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FUEL PUMP SYSTEM CONTROLS

GENERAL

1. THIS CONTROL SEQUENCE APPLIES TO THE FOLLOWING UNITS: FOP-1A, FOP-1B, FOP-2A, AND FOP-2B.
2. THE FUEL OIL SYSTEM CONTROL PANEL SHALL CONTROL AND MONITOR OPERATION OF ALL UNITS INCLUDING ENABLING PUMPS, CONTROL OF VALVES, AND SAFETIES AND ALARMS DESCRIBED BELOW.
3. THE BCS SHALL MONITOR ALL ALARMS ISSUED BY THE FUEL OIL CONTROL PANEL OVER BACnet INTERFACE, SEE SPECIFICATIONS FOR ADDITIONAL DETAILS.
4. PROVIDE ADEQUATE DEAD-BANDS TO PREVENT SHORT-CYCLING OF UNIT.
5. CONTROLLERS FOR THIS SEQUENCE SHALL BE PROVIDED WITH UNINTERRUPTABLE POWER SUPPLY CONNECTED TO EMERGENCY POWER.

CONTROL SEQUENCE

NORMAL CONDITIONS:

UNDER NORMAL CONDITIONS, 1600 GALLONS OF FUEL SHALL BE CIRCULATED ONCE PER WEEK TO PROVIDE FUEL FILTRATION.

1. THE NORMALLY CLOSED SOLENOID VALVE FOR1V SHALL BE POWERED OPEN. FOP-2A AND FOP-2B SHALL BE ENGAGED ALTERNATELY AFTER EVERY 15 HOURS OF RUNTIME TO PROVIDE FUEL FILTRATION. THE RETURN PUMP IN SEQUENCE SHALL BE COMMANDED ON UNTIL 1600 GALLONS OF FUEL HAVE BEEN CIRCULATED AS MEASURED AT FOR-FL.
2. THE NORMALLY OPEN SOLENOID VALVES FOS2V AND FOS3V SHALL BE POWERED CLOSED.
3. FOP-1A SHALL BE COMMANDED OFF, THE NORMALLY CLOSED SOLENOID VALVE FOS1V SHALL BE POWERED OPEN. FOP-1B SHALL BE ENGAGED TO PROVIDE FUEL FILTRATION UNTIL 1600 GALLONS OF FUEL HAVE BEEN CIRCULATED AS MEASURED AT FOS-FL.
4. WHEN THE WEEKLY FUEL CIRCULATION IS COMPLETE, ALL PUMPS WILL BE COMMANDED OFF AND ALL SOLENOID VALVES SHALL BE CLOSED.

EMERGENCY CONDITIONS:

1. FOP-1B SHALL BE COMMANDED OFF. THE NORMALLY CLOSED SOLENOID VALVE FOS1V SHALL CLOSE AUTOMATICALLY.
2. FOP-1A SHALL BE ENGAGED WHEN THE FUEL LEVEL IN THE DAY TANK FALLS BELOW 50%. THE NORMALLY OPEN SOLENOID VALVE FOS2V SHALL OPEN AUTOMATICALLY. FOP-1A SHALL BE COMMANDED OFF WHEN THE FUEL OIL LEVEL IN THE DAY TANK REACHES 85%.
3. THE NORMALLY OPEN SOLENOID VALVE FOS3V SHALL OPEN AUTOMATICALLY.
4. FOP-2A AND FOP-2B SHALL BE COMMANDED OFF. THE NORMALLY OPEN SOLENOID VALVE FOR1V SHALL CLOSE AUTOMATICALLY.

SAFETIES:

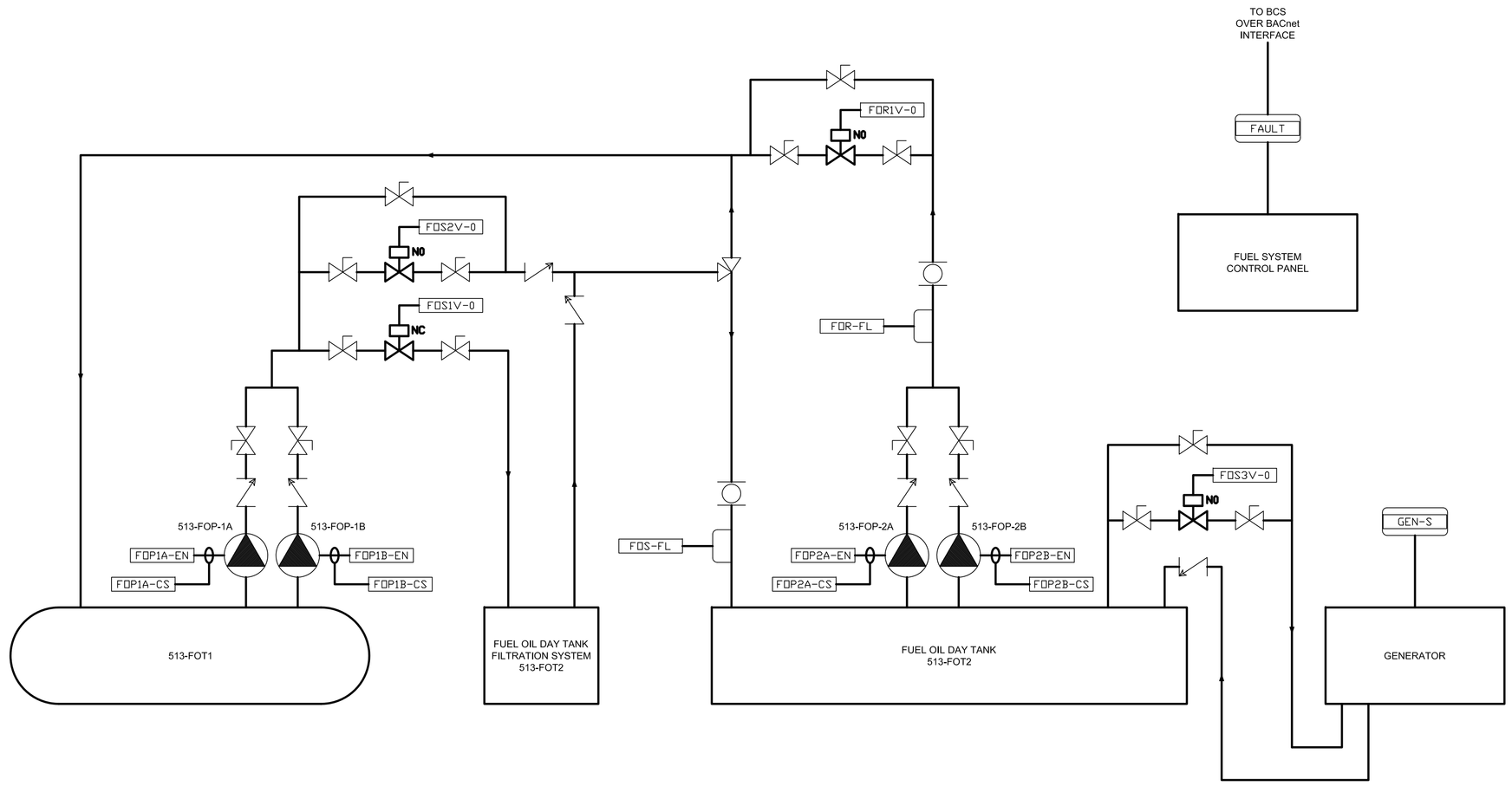
1. THE FOLLOWING SAFETIES SHALL SHUT DOWN ITS RESPECTIVE UNIT, AND INITIATE AN ALARM THROUGH THE BCS AFTER APPROPRIATE TIME DELAYS WHERE SPECIFIED:
   - 1.1. UNIT CONTROLLER OR INTERNAL SAFETIES INDICATE A "FAULT."- DELAY: NONE. UNIT SHALL SHUT DOWN AND REPORT THROUGH THE BCS.
   - 1.2. IF THE FUEL LEVEL IN THE DAY TANK REACHES 95%, THE RETURN PUMP IN SEQUENCE SHALL BE COMMANDED ON UNTIL THE FUEL LEVEL IN THE TANK DROPS TO 85%, THE SOLENOID VALVE FOR1V (NC) SHALL BE POWERED OPEN, THE SUPPLY PUMPS SHALL BE COMMANDED OFF. THE SOLENOID VALVES FOS1V (NC) & FOS2V (NO) SHALL BE CLOSED.

ALARMS:

1. THE CONTROL SYSTEM SHALL ANNUNCIATE AN ALARM TO THE BCS IF ANY OF THE FOLLOWING CONDITIONS ARE MET:
   - 1.1. UNIT IS COMMANDED TO START AND INTERNAL SAFETIES INDICATE FAULT, DELAY: NONE.

FUEL OIL SYSTEM POINT SCHEDULE

POINT	DESCRIPTION	TYPE
FOP1A-EN	FUEL OIL PUMP ENABLE	DIGITAL OUTPUT
FOP1A-CS	FUEL OIL PUMP CURRENT	ANALOG INPUT
FOP1B-EN	FUEL OIL PUMP ENABLE	DIGITAL OUTPUT
FOP1B-CS	FUEL OIL PUMP CURRENT	ANALOG INPUT
FOS1V-0	FUEL OIL SUPPLY VALVE	DIGITAL OUTPUT
FOS2V-0	FUEL OIL SUPPLY VALVE	DIGITAL INPUT
FOS-FL	FUEL OIL SUPPLY FLOW METER	ANALOG INPUT
FOP2A-EN	FUEL OIL PUMP ENABLE	DIGITAL OUTPUT
FOP2A-CS	FUEL OIL PUMP CURRENT	ANALOG INPUT
FOP2B-EN	FUEL OIL PUMP ENABLE	DIGITAL OUTPUT
FOP2B-CS	FUEL OIL PUMP CURRENT	ANALOG INPUT
FOR1V-0	FUEL OIL SUPPLY VALVE	DIGITAL OUTPUT
FOR-FL	FUEL OIL RETURN FLOW METER	ANALOG INPUT
FOS3V-0	FUEL OIL SUPPLY VALVE	DIGITAL OUTPUT
FAULT	EQUIPMENT INTERNAL SAFETY FAULTS	ANALOG INPUT
GEN-S	GENERATOR STATUS	DIGITAL INPUT



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EMERGENCY POWER SYSTEM MONITORING CONTROL POINTS

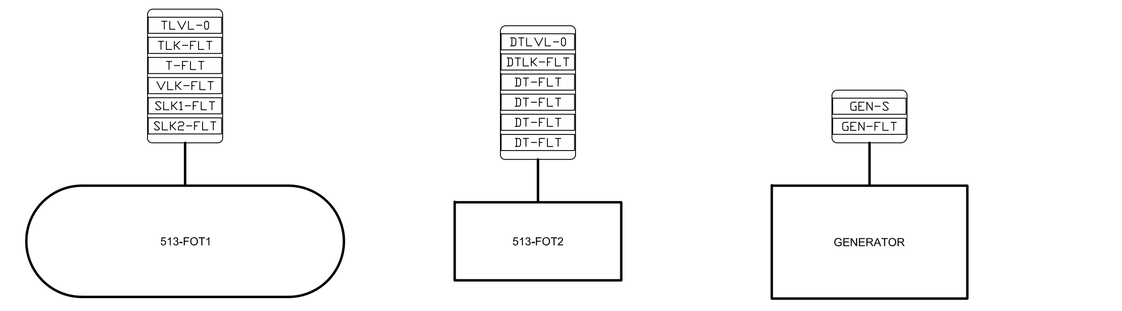
*THIS EQUIPMENT SHALL BE CONTROLLED BY THE PACKAGED FUEL OIL AND GENERATOR CONTROL SYSTEM. THE POINTS LISTED ARE ONLY FOR MONITORING BY THE BCS.

BCS MONITORING OF FUEL OIL AND GENERATOR

POINT	DESCRIPTION	TYPE
TLVL-0	TANK FILL LEVEL	ANALOG INPUT
TLK-FLT	TANK LEAK ALARM	DIGITAL INPUT
T-FLT	TANK FAULT ALARM	DIGITAL INPUT
VLK-FLT	TANK VENT LEAK ALARM	DIGITAL INPUT
SLK1-FLT	TANK SUMP 1 LEAK ALARM	DIGITAL INPUT
SLK2-FLT	TANK SUMP 2 ALARM	DIGITAL INPUT
DTLVL-0	DAY TANK FILL LEVEL	ANALOG INPUT
DTLK-FLT	DAY TANK LEAK ALARM	DIGITAL INPUT
DT-FLT	DAY TANK FAULT ALARM	DIGITAL INPUT
DTVLK1-FLT	DAY TANK VENT 1 LEAK ALARM	DIGITAL INPUT
DTVLK2-FLT	DAY TANK VENT 2 LEAK ALARM	DIGITAL INPUT
DTVLK3-FLT	DAY TANK VENT 3 LEAK ALARM	DIGITAL INPUT
GEN-S	GENERATOR STATUS	DIGITAL INPUT
GEN-FLT	GENERATOR FAULT ALARM	DIGITAL INPUT

ALARMS

1. THE CONTROL SYSTEM SHALL ANNUNCIATE AN ALARM TO THE BCS AFTER THE APPROPRIATE TIME DELAY IF ANY OF THE FOLLOWING CONDITIONS ARE MET:
   - 1.1. DAY TANK FUEL LEVEL EXCEEDS 95%. DELAY: NONE.
   - 1.2. DAY TANK FUEL LEVEL FALLS BELOW 35%, DELAY: NONE.
   - 1.3. DAY TANK LEAK DETECTOR INDICATES LEAK. DELAY: NONE.
   - 1.4. DAY TANK INDICATES FAULT. DELAY: NONE.
   - 1.5. DAY TANK VENT INDICATES LEAK. DELAY: NONE.
   - 1.6. DAY TANK EMERGENCY VENT INDICATES LEAK. DELAY: NONE.
   - 1.7. DAY TANK LEVEL FALLS BELOW 15%. DELAY: NONE. SHUT DOWN GENERATOR.
   - 1.8. UNDERGROUND MAIN TANK FUEL LEVEL EXCEEDS 95%. DELAY: NONE.
   - 1.9. UNDERGROUND MAIN TANK FUEL LEVEL FALLS BELOW 60%. DELAY: NONE.
   - 1.10. UNDERGROUND MAIN TANK LEAK DETECTOR INDICATES LEAK. DELAY: NONE.
   - 1.11. UNDERGROUND MAIN TANK INDICATES FAULT. DELAY: NONE.
   - 1.12. UNDERGROUND MAIN TANK VENT INDICATES LEAK. DELAY: NONE.
   - 1.13. GENERATOR IS COMMANDED ON BUT INDICATES FAULT. DELAY: NONE.
2. THE FUEL OIL CONTROL SYSTEM SHALL ISSUE AN ALARM TO THE OVERFILL ALARM CONTROL PANEL IF ANY OF THE FOLLOWING CONDITIONS ARE MET:
   - 2.1. UNDERGROUND MAIN TANK FUEL LEVEL EXCEEDS 92%. DELAY: NONE. PROVIDE FLASHING LIGHT AND AUDIBLE PULSATING HORN SIGNALS AT PANEL NEAR FUEL FILL PORT. PROVIDE LIGHT AND HORN RESET AT ALARM CONTROL PANEL.
   - 2.1. UNDERGROUND MAIN TANK FUEL LEVEL EXCEEDS 95%. DELAY: NONE. OVERFILL VALVE AUTOMATICALLY CLOSES. PROVIDE CONSTANT LIGHT AND AUDIBLE CONSTANT HORN SIGNALS. PROVIDE MANUAL HORN RESET AT ALARM CONTROL PANEL. LIGHT TO REMAIN LIT UNTIL RESET AT FUEL OIL CONTROL PANEL.



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