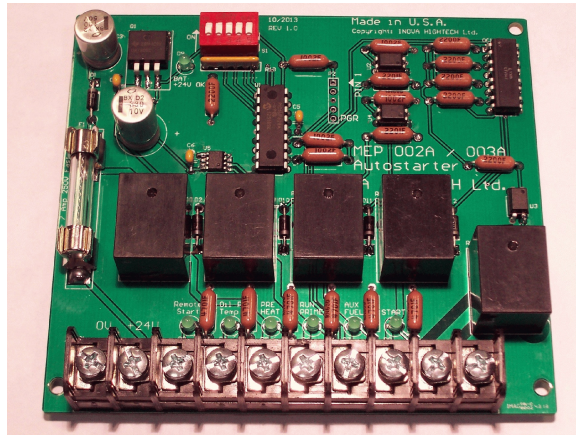


# INOVA HIGHTECH Ltd.

## MEP 002/003 Auto Starter Manual



Complete Installation and Operating Manual  
for the  
MEP 002/003 Auto / Remote Starter  
for the following MEP Power Generators:

**MEP 002A/003A/011A/802A/803A/811A**

## **Index**

<i>Index</i>	<b>1</b>
<i>Introduction</i>	<b>2</b>
<i>The MEP002/003 Autostarter</i>	<b>3</b>
<i>Dip Switch Settings and Timing</i>	<b>4</b>
<i>Theory of Operation</i>	<b>5</b>
<i>Before you Begin and Tools needed</i>	<b>6</b>
<i>Installing the Auto Starter Circuit Board</i>	<b>7</b>
<i>Wiring the Auto Starter Circuit Board</i>	<b>8</b>
<i>The “Start and Power Control Circuit”</i>	<b>12</b>
<i>Wiring Diagram:</i>	
<i>Remote Start with 24 VDC Coil 3 Phase Contactor</i>	<b>14</b>
<i>Wiring Diagram:</i>	
<i>Remote Start with 120 VAC Coil 3 Phase Contactor</i>	<b>15</b>
<i>Wiring Diagram:</i>	
<i>Sample Automatic Transfer Switch</i>	<b>16</b>
<i>Check of Glow / Air Pre Heat Plug</i>	<b>17</b>

### ***INOVA HIGHTECH Ltd.***

*15115 Chestnut Street*

*Basehor, KS 66007*

*U.S.A.*

*Tel: (913) 728 2662*

*Web Site: <http://www.inovahightech.com>*

*E-Mail: [Sales@inovahightech.com](mailto:Sales@inovahightech.com)*

**© 2013 INOVA HIGHTECH Ltd.**

## ***Introduction:***

Thank you for purchasing a IHT MEP 002/003 Autostarter. We hope that this Manual will help you to properly install our product and assure easy and problem free operation of your MEP Generator.

We, at IHT developed this board with customers like you in mind. Our Autostarter is meant to ease the operation of the MEP generator in a safe and reliable way.

The MEP002/003 Autostarter can be used solely to remote start the Generator or in combination with a Power Transfer Switch.

The MEP002/003 Autostarter will allow you to setup the Warm Up and the Cool down time prior to engaging and disconnecting power output. The MEP002/003 Autostarter has a built in Temperature Sensor which will adjust the Pre Heat Time for the Glow Plugs and Air Intake Heaters in reference to the Ambient Temperature. The Pre Heat Time will Range for 17 sec at ambient temperatures above +30° Celsius to app. 85 sec for ambient temperatures of below -40° Celsius. The Pre Heat time can also be set at either 15sec or 45 sec if the Generator set is operated within a building at a steady ambient temperature.

The MEP002/003 Autostarter also Monitors the Oil Pressure Switch and the Over Heat Switch on your MEP Generator.

The monitoring starts after the initial startup and continues uninterrupted until the unit has shut down.

The Oil Pressure Switch and Overheat Switch are bypassed on the MEP 002/003/004/011 Series of Power generators by means of the Switch S1 during the startup.

It is ***extremely*** important to check the ***oil level*** prior to the manual startup of your Generator Set and the Oil Level should be checked on a weekly basis.

The MEP002/003 Autostarter is wired in parallel to the S1 Switch of your unit. The Oil Level / Pressure can only be visually monitored by watching the Oil Pressure Gauge during “Start Operation”.

Correct Oil Pressure should be checked prior to installing the MEP002/003 Autostarter in your set by manually starting and observing the Oil Pressure Gauge.

The normal Oil Pressure for the MEP 002/003 is between 15 PSI to about 50 PSI, depending upon the Engine Oil used and the ambient Air Temperature.

Please refer to the Military TECHNICAL MANUAL - OPERATION AND/OR ORGANIZATIONAL MANUAL TM-05684C/05685B-12 (MEP 003) for the correct Engine Oil's, Filters, lubricants etc.

Please contact us via e-mail [sales@inovahightech.com](mailto:sales@inovahightech.com) if you cannot find the correct Military Manual for your Power Generator.

## The MEP002/003 Autostarter:

The MEP002/003 Autostarter was designed to be an affordable Kit and to provide the user with an easy to install Auto / Remote Starter with some basic features and a reduced wiring requirements.

<b>Data Sheet:</b>		
<b>Condition</b>	<b>normal</b>	<b>max. Value</b>
Power	+24 VDC	+39 VDC
Inputs	+24 VDC	+39 VDC
Outputs	240 VAC / 5 Amp / 1/8HP	240 VAC / 5 Amp / 1/8HP
Idle current	8 - 10 mA	20 mA
Operating Temperature	-40°C to +85°C	-40°C to +85°C
Humidity	100% (with Conformal Coating) 80% (without Conformal Coating, NON CONDENSING!)	100% (with Conformal Coating) 80% (without Conformal Coating, NON CONDENSING!)
Vibration Resistance	14G - continues up to 360 Hz 24+ hours	14G - continues up to 360 Hz 24+ hours
MIL-STD		MIL-STD-810G (not all test performed)

<b>Timing Sequence:</b>		
<b>Task</b>	<b>Time</b>	<b>Selectable</b>
Initial Wake up and Temp reading	3 sec	Fixed
Prime	1.5 sec	Fixed
Prime + Pre-Heat	15 sec / 45 sec / 17 sec to 85 sec	Selectable / Variable
Prime + Pre-Heat + Start	15 sec	Per MIL Operating Manual
Warm Up	60 sec or 300 sec	Selectable
RUN	as long as REMOTE START INPUT is ACTIVE	
Cool Down	120 sec, 360sec or 600 sec	Selectable
Shut Down	250 msec	Fixed
Min / Max Total Primer Time	31.5 sec / 101.5 sec	
Min / Max Total Pre Heat Time	30 sec / 100 sec	

DIP Switch Settings			
DIP SWITCH	Function	DIP SWITCH ON POSITION	DIP SWITCH OFF POSITION
1	AUX FUEL	YES	NO
2	Warm Up	5 min (300 sec)	1 min (60 sec)
3	Cool Down	DIP2 OFF 06 min (360 sec) DIP2 ON 10 min (600 sec)	DIP2 OFF 02 min (120 sec) DIP2 ON 06 min (360 sec)
4	Pre Heat	FIXED TIME (select with DIP #5)	AMBIENT AIR TEMPERATURE (see table)
5	Fixed Time	45 sec	15 sec

Time / Ambient Air Temperature Relationship Table - Pre Heat											
-55°C	85.0 sec	-35°C	65.5 sec	-15°C	45.0 sec	+05°C	23.5 sec	+25°C	21.5 sec	+45°C	19.0 sec
-50°C	80.0 sec	-30°C	60.0 sec	-10°C	40.0 sec	+10°C	23.0 sec	+30°C	20.5 sec	+50°C	18.0 sec
-45°C	75.0 sec	-25°C	55.0 sec	-05°C	35.0 sec	+15°C	22.5 sec	+35°C	20.0 sec	+55°C	17.5 sec
-40°C	70.0 sec	-20°C	50.0 sec	± 0°C	24.0 sec	+20°C	22.0 sec	+40°C	19.5 sec		

Connections (I/O Descriptions)	
I/O Terminal Block	Function
TB #1 0V	Supply: Ground (0V)
TB #2 +24 VDC	Supply: + 24 VDC Supply
TB #3 Remote Start	INPUT: Remote Start [Active High]
TB #4 Oil Pressure / Heat	INPUT: Oil Pressure / Heat [Active High]
TB #5 Pre Heat	RELAYS OUTPUT: Pre Heat [Active High +24 VDC]
TB #6 RUN / PRIME	RELAYS OUTPUT: Run / Prime [Active High +24 VDC]
TB #7 AUX FUEL	RELAYS OUTPUT: Aux Fuel [Active High +24 VDC]
TB #8 START	RELAYS OUTPUT: Start [Active High +24 VDC]
TB #9 Power On COM	RELAYS OUTPUT: COM contact of Relay
TB #10 Power On N/O	RELAYS OUTPUT: Normally Open contact of Relay

DIP Switch Settings for Warm Up and Cool Down Times		
Dip Switch Settings	Warm Up Time	Cool Down Time
DIP2 "Off" and DIP3 "Off"	1 Min ( 60 sec )	2 Min ( 120 sec)
DIP2 "ON" and DIP3 "Off"	5 Min ( 300 sec )	6 Min ( 360 sec)
DIP2 "Off" and DIP3 "ON"	1 Min ( 60 sec )	6 Min ( 360 sec)
DIP2 "ON" and DIP3 "ON"	5 Min ( 300 sec )	10 Min ( 600 sec)

## Theory of Operation:

The Unit is constantly connected to the 24 Volt DC Circuit. The Microcontroller and the LED BAT +24V OK draw an average idle current of app 10mA. The two 12 V batteries of the Generator have a combined 100 Ah. It would take 416 days for the Unit to drain the Batteries if the Unit would not be operated. However the original Military Manual requires for the Batteries to be disconnected if the unit is not operated for more than two weeks.

The software continuously scans the Input TB #3 "Remote Start" for a change of state. This is an active High Input. Upon applying a High Signal the Unit will enter it's Start Phase. The DIP Switch Settings are now read to determine all necessary timing. The Outputs are now activated with the selected time delays and the periods necessary. Oil Pressure is checked upon exiting the Start Cycle.

If the Input TB #3 "Remote Start" goes low prior to the end of the Start Phase, then the unit will stop at the end of the Start Phase.

<b>Decision Table upon exit of Start Routine and enters RUN MODE</b>		
<b>Input Condition</b>	<b>Routine</b>	<b>Condition</b>
OIL P = 1 + REMOTE START = 1	RUN	Normal
OIL P = 0 + REMOTE START = 1	OIL PRESSURE / LOW OIL CYCLE	No Restart - Reset Power
OIL P = 1 + REMOTE START = 0	1. POWER ON RELAY = OFF; 2. COOL DOWN CYCLE , 3. STOP	Engine will run for 2 min,6 min or 10 min and Unit goes back to idle ( monitoring Remote Start Input)
OIL P = 0 + REMOTE START = 0	OIL PRESSURE / LOW OIL CYCLE	No Restart - Reset Power

If there is no Oil Pressure and the Input Oil Pressure Heat is low then Unit enters it "LOW OIL" Cycle. The LED Aux Fuel will Flash and the Relay REL3 turns on and off, indicating a audio visual alarm.

The unit can be reset by removing the fuse F1 for about 5 seconds or turning off the supply power by disconnecting the negative lead of the Battery or by pulling the DC Control Circuit Breaker.

If the Oil Pressure Input is high up exiting the Start Cycle then the Unit will go into RUM Mode. Depending upon the selected warm up time the unit will run for this time and then turns on Relay REL5 POWER ON. Both inputs for Oil and Remote Start are continuously monitored. Please see Table "Decision Table" above. The Unit will go back into "Idle Mode" and continuously scan the Input TB #3 "Remote Start" for a change of state.

# BEFORE YOU BEGIN!

Please disconnect the 24 Volt Battery System by removing the negative lead prior to any work being performed!

THE GENERATOR SET SHOULD BE IN FULLY FUNCTIONAL CONDITION, MECHANICALLY AND ELECTRICALLY PRIOR TO INSTALLATION OF THE AUTOSTARTER KIT.

## THIS MEANS:

01. THE UNIT HAS CORRECT OIL LEVEL AND OIL PRESSURE AND NO OIL LEAKS!
02. THE UNIT HAS ENOUGH COMPRESSION AS SPECIFIED IN THE MAINTENANCE MANUAL
03. THE UNIT DOES NOT OVERHEAT (Air Flow in enclosed rooms etc.)
04. THE AIR INTAKE IS CLEAR AND FREE
05. THE AIR FILTER IS CLEAN AND OR SET FOR COLD WEATHER OPERATIONS
06. ALL FUEL PUMPS ARE WORKING WITH CORRECT FUEL PRESSURE
07. THE FUEL FILTERS ARE CLEAN AND THERE IS NO WATER IN THE FUEL SYSTEM
08. THE GOVERNOR IS WORKING CORRECTLY
09. ALL ELECTRICAL DEVICES ARE WORKING TO SPEC  
(BREAKERS, SWITCHES, STARTER, ALTERNATOR etc.)
10. ALL GLOW PLUGS ARE TESTED
11. THE UNIT HAS BEEN LOAD TESTED AT FULL POWER RATING FOR AT LEAST ONE HOUR
12. THE UNIT HAS GONE THROUGH SEVERAL START UP, RUN AND POWER DOWN CYCLES SUCCESSFULLY BY MANUAL OPERATIONS
12. THE UNIT DOES NOT HAVE ANY OTHER PROBLEMS OR DAMAGE

You will need the following tools:

1. Side Cutters
2. Pliers
3. Slotted Screw Driver
4. Phillips Screw Driver
5. Crimping Tool (should fit included cable shoes)
6. Razor Blade
7. Wire Strippers
8. Electric Drill
9. 5/32" Drill Bit and a drill bit for your 4 PIN Receptacle (if used)
10. Volt Ohm Meter (VOM) or Digital Multi Meter (DMM) with Continuity Tester

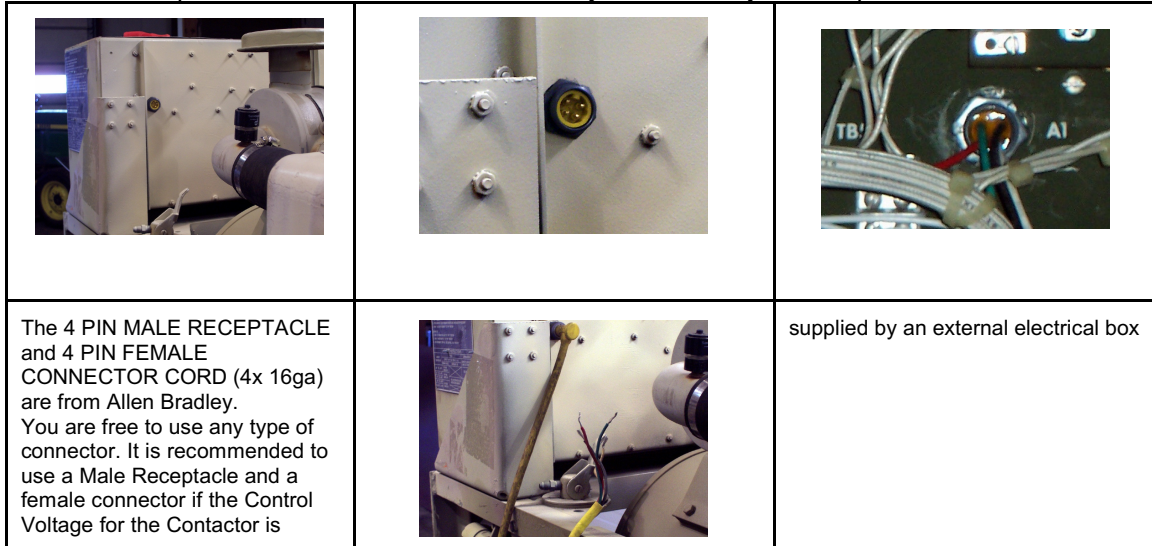
## Installing the Auto Starter:

1. Drill all Holes. Follow the instruction below on how to apply the circuit board drill template, then just simply drill the Holes as marked on the drill template.

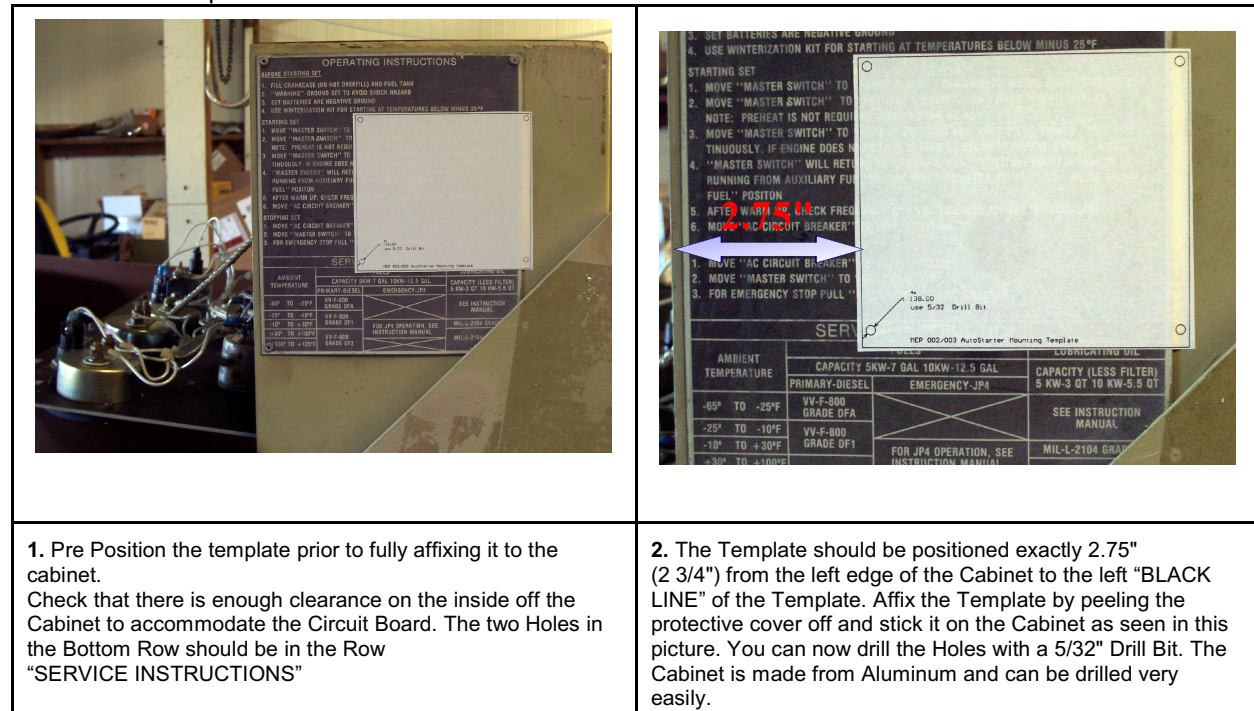
### 4 - Pin Receptacle:

We recommend using a 4 PIN Receptacle to connect your Generator with your outside Control Wiring for the Remote Start and the 3 Phase Contactor Coil.

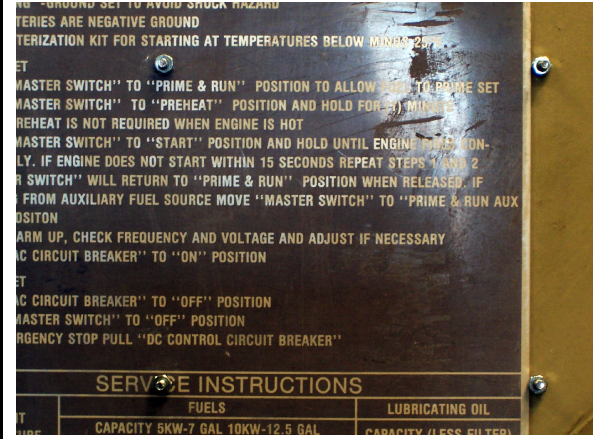
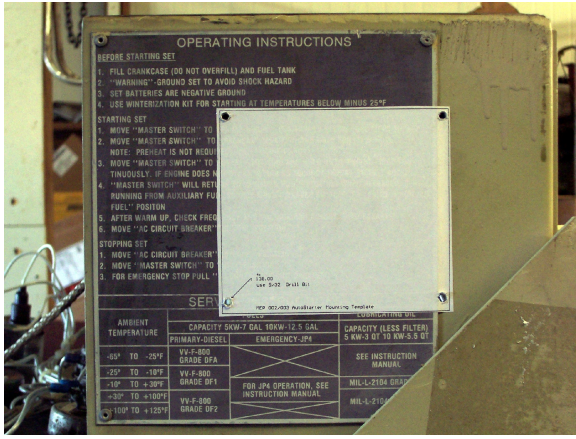
This is a example of how this could look like. Drill your Hole for your receptacle.



The best place to install the autostarter PCB is on the right hand side of the Control Cubicle. Use the enclosed drill template by simply peeling off the back and aligning it on the outside off the box as seen here in the pictures

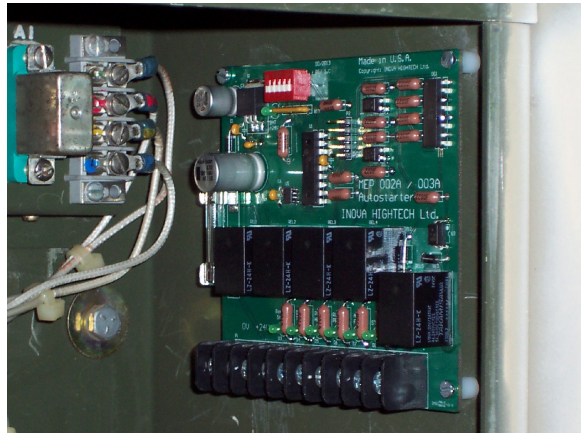






3. After Drilling the Holes carefully deburr the Holes on the inside and outside of the Cabinet. Remove the template by peeling it back and removing any residue carefully with a razor blade.

4. Finished Installed Board. Don't forget to put the Lock Washers on before putting on the Nut!

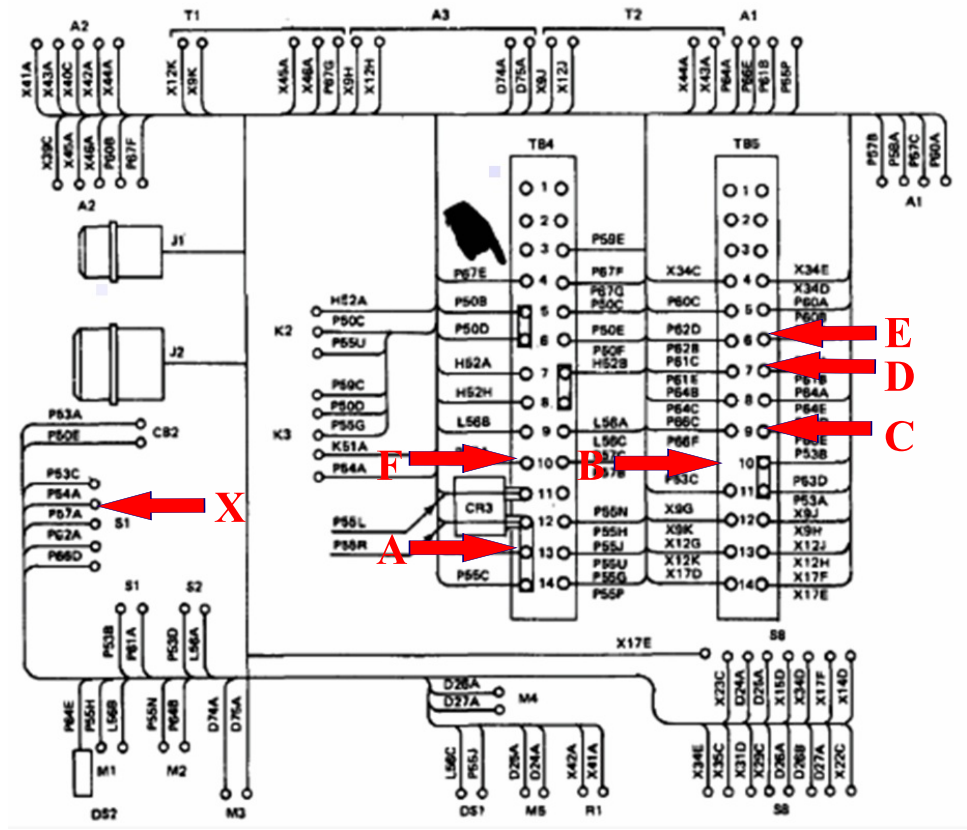


Your board should now be in the same position as in this picture and is now ready to be wired up.

## 2. Wiring the Circuit Board

Make all connections according to the wiring instructions in the table on the next page. Attach a Fork Lug on each Side, except for the wire which connects to Switch S1 Terminal 15, which uses a Ring Lug. Make sure all connections are mechanically fully secure and cannot come loose. It is recommended to wire the OV and then +24V wires first, briefly reconnect the battery and verify that the LED "BAT +24V OK" on the Circuit Board is "ON". Then disconnect the battery again and then proceed with making the remaining connections. It is easier to use a Fork Lug rather than a Ring Lug on connections which have already two wires attached to the Terminal. The fork lug can be inserted underneath the existing Ring Lugs without taking out the Screw.

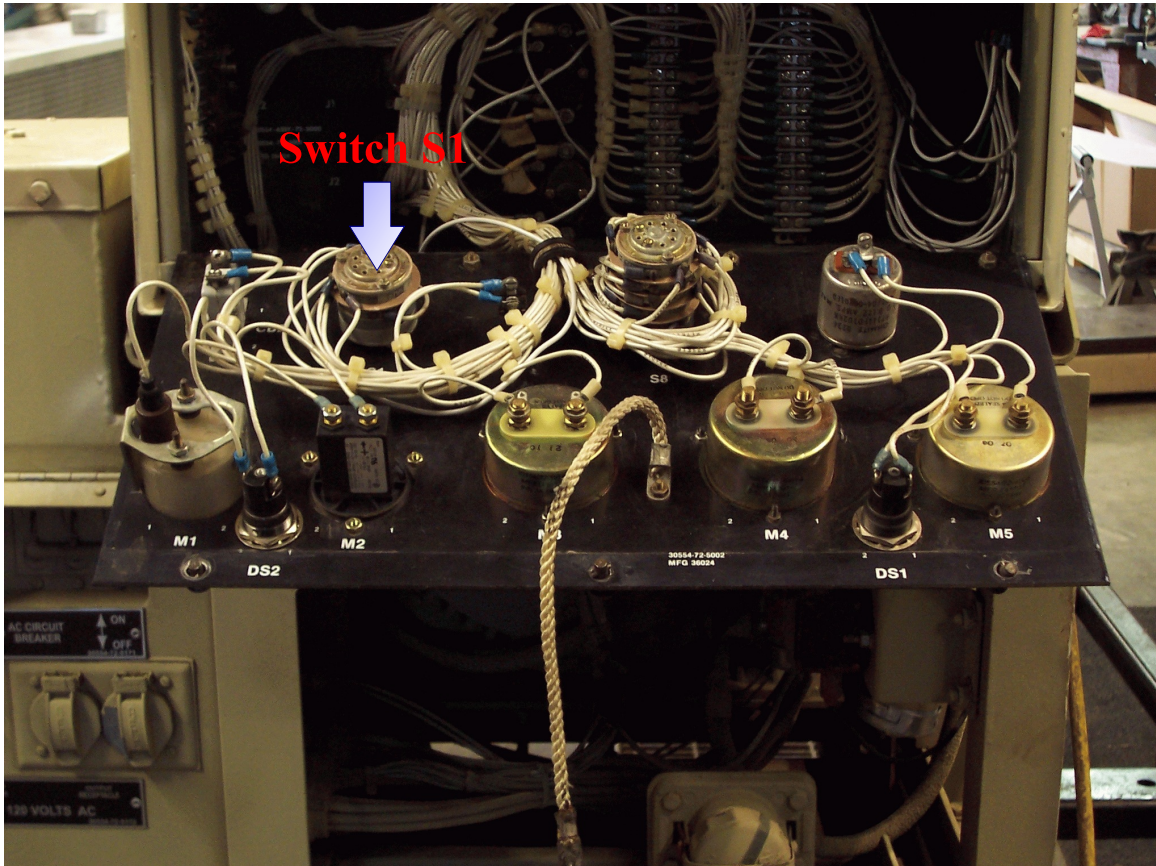
# Wiring Connections between Control Cubicle TB and Switch S1 and Autostarter TB



FROM	TO
Control Cubicle Terminal Block [ TB ] and Switch S1	Autostarter TB Label Number
A	0V
TB 4 - 13 L	TB # 1
B	+24V
TB 5 - 10 L	TB #2
C	Oil P / Temp
TB 5 - 09 R	TB #4
X	Pre Heat
Switch S 1 Terminal 15	TB #5
D	Run / Prime
TB 5 - 07 R	TB #6
E	AUX Fuel
TB 5 - 06 R	TB #7
F	Start
TB 4 - 10 L	TB #8
L = Left Side of TB R = Right Side of TB TB = Terminal Block	

## Wiring the Switch S1 Terminal 15 to Terminal # 4 “Pre Heat” on the Circuit Board:

The Pre Heat wire is connected to Terminal 15 of Switch S1 in parallel with the existing wire.  
Use the Ring Lug for the Switch Side and the Fork Cable Lug for the Circuit Board Terminal





This concludes the wiring of the Circuit Board with the Generator Set itself.

### 3. Connecting the Auto Starter with the “Start and Power Control Circuit”

After having completed the initial wiring of the circuit board with the actual circuitry, we need to be able to start and stop the Generator now with an external Control Circuit.

There are two possible Options:

I. *With a Remote Switch without an external 3 Phase Contactor:*

The Remote Switch simply applies +24V to the Input “Remote Start” TB #3 and starts the Unit. The Generator will now cycle through all stages: Initial Power On, Prime, Preheat, Start, Run and Shutdown.

The Warm Up Time and Cool down Time are controlled manually by engaging / disengaging the 3 Phase Circuit Breaker on your Generator Set.

For this setup you will need only a two PIN Male Receptacle with a mating female receptacle.

Connect one wire of your receptacle to TB5 - 10 L with a Fork Connector and the other cable to Terminal #3 “Remote Start” also with a fork connector.

Install your remote switch at a suitable location and wire it to the female connector which connects to your Male Receptacle on your Generator.

Make sure the Connector, Receptacle and Cable are NEMA 4 or 4x rated If the Generator is operated outdoors.

Select the appropriate DIP Switch Settings for your particular situation.

You will have to manually operate the 3 Phase Circuit Braker to switch the Load In and Out.

Your Unit is now ready for operation.

II. *With a Remote Switch with an external 3 Phase Contactor:*

The first step here is to determine of what size of Contactor you need to use which depends of what type of power the Generator is set to produce. Please locate the nameplate on you Generator:



For this Model MEP-003A the Contactor Rating should be  
125Amps for 120V 1 Phase  
60 or 65 Amps for 120V/240V 1 Phase  
40 Amps for 120V/208V 3 Phase

The Contactor Rating should be for AC3 which includes heavy inductive loads and should be a few Amps higher then the maximum Output capability of the Generator.

If you want to be able to change the Output configuration at a later point then simply choose a 125 Amp Three Phase Contactor, which will be able to handle all currents.

**IF YOU ANTICIPATE TO OPERATE YOUR GENERATOR AT 133% OF MAXIMUM POWER THEN THE CONTACTOR HAS TO HAVE A 50% HIGHER RATING THEN THE AMPERAGE ON THE NAME PLATE EXAMPLE:**

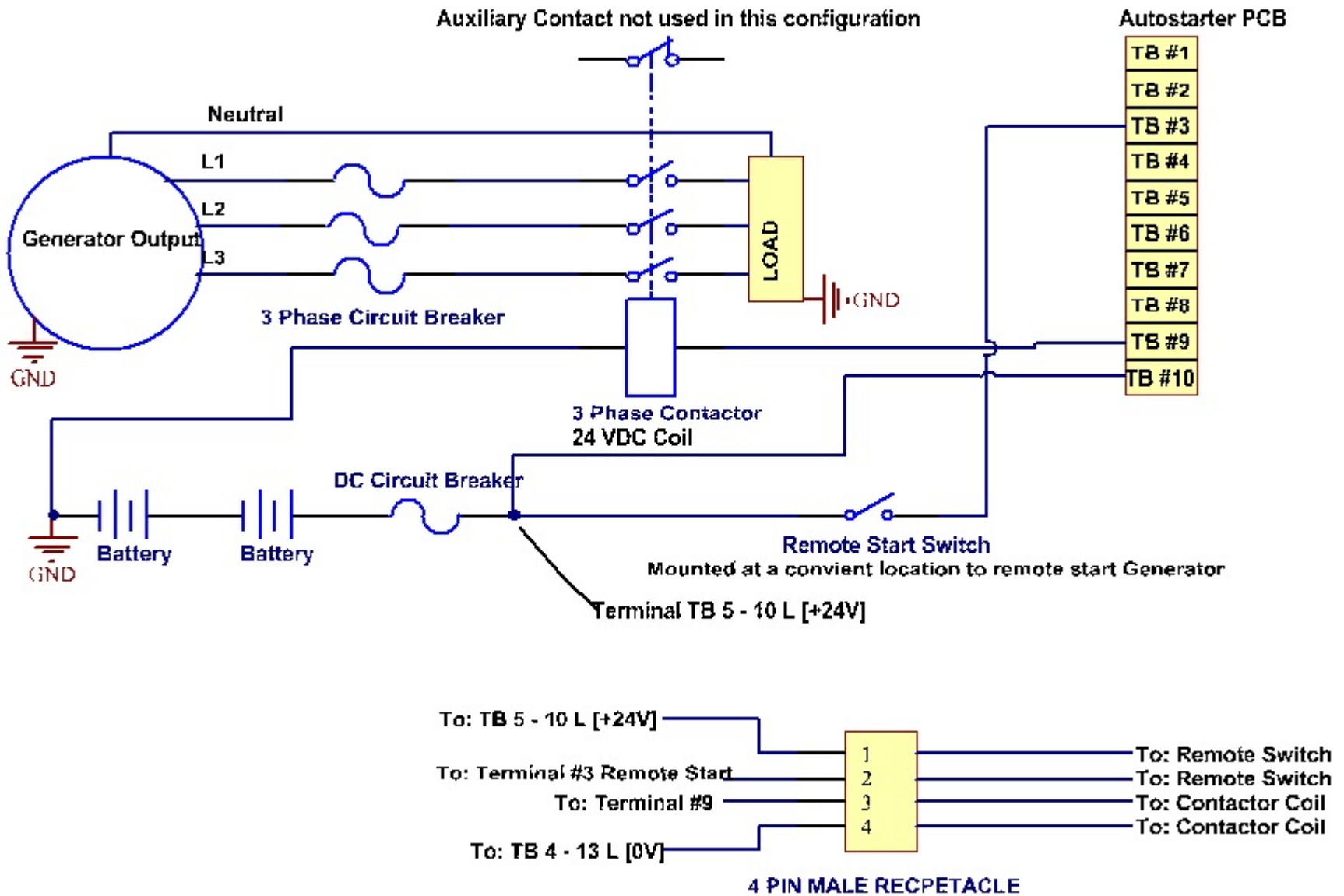
**104 Amp Name Plate Rating =  
maximum Generator Current = 138.32 Amps / 16.6 KW  
Recommended Contactor = 150 Amp / AC3**

The contactor is operated via the Power Output Relay, which is a Normally Open Contact available on Terminals #9 and 10# on the Autostarter Circuit Board.

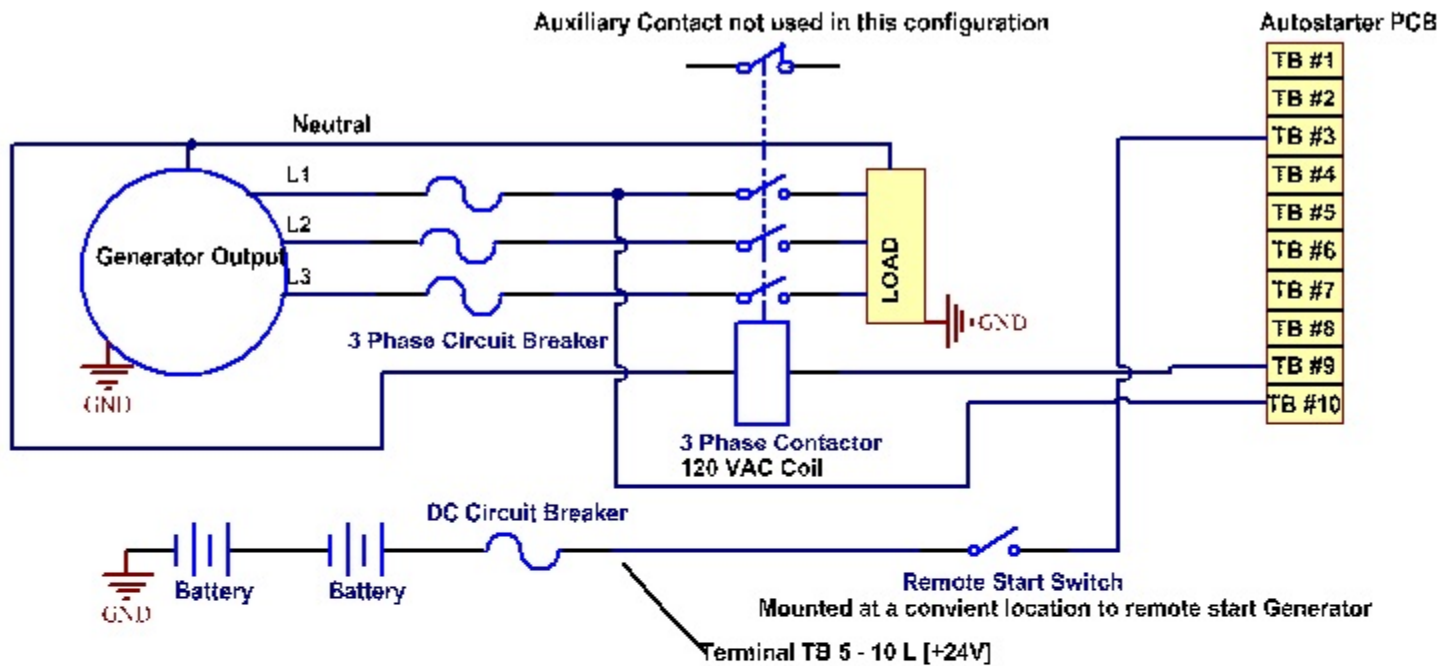
The terminals are not labeled by purpose. The contacts of Relays [REL 5] are galvanically separated from the Generator 24 V DC Circuit as well as of the High Voltage Output. This Relays Output can switch up to 240 VAC / 5 Amp and up to 120 VDC / 5 AMP inductive Loads. The Contact

provides ample reserve to switch even the largest 250 Amp 3 Phase Contactor on the market.

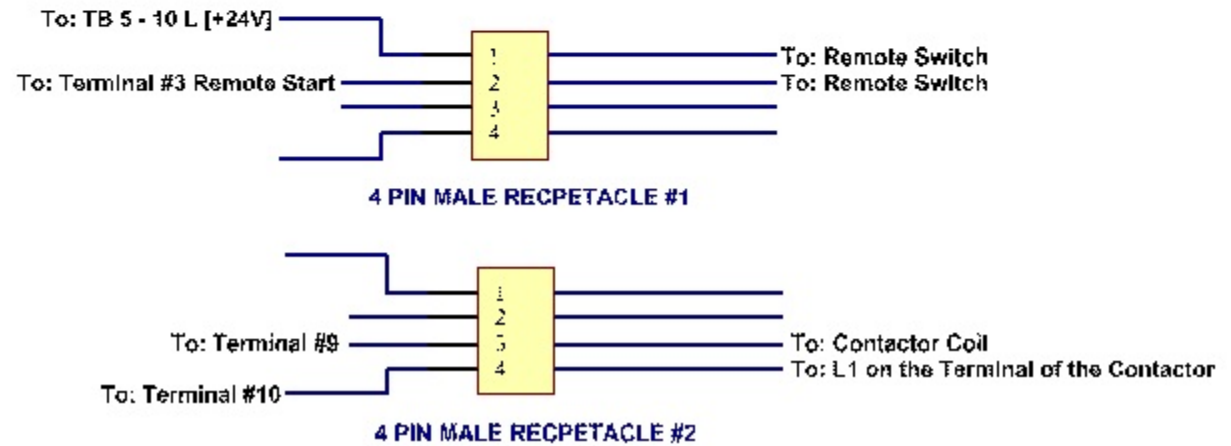
Wiring Diagram for Control Voltage and High Voltage Remote Start with 24 VDC Coil 3 Phase Contactor



# Remote Start with 120 VAC Coil 3 Phase Contactor

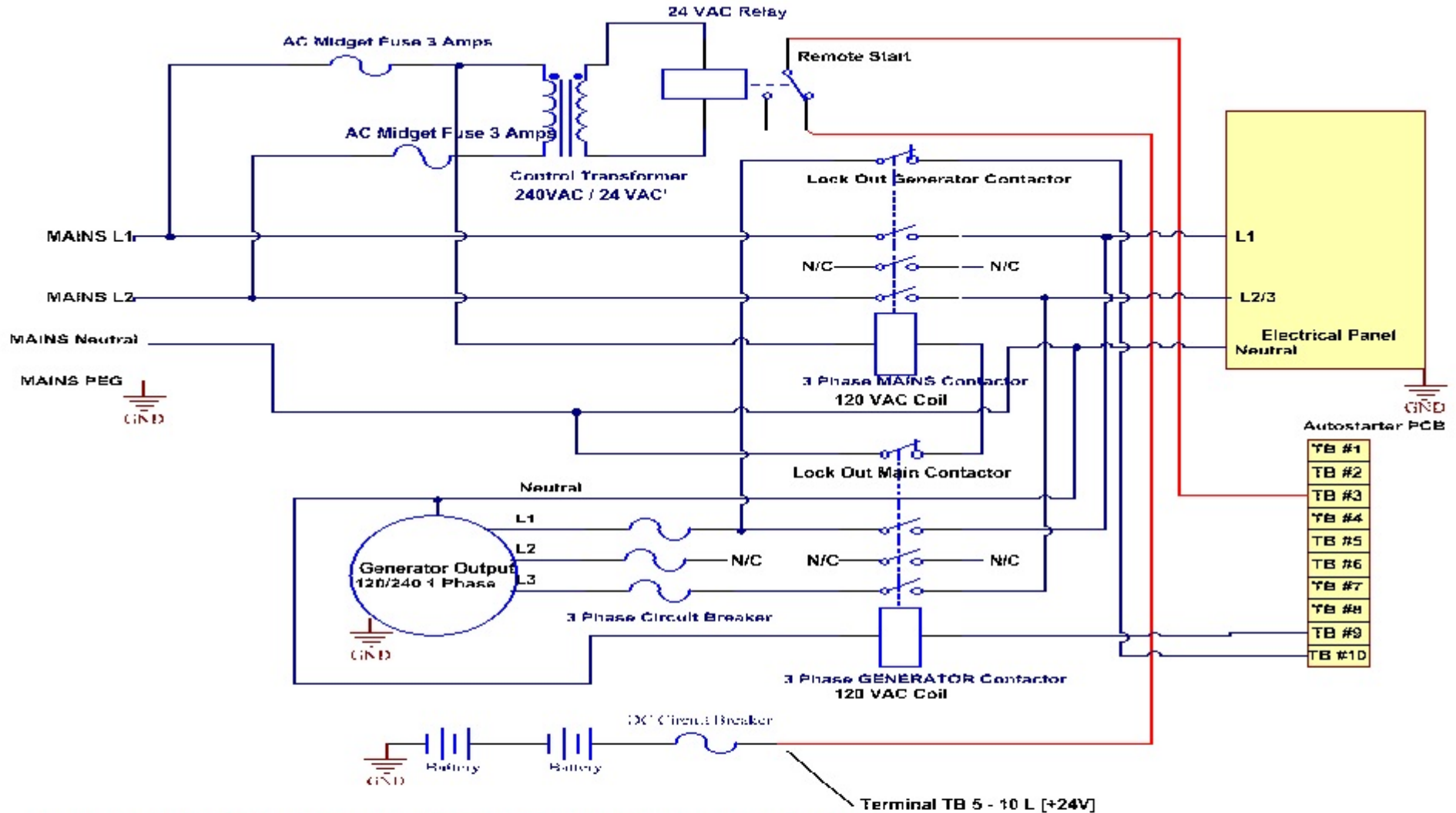


**Warning: it is recommended to use two separate Receptacles to seperate High and Low Voltage!**

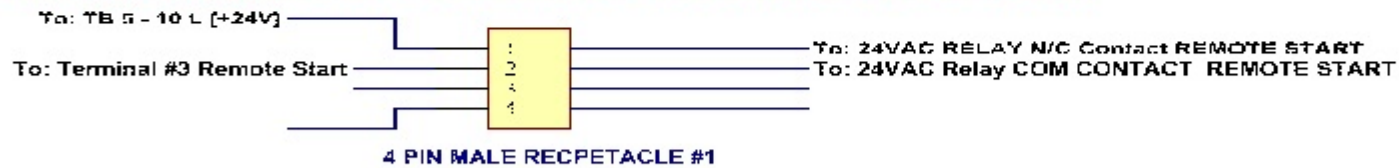




**Sample Automatic Transfer Switch (Please check with your local Electrical Code for compliance)**



**Warning: It is recommended to use two separate Receptacles to separate High and Low Voltage!**



## Resistance check of each Glow / Air Pre Heat Plug:

The Resistance should be:  
5 Ohm  $\pm$  0.25 Ohm  
for the following:

Glow Plug: NSN 2920-00-106-1817

HEATER,MANIFOLD (Glow Plug):  
NSN 2920-01-040-0308

After verifying the resistance it is recommended to remove each Glow Plug, check visually for any damage and connect each Plug to 24 VDC Power-supply, capable of delivering at least 15 Amps - verifying that the entire tip of the Plug changes color to orange/red within 15 seconds -  
**BE CAREFUL! TIP IS EXTREMELY HOT!**

Any Plug where the entire Tip changes Color should be replaced.

If it takes about 1 Minute for either the Glow Plug or the Manifold Heater Plug to complete change color (heat up), then you have the original 1960's discontinued Glow Plugs:

Glow Plug: NSN 2920-01-048-8867  
[Discontinued]

HEATER,MANIFOLD (Glow Plug):  
NSN 2920-00-757-7144  
[Discontinued]

and you need to change those to the new NSN Glow Plugs above. The following Manufacturers make these Glow Plugs:

Onan, Champion, Cummins, Wheeler Bros., Wellman Thermal Systems Corp., E.C.A Etablissement  
Central DES, W A P LLC