ECM- 72180-411

d. 120/240 Volt 50 Amp 4 wire twistlock. This receptacle is rated for dual voltage, 120 or 240 volt use. It is a four wire receptacle, with a center grounding pin. Four wire drop cords plugged into this receptacle may be split into 120 volt receptacles at a distribution box. This receptacle is protected by a two pole 50 amp circuit breaker mounted just above it. THIS RECEPTACLE UTILIZES A SPECIAL HUBBELL PLUG.(HUBBELL PART NUMBER "CS 6365".)

B. Full Power Load Connections and Breakers - This Mobile Diesel Power System is equipped with both high voltage (480) and low voltage (208/240) main line breakers. The breakers are interlocked with a lockable bar to insure that only one breaker can be turned on at a time.

A full power output terminal block is provided. This terminal block is located below the main power breakers and is accessible through the rear door. For your convenience a small lead wire access door has been provided just below the main rear door.

C. ENGINE CONTROL MODULE (ECM) - The ECM is a microprocessor based module that controls the complete unit. It is designed to start the engine either in the "automatic" remote or "run" local mode and disconnect the starter once the unit is running. It monitors all the engine safety sensors such as oil pressures, water temperature, overspeed and overcrank, shuts the unit down should any one of the sensor circuits show a fault in either manual or automatic mode.

1. Control switch inputs - The following front panel controls and instruments are wired into the microprocessor through the E.C.M. terminal blocks.

a. Run-Off-Auto switch:

1). "Run" - run position causes the generator set to start and run immediately.

2). "Off" - off position prevents unit operation regardless of status of remote control signal status.

3). "Auto" - auto position allows unit to be controlled via any remote single-pole "dry" contact (transfer switch, etc). Contact closure causes unit to start and run, while contact opening causes unit to shutdown.

b. Lamp test -Push button energizes all four alarm

lights simultaneously. This feature is disabled with the run-stop-auto switch in the "stop" position, and has no other effect on unit operation.

2. Safety inputs:

a. Low oil pressure shutdown -(LOP)- Monitoring of oil pressure begins 12 seconds after the unit starts, and remains in effect until unit is shutdown by normal control circuits (except as noted in "loss of frequency input" below). The 'LOP' signal is derived from an oil pressure switch mounted on the engine.

b. High water temperature shutdown -(HWT)- The engine coolant sensor temperature monitoring begins immediately with the start signal. If water temperature is excessive at time of start, (i.e. heat soak after shutdown), the unit is still permitted to start. The 'HWT' condition is permitted to exist for up to 60 seconds after the unit initially starts before a shutdown WITH ALARM occurs. If the excessive water temperature condition is corrected within the initial 60 second period, the 'HWT' circuit begins normal monitoring of the engine temperature and the 'safety shutdown' circuit is reactivated. The 'HWT' signal is derived from a temperature sensor switch mounted on the engine.

c. Overspeed adjustment -(OS)- Overspeed protection is provided by a frequency sensing network within the controller. The trip point of the frequency network is adjustable via a rheostat located on the top of the controller, at the right hand side. (See fig. above). Clockwise (CW) rotation increases the tip frequency, and thereby raises the shutdown speed. The frequency input is obtained from the engine battery charging alternator.

d. Overcrank protection -(OC)-These Mobile Diesel units are designed to use cycle cranking. This feature provides a series of five cranking cycles lasting 12-seconds with a 12 second rest period between each. Failure of the engine to start by the end of the fifth crank period results in an "overcrank" shutdown and alarm indication.

3. Cranking disconnect adjustment -(C.D.S. adj.)- The cranking disconnect signal is obtained by a frequency network within the controller. The trip point of the frequency network is adjustable via a rheostat located

on the top of the controller at the left hand side. C.W. rotation increases the trip frequency, and thereby raises the starter motor drop-out speed. The frequency input is obtained from the engine battery charging alternator.

4. E.C.M. - Program notes

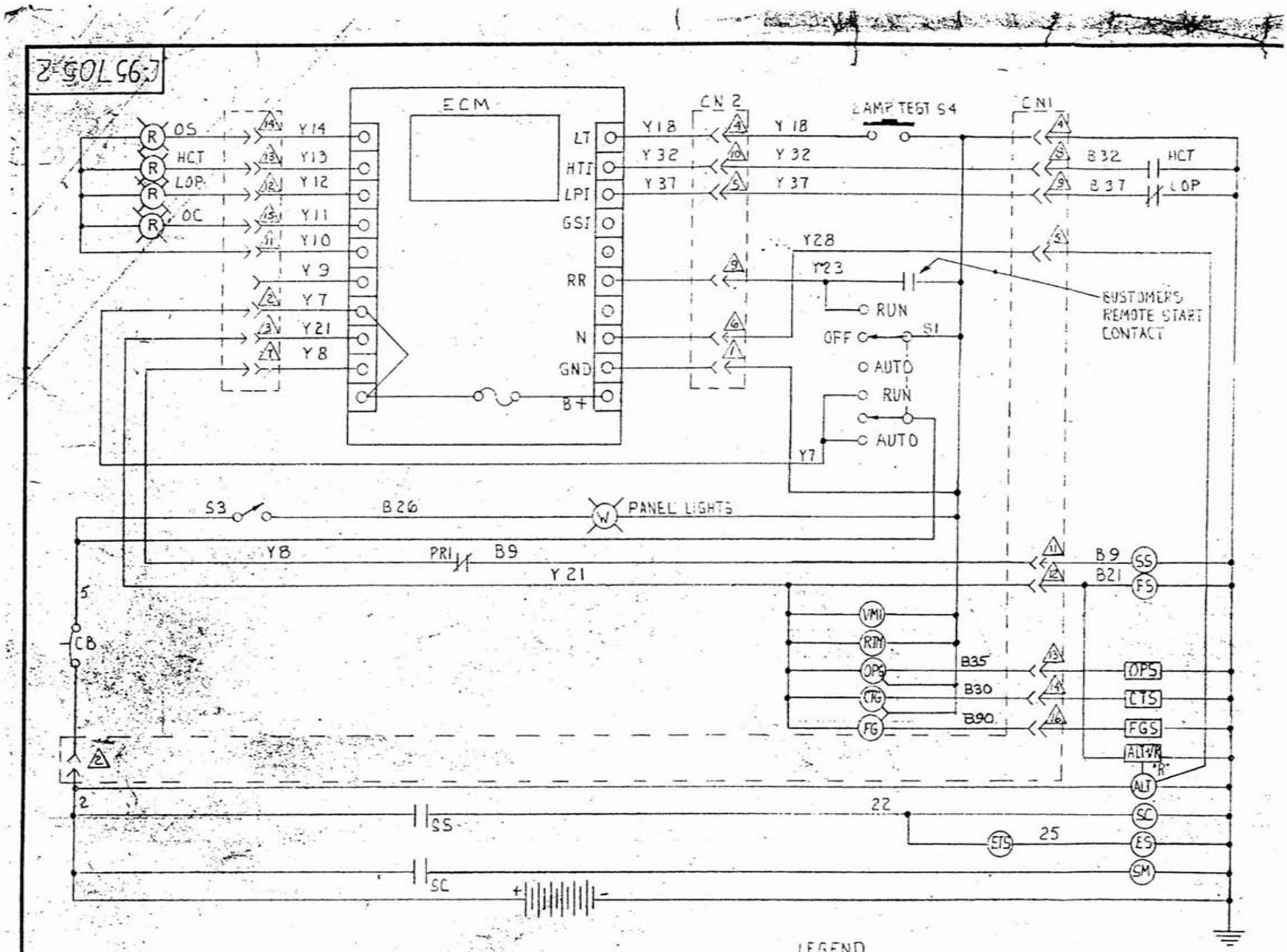
a. Loss of frequency input - Internal protection against loss of frequency input to the cranking disconnect circuit is programmed in after the unit has started normally. In the event the frequency goes to zero (engine runs out of fuel, battery charging alternator fails, etc), the L.O.P. shutdown circuit is by-passed, and a 12 second wait period is initiated. If frequency returns within this time period, L.O.P. monitoring resumes and operation continues normally. If frequency has not returned at the end of this time period, the engine oil pressure status is observed to determine whether the engine is actually running or stopped. If the engine has stopped (i.e.- air in fuel, (etc), the unit is shutdown with an "overcrank" indication and alarm.

b. "Overcrank" indicator light can mean a loss of crank disconnect signal during the previous run period (i.e.- bat. charging alternator belt broken). The manufacturer has installed an additional backup relay operated by the AC output voltage. If this redundant cranking system lockout is not operational, attempting to restart the engine with out a cranking disconnect signal will destroy the starter motor and pose a potentially serious personnel hazard.

NOTE; TROUBLE SHOOTING HINT

This is of particular note since the tendency is to pursue only cranking and start related faults. The cranking disconnect signal source (battery charging alternator) is a key component in this system and must be checked out thoroughly whenever an "OC" shutdown occurs.

Please note: The controller does not provide protection against loss of signal during start-up. A shutdown with alarm due to any of the above conditions will prevent any subsequent operation of the generator set. The run-stop-auto selector switch on the control panel must be momentarily placed in the "stop" position to reset.



LEGEND

ALT	ALTERNATOR	OPG	OIL PRESSURE GAUGE
ALT-VR	ALTERNATOR VOLTAGE REGULATOR	OPS	OIL PRESSURE SENDER
CB	CIRCUIT BREAKER	OS	OVER SPEED
CR	CONTROL RELAY	PR	PROTECTIVE RELAY
CTG	COOLANT TEMPERATURE GAUGE	RC	RECEPTACLE CONNECTOR
CTS	COOLANT TEMPERATURE SENDER	RTM	RUNNING TIME METER
ETS	ETHER TEMPERATURE SWITCH	SI	SWITCH

Remote Start
801-1005-2340
MD 00/12S

GENSET CONTROL MODULE OPERATION - A121/A241

A. GENERAL

The Genset control module is a microprocessor based module that monitors engine control and safety inputs and provides all the required START and STOP functions automatically.

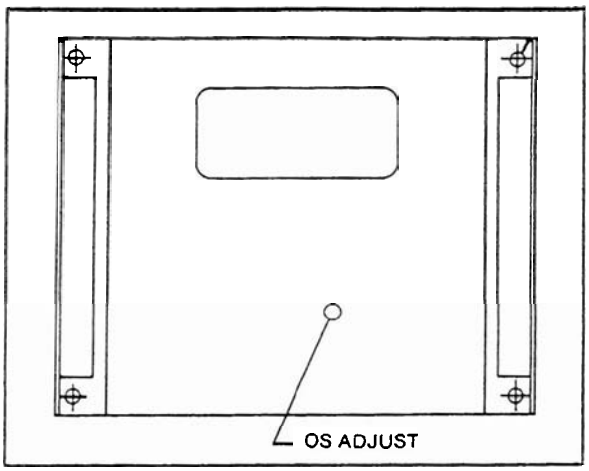


Figure 1

B. CONTROL SWITCH INPUTS:

The following front panel controls and instruments are wired into the microprocessor through the front-mounted terminal blocks.

1. Run-Off-Auto Switch

   a. "Run" - run position causes the engine to start and run immediately.

   b. "Auto" - auto position allows unit to be controlled via any remote single-pole "dry" contact (transfer switch, etc.). Contact closure causes the unit to start and run, while contact opening causes unit to shut down.

2. Lamp Test

   Push button energizes all four alarm lights simultaneously. This feature is disabled with the run-stop-auto switch in the "stop" position, and has no other effect on unit operation.

C. RELAY FUNCTIONS

1. Master control relay - (FS) - operates fuel solenoid, etc.
2. Cranking control relay - (CS) - controls engine cranking.
3. Alarm relay - (AL) - provides isolated contact (2-amp maximum) for remote alarm indication, bell, etc.

D. SAFETY INPUTS

1. Low Oil Pressure Shutdown - (LPI)

   Monitoring of oil pressure begins 12-seconds after unit starts and remains in effect until unit is shut down (except as noted in "loss of frequency input" below). The LPI signal is derived from an oil pressure sensor switch mounted on the engine.

2. High Water Temperature Shutdown - (HTI)

   The engine coolant sensor temperature monitoring begins immediately with the start signal. However, if water temperature is excessive prior to start, (i.e., heat soak after shutdown), the unit is permitted to start. The high temperature condition is permitted to exist for up to 60 seconds after the unit is running before shutdown with alarm occurs. If the high temperature condition is corrected within that time period, the microprocessor circuit reverts to normal monitoring. The HTI signal is derived from a temperature sensor switch mounted on the engine.

3. Overspeed Adjustment - (OS)

   Overspeed shutdown protection is provided by a frequency sensing network within the control module. The trip point of the frequency network is screw driver adjustable thru the opening in the face of the control module. (See Figure 1). Clockwise rotation increases the trip frequency and, thereby, raises the shutdown speed.

E. CRANKING CONTROL

1. Overcrank Protection - (OC). Two different cranking cycles are programmed into the microprocessor:

   a. Fixed single cycle - provides a single, non-adjustable, crank period of 48 seconds. Failure of the engine to start within that time results in a "overcrank" shutdown and alarm.

   b. Cycle cranking feature - the controller may be field-converted to the "cycle cranking" feature by grounding the "CCI" terminal on the control module. This feature provides a series of five cranking cycles, each 12 seconds long with a 12-second rest period between each. Failure of the engine to start by the end of the fifth crank period results in an "overcrank" shutdown and alarm indication.

2. Cranking Disconnect

The cranking termination speed is obtained from the frequency network within the control module. The microprocessor automatically sets the cranking termination speed at 30% of the selected overspeed trip value.

F. MICROPROCESSOR PROGRAM NOTES

Internal protection against loss of frequency input signal is programmed in after the unit has started normally. In the event the frequency goes to zero (engine runs out of fuel, frequency signal source fails, etc.), the Lo-oil pressure shutdown circuit is bypassed and a 12-second wait period is initiated. If frequency returns within this time period, Lo-oil pressure monitoring resumes and operation continues normally. If frequency has not returned at the end of this time period, the engine oil pressure status is observed to determine whether the engine is actually running or stopped. If the engine has stopped, the cranking cycle will begin in an effort to restart the engine. If the engine has **not** stopped (loss of input signal, etc.), the unit is shut down with an "overcrank" indication and alarm.

WARNING: "Overcrank" indication can mean a loss of frequency input signal during the previous run period. Attempting to restart the engine with no frequency input signal can destroy the starter motor, which can cause serious personal injury. The frequency signal source is a key component in this system and must be checked out thoroughly whenever an "overcrank" shutdown occurs, since the control module cannot provide protection against loss of signal during startup.

G. RESETTING A FAULT SHUTDOWN

A shutdown with alarm, due to any fault condition, will prevent any subsequent operation of the generator set. The run-stop-auto selector switch on the control panel must be momentarily placed in the "stop" position to reset these functions.