



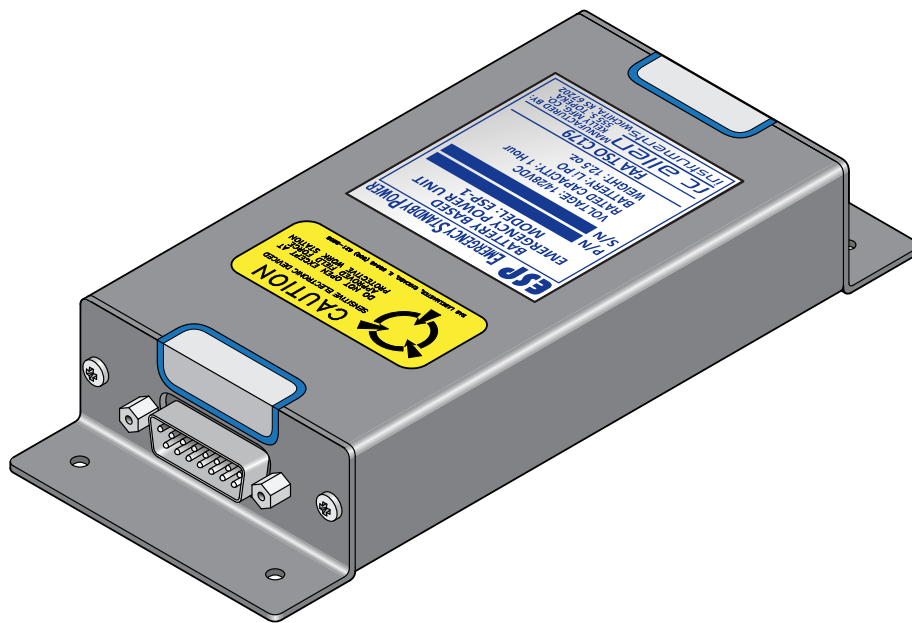
KMC PUBLICATION NO. 1402

# ESP SYSTEM

*EMERGENCY STANDBY POWER*

BATTERY-BASED EMERGENCY POWER UNIT (BEPU)

## INSTALLATION/OPERATION GUIDE



**MODEL ESP-1**  
**P/N 107-0001-01**



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## REVISION DETAIL

REVISION	DATE	DETAIL
A	03/12/2009	Initial Release
B	07/13/2009	Changed FAA TSO to TSO-C179 (Page 3). Added Battery Warning (Page 7).
C	04/20/2010	Added Quick Disconnect Link reference (Pages 4-5).
D	12/10/2014	Revised DO-160F Environmental Qualification Form, page 8.

## SECTION 1: GENERAL DESCRIPTION

### 1.1 PURPOSE OF EQUIPMENT

The **Emergency Standby Power** unit, known as the **ESP**, is a Battery-based Emergency Power Unit (BEPU). It is designed to supply emergency power for a minimum of one hour to operate any 14 volt, 28 volt or multi-volt attitude indicator when aircraft power has been disrupted. During normal flight, the **ESP** utilizes the main aircraft power buss to maintain a full charge.

### 1.2 PHYSICAL DESCRIPTION

The **ESP** system consists of 3 basic components, the Battery Power Unit, the Wire Harness, and the panel mounted Illuminated Status Switch. (See table 1.1 for leading particulars).

#### Battery Power Unit

The Battery Power Unit (BPU) can be mounted anywhere behind the instrument panel. It can power a standard gyro for an hour or a digital horizon like the **RCA 2600** Series for up to 6 hours. The battery recharges during normal flight operation and has a “sleep” mode to prevent aircraft battery drain when not in use. The **ESP** utilizes a 7.4 volt, 2300mAh lithium polymer battery - the same kind of battery found in most laptop computers. It does not have the “memory” charge degradation found on other types of rechargeable batteries. (See figure 2.1, Battery Power Unit General Dimensions).

#### Illuminated Power Switch

The Illuminated Status Switch is mounted in a 5/8 inch hole on the instrument panel near the instrument that is backed up. It turns the **ESP** on or off, indicates the status of the battery charge, and indicates battery status (on or off).

#### Wire Harness

The Wire Harness, which comes supplied with the **ESP** is designed to interconnect the **ESP** with the instrument to be powered and includes the Illuminated Power Switch. Due to the different pinouts for various instruments and the different voltages of aircraft power system, the harness is designed specifically to the model of instrument, and aircraft voltage. (See Table 2.1, Harness Compatibility).

<u>BATTERY POWER UNIT</u> .....	Voltage In.....	14 or 28VDC
	Voltage Out.....	14 or 28VDC
	Circuit Breaker Size.....	28 Volt load ..... 2 AMP
		14 Volt load ..... 3 AMP
	Weight .....	12.5 ounces
	Dimensions.....	See Figure 1.1
	Operating Temperature Range .....	-30° to +50° C
	Location .....	Inside cabin bulkhead
<u>BATTERY</u> .....	Nominal Voltage .....	14/28VDC
	Battery Type .....	7.4VDC, 2300 mAh Li-PO Lithium Polymer
<u>ILLUMINATED STATUS SWITCH</u> .....	Light Source .....	2 LED lights
	Dimensions.....	0.70 x 0.70 inches
	Location .....	Panel mounted
	Panel Hole .....	5/8 inch diameter
<u>PERFORMANCE</u> .....	Rated Capacity .....	Mechanical Instrument..... 60 Minutes
		Electronic Instrument ..... 6+ Hours
	Maintenance .....	Replace battery every 3 years
<u>QUALIFICATIONS</u> .....	Minimum Performance Standard.....	FAA TSO-C179
	Environmental Qualification.....	DO-160F
	Env. Cat. [D1X]CAA[SM]XXXXXXZ[BRX]AZZC[WW]L[A3C3X]XXAX	

Table 1.1, Leading Particulars

## SECTION 2: INSTALLATION

### 2.1 GENERAL INFORMATION

The conditions and test required for the TSO approval of this BEPU are minimum performance standards. Those installing this BEPU on or in a specific type or class of aircraft must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have a separate approval for installation in an aircraft. The article may be installed only if performed under 14CFR Part 43 or the applicable airworthiness requirements.

### 2.2 BATTERY POWER UNIT LOCATION

The **ESP Battery Power Unit** may be located anywhere behind the instrument panel within the cabin bulkhead area. Avoid locating the unit near high heat sources such as heater vents etc. Mounting hardware is to the discretion of the installer. Wire Harness length and routing should be considered when locating the Battery Power Unit.

### 2.3 WIRE HARNESS

Route Wire Harness as practicable, avoiding high heat sources. Secure harness with clamps or ties as required. The standard length for the harness is 3 feet. Custom harness lengths are available upon request. (See Figure 2.2, Wire Harness General dimensions & hookup).

To allow for easy removal of the ESP, the Wire Harness includes a Quick Disconnect Link that attaches to the Illuminated Status Switch. Install the switch in the panel before attaching the link. When removal of the ESP is necessary, disconnect the ESP harness from the link

#### NOTE

The Wire Harness is specific to the aircraft voltage and model of instrument powered and may not be interchangeable with other aircraft or instruments.

HARNESS P/N	SYSTEM VOLTAGE	USE ON	INST. PIN OUT
702-0028-01	28VDC	RCA26BK-2, -3, -6, -7, -8 -9, -10, -11, -12, -14, -15, -16, -20, -22, -26, -28, -29, -30, -32, -34, -35, -36, -37 RCA26EK-1, -2, -3, -4, -5, -6, -7, -8, -9, -11, -12, -13, -14	A = GND B = GND (lights) C = POS D = POS (lights)
702-0028-02	28VDC	RCA26EK-10 RCA2600-2, -3	A = GND B = POS C = GND (lights) D = POS (lights)
702-0014-01	14VDC	RCA26AK-1, -3, -4, -6, -7, -8 RCA 26EK-10 RCA2600-2, -3	A = GND B = POS C = GND (lights) D = POS (lights)
702-0014-02	14VDC	RCA26AK-2, -5 RCA26EK-1, -2, -3, -4, -5, -6, -7, -8, -9, -11, -12, -13, -14	A = GND B = GND (lights) C = POS D = POS (lights)

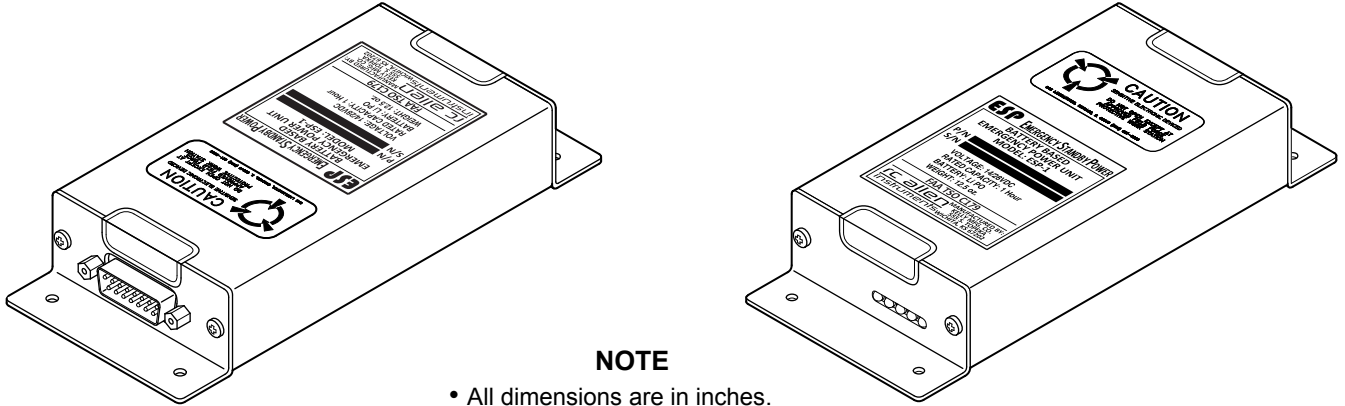
Table 2.1, Harness Compatibility

### 2.4 ILLUMINATED STATUS SWITCH

Locate the Illuminated Status Switch adjacent to the instrument to be powered by the **ESP**. A 5/8 inch hole is required in the instrument panel to mount the Illuminated Status Switch.

### 2.5 TECHNICAL HELP

Technical questions may be sent to: [engineering@kellymfg.com](mailto:engineering@kellymfg.com)



**NOTE**

- All dimensions are in inches.
- Tolerance is  $\pm 0.015$

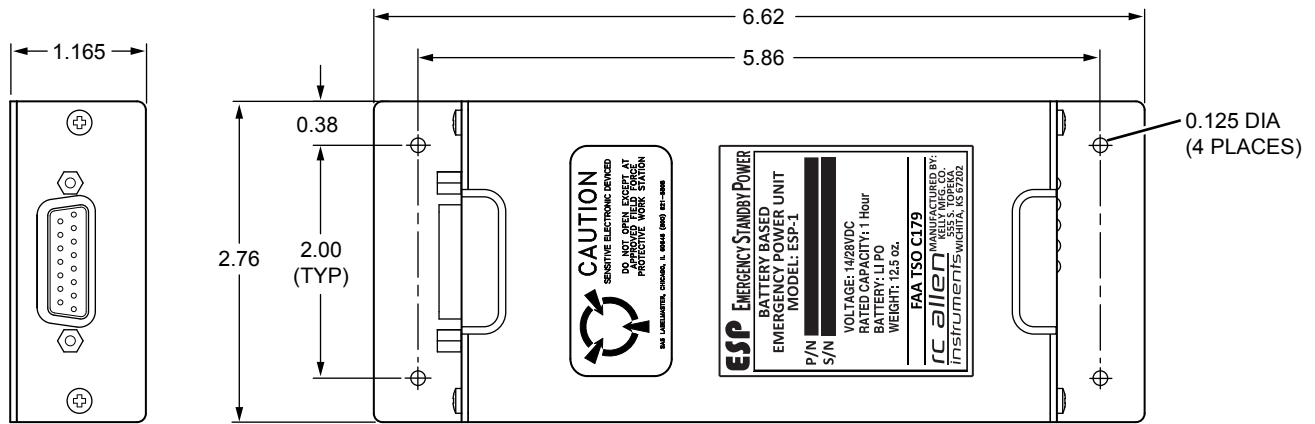


Figure 2.1, Battery Power Unit General Dimensions

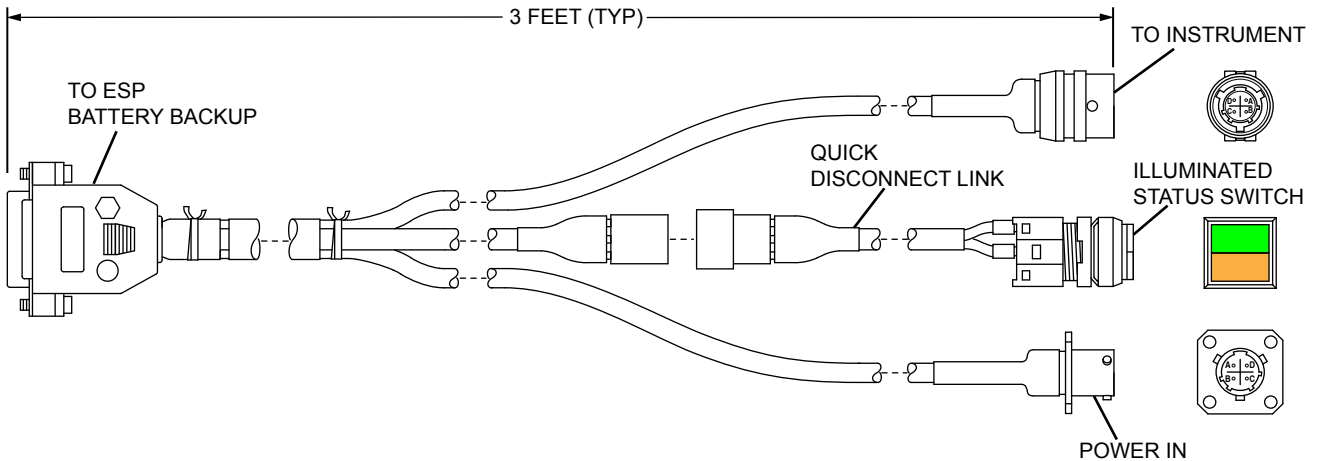


Figure 2.2, Wire Harness General Dimensions & Hookup

### SECTION 3: OPERATION

#### 3.1 STARTUP

At startup, the green light on the Illuminated Status Switch will come on; indicating that the system is receiving power. After about 30 seconds, the amber light will come on indicating that the battery is being recharged. The battery charge level may be checked at any time while in STANDBY MODE by pressing the Illuminated Status Switch. The **ESP** will go into BATTERY CHECK MODE and the green light will flash from 1 to 5 times; indicating the amount of charge in the battery - 1 flash indicating low charge and 5 flashes indicating a full charge. The **ESP** will then return to the STANDBY MODE.

#### 3.2 NOMINAL OPERATION

After startup, the amber light will either remain steadily on, indicating that the **ESP** battery is being charged, or the amber light will go out, indicating that the battery is fully charged. The amber light may come on occasionally during flight to indicate a charge to keep the **ESP** battery at full capacity.

The green light will remain steadily on at all times indicating STANDBY MODE is on and that the system is operational.

#### 3.3 EMERGENCY OPERATION

In the event of aircraft power loss, the green light will flash on and off. This indicates that the **ESP** is in POWERED STANDBY MODE and alerts the pilot that action is required. In POWERED STANDBY MODE, the **ESP** will supply power to the instrument for 2 minutes. *The pilot must press the Illuminated Status Switch within this time to turn the **ESP** into FULL BACKUP MODE - otherwise, the unit will shut down. The green status light will remain steadily on until the battery runs out of power. If the **ESP** shuts down, the pilot may restore backup power by pressing the Illuminated Status Switch.*

**WARNING**

In the event that the pilot fails to switch to FULL BACKUP MODE, the **ESP** will shut down within 2 minutes. Due to the amperage required to spin-up a gyro type instrument after restoring backup power, a significant drain to the battery will occur thus reducing the total powered backup time.

When aircraft power is restored, the **ESP** will automatically switch to STANDBY MODE and will recharge; indicated by the amber light.

When the **ESP** is charging, it does not mean that your backup system is not functioning, it only means your system is staying at optimum operating charge.

MODE	INDICATOR	DESCRIPTION
BATTERY CHECK	1 TO 5 FLASHES OF GREEN LIGHT	Indicates battery strength. ( 1 low, 5 full)
STANDBY	STEADY GREEN LIGHT	Power applied to unit and ready for operation.
CHARGE	STEADY AMBER LIGHT & GREEN LIGHT	Power applied to unit and battery recharging.
POWERED STANDBY	FLASHING GREEN LIGHT ONLY	Temporary power to instrument (2 minute warning)
FULL BACKUP	STEADY GREEN LIGHT ONLY	Continued backup power to instrument.
SLEEP	NO LIGHT	Standby switch inoperative. (after 16 hours)

Table 3.1, Mode Description

### 3.4 AIRCRAFT SHUTDOWN

When the aircraft engine is shut off, the **ESP** will switch to POWERED STANDBY MODE as indicated by a blinking green light, and will continue to supply power to the instrument for 2 minutes. The pilot may either allow the **ESP** to automatically shut down after 2 minutes or may press the Illuminated Status Switch and hold until the green light goes out (about 5 seconds) to shut the **ESP** off.

### 3.5 SLEEP MODE

After 16 hours of non-use, the **ESP** will go into SLEEP MODE which disables the Illuminated Status Switch to prevent aircraft battery drain. Instruments cannot be powered-up in SLEEP MODE. When aircraft power is applied to the **ESP**, the unit will wake up and enable the status switch for normal operation.

## SECTION 4: CARE

### 4.1 MAINTENANCE

The **ESP** requires very little maintenance. The battery is kept in a fully-charged state during normal use and does not require removal for recharging.

#### **NOTE**

A fully discharged battery may take up to four hours to recharge. Aircraft power must be on for battery recharge.

### 4.2 BATTERY LIFE:

It is recommended that the battery is replaced after three years.

If the Amber light does not go out during normal operation, the battery pack may be getting old and will need to be replaced.

#### **WARNING**

Risk of fire, explosion, and burns. Do not disassemble, crush, heat above 212°F, or incinerate battery.

There are no user replaceable parts in the **ESP** and the unit must be sent to Kelly Manufacturing Co. Service Department for battery replacement.

For repair information, contact:

Phone: (316)265-6868

Fax: (316)265-6687

Email: [service@kellymfg.com](mailto:service@kellymfg.com)

**APPENDIX A**

DO-160F Environmental Qualification Form

**NOMENCLATURE:** Battery-Based Emergency Power Unit (BEPU)

**MODEL NUMBER:** ESP-1                      **TSO NUMBER:** C174/C179

**MANUFACTURERS SPECIFICATIONS:** STP 1200 Rev. REL (9/10/08)

**MANUFACTURER:** Kelly Manufacturing Company

**ADDRESS:** 555 S. Topeka, Wichita, KS 67202

**REVISION & CHANGE NUMBER OF DO-160:** Rev. F dated 12/6/07 **DATES TESTED:** 9/08 – 2/09 & 11/14

CONDITIONS	SECTION	DESCRIPTION OF TESTS CONDUCTED
Temperature and Altitude	4.0	Equipment tested to Category D1
Low Temperature	4.5.1	
High Temperature	4.5.2 & 4.5.3	
Altitude	4.6.1	
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Operational Shocks and Crash Safety	7.0	Equipment tested to Category A
Vibration	8.0	Equipment tested to Category S, curve M
Explosive Atmosphere	9.0	Equipment identified as category X, no test performed
Waterproofness	10.0	Equipment identified as category X, no test performed
Fluids Susceptibility	11.0	Equipment identified as category X, no test performed
Sand and Dust	12.0	Equipment identified as category X, no test performed
Fungus	13.0	Equipment identified as category X, no test performed
Salt Fog Test	14.0	Equipment identified as category X, no test performed
Magnetic Effect	15.0	Equipment tested to Category Z
Power Input	16.0	Equipment tested to Category BRX
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Susceptibility	18.0	Equipment tested to Category Z
Induced Signal Susceptibility	19.0	Equipment tested to Category ZC
Radio Frequency Susceptibility (Radiated and Conducted)	20.0	Equipment tested for Radiated Susceptibility to Category W Equipment tested for Conducted Susceptibility to Category W
Emissions of Radio Frequency Energy	21.0	Equipment tested to Category L
Lightning Induced Transient Susceptibility	22.0	Equipment tested to Pin Injection Test: Waveform set B, Level 3 Cable Bundle Test: Waveform set H, Level 3 Multiple Burst: Level 3 [B3H33]
Lightning Direct Effects	23.0	Equipment identified as category X, no test performed
Icing	24.0	Equipment identified as category X, no test performed
Electrostatic Discharge	25.0	Equipment tested to Category A
Fire, Flammability	26.0	Equipment identified as category X, no test performed

**REMARKS**

- In the power input test, equipment was tested to subparagraph 16.5.1.4 b, requirement for equipment with digital circuits