ESI ENGINE SYSTEMS, INC.

301 South Church St., Suite 100 / P.O. Box 1928 / Rocky Mount, NC 27802-1928 / Telephone: (919) 977-2720 / Fax (919) 446-3830

AUTHORIZED DISTRIBUTOR ELECTRO MOTIVE

January 26, 1999

U.S. Nuclear Regulator Commission
Document Control Desk
Mail Stop 0-11A1
Washington, DC 20555

Subject: 10CFR21 Reporting of Defects and Non-Compliance -
Engine Systems, Inc. Report No. 10CFR21-0078

Synchrostart model ESSB-4AT speed switch (p/n SA-2110)

Dear Sir:

The enclosed report addresses a reportable defect and the corrective action to be taken by users of the subject speed switch. This notification is being sent to all of our nuclear customers.

Should you have any questions, please feel free to call.

Please sign below, acknowledging receipt of this report, and return a copy to the attention of Engineering Document Control at the address below (or, fax to number 919/446-1134) within 10 working days after receipt.

Yours very truly,

ENGINE SYSTEMS, INC.

JoAnn Mason

Jo-Ann Mason
Engineering Document Control

1/1

IE19

Please let us know if ANY of your mailing information changes - name of recipient, name of company/facility, address, etc. Mark the changes on this acknowledgment form and send to us by mail or FAX to the number above.

RECEIVED: _____

(91)

DATE: _____

ENGINE SYSTEMS, INC.
301 South Church St., Suite 100 / P.O. Box 1928 / Rocky Mount, NC 27802-1928 / Telephone: (919) 977-2720 / Fax (919) 446-3830

AUTHORIZED DISTRIBUTOR

Report No. 10CFR21-0078
Rev. 0: January 25, 1999

10CFR21 REPORTING OF DEFECTS AND NON-COMPLIANCE

COMPONENT: Synchrostart ESSB-4AT speed switch

SYSTEM: Standby EMD diesel generator control systems

CONCLUSION: Defect is reportable in accordance with 10CFR21.

PREPARED BY: _____ DATE: 1/26/99
Donald D. Galeazzi
Engineering Manager

REVIEWED BY: _____ DATE: 1/26/99
Michael Nuding
Quality Assurance Manager

SUMMARY:

Engine Systems Inc. has received notification that Hope Creek generating station experienced the degradation of three Synchrostart model ESSB-4AT speed switches. As reported in Operating Experience document OE9504 (see Exhibit 1), all three degradations occurred because an incorrect resistor was installed on the speed switch's power supply card. This resulted in heat related damage to the power supply card components. The cited speed switches were supplied by Coltec.

The Synchrostart ESSB-4AT speed switch is a standard component in Engine Systems' safety related EMD diesel generator control systems. As applied by Engine Systems, the speed switch provides a safety related function. Failure of the speed switch could disable generator field flashing, resulting in failure of the diesel generator to build output voltage. Because of the safety related application of the ESSB-4AT speed switch, Engine Systems is sending this notification to all nuclear customers.

COMPONENT:

Synchrostart ESSB-4AT speed switch (p/n SA-2110).

CUSTOMERS AFFECTED:

All nuclear users of EMD diesel generators.

DEFECT:

The speed switch power supply card contained an incorrectly sized resistor. An 82 ohm resistor was installed in place of the correctly sized 1200 ohm resistor.

CORRECTIVE ACTION:

According to the information contact identified in OE9504, severe heat damage to the power supply card components became visibly evident within the first 10 hours of engine operation. A DC system ground or erratic speed indication occurred after approximately 40 to 60 hours of operation. The circuitry at Hope Creek only applies power to the speed switch during engine operation. Engine Systems' circuit design applies power to the speed switch continuously (operating as well as standby modes); therefore, speed switch degradation would occur within 3 days following completion of installation. As a result, speed switches with incorrect resistors would have been identified during periodic testing of the diesel generator; therefore, installed speed switches <u>are not</u> suspect.

1. All users with ESSB-4AT speed switches should check their spare ESSB-4AT speed switches to ensure that the correct resistor is installed.

   A. Remove the four cover mounting screws.
   B. Lift the cover (with attached circuit cards) out of the switch housing.

C. Identify the power supply card.

The power supply card is located at the bottom of the cover and is unique because it has "fingers" which rest in a slot in the switch housing.

D. Identify the suspect resistor.

The suspect resistor is the only component mounted in a spring clip. This resistor should be 1200 ohms. If the resistor markings are not readable, connect an ohmmeter across the resistor (use exposed leads) to verify resistance (1200 ohms +/- 2%).

E. Reinstall cover in housing, making sure that the "fingers" of the power supply card rest in the slot at the bottom of the housing. Install four cover mounting screws and tighten hand (snug) tight.

2. Switches with incorrect resistors should be returned to Engine Systems, Inc., contact our Customer Service department.

3. Switches with correct resistors can be returned to inventory.

EXHIBIT 1

OPERATING EXPERIENCE REPORT OE9504 (2 pages)

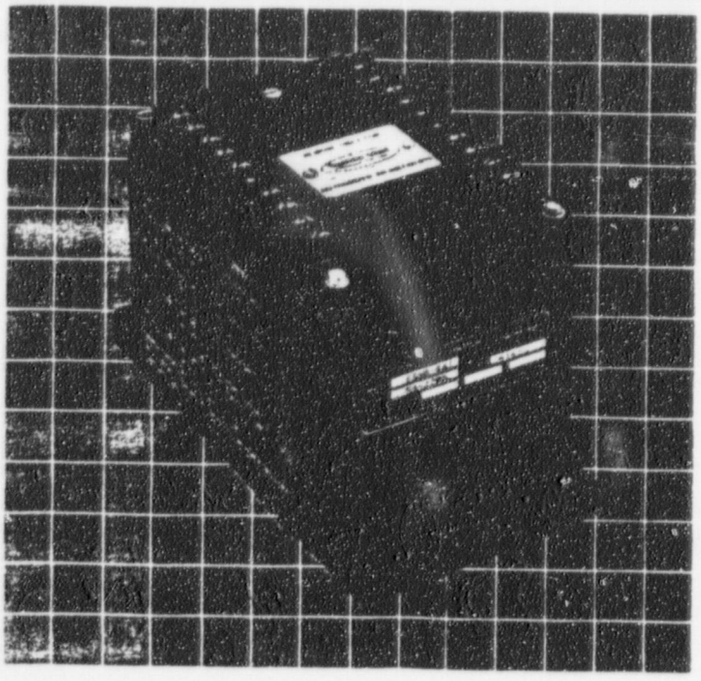
SYNCHROSTART ESSB CATALOG CUT (1 page)

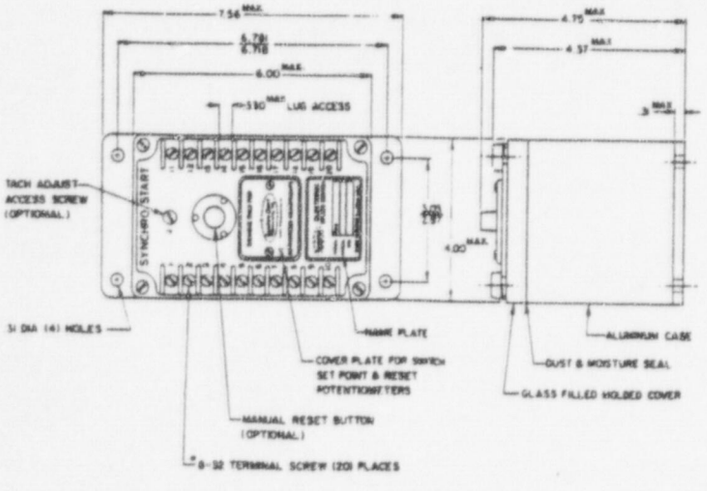
OPEX OE9504

> > Unit Name: .....Hope Creek
> > Year Commercial: 1986
> > NSSS/A-E: .....GE/Bechtel
> > Rating: 1117.5
> > Turbine Mfg: .....GE
> > Event Date: 9/23/98
> > Docket No: 50-354
> >
> > EIIS System Code: EK
> >
> > NSSS Applicability: BWR and PWR
> >
> > Maintenance Rule: Yes
> >
> > ABSTRACT:
> > Hope Creek Generating Station has experienced the degradation of three
> > Synchro-Start speed switches. All three degradations occurred because
> > the switch's internal power supply card contained a wrong sized
> > current limiting resistor. A spare speed switch from inventory was
> > also found to contain a wrong resistor. The affected speed switches
> > have different batch numbers, but all contain the same wrong sized
> > current limiting resistor. The cited speed switches were manufactured
> > by Synchro-Start (M/N ESSB-4AT) and purchased through Coltec (P/N
> > 01709876-162).
> >
> > DESCRIPTION:
> > During a planned run of the 'A' emergency diesel generator in
> > September 1998, it was observed that the engine auxiliaries that
> > normally turn on as the engine coasts down cycled on then off 5 to 6
> > times. Corrective maintenance identified several overheated components
> > on the power supply card internal to the speed switch, (Synchro-Start,
> > M/N ESSB-4AT). The switch was replaced with a new unit and the
> > degraded switch sent to the original vendor for a root cause
> > determination. A review of the corrective maintenance history
> > indicated that this switch was replaced in March 1998, due to a ground
> > on the 125 VDC control system. Photos of the degraded March 1998
> > switch appear to be identical to that of the degraded September 1998
> > switch.
> >
> > Prior to completion of the vendor evaluation, a planned maintenance
> > outage of the 'D' emergency diesel generator in October 1998,
> > identified similar evidence of component overheating on the power
> > supply card internal to the switch. The switch calibrated
> > satisfactorily, however based upon the apparent heat related damage,
> > the switch was replaced with a new unit. Following four maintenance
> > test runs and the 24 hour surveillance run, during the hot restart
> > test the analog speed indicators read high. An internal inspection of
> > the switch in the 'D' diesel revealed significant overheating of the
> > power supply components similar to what was observed on the 'A'
> > diesel.
> >
> > The control circuit of each emergency diesel contains an 'electronic
> > speed switch', which controls the sequence/operation of various engine
> > support/auxiliary systems. The diesel speed switch circuitry consists
> > of an engine mounted sensor, a speed switch with four output contacts
> > and two local analog tachometers. Output contacts enable/disable
> > select alarms and control key engine auxiliary components essential
> > for engine and generator operation. (Relays activate functions at 40,
> > 95, 125, and 365 rpm. The analog output is calibrated from '0' to
> > '750' rpm and normal engine running speed at 514 rpm.)

> > On-site bench testing by utility personnel concluded that the cause of
> > the power supply degradation was an incorrect current limiting
> > resistor installed by the vendor. A portion of the supply consists of
> > a 5 VDC circuit which supplies power to the card logic circuits and
> > the analog output control circuit. A current limiting resistor, by
> > design, is suppose to have a value of 1200 ohms. The as found resistor
> > in the 9/98 and 10/98 degraded speed switches had an 82 ohm resistor.
> > A spare switch from the storeroom was also found to have an incorrect
> > resistor installed.
> >
> > The cited speed switches have a serial number listed on the name
> > plate; however, this serial number represents a single 'batch' number
> > which is assigned when a group of switches are fabricated. The 'batch'
> > numbers of the degraded switches are 79116 and 81297.
> >
> >
> > CAUSE:
> > Wrong current limiting resistor installed on the power supply card
> > internal to the speed switch during the manufacturing process. The
> > original manufacturer, Synchro-Start, has concurred that the 82 ohm
> > resistor is incorrect and causes the power supply to overheat. (Note:
> > the correct current limiting resistor should be 1200 ohms.)
> >
> > SAFETY SIGNIFICANCE:
> > Engineering has determined that the cited speed switch degradation
> > does not impact the ability of the diesel generator to perform its
> > safety function. A reasonable assurance that the emergency diesel
> > will perform its intended design function is based upon the following:
> >
> > + actual degradations to-date have not impacted satisfactory
> > monthly testing
> > + an operability determination which analyzed all possible
> > switch functions against potential malfunctions
> > + compensatory action taken at the conclusion of each diesel
> > run
> >
> >
> > HISTORY:
> > There have been several Operating Experience documents (OE 5008, OE
> > 5433 & OE 5919) involving defective speed switches manufactured by
> > Synchro-Start, which have symptoms similar to those seen here, but
> > none of the documents indicate that the degradation was due to the use
> > of a wrong sized resistor.
> >
> >
> > CORRECTIVE ACTIONS:
> > 1) All speed switches will be replaced with units verified to
> > have the correct current limiting resistor.
> > 2) Inventory has been checked to insure that replacement
> > switches have the correct current limiting resistor.
> > 3) Notification of the Nuclear Industry has been made via
> > this OE.
> >
> > Subject: OE9504 - Defective EDG Speed Switches
> >
> > INFORMATION CONTACT: George S. Daves (609) 339-3071, gdaves@PSEG.COM

ESSB





The model ESSB Electronic Speed Switch has many years of proven service. It is engineered to provide a wide variety of features and options including up to four switch points, adjustable reset, a selection of voltage inputs and DC current for tachometers.

The ESSB Speed Switch is molded in a rugged NEMA 4 enclosure which provides protection against the rough environmental conditions associated with diesel engines.

FEATURES/OPTIONS

- **Adjustable Switch Points**
- **Sealed NEMA 4 Enclosure**
- **Transient and Reverse Polarity Protection**
- **Precise Repetitive Speed Switch Points**
- **Automatic, Manual or Remote Manual Reset**
- **Power Loss Protection**
- **D.C. Output for Model 30 Tach (1 ma)**
- **8-40 VDC; 64 VDC; 100-140 VDC; or 100-130 VAC Powe**
- **Broken Signal Lead Protection**
- **Standard or Reverse Relay Logic**
- **Lockwire Seal**
- **Vibration Isolation Kit**
- **Conduit Cover**

SPECIFICATIONS

ELECTRICAL

- **Power Input**
  8-40 VDC
  64 VDC
  100-140 VDC
  100-130VAC
- **Reverse Polarity Protection**
  1000 VDC
- **Maximum Current**

(2 ch. 8-40 VDC)	12 Volt	24 Volt
Operating	200 ma	220 ma
Standby	50 ma	60 ma

- **Signal Input**
  Minimum— 0.7 VRMS
  Impedance—2K OHMS
- **Relay Contact Ratings**
  Resistance Load—0.1 to 10 amps 28 VDC
  Inductive Load— 0.1 to 8 amps 28 VDC
- **Overspeed Response Time**
  100 Milliseconds Typical
- **Setpoint Reset**
  Automatic— 80% to 90% of Setpoint
  Adjustable—(Variable Automatic)
  50% to 98% of Setpoint
- **Setpoint Stability**
  0.8% over voltage range and 0.01% per °F Typical

MECHANICAL/ENVIRONMENTAL

- **Operating Temperature**
  −40°C to +85°C (−40°F to +185°F)
- **Vibration**
  4g's 9 to 200 Hz
- **Shock**
  4 Foot Drop Test
- **Case**
  NEMA 4 High Impact Molded Enclosure
- **Weight**
  4.5 lb. (2 kg.)