECU-22 provides two 18 ways plugs to connect to ECU-02 module. All the protected fuses and power relays for engine pre-heat, start, fuel, stop, and alarm output are pre-assembled on the relay module. Simply connect the control wires to the correct terminals on the module, thus minimizing assembly time and potential for errors when assembling and installing the engine control wires.

### 2. ECU-11 (12V) & ECU-22(24V) CONNECTION DETAILS



- 1) The plug J1( Pin1 ~ Pin18 ) connected to the plug J1 of ECU-02.
- 2) The plug J2( Pin19 ~ Pin36 ) connected to the plug J2 of ECU-02.

**IMPORTANT:** If the outputs are being used to switch heavy inductive loads such as starters, starter relays, armatures, solenoids, etc. Then a “flywheel” diode (back EMF suppression diode) must be fitted across the coil of each load as near to the coil as possible.

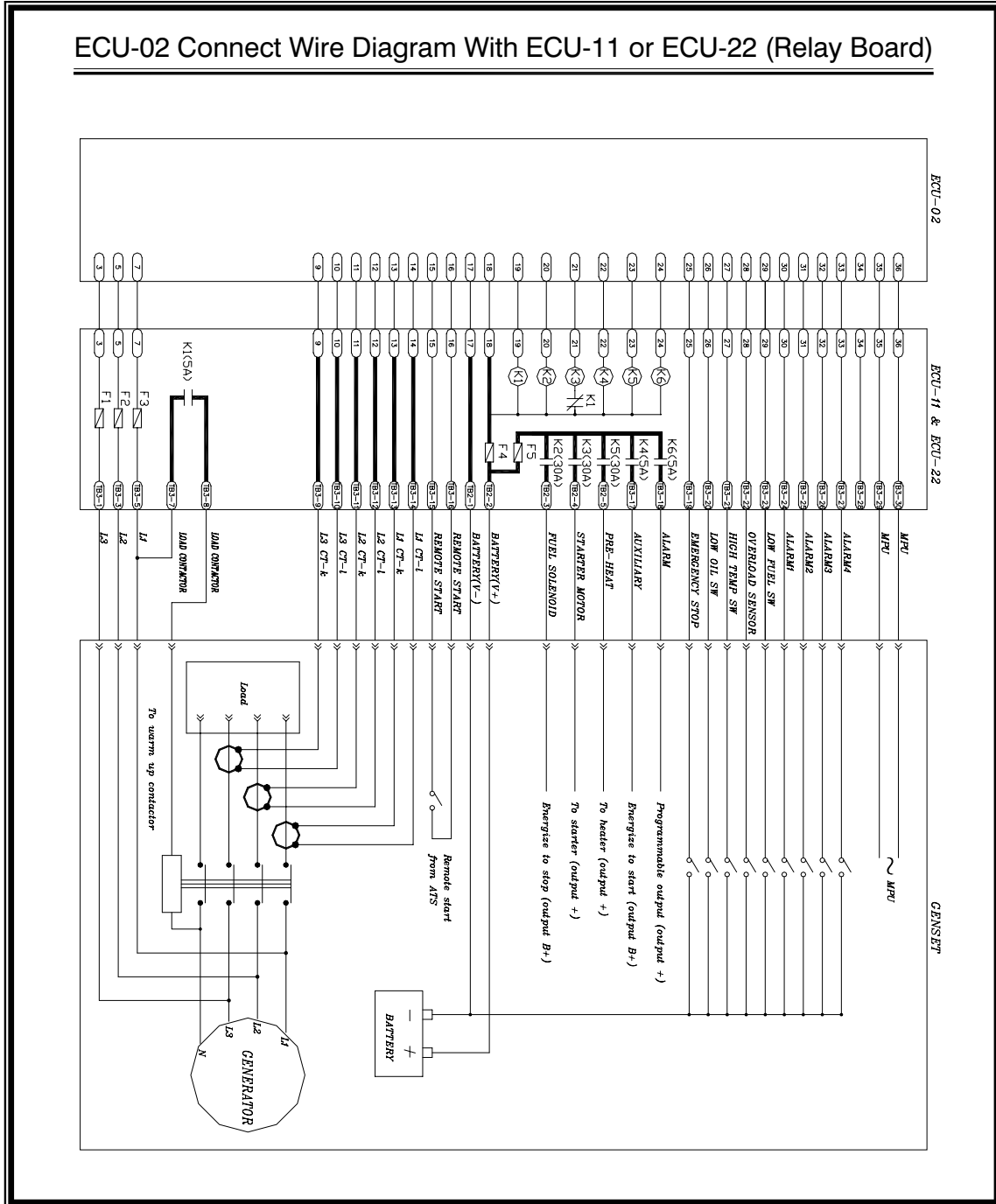
### 3. TERMINAL TB2 POWER AND 30 AMP OUTPUT CONNECTIONS

TB2-1	DC Plant Supply Input (-v)	System DC negative input. (Battery Negative). AWG10
TB2-2	DC Plant Supply Input (+v)	System DC positive input. (Battery Positive). AWG10
TB2-3	Fuel solenoid signal Output Programmable to ET STOP or ET START	Controls the fuel solenoid or engine fuel control system. Supply (+v) 30 Amp rated.
TB2-4	Start signal Output	Controls the Starter Motor. Supply (+v) 30 Amp rated.
TB2-5	Pre-heat signal Output	Controls the engine pre heater Supply (+v) 30 Amp rated.

### 4. TERMINAL TB3

TB3-1		
TB3-1	Generator L3 sensing input.	Connect to alternator L3 output.
TB3-2	Not Used	Spare
TB3-3	Generator L2 sensing input.	Connect to alternator L2 output.
TB3-4	Not Used	Spare
TB3-5	Generator L1 sensing input.	Connect to alternator L1 output.
TB3-6	Not Used	Spare
TB3-7	Warm up signal Output	Used to control the Warm up contactor. 5 Amp rated.
TB3-8	Warm up signal Output	Used to control the Warm up contactor. 5 Amp rated.
TB3-9	CT secondary for L3	Connect to secondary of L3 monitoring CT.
TB3-10	CT secondary for L3	Connect to secondary of L3 monitoring CT
TB3-11	CT secondary for L2	Connect to secondary of L2 monitoring CT
TB3-12	CT secondary for L2	Connect to secondary of L2 monitoring CT
TB3-13	CT secondary for L1	Connect to secondary of L1 monitoring CT
TB3-14	CT secondary for L1	Connect to secondary of L1 monitoring CT
TB3-15	Remote start input	Connect to A.T.S remote start contact.
TB3-16	Remote start input	Connect to A.T.S remote start contact.
TB3-17	Auxiliary signal Output	Energize to start. (+v) 5 Amp rated. (Not Programmable) for use with Electronic Governors, Battery charging alternator exciter. Etc.
TB3-18	Alarm signal Output	For use with an external alarm. Supply (+v) 5 Amp rated.
TB3-19	Emergency Stop Input	Connect to external emergency stop switch. (Panic Button)
TB3-20	Oil Pressure Input	Connect to Oil pressure sender.
TB3-21	Coolant Temperature Input	Connect to Coolant Temperature sender.
TB3-22	Overload sender Input	Connect to Overload sender.
TB3-23	Low fuel sender Input	Connect to low fuel indicator switch sensor.
TB3-24	Auxiliary Input 1	This is a negative switched configurable input with time out
TB3-25	Auxiliary Input 2	This is a negative switched configurable input
TB3-26	Auxiliary Input 3	This is a negative switched configurable input
TB3-27	Auxiliary Input 4	This is a negative switched configurable input
TB3-28	Not Used	Spare
TB3-29	Magnetic Pickup Input (+v)	Connect to Magnetic Pickup device. AC signal from the magnetic pickup for speed sensing.
TB3-30	Magnetic Pickup Input (-v)	Connect to Magnetic Pickup device. AC signal from the magnetic pickup for speed sensing.

### 5. ECU-11(12V) & ECU-22(24V) TYPICAL WIRING DIAGRAM



# *PTU-03*

## *TRANSFORMER UNIT: PTU-03* *ECU Voltage Isolation*

**OPTION FOR USE IN GENERATORS  
WITH OVER 400 VOLT OUTPUT**



The transformer unit PTU-03 is necessary for generators whose output exceeds 400 volts and whose first Y is not available for connection to ECU-02, as feeding voltage greater than 400v is dangerous to the ECU-02. This accessory halves input voltages into the ECU-02 with a 1 to ½ ratio, allowing safe voltage for the inner circuit board. For example, the PTU-03 is required for a 4-wire 480/277 volt generator with no connections to the first Star.

## 2. TRANSFORMER UNIT: PTU-03 WIRING DIAGRAM

