EMERGENCY POWER UNIT
EPU28-24XXX

OPERATOR/INSTALLATION MANUAL

CASTLEBERRY

Instruments & Avionics

817 West Howard Lane
Building # B
Austin, Texas U.S.A., 78753

Tel: (512) 251-5322
Fax: (512) 252-7322
www.ciamfg.com

This manual is restricted for use with CIA EPU Serial Numbers 098H01097 and greater only.

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SECTION I

1.0 DESCRIPTION AND OPERATION

1.1. INTRODUCTION

The Castleberry Instruments & Avionics EPU 28-24 XXX is manufactured for use in approved aircraft systems and as a back-up power supply for communication radios. Use of this equipment on approved aircraft systems may require FAA field approval (Form 337) or STC. The EPU 28-24 XXX Emergency Power unit (EPU) operates from an aircrafts nominal DC input power and provides depending upon model either 24, 14, or 28 volt DC battery output of 5 amps maximum.

The EPU 28-24 XXX is intended to operate emergency equipment such as attitude gyro and other essential equipment in the event the aircraft's primary power is interrupted or fails. During normal aircraft operation, the EPU will be maintained at full charge and any equipment connected to the EPU emergency buss will be powered from the aircraft's electrical system. In the event of aircraft electrical system failure, the EPU will switch the equipment on its emergency buss to emergency power supplied by its internal batteries.

The EPU utilizes sealed lead acid batteries having a long float charge life and high-energy capacity. With proper load analysis, the EPU 28-24 XXX can furnish electrical power for an adequate period of time to a variety of equipment on board an aircraft.

1.2. FEATURES

Automatically maintains batteries in a state of full charge during normal aircraft operation.

High energy, long life, deep discharge, sealed lead acid batteries.

Automatically switches to emergency power upon aircraft electrical system failure when EPU is armed.

Lightweight, compact design.

Overload protected.

Totally rechargeable.

There are differences in the specifications for the different models. Where applicable the differences are annotated as follows:

(24VDC)	for the EPU 28-24 RM & EPU 28-24 RMT
(14VDC)	for the EPU 28-24 RM4
(28VDC)	for the EPU 28-24 RM8

1.3 (24VDC) TECHNICAL SPECIFICATIONS

Input Voltage	22-33 VDC
Output Voltage	24 VDC Nominal
Output Current	5 Amps Maximum
Battery Capacity	2.5 Amp-hours Nominal
Size (width x height x length)	3.15" x 3.85" x 12.50"
Weight with mounting rack	7.5 lbs. Maximum
Mounting	Rack Mounting
Operating Temperature	-40ºC to +65ºC
Storage Temperature	-65ºC to +65ºC
Altitude	55,00 ft. Maximum
Humidity	95% @ 50ºC for 48 hours
Vibration	DO-160D Category M
Shock	DO-160D Category B
Power Input Test	DO-160D Category B
Voltage Spike Test	DO-160D Category B
Audio Frequency Conducted	DO-160D Category B
Induced Signal Susceptibility Test	DO-160D Category B
Radio Frequency Susceptibility	DO-160D Category U
Electromagnetic Compatibility Test	DO-160D Category B

1.3A (14VDC) TECHNICAL SPECIFICATIONS

Input Voltage	11-16.5 VDC
Output Voltage	14 VDC Nominal
Output Current	5 Amps Maximum
Battery Capacity	5 Amp-hours Nominal
Size (width x height x length)	3.15" x 3.85" x 12.50"
Weight with mounting rack	7.5 lbs. Maximum
Mounting	Rack Mounting
Operating Temperature	-40ºC to +65ºC
Storage Temperature	-65ºC to +65ºC
Altitude	55,00 ft. Maximum
Humidity	95% @ 50ºC for 48 hours
Vibration	DO-160D Category M
Shock	DO-160D Category B
Power Input Test	DO-160D Category B
Voltage Spike Test	DO-160D Category B
Audio Frequency Conducted	DO-160D Category B
Induced Signal Susceptibility Test	DO-160D Category B
Radio Frequency Susceptibility	DO-160D Category U
Electromagnetic Compatibility Test	DO-160D Category B

1.3B (28VDC) TECHNICAL SPECIFICATIONS

Input Voltage	22-33 VDC
Output Voltage	28 VDC Nominal
Output Current	5 Amps Maximum
Battery Capacity	2.5 Amp-hours Nominal
Size (width x height x length)	3.15" x 3.85" x 12.50"
Weight with mounting rack	7.5 lbs. Maximum
Mounting	Rack Mounting
Operating Temperature	-40ºC to +65ºC
Storage Temperature	-65ºC to +65ºC
Altitude	55,00 ft. Maximum
Humidity	95% @ 50ºC for 48 hours
Vibration	DO-160D Category M
Shock	DO-160D Category B
Power Input Test	DO-160D Category B
Voltage Spike Test	DO-160D Category B
Audio Frequency Conducted	DO-160D Category B

Induced Signal Susceptibility Test	DO-160D Category B
Radio Frequency Susceptibility	DO-160D Category U
Electromagnetic Compatibility Test	DO-160D Category B

NOTE: DO-160D specifications relating to this unit are on file at the address listed and can be obtained by writing to: Castleberry Instruments & Avionics
817 West Howard Lane, Bldg B
Austin, Texas 78753

1.4. OPERATION

1.4.1. GENERAL

Operation of the EPU system is dependent upon the equipment being powered and types of installation (refer to Interconnect Diagram, page 3-3). When the aircraft electrical system is operating normally, the EPU battery charge will be maintained and the emergency equipment will be operated from the aircraft electrical system (through the EPU).

In the event of aircraft electrical system failure, the EPU will automatically switch to the EPU batteries and power the emergency equipment.

An EPU arming switch and indicator lamp is recommended offering the operator an option of disconnecting any equipment from the EPU batteries to prevent accidental discharge while the aircraft electrical system is shut down under normal non-emergency conditions. (Refer to Interconnect Diagram, page 3-3).

When an EPU arming switch and indicator lamp is installed (refer to Interconnect Diagram, page 3-3), the lamp serves as an indication of the EPU operational status. Under normal aircraft electrical system operation, the indicator lamp will glow at half brightness signifying EPU is in the battery-charging mode and the EPU fuse is intact. Under aircraft electrical system failure, the lamp will glow at full brightness. This indicates that the EPU is in its emergency battery power mode. If the EPU fuse is defective, the indicator lamp will not illuminate.

**********NOTE**********
The battery charging circuit is independent of the EPU arming switch
and will continue to charge the batteries under normal operation even
with the arming switch off.
**********NOTE**********

1.4.2. PERIODIC DISCHARGE/CHARGE

It is recommended that once each month the EPU be partially discharged for a period of approximately 50 percent of the emergency equipment desired operating time. The EPU should then be recharged for a period of one-hour minimum. The discharge/charge cycle can be accomplished by activating the

emergency equipment on the EPU batteries for 50% (approximately) of its desired operating time prior to aircraft flight for at least one-hour duration. The discharge/charge cycle keeps the batteries active and will sustain battery capacity over time.

**********NOTE**********

Should the EPU fail to power the emergency equipment for the required period, flight should not be conducted if the emergency equipment is required for safe operation of the aircraft.

**********NOTE**********

1.4.3. BATTERY CHARGING TIME

The EPU 28-24 XXX charging circuit is capable of fully recharging the EPU batteries at 25 ºC within the guidelines set forth below:

PERCENT OF BATTERY CAPACITY REMOVED	TIME TO FULL CAPACITY CHARGE @ 25ºC
80%	3 hours
100%	5 hours

**********NOTE**********

Although discharge in excess of 100% (deep discharge) will not adversely effect the batteries, a longer recharge period will be necessary if the batteries are deep discharged.

**********NOTE**********

1.4.4. BATTERY PROTECTION

Castleberry Instruments & Avionics EPU 28-24 XXX batteries are protected from external electrical faults by a 6.25 amp fuse (installed on the front panel assembly). See to the Interconnect Diagram, page 3-3, for recommended breaker protection.

SECTION II

2.0 INSTALLATION

2.1 GENERAL

Only installers possessing basic knowledge of aircraft electrical wiring practices should perform installation. Improper connection of wiring can cause damage to the aircraft and the EPU. Proper wiring and safety practices according to FAR's should be followed. In all cases, instructions furnished by airframe manufacturer and FAR mandated practices should be followed where they deviate from instructions in this manual.

2.2 INSTALLATION APPROVAL

The Castleberry Instruments & Avionics EPU 28-24 XXX is manufactured for use in approved aircraft systems and as a back-up power supply for communication radios. Use of this equipment on approved aircraft systems may require FAA field approval (Form 337) or an STC. Only qualified personnel with knowledge of aircraft electrical systems should install the EPU.

2.3 MOUNTING THE EPU

Install the EPU in a suitable location in the aircraft. A human or controlled environment is best suited for the batteries as under extreme cold temperatures the batteries lose capacity. The EPU can be mounted at any attitude.

Mount the EPU using the mounting rack as a template. Secure the EPU using hardware and mounting structure in accordance with the G forces to be encountered in operation of the aircraft (see the Outline Drawing, page 3-1, for dimensions).

2.4. WIRING THE EPU

Recommended EPU wiring and gage sizes are shown on the Interconnect Diagram, page 3-3. Wire runs should be as short as possible to prevent excessive voltage drop. All wires should be kept at less than 20 feet in length. An internal block diagram (see figure 3.2) is included to aid the installer in understanding EPU operation.

2.5. LOAD ANALYSIS

The EPU battery voltage is nominally 24 VDC when the EPU is in the emergency mode (aircraft electrical system off or disconnected).

To determine operating time see Fig. 2.5B for operating time at anticipated current draw. Care should be exercised to ensure that the EPU would power the emergency equipment for the desired period of time. The responsibility of assuring proper load analysis rests with the installer.

2.6. INSTALLATION TEST AND CHECK OUT

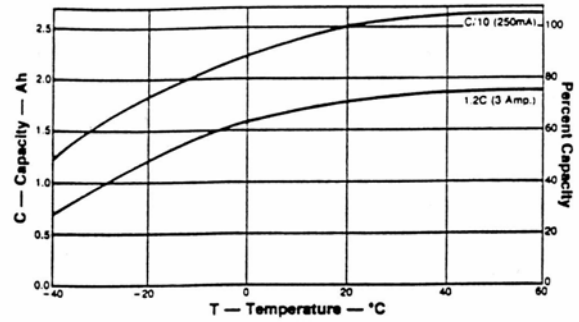
After installation is complete, charge the EPU fully and perform a battery capacity test as outlined in paragraph 2.7. If an EPU arming switch is used, verify that it disconnects the EPU batteries from the emergency equipment when in the off position. Read the information on the Warranty policy (see page 4-0) to verify system coverage.

2.7. ROUTINE MAINTENANCE - BATTERY CAPACITY TEST

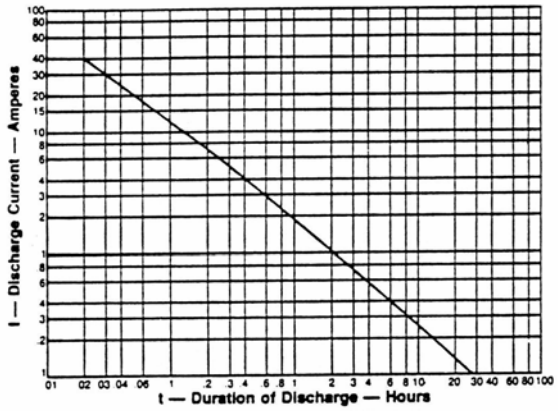
It is recommended that the Castleberry Instruments & Avionics EPU 28-24 XXX be tested for battery capacity at six-month intervals to determine battery condition.

This test is performed by supplying EPU power to the equipment it is intended to operate, determining if sufficient back-up battery power will support the load for the required time. An EPU not meeting the rated capacity should be recharged and re-tested. A second battery capacity test failure shall require replacement of the EPU battery pack.

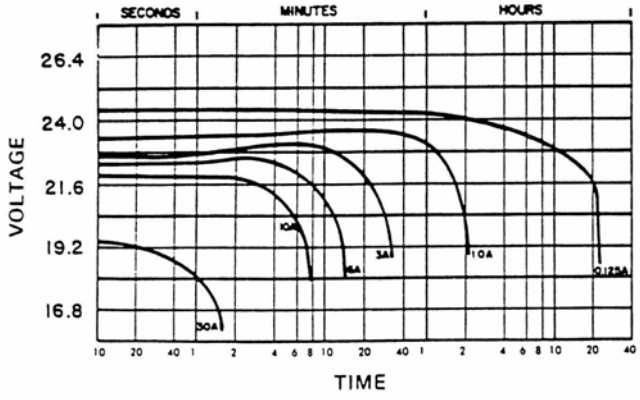
EPU 28-24 XXX
EMERGENCY POWER UNIT
2.8 BATTERY CHARACTERISTICS



Temperature Characteristics
Figure 2.5A



Discharge Current Characteristics @ 23°C
Figure 2.5B

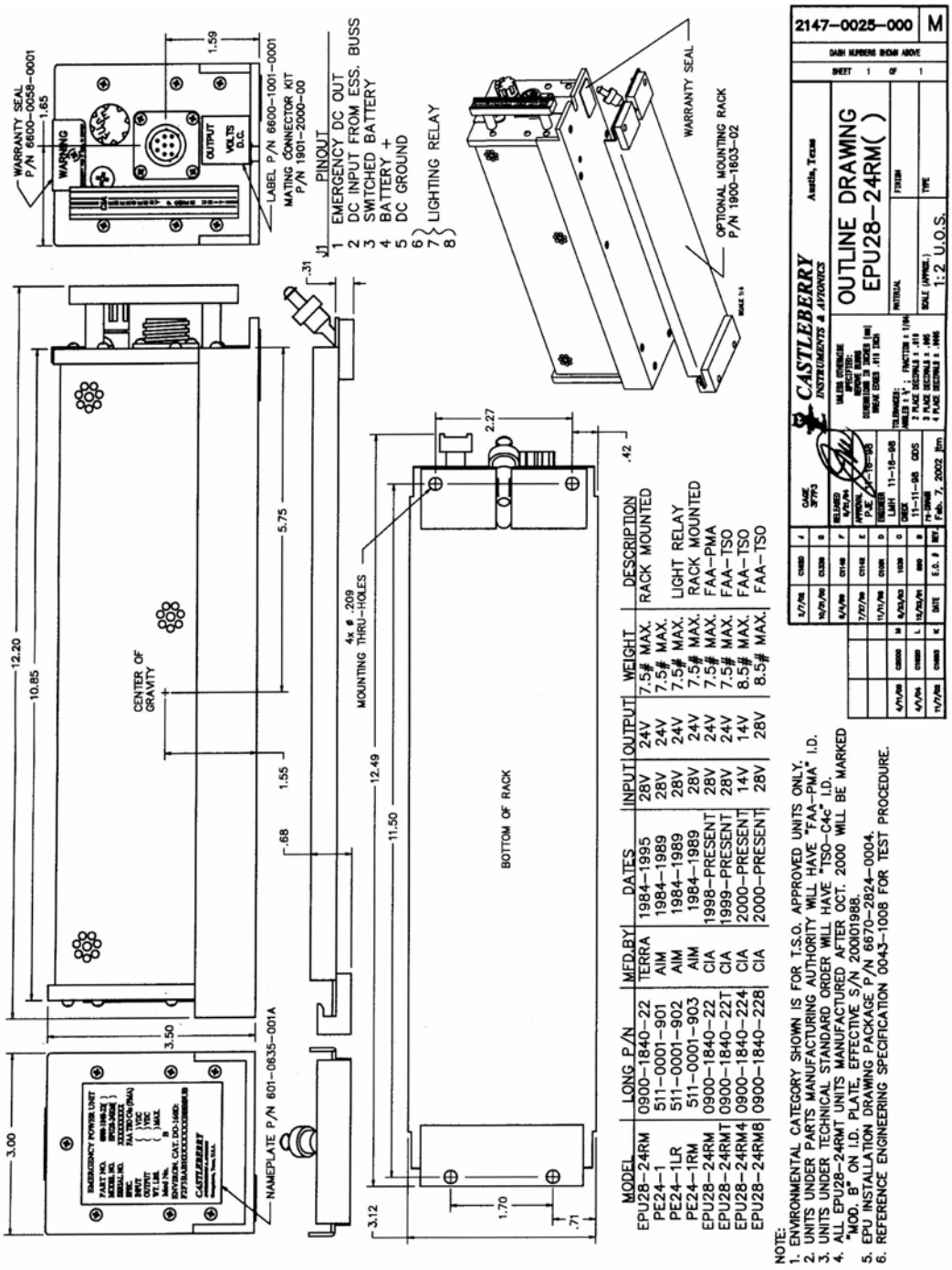


Discharge Voltage Characteristics @ 23°C
Figure 2.5C

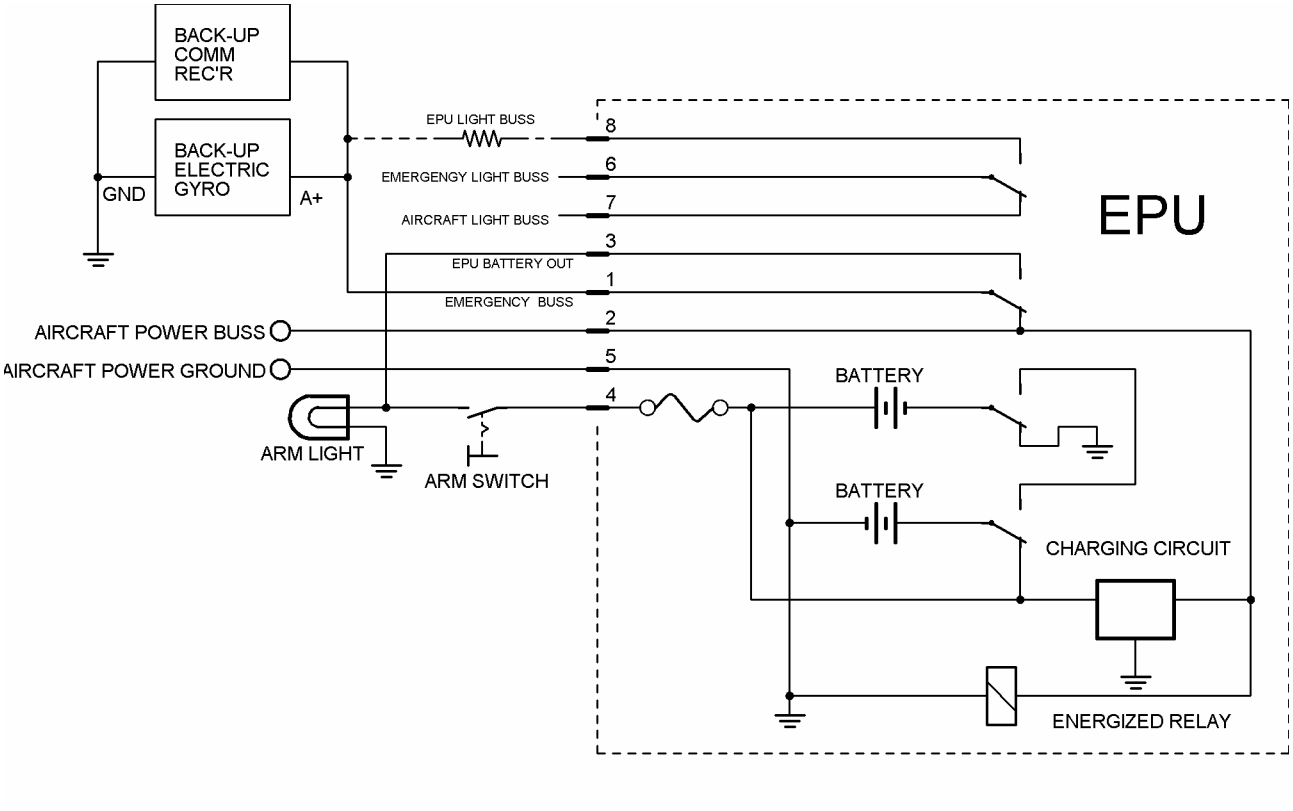
SECTION III

3.0 ILLUSTRATIONS

3.1 OUTLINE



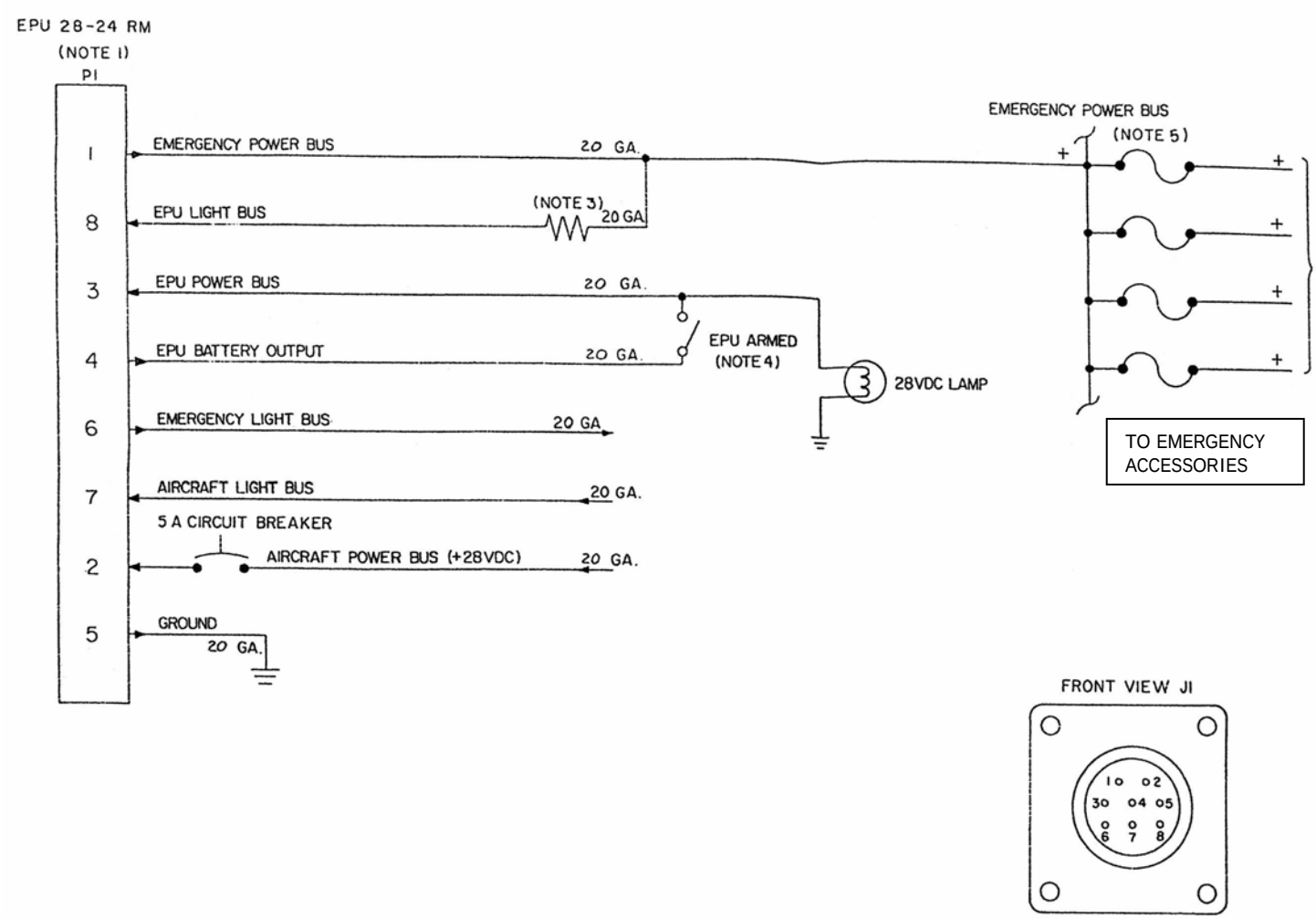
3.2 BLOCK DIAGRAM



NOTE:

When used as an emergency back-up for the aircraft communication radio, refer to figure above for wiring interconnection of the radio and the emergency power unit (EPU). An ARM Switch must be installed in the circuit and switched open (OFF) to prevent battery drainage when the aircraft is shut down. The ARM switch must be in the closed (ARM) position to allow the EPU to automatically switch to back-up operation. Under normal conditions the communications radio and battery charge will be maintained by aircraft power. Upon failure of aircraft power the EPU will switch to back-up mode and the radio will continue to be operational for the length of time determined by total load on the emergency buss and the battery capacity.

3.3 BLOCK DIAGRAM



NOTE 1: CONNECTOR – AMP 205838-1
CRIMP SOCKETS – AMP 66569-3
CRIMP TOOL – M22520/2-01

NOTE 2: ALL WIRES SHOULD BE MAINTAINED AS SHORT AS POSSIBLE (LESS THAN 20FT IN LENGTH).

NOTE 3: SELECT RESISTOR VALUE FOR PROPER VOLTAGE (OTHER THAN 24VDC) ON LIGHT BUS (EPU PIN 6).

NOTE 4: EPU ARMED SWITCH WITH INDICATOR LAMP USED TO PREVENT ACCIDENTAL EPU DISCHARGE WHEN AIRCRAFT BUSS IS TURNED OFF UNDER NON-EMERGENCY CONDITIONS. LAMP ILLUMINATES DIM TO INDICATE EPU FUSE OK AND EPU IS ARMED WHEN NORMAL AIRCRAFT POWER IS PRESENT. LAMP ILLUMINATES BRIGHT TO INDICATE EPU IS POWERING EMEGENCY ACCESSORIES WHEN AIRCRAFT POWER IS ABSENT.

NOTE 5: CIRCUIT BREAKER OR FUSE OF APPROPRIATE RATING MUST PROTECT ALL ACCESSORIES.

NOTE 6: FRONT PANEL 6 ¼ AMP FUSE TO PROTECT EPU BATTERY PACK.

SECTION IV

WARRANTY

CASTLEBERRY *Instruments & Avionics, L.L.C.*
Austin, Texas

LIMITED WARRANTY CERTIFICATE

CASTLEBERRY *Instruments & Avionics (*herein called ***CIA***) warrants each item of new equipment manufactured or sold by it to be free from defects in material and workmanship under normal use for which intended for a period of **24** months from date of shipment by ***CIA.*** No claim for breach of warranty will be allowed unless ***CIA*** is notified thereof in writing within thirty (30) days after the material or workmanship defect is found.

The obligation of *CIA* shall be limited to replacing or repairing at it's factory, the equipment found defective under the terms of this warranty certificate: providing that such equipment is returned in an approved shipping container, transportation charges prepaid, to:

CASTLEBERRY Instruments & Avionics, L.L.C.
817 West Howard Lane, Bldg. B
Austin, TX 78753
Ph. (512) 251-5322 Fax (512) 252-7322

or such other location as *CIA* may authorize. ***CIA*** reserves the right to have necessary repairs performed by an authorized agency.

This warranty shall not apply to any unit or part thereof which has not been installed or maintained in accordance with *CIA* instructions, or has been repaired or altered in any way so as to adversely affect its performance or reliability, or which has been subjected to misuse, negligence or accident.

This warranty is exclusive and is accepted by buyer in lieu of all other guaranties or warranties of merchantability and fitness for a particular purpose. Buyer agrees that in no event will *CIA* liability for all losses from any cause, whether based in contract, negligence, strict liability, other tort or otherwise, exceed buyer's net purchase price,, nor will *CIA* be liable for any special, incidental, consequential or exemplary damages.

CIA reserves the right to make changes in design or additions to or improvements in its equipment without the obligation to install such additions or improvements in equipment theretofore manufactured.