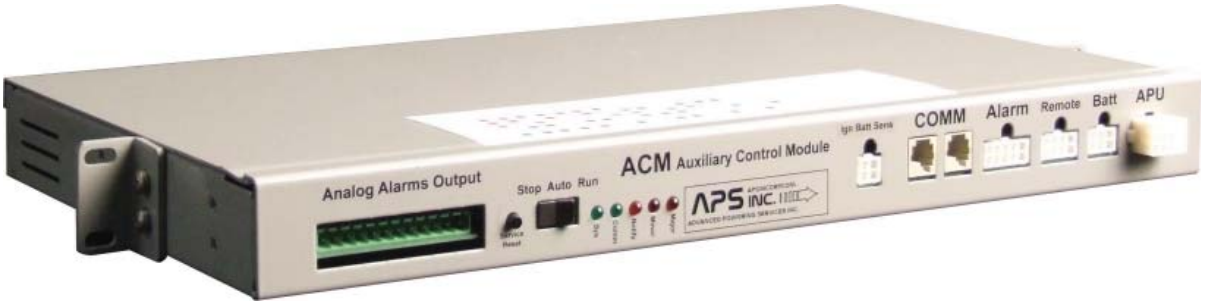
Cable Series

APU Control Module (ACM)



Operation and Maintenance Manual

Effective: February 2010

Alpha Technologies

Power

Alpha Technologies

APU Control Module
Operation and Maintenance Manual

018-340-B0-001, Rev. A

Effective Date: February, 2010

Alpha Technologies, Inc.

member of The Group™

NOTE:

Photographs contained in this manual are for illustrative purposes only. These photographs may not match your installation.

NOTE:

Operator is cautioned to review the drawings and illustrations contained in this manual before proceeding. If there are questions regarding the safe operation of this powering system, please contact Alpha Technologies or your nearest Alpha representative.

NOTE:

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1-800-863-3930,

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Figures and Tables

Safety Notes

Review the drawings and illustrations contained in this manual before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies or the nearest Alpha representative. Save this document for future reference.

To reduce the risk of injury or death, and to ensure the continued safe operation of this product, the following symbols have been placed throughout this manual. Where these symbols appear, use extra care and attention.

ATTENTION:

The use of ATTENTION indicates specific regulatory/code requirements that may affect the placement of equipment and /or installation procedures.

NOTE:

A NOTE provide additional information to help complete a specific task or procedure.

CAUTION!

The use of CAUTION indicates safety information intended to PREVENT DAMAGE to material or equipment.

WARNING!

WARNING presents safety information to PREVENT INJURY OR DEATH to the technician or user.

Battery Safety Notes

- Always refer to the battery manufacturer's recommendation for selecting correct "FLOAT" and "ACCEPT" charge voltages. Failure to do so can damage the batteries.
- Verify the Power Supply's battery charger "FLOAT" and "ACCEPT" charger voltage settings.
- Batteries are temperature sensitive. During extremely cold conditions, a battery's charge acceptance is reduced and requires a higher charge voltage; during extremely hot conditions, a battery's charge acceptance is increased and requires a lower charge voltage. To compensate for changes in temperature, the battery charger used in the power supply is temperature compensating.
- If the batteries appear to be overcharged or undercharged, first check for defective batteries and then verify the correct charger voltage settings.
- To ensure optimum performance, inspect batteries every three to six months for signs of cracking, leaking, or unusual swelling (note that some swelling is normal).
- Check battery terminals and connecting wires. Clean battery terminal connectors periodically and retighten to approximately 50 inch-pounds (or to manufacturer's specifications if not AlphaCells). Spray the terminals with an approved battery terminal coating such as NCP-2.

NOTE:

If installed, disconnect the AlphaGuard prior to measuring battery voltage.

NOTE:

Even with a AG-CMT present in the system, any battery which fails the 0.3V load test *must be replaced with an identical type of battery.*

- Check battery voltages UNDER LOAD. Use a load tester if available. Differences between any battery in the set should not be greater than 0.3Vdc.
- Refer to the battery manufacturer's recommendation for correct charger voltages and the power supply operation manual for corresponding charger settings.
- Number the batteries (1, 2, 3, etc.) inside the enclosure for easy identification (refer to the appropriate enclosure installation guide).
- Establish and maintain a battery maintenance log.

1.0 System Overview

1.1 Introduction

The primary purpose of Alpha's APU Control Module (ACM) is to control and monitor generator systems that utilize the ACU Module. Depending upon the standby powering configuration, the ACM and generator combination are installed remotely, or co-located, with other Alpha equipment such as power supplies and batteries.

The ACM monitors AC line and DC bus status to determine when to start and stop the APU. In the event of an extended power outage, self test initiation, remote start command or low battery bus voltage, the ACM will start the APU. The APU will prevent the backup batteries from discharging to a reduced voltage level which would compromise the ability of the system to provide a continuous, reliable source of power.

In addition to starting the APU, the ACM monitors the entire generator system for abnormal operating conditions such as engine over-temperature, gas leak, enclosure pad shear, etc. If certain abnormal conditions or alarms are present, the ACM and or the APU controller (APS-CP, A2034 Logic PCB, CCG or ECI-2) will either prevent the generator from starting or shut it down immediately. This provides for public safety, while preventing any serious damage to the APU. The system operator also has the ability to override the ACM and control the APU manually or remotely.

Finally, the ACM provides the interface between the APU and Alpha Technologies' communication devices. The ACM is designed to control and monitor the APU while responding to commands and queries from a system controller via an isolated RS-485 data bus. Status information and alarms can be read from the ACM remotely via the data bus, locally from the Light Emitting Diodes (LEDs) on the unit's front panel, or by an optically isolated analog transponder interface. The ACM is capable of reporting 7 major alarms, 6 minor alarms and 2 notifications.

1.2 Theory of Operation

1.2.1 Normal Operating Condition

Under normal operating conditions (no alarms) the ACM's Run-Auto-Stop (RAS) three position rocker switch will be in one of two positions: "AUTO" or "RUN". (See Section 3, Indicators, Controls and Connectors) The ACM has control over the starting and stopping of the APU while in the AUTO mode. The ACM is monitoring the utility input, via an AC sense, the DC buss voltage, Ignition battery charger output, enclosure sensors and the APU status sent from the APU controller. If a fault occurs, the ACM determines whether or not to start or inhibit the APU based upon the failure. The ACM can also receive remote start commands via the RS-485 buss or the analog transponder interface. The ACM can be removed from controlling the APU by switch the RAS to run or "manual" mode. In this mode, the APU will run until a fault condition shuts it down.

1.2.2 Standby Operating Condition (Less Than 10 Minutes)

If an AC line disturbance or outage is less than 10 minutes, the ACM will not start the APU unless the battery buss voltage drops below a programmable threshold (Low DC Buss Level) which defaults to 1.95 Volts per cell or 35.1/46.8/93.6 Volts for 36/48/96 Volt systems respectively. However, the ACM will notify the system operator of a line failure via the front panel LED's (see alarm section). Otherwise, the ACM will appear to be in a "normal" operating condition.

1.2.3 Standby Operating Condition (More Than 10 Minutes)

If an AC line disturbance or outage is greater than 10 minutes, the ACM start delay timer will expire and the ACM will attempt to start the APU. The ACM will attempt to start the engine 9 times with either a 30 second or a 60 second pause between attempts (See Table 1-1). If the engine fails to start, the ACM will report an "Engine Over-crank" alarm. Otherwise, the ACM will start and continue to run the APU until either a normal shutdown or Major alarm occurs (See section 4.1, Alarms).

Crank Cycle									
Crank Attempt	1	2	3	4	5	6	7	8	9
Cranking Engine	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec
Pause (no crank)	30 Sec	30 Sec	60 Sec	30 Sec	30 Sec	60 Sec	30 Sec	30 Sec	Engine Overcrank Alarm

Table 1-1, Normal Mode Crank Cycle

1.2.4 Normal APU Shutdown

The ACM will initiate a normal APU shutdown when AC line is qualified, DC bus alarm is not active, the 12 minute cool-down period has elapsed, and the Engine Run command is not active. Otherwise, the ACM will continue to run the APU until the above conditions are met or a major alarm occurs. Also, the APU will run for a minimum of 30 minutes if started due to low DC Bus voltage, or if the RAS switch is switched from Run to Auto (See section 3.1, Indicators, Controls and Connectors).

1.2.5 Abnormal APU Shutdown

The ACM will immediately shutdown the APU under the following conditions:

- Major alarm
- Activation of manual engine stop switch
- Receipt of software engine stop command
- General generator failure

2.0 Installation, Configuration and System Interface

2.1 Field Installation

1. Disconnect all connectors from front of ACU.
2. Remove 4 screws from ACU mounting ears
3. Install ACM in place of ACU; install 4 mounting screws to secure ACM to rack and rail.
4. Connect ACM using existing cable assemblies

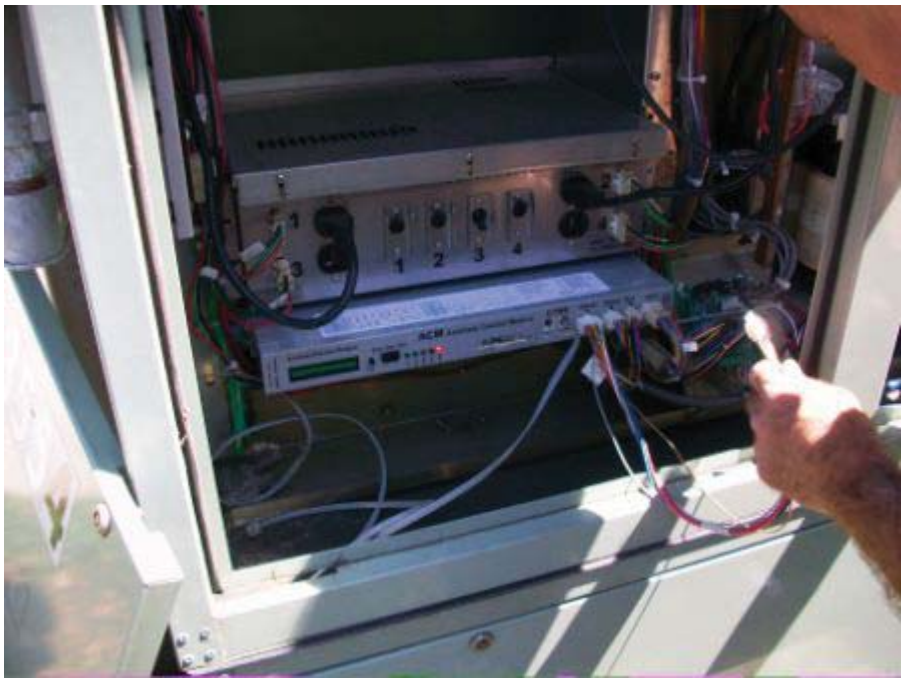

Fig. 2-1, CPS-6 Configuration

2.2 ACM-96 and ACM-96G

2.2.1 A2304 Generator Controller Configuration

1. The A2034 logic board is located in the electronics compartment of the APU enclosure. Locate the 4-position Dip Switch and set switch 2 in the OFF position. For the new configuration, switches 1 and 3 should be on, and switches 2 and 4 should be off.

Fig. 2-2, A2304 Dip Switch Configuration

2. Remove the Y alarms harness and connect the 15 pin male mini mate-n-lock connector directly to J2 of the 704-619 board.

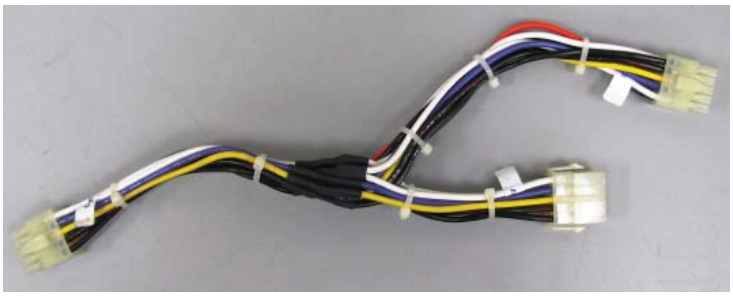

Fig. 2-3, Y Alarms Harness

3. Install provided alarm jumper to J4 of the A2034 logic board.

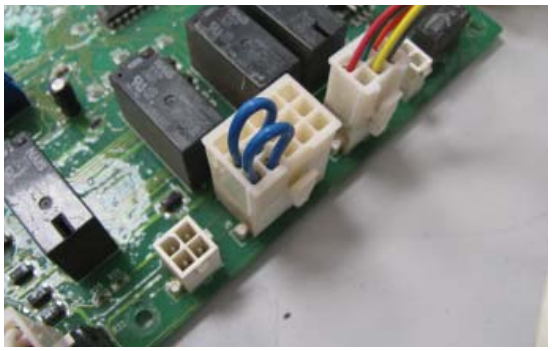

Fig. 2-4, Alarms Jumper

2.2 ACM-96 and ACM-96G, continued

2.2.2 APS-CP Generator Controller Configuration

Locate the Dip Switch on the APS-CP by removing the screws in the bottom corners and lifting the front cover. If it is a 5-position Dip Switch, set switches 1 and 5 to the ON position.

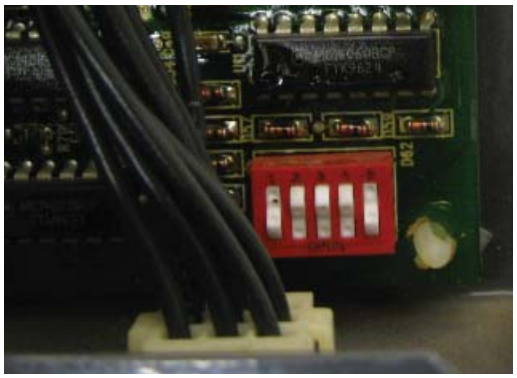

Fig. 2-5, 5-Position APS-CP Dip Switch

If it is a 4-position Dip Switch, leave default switch positions.

2.2.3 ECI-2 Configuration

The ECI-2 Engine controller can be directly connected. No changes are required for configuration.

Fig. 2-6, ECI-2 Engine Controller

NOTE:
ACM-96G requires Genasys DC Bus Harness

NOTE:
ACM-48 and ACM-36 models are also available and can be installed to directly replace existing CE style stand-alone AlphaGen ACU units.

3.0 Indicators, Controls and Connectors

Fig. 3-1, ACM Front Panel

APU Control Module LED Indicators and switches:

1. “Major” Alarm Indicator (Red LED)
2. “Minor” Alarm Indicator (Red LED)
3. “Notify” Indicator (Amber LED)
4. “Comm” Indicator (Green LED)
5. “System” Indicator (Green LED)
6. “Run-Auto-Stop” Switch
7. “Service/Reset” Push Button Switch
8. Analog Alarms Output
9. Communications Interface
10. Alarm: Input Signals
11. Remote: DCIU Breaker Trip
12. Battery DC Bus Input
13. APU AC/DC Power and Control Signals

The ACM user interface consists of 5 LEDs (1-5), a three-position rocker switch (6), and a momentary contact, push-button switch (7). The Communications Interface (9) can be used to attach an Alpha Technologies system controller. Provisions are made for Transponder connections through the Analog Alarms Output (8). The interface with the DOCSIS transponder platform is with an offset data cable from one of the parallel connected communications ports (9).

3.1 Indicators

The Major and Minor alarm LEDs (1, 2) are red and reflect the state of the discrete major and minor alarms monitored by the ACM. A Major alarm indicates failure of a critical component or some other situation (pad shear, for example) where the system either has gone off-line, or system failure and/or shutdown is imminent. Major alarms cause the engine to shutdown immediately and generally prevent further operation. Most major alarms are latched by the ACM. A site check by service personnel is required to repair the fault and clear the system. A Minor alarm indicates a system fault which, though not indicative of imminent system failure or shutdown, requires service attention as the fault condition could worsen leading to a shut down the system. A site check by service personnel is recommended. The amber Notify LED (3) represents status information that is not significant enough to be classified as an alarm. At present, only two items fit into this category: AC line status and Engine Service Required. The Communications LED (4) illuminates for two seconds after each communications session on the Alpha bus. This is a standard that is used throughout the Alpha bus communications system. The green System status LED (5) indicates that the microprocessor has power and is operating normally. This LED flashes at a 1 Hz rate with a 50% duty cycle. When the ACM is in factory test mode, this LED will flash at a 0.5 Hz rate.

3.2 Control Functions

RUN-AUTO-STOP Switch: The three positions of the rocker switch (6) are RUN, AUTO and STOP (RAS). The RAS switch is normally left in the center, AUTO, position so that the ACM has control of the generator set. A minor alarm is indicated when the RAS switch is not in the AUTO position. The STOP (“left”) position is used to stop or prevent APU operation during maintenance. Placing the RAS switch in the STOP position for three (3) seconds, then switching back to AUTO will clear any latched alarms and start the generator if the cause of the alarm has been corrected. Placing the RAS switch in the RUN (“right”) position will cause the engine to start and run until this switch is released to AUTO.

The engine will not shut down immediately when the switch is returned to AUTO from RUN; there is a 30-minute cool down, and the ACM’s shutdown criteria must be met in order to shutdown the engine. Also, each time the RAS switch is placed in the AUTO position (from the STOP position), the ACM will start and run the APU for one minute after a short delay.

Service/Reset Push Button Switch: The service reset push button switch (7) has two purposes:

1. It resets the engine service timer when depressed for 5 seconds. The service interval is a programmable counter within the ACM that defaults to 100 hours after the initial 25-hour break-in period. When 100 hours of engine run time elapses, the Service Required notification is set and the notification LED illuminates. After the engine has been serviced, pressing and holding the service reset switch for 5 seconds will reset the 100-hour service counter. All of the LEDs flash, while the switch is depressed, until a five-second timer elapses at which time all of the LEDs remain on solid until the switch is released. This provides feedback to the technician, indicating the effective resetting of the engine service counter.

2. It can be used to determine which alarms are active. The service reset push-button is also used to obtain information about active alarms. The Major and Minor alarm LEDs are very general and a technician will need more detailed information upon arrival to the site of an alarming ACM. To retrieve details about an active alarm, the user presses and releases the service-reset switch. An active alarm (Major or Minor) will be indicated by the LEDs as indicated in Figure 4-1. Note that depressing the service-reset switch for 5 seconds will cause the service timer to clear possibly disrupting the preventive maintenance schedule. When the service-reset button is pressed again, the LEDs will represent the next active alarm. Pressing the button when there are no more active alarms will reset the LEDs to their normal usage. Several quick flashes of all five LEDs will indicate end of the alarm list before the LEDs return to normal operation. If the service reset button is not depressed again when an alarm is indicated, the LEDs will return to normal operation after 30 seconds have elapsed. Resetting alarms via status monitoring or via the manual stop switch will also clear the alarm pattern indicated by the LEDs.

4.0 Alarms and Notifications

4.1 Alarms

The ACM is capable of reporting “Major” alarms, “Minor” alarms and “Notifications”. The following are detailed descriptions of each.

Major	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Abbreviation	OT	DT	OC	GH	WI	PS	LP	CF	TF	IB	AD	TP	DC	LF	SR
Major	●	●	●	●	●	●	●								
Minor	●	●		●		●		●	●		●	●	●		
Notify	●	●	●				●	●		●	●				
Comm			●		●	●		●	●	●			●		●
System	●		●	●	●		●		●	●		●		●	

1. Engine Over-Temp (OT)
2. DCIU Breaker Trip (DT)
3. Engine Over-Crank (OC)
4. Gas Hazard (GH)*
5. Water Intrusion (WI)
6. Pad Shear (PS)*
7. Low Fuel Pressure (LP)
8. Control Fail (CF)
9. Self-Test Fail (TF)
10. Low Ignition Battery (IB)
11. Auto-mode Disabled (AD)
12. Tamper (TP)
13. DC Bus fault
14. Line Failure (LF)
15. Service Required (SR)

Control Fail (8), can be associated with a low oil pressure condition. Verify engine oil level prior to running or testing APU.

Fig. 4-1, Alarms Matrix

MAJOR ALARMS:

A Major alarm indicates failure of a critical component or some other situation (pad shear, for example) where the system either has gone off-line, or system failure and/or shutdown is imminent. Major alarms cause the engine to shutdown immediately and generally prevent further operation. Most major alarms are latched by the ACM. A site check by service personnel is required to repair the fault and clear the system. Placing the RAS switch in the STOP position for three (3) seconds, then switching back to AUTO will clear any latched alarms and start the generator if the cause of the alarm has been corrected.

1. Engine Over-Temp (OT): Indicates engine temperature has exceeded safe limits and operation of the unit has been suspended. The alarm is reset when the engine temperature falls below safe limits.

2. DCIU Breaker trip (DT) (Latching): For 7.5kw DC generators with a DCIU only. The DICU breaker has tripped because the APU alternator output voltage is too high. Operation of the unit has been suspended. The alarm is cleared when the Reset command is issued or when the manual stop switch is activated.

3. Engine Over-Crank (OC) (Latching): Indicates the failure of the engine to start when commanded to do so. Clear the alarm after the DCIU breaker trip issue is resolved. To clear the alarm initiate the Reset command or move the RAS switch to stop the return to AUTO or RUN.

4. Gas Hazard (GH) (Latching): The concentration of hydrocarbon fuel in the power system’s enclosure air space has exceeded safe limits or 10%-20% of the Lower Explosive Limit (LEL) For more than three (3) or ten (10) seconds depending on the detector use. APU operation is suspended. The alarm is cleared when the Reset command is issued or when the manual stop switch is activated.

5. Water Intrusion (WI) (Latching if encountered while the engine is running): Water level within the main or fuel enclosure has exceeded safe limits for generator operation. APU operation is suspended while this alarm is active. The alarm is reset when the water level falls below maximum limits if alarm occurs while the APU is not running.

4.0 Alarms and Notifications, continued

4.1 Alarms, continued

6. Pad Shear (PS) (Latching): Indicates that the main or fuel enclosure has shifted from its pad mounting position. APU operation is suspended. The alarm is reset when the unit is returned to its original position and the reset command is issued or when the manual stop switch is activated.

NOTE:

APU will not start if Pad Shear magnet is not correctly installed below the Pad Shear sensor.

7. Low Fuel Pressure (LP) (Latching - after 5 activations): Indicates that site fuel supply (Propane-fueled APU only) is insufficient for extended engine operation. The alarm is reset 5 minutes after the fuel supply is replenished.

MINOR ALARMS:

Minor alarms indicate a system fault which, though not indicative of imminent system failure or shutdown, require service attention as the fault condition could worsen to shut down the system. A site check by service personnel is recommended.

8. Control Fail (CF) (Latching - after 5 activations): This alarm indicates a control failure between the ACM and the generator set. Typically this means that the engine did not start or stop when commanded to do so. This alarm could also be an indication of Major Condition if engine oil pressure is below safe limits and the APU's CCG, APS-CP, A2034 or the ECI-2 control unit shuts down or suspends operation of the APU. The alarm is cleared when the Reset command is issued or when the manual stop switch is activated.

9. Self-Test Fail (TF) (Latching): Status of most recent generator test. The alarm is cleared when the Reset command is issued, the manual stop switch is activated or another Self-Test command is issued.

10. Low Ignition Battery (IB): Indicates that the generator's ignition battery voltage has fallen below 11.5Vdc. Alarm is cleared when battery voltage rises above 12.0Vdc indicating battery recovery has begun. Note that low ignition battery voltage is not alarmed during engine cranking.

NOTE:

This input requires the ignition battery sense jumper to be removed and a harness installed directly from the ignition battery terminal through a current limiting resistor, on the positive lead, to a 4 pin mini mate-n-lock connector. If this option is not utilized do not remove the installed jumper in the ignition batt sense connector.

11. Auto Mode Disabled (AD): Indicates the position of the ACM control select switch. When the Run-Auto-Stop (RAS) switch is in a manual (STOP or RUN) position, the ECM has no control over engine operation and therefore raises an alarm. This is a hardware 'lockout' input and cannot be changed via status monitoring.

12. APU Tamper (TP): One of the doors on the APU enclosure is open. The alarm clears when the door is closed. For configuration with a separate APU enclosure, (such as the 7.5kw DC APU) install the provided modified Alarm harness to monitor the APU tamper separate from the power supply enclosure tamper.

13. DC Bus Fault (DC): Indicates that the power system DC bus voltage, as measured at the ACM, is less than 1.95 volts per cell. This alarm clears automatically when the bus voltage exceeds 2 volts above nominal (i.e., 50Vdc in a 48V system).

4.2 Notifications

Additionally, the ACM will report the following “Notification” information.

14. Line Failure (LF): The ACM’s determination of the state of AC line voltage. Loss of AC utility input is one of the criteria for starting the generator. When replacing the Genasys ACU this is a 240vac sense voltage. When replacing the ACU for the distributive 2.7kw 36Vdc APU or 3.0kw 48Vdc APU it is a 120Vac sense voltage. There is a voltage selector on the interface board that comes pre-configured depending on the level of this sense voltage.

15. Service Required (SR): Indicates that routine maintenance of the engine - generator is overdue. This alarm activates when Service Countdown reaches 0. It is cleared by depressing the service timer reset button for five seconds. (Refer to Section 5.2 “System Maintenance” for further information).

4.3 Analog Transponder Interface

The ACM also provides a transponder interface for proprietary status monitoring. The transponder interface consists of a 12-position terminal block wtih 8 optically-isolated output signals and one switch closure input signal. The wiring diagram for the transponder interface is shown in Fig. 4-3, with the following signals mapped to the transponder interface terminal block as shown below.

PIN	Input/Output	Description	Active State
1	Output	Major Alarm (1)	Open with respect to Pin 9
2	Output	Minor Alarm (2)	Open with respect to Pin 9
3	Output	Engine Alarm (3)	Open with respect to Pin 9
4	Output	Gas Hazard	Open with respect to Pin 9
5	Output	Test Fail	Open with respect to Pin 9
6	Output	Enclosure Alarm (4)	Open with respect to Pin 9
7	Output	Engine Status (Running, Stopped)	Closed to Pin 9
8	Output	Tamper	Closed to Pin 9
9		Output Common	
10	Input	Engine Run	Connect to Pin 11
11	Ground	Engine Run Return	
12		To Be Determined	

Table 4-1, Analog Transponder Interface

1. Major Alarms:
   - Engine Over-Temp
   - DCIU Breaker Trip
   - Engine Overcrank
   - Output Over-voltage
   - Low Fuel
   - Water Intrusion
   - Pad Shear
   - Gas Hazard

2. Minor Alarms
   - Control Fail
   - Self-Test Fail
   - Low Ignition Battery
   - Auto-mode Disabled
   - Tamper
   - DC Bus fault

3. Engine Alarms:
   - Engine Over-Temp
   - DCIU Breaker Trip
   - Engine Overcrank

4. Enclosure Alarms
   - Water Intrusion
   - Pad Shear

NOTE:

Alarm Filter Board (P/N 704-717-20) is required when using an embedded propietary transponder or external transponder.

Fig. 4-2, Alarm Filter Board

4.4 Standard ACM-Transponder Interconnection

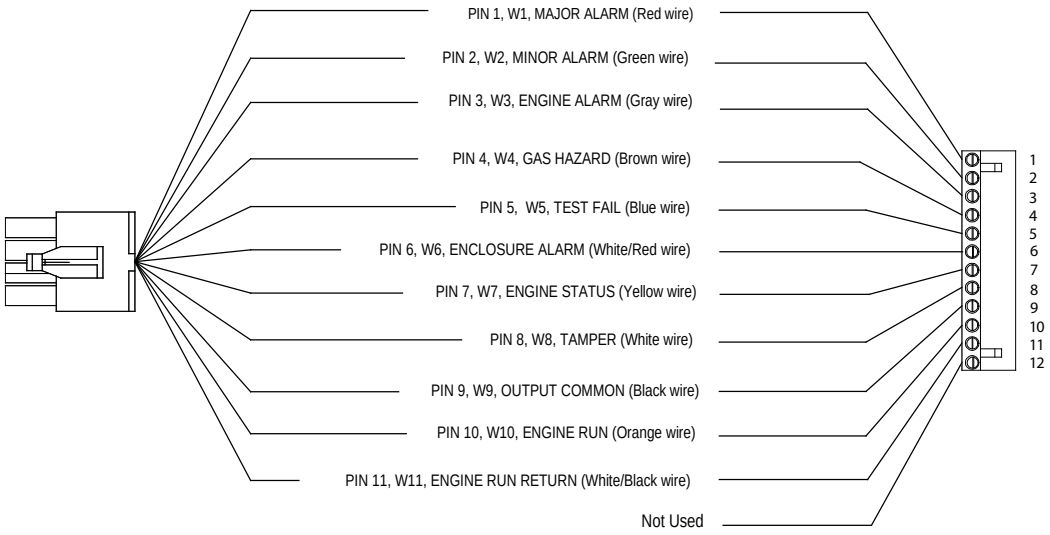

Fig. 4-3, Standard Transponder-to-ACM interconnect cable, **collocated** applications

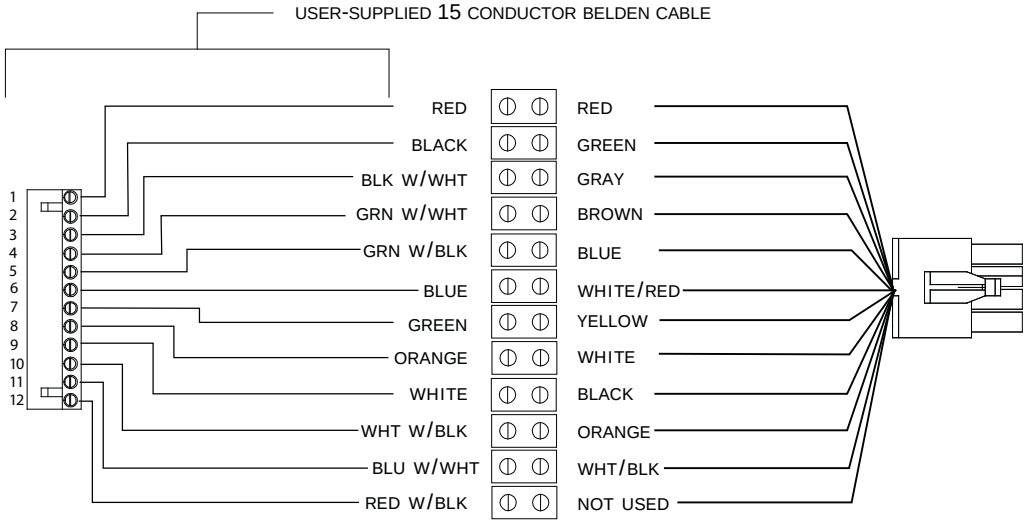

Fig. 4-4, Standard Transponder-to-ACM interconnect cable, **remote** applications

4.5 Transponder System Block Diagram

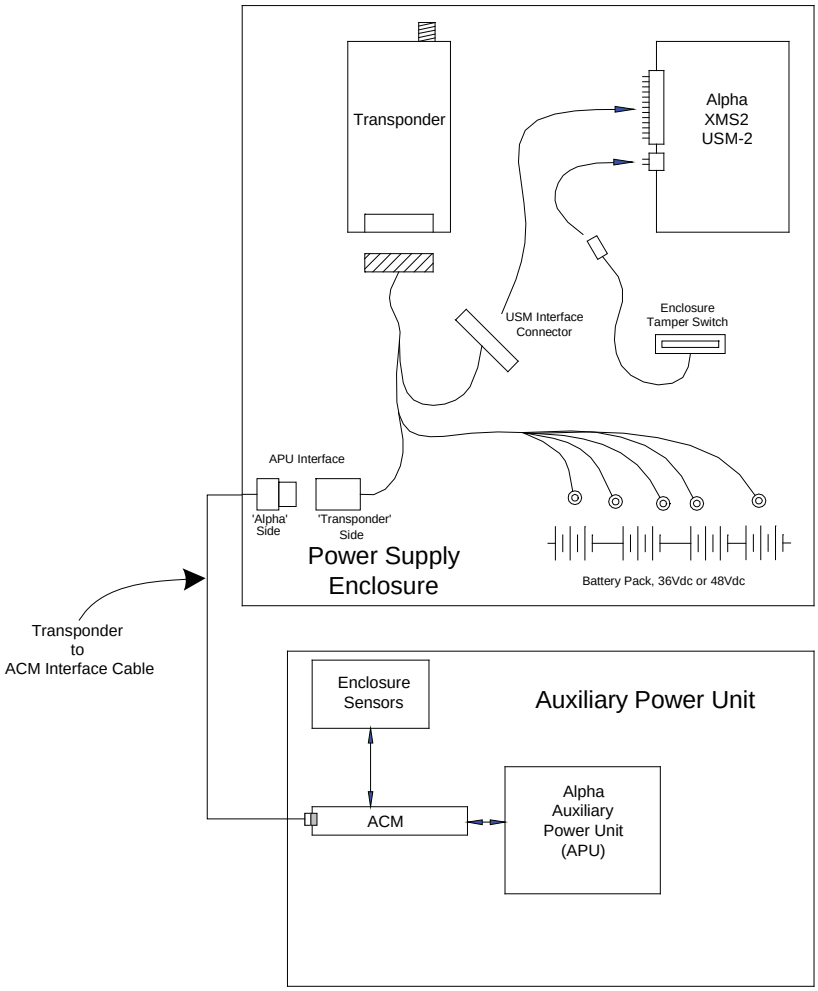

Fig. 4-5, Transponder System Block Diagram

4.6 DOCSIS Transponder Interface

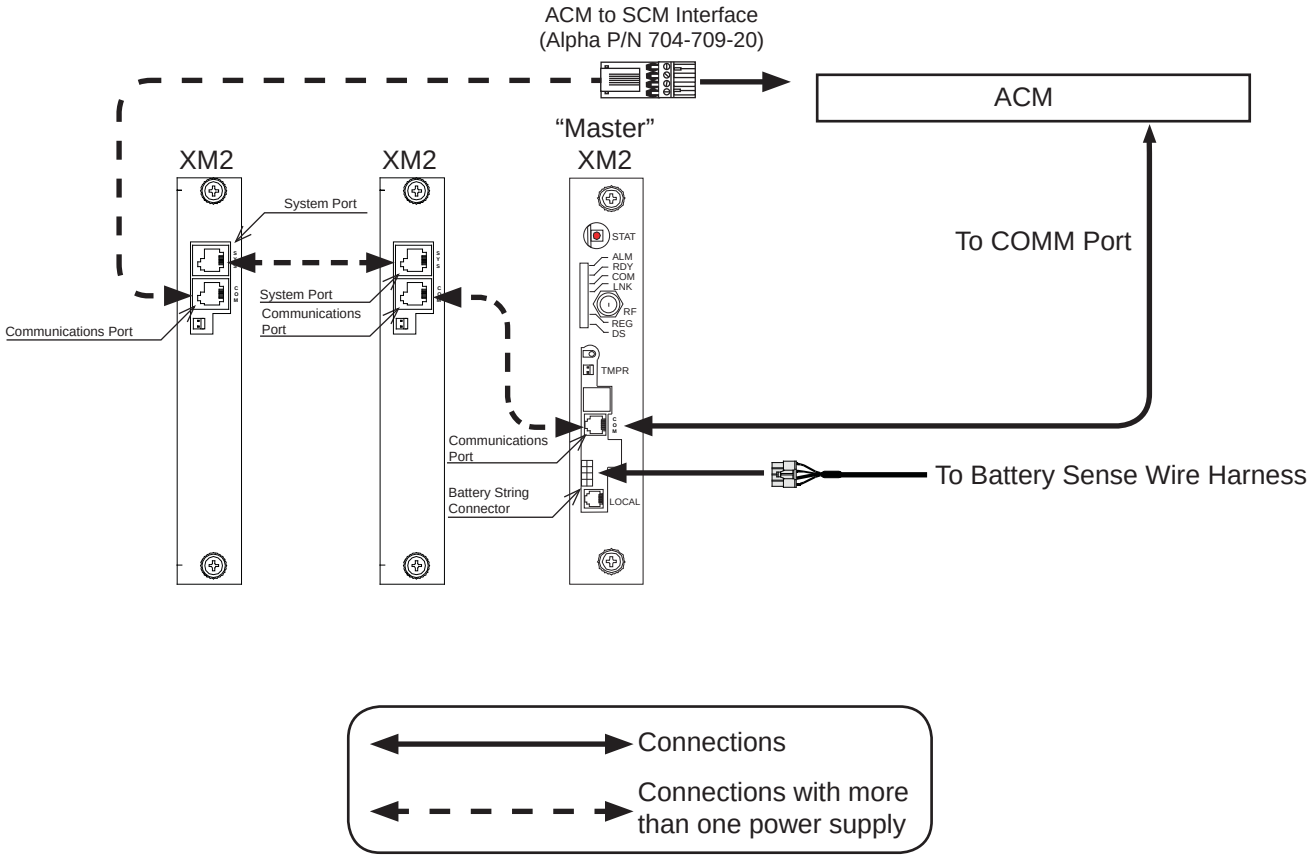

Fig. 4-6, System Interconnection Diagram

5.0 System Self-Test and Maintenance

5.1 Self-Test

Generator testing can be initiated in four ways:

1. The ACM can be programmed to periodically run an automatic test (Default OFF).

2. A Self-Test can be commanded via status communications.

3. Momentary activation of the Engine Run command will cause the ACM to effectively run a test. Note that this method is the least desirable because the Self-Test Fail alarm will not be set if an alarm condition arises.

4. A one-minute automatic test is performed when the manual control switch is returned to Auto from Stop. Generator testing consists of starting and running the generator for a programmable period of time (the default test duration is 10 minutes). The ACM monitors all engine-related signals and will declare a self-test as failed if any of the following alarms activate during the test:

   • Low Oil Pressure registered as a control fail

   • Engine Over-temperature

   • Engine Over-crank

   • Low Fuel

   • ACM Control Failure

   • Low Ignition Battery

   • Low DC Bus Voltage

The ACM will not start a self-test if the engine is disabled, the stop switch is asserted, or the engine is already running.

5.0 System Self-Test and Maintenance, continued

5.1 Self-Test, continued

If AC line should fail during a test, the test will terminate normally but the engine will continue to run until line returns. If the test fails because the DC Bus alarm activates, the test will terminate, the self-test fail alarm will activate but the generator will continue to run until the DC Bus alarm clears. The Self-Test Fail alarm may be cleared via a reset command or by successfully running a subsequent test. The programmable, internal ACM variables listed below control automatic self-tests.

Auto-Test Interval
This feature represents the number of days between automatic tests. Auto-test interval is 17 days.

Auto-Test Countdown
This countdown timer is monitored by the ACM to determine when the next automatic test should be initiated. Although this timer is normally used as a status indicator, it can be used to set the start time for the next auto-test. For example, if the user wants to start the automatic test sequence at 12:30pm and it is presently 10:15am, they can wait until 10:30 and program Auto-Test Countdown to 2 hours. Subsequent tests will begin at nearly the same time of day so long as the ACM doesn't lose power in the interim. The ACM sets Auto-Test Countdown whenever the Auto-Test Interval is changed. Thus, if the Auto-Test Interval is programmed to 10 days, the ACM will set Auto-Test Countdown to 240 hours.

Auto-Test Duration
The length of each Auto-test is measured in minutes. The default test duration is 10 minutes. The test duration may be set between 10 and 120 minutes.

Manually enabling the Autotest feature
Switch SW5-8 is used to enable the autotest feature with a 14-day test interval. The first autotest will begin 14 days from the time the ACM is powered up with the configuration switch changed from 0 to 1 (OFF to ON). To disable the autotest sequence, place switch SW5-8 in the OFF position and restart the ACM. It is important to understand that upon power up, the ACM looks for a change in the switch position before it changes the test control parameters.

5.2 System Maintenance

The ACM monitors time between periodic maintenance of the engine-generator. The Service Interval internal ACM variable represents the number of hours of engine-run-time between periodic services. When the engine runs for a number of hours equal to Service Interval, the ACM sets the Service Required Alarm and turns on the amber notification LED. The default value of Service Interval is 100 hours. Pressing and holding the service-reset switch for 5 seconds resets the service counter and Service Due is updated with the current value of the service interval.

NOTE:

Oil change exact times will vary as a function of temperature and operating conditions.

Power Node/ACM Certification

Power Node Location_____**Node**_____ **Model#**_____
Technician_____**Date** _____ **Serial #**_____

Ignition Battery Check *(Record Results)*

Verify correct Ignition Battery and Charger cables attachment ..... Pass / Fail
Verify Battery Terminal surfaces clean, tight, and covered with approved corrosion inhibitor (NCP-2) ..... Pass / Fail
Battery Voltage Range 12.5-14.1Vdc. ..... Actual= _____
Verify Enclosure Fan Running? ***See note 1*** ..... Pass / Fail

ACM Interface Checks

Line sense Voltage. ****See note 2*** ..... Actual = _____
Line sense Frequency Range 60Hz +/- 1Hz. ****See note 2*** ..... Actual = _____
Verify all connectors correctly installed and locked into place. ..... Pass / Fail
Run-Auto-Stop (RAS) rocker switch set to Auto. ****See note 3*** ..... Pass / Fail
Verify Pad Shear Magnet is correctly installed. ..... Pass / Fail
Verify Gas Detector is correctly installed. Pass / Fail
Verify Water Intrusion sensor is correctly installed. ..... Pass / Fail

ACM Alarm Verification

Verify no Major alarms are reported. ..... Pass / Fail
Verify the only Minor alarm reported is “Tamper” (Enclosure Door Open) ..... Pass / Fail
Water Intrusion Sensor (Hold float up to activate major alarm). ..... Pass / Fail
Pad Shear Sensor *(Place metal object between sensors to activate major alarm).* ..... Pass / Fail
Gas Detector *(Disconnect to activate alarm).* ..... Pass / Fail
Verify Line Failure Notification by disconnecting Line Sense. ****See Note 4*** ..... Pass / Fail
Verify DC Bus Fault alarm by disconnecting Battery Sense. ****See Note 5*** ..... Pass / Fail

Generator Functional Verification

Verify oil clean and filled to capacity. ..... Pass / Fail
Verify air filter clean and installed. ..... Pass / Fail
Verify no oil leakage from oil filter, drain plug, and oil fill tube. ..... Pass / Fail
Perform one minute self-test. ****See note 3*** ..... Pass / Fail
Engine does not “hunt” excessively during idle/no load conditions. ..... Pass / Fail
Enclosure properly grounding. ..... Pass / Fail

Power Supply Verification

XMS2 Power Supply checked per section 5 of the operator’s manual ..... Pass / Fail
Battery pack voltage *(no load, generator off)* range. ****See note 6, note 7*** ..... Actual =_____
Battery Terminals clean, tight, and covered with approved corrosion inhibitor (NCP-2). ..... Pass / Fail
Service Entrance, Enclosure, and Power Supply grounded properly. ..... Pass / Fail
Successful completion of 10 minute Self-test. ..... Pass / Fail
No Major or Minor alarms reported on XMS2 Smart Display. ..... Pass / Fail

NOTES:

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1. During initial installation, the fan will completely discharge the ignition battery if utility power is not available.
2. Verify via status monitoring.
3. Each time the RAS switch is placed in Auto, a one minute self-test is performed.
4. The generator will not start unless a line failure is greater then 10 minutes.
5. The generator will start immediately and run for a minimum of 30 minutes (Use RAS to stop Gen).
6. The difference between any battery in the string should not exceed 0.3 Vdc under load (XMS2 self-test).
7. Typical battery pack voltage ranges are 39.6-42.3Vdc, 52.8-56.4Vdc, and 105.6-112.8Vdc for 36/48/96 volt systems, respectively.

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