SEQUENCE OF OPERATION

SYSTEM IN 'FUELING' MODE

TO INITIATE AN AIRCRAFT FUELING OPERATION (PUMP SELECTOR SWITCHES, LOCATED IN CONTROL ROOM, MUST BE IN THE 'AUTO' POSITION), AN OPERATOR DEPRESSES THE START PUSHBUTTON LOCATED AT THE AIRCRAFT DIRECT FUELING STATIONS. THIS STARTS THE SELECTED LEAD FUELING PUMP ESTABLISHING A FLOW OF 600 (±) GPM THROUGH THE SYSTEM ISSUE VENTURI AND ENERGIZES THE BACK PRESSURE CONTOL VALVE (BPCV) SOLENOID ALLOWING BPCV TO MODULATE AT ITS SETPOINT. NEXT, THE PANTOGRAPH IS CONNECTED TO THE AIRCRAFT VIA THE PRESSURE NOZZLE.

1. TO REFUEL, AN OPERATOR SHALL VISUALLY CHECK PRESSURE GAGE LOCATED ON FUELING CONTROL VALVE (FCV) INLET SIDE TO ENSURE SYSTEM LOOP IS PRESSURIZED. OPERATOR THEN DEPRESSES THE 'DEADMAN' CONTROL WHICH OPENS THE FCV. THIS ESTABLISHES FUEL FLOW TO THE AIRCRAFT.

2. WITH DPT-1 OR DPT-2 (DEPENDING ON MICROPROCESSOR SELECTION) SENSING DIFFERENTIAL PRESSURE CORRESPONDING TO A FLOW RATE OF 600 (±) GPM THROUGH THE ISSUE VENTURI AND DPT-3 OR DPT-4 (DEPENDING ON MICROPROCESSOR SELECTION) SENSING DIFFERENTIAL PRESSURE CORRESPONDING TO A FLOW RATE OF LESS THAN 40 (±) GPM THROUGH THE RETURN VENTURI FOR A PERIOD OF 10 SECONDS, THE SECOND PUMP WILL BE STARTED AUTOMATICALLY.

3. WITH DPT-1 OR DPT-2 SENSING DIFFERENTIAL PRESSURE CORRESPONDING TO A FLOW RATE OF 1200 (±) GPM THROUGH THE ISSUE VENTURI AND DPT-3 OR DPT-4 SENSING DIFFERENTIAL PRESSURE CORRESPONDING TO A FLOW RATE GREATER THAN 40 (±) GPM BUT LESS THAN 700 (±) GPM, THE SECOND FUELING PUMP WILL CONTINUE TO RUN AND THE BPCV WILL CONTINUE MODULATING TO PASS FLOW AS NECESSARY TO MAINTAIN UPSTREAM PRESSURE REQUIREMENT AND NO ADDITIONAL CONTROL FUNCTIONS WILL BE INITIATED UNTIL SYSTEM OPERATING CONDITIONS CHANGE.

   A. IF DPT-3 OR DPT-4 SENSES A DIFFERENTIAL PRESSURE CORRESPONDING TO A FLOW RATE THROUGH THE RETURN VENTURI OF GREATER THAN 700 (±) GPM FOR 30 SECONDS, THE CONTROL SYSTEM WILL INITIATE CONTROL SIGNALS TO SHUT DOWN THE SECOND FUELING PUMP.

   NOTE:
   THE REMAINING SUBSEQUENT FUELING PUMPS (THIRD AND FOURTH) DEPENDING ON THE SYSTEM CAPACITY WILL BE STARTED AND STOPPED AS DESCRIBED ABOVE. (SEE PARAGRAPH 3A)

4. AFTER REFUELING THE AIRCRAFT, OPERATOR RELEASES 'DEADMAN' CONTROL THUS CLOSING THE FUELING CONTROL VALVE AND OPENING THE PANTOGRAPH PRESSURE CONTOL VALVE (PPCV). OPERATOR THEN DISCONNECTS AIRCRAFT DIRECT FUELING SYSTEM PANTOGRAPH FROM THE AIRCRAFT.

5. UPON COMPLETION OF AIRCRAFT REFUELING OPERATION, AN OPERATOR DEPRESSES AIRCRAFT DIRECT FUELING STATION STOP PUSHBUTTON. THIS STOPS THE LEAD FUELING PUMP (PROVIDED ONLY THE LEAD PUMP IS RUNNING AND FLOW THROUGH RETURN VENTURI IS GREATER THAN 560 GPM) AND DE-ENERGIZES THE BPCV SOLENOID. AT THIS POINT THE SYSTEM HAS RETURNED TO AN IDLE, STATIC PRESSURE CONDITION.

   A. IF ANOTHER FUELING STATION IS CURRENTLY OPERATING THE 'OFF' SIGNAL WILL BE IGNORED. IN THE EVENT THE OPERATOR NEGLECTS TO PRESS STOP PUSHBUTTON, THE SYSTEM WILL AUTOMATICALLY STOP LEAD PUMP AND DE-ENERGIZE THE BPCV SOLENOID. AFTER 10 MINUTES PROVIDED ONLY THE LEAD PUMP IS RUNNING AND FLOW THROUGH RETURN VENTURI REMAINS GREATER THAN 560 GPM.

   NOTE:
   IN THE EVENT A FUELING PUMP IS CALLED ON AND FAILS TO START OR FAILS AFTER SUCCESSFULLY STARTING (AS INDICATED BY OPEN CONTACTS ON THE ASSOCIATED PUMP DISCHARGE FLOW SWITCH FOR A 10 SECOND INTERVAL), THE AFFECTED FUELING PUMP WILL BE CALLED OFF AND THE NEXT IDLE FUELING PUMP IN THE PREDETERMINED SEQUENCE OF PUMPS WILL BE CALLED ON AUTOMATICALLY.

SYSTEM 'LOOP FLUSH' MODE

UPON ESTABLISHING A REQUIREMENT TO FLUSH THE PIPING DISTRIBUTION SYSTEM 'LOOP', PERFORM THE FOLLOWING SEQUENCE:

1. PLACE FUELING PUMP'S HAND-OFF-AUTO SELECTOR SWITCHES (LOCATED IN CONTROL ROOM) TO THE 'OFF' POSITIONS.

2. PLACE THE MODE SELECTOR SWITCH (LOCATED IN THE CONTROL ROOM) IN THE 'LOOP FLUSH' MODE. THIS WILL, THROUGH A MOTORIZED OPERATOR, OPEN THE N.C. FLUSHING VALVE TO PERMIT HIGH FLOW RATE FLUSHING. THIS WILL DE-ENERGIZE THE BPCV SOLENOID, CLOSING THE VALVE.

3. POSITION MANUALLY OPERATED VALVES IN THE SYSTEM TO REQUIRED POSITIONS TO DIRECT FUEL THROUGH THE DESIRED FLOW PATH (I.E. TRANSFERRING FUEL FROM ONE OPERATING TANK TO ANOTHER, FLUSHING SUSPECT FUEL FROM LOOP PIPING AND ROUTING THIS FUEL THROUGH THE RECEIVING FILTER SEPARATORS, ETC.)

4. SELECT PUMP TO BE USED FOR FLUSHING. PLACE THE FUELING PUMP'S HAND-OFF-AUTO SELECTOR SWITCH IN THE 'HAND' POSITION. THIS WILL START THE PUMP.

   NOTE:
   MORE PUMPS MAY BE STARTED MANUALLY TO OBTAIN A GREATER FLUSHING FLOW RATE.

5. FOLLOWING THE FLUSHING PROCEDURE, PLACE FUELING PUMP(S) HAND-OFF-AUTO SELECTOR SWITCH(ES) IN THE 'OFF' POSITION. POSITION MANUALLY OPERATED VALVES TO THEIR NORMALLY OPENED OR CLOSED POSITIONS.

6. PLACE THE MODE SELECTOR SWITCH IN THE 'FUELING' MODE FROM THE 'LOOP FLUSH' MODE, AND ALL FUELING PUMP SELECTOR SWITCHES BACK IN THE 'AUTO' POSITIONS.

BACK PRESSURE CONTROL VALVE (BPCV) SOLENOID

CONDITION	VALVE ACTION	SOLENOID
'FUELING' MODE	ENABLE	ENERGIZED
'FUELING' MODE	CLOSE	DE-ENERGIZED
'LOOP FLUSH' MODE	CLOSE	DE-ENERGIZED

PANTOGRAPH FLUSH

1. CONNECT FUELING NOZZLE(S) TO RECIRCULATION ADAPTOR AND DEPRESS PUMP 'ON' CONTROL.

2. DEPRESS DEADMAN CONTROL.

3. A MAXIMUM OF 10 MINUTES FLOW IS PERMITTED PRIOR TO LEAD PUMP SHUT DOWN.

AUTOMATIC RELEASE OF PANTOGRAPH PRESSURE

1. PANTOGRAPH PRESSURE CONTROL VALVE (PPCV) IS ENABLED TO CONTROL AT SET POINT (ABOUT 10 % ABOVE MAXIMUM FUELING PRESSURE) WHEN DEADMAN IS DEPRESSED AND OPENS WHEN DEADMAN IS RELEASED. PPCV ALSO CONTAINS A CHECK FEATURE TO PREVENT REPRESSURIZATION OF PANTOGRAPH ASSEMBLEY.

EMERGENCY OPERATION-MICROPROCESSORS DOWN

IN THE EVENT BOTH MICROPROCESSORS ARE DOWN, THE SYSTEM MAY BE ACTIVATED FOR EMERGENCY REFUELING AS FOLLOWS:

1. PLACE ALL FUELING PUMP SELECTOR SWITCHES IN THE 'OFF' POSITION.

2. ENSURE SELECTED OPERATING TANK(S) INLET AND OUTLET VALVES ARE OPEN.

3. MANUALLY BY-PASS SOLENOID ON BPCV ALLOWING VALVE TO MODULATE AT SET POINT.

4. MANUALLY START FUELING PUMP(S) AS REQUIRED BY PLACING SELECTOR SWITCH(ES) IN THE 'HAND' POSITION.

   NOTE:
   OPERATOR IS REQUIRED TO CONTINUOUSLY VERIFY OPERATING TANK(S) FUEL LEVEL TO ENSURE AN ADEQUATE FUEL SUPPLY IS AVAILABLE. FUEL LEVEL VERIFICATION SHALL BE BY MEANS OF THE OPERATING TANK(S) GROUND LEVEL READING GAGE. UPON COMPLETION OF EMERGENCY OPERATION, OPERATOR SHALL RETURN FUELING PUMP SELECTOR SWITCHES TO THEIR ORIGINAL POSITIONS.

EMERGENCY STOP AND RESET

1. DEPRESSION OF ANY EMERGENCY STOP PUSHBUTTON OR ACTIVATION OF THE FIRE ALARM SYSTEM SHALL STOP FUELING PUMPS AND DE-ENERGIZE THE EMERGENCY SHUT-OFF SOLENOID ON THE PUMP NON-SURGE CHECK VALVE, CAUSING THE VALVE TO CLOSE. THIS ACTION IS EXECUTED WITHOUT REGARD FOR WHETHER PUMPS WERE AUTOMATICALLY CALLED ON OR MANUALLY STARTED.

2. IN ORDER TO RESET SYSTEM AFTER AN ALARM, DEPRESS 'RESET' PUSHBUTTON LOCATED AT PUMP CONTROL PANEL. AFTER RESETTING THE INITIAL ACTIVATED EMERGENCY STOP PUSHBUTTON STATION AND/OR FIRE ALARM SYSTEM.

EMERGENCY FUELING USING RETURN LINE

1. IN THE EVENT THE ISSUE LINE IS DOWN FOR MAINTENANCE, THE SYSTEM DESIGN WILL PERMIT FUELING IN THE 'MANUAL MODE'. BY OPENING THE CROSS CONNECTION VALVES AND THE FLUSHING VALVE, FUEL CAN BE RUN THRU THE RETURN LINE TO THE ISSUE PANTOGRAPH. LIMIT ONE PUMP OPERATION.

SYM.	DESCRIPTION	DATE	APPROVED

REVISIONS

A/E LJB DESIGN — JB DRAFTER — MF REVIEW — TS CHIEF ARCH/ENGR.
EFD PROJECT MANAGER, FIRE PROTECTION, QUALITY CONTROL, DESIGN MANAGER, DESIGN DIRECTOR

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APPROVED DATE
ACTIVITY - SATISFACTORY TO
APPROVED DATE
FOR EFD, FOR COMMANDER NAVFAC

SATISFACTORY TO:
FOR, COMMANDER, NAVAIRSYSCOM DATE

DEPARTMENT OF THE NAVY
NAVAL STATION
DEFINITIVE
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA
STANDARD

AIRCRAFT DIRECT FUELING SYSTEM
SEQUENCE OF OPERATION

CODE I.D. NO. 80091 SIZE D
SCALE: —
EFD NO. —
STA. PROJ. NO. —
SPEC. NO. —
CONSTRN. CONTR. NO. —
NAVFAC DRAWING NO. 1404002
SHEET — OF —
3 OF 4

RAC JOB NO. 99009-00