SEQUENCE OF OPERATION
SCHEME A

-LEAD FUELING PUMP STARTED AND STOPPED BY PUSHBOTTON AT AIRCRAFT DIRECT FUELING STATION.
-SUBSEQUENT FUELING PUMP STARTED AND STOPPED AUTOMATICALLY.

SYSTEM IN "REFUELING" MODE

TO INITIATE AN AIRCRAFT REFUELING OPERATION (PUMP SELECTOR SWITCHES, LOCATED IN CONTROL ROOM, MUST BE IN THE "AUTO" POSITION), AN OPERATOR CONNECTS PANTOGRAPH TO AIRCRAFT AND DEPRESSES 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 CONTROL VALVE (BPCV/SOLENOID ALLOWING BPCV TO MODULATE AT ITS SETPOINT:

1. TO REFUEL AN OPERATOR DEPRESSES THE HYDRAULIC (LINE PRESSURE) "DEADMAN" CONTROL. THIS OPENS THE REFUELING CONTROL VALVE ESTABLISHING 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-3L OR DPT-4L (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-3L OR DPT-3H AND DPT-4L OR DPT-4H 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-3H OR DPT-4H SENSES A DIFFERENTIAL PRESSURE CORRESPONDING TO A FLOW RATE THROUGH THE RETURN VENTURI OR GREATER THAN 700+/- GPM FOR 15 SECONDS, THE CONTROL SYSTEM WILL INITIATE CONTROL SIGNALS TO SHUT DOWN THE SECOND FUELING PUMP.
4. AFTER REFUELING THE AIRCRAFT, OPERATOR RELEASES "DEADMAN" CONTROL THUS CLOSING THE REFUELING CONTROL VALVE. 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 THRU RETURN VENTURI IS GREATER THAN 560 GPM) AND DE-ENERGIZES THE BPCV SOLENOID (OPENING THE BPCV). AT THIS POINT THE SYSTEM HAS RETURNED TO AN IDLE, STATIC PRESSURE CONDITION.
   A. IN THE EVENT OPERATOR NEGLECTS TO PRESS STOP PUSHBUTTON, THE SYSTEM WILL AUTOMATICALLY STOP LEAD PUMP AND DE-ENERGIZE THE BPCV SOLENOID (OPENING THE BPCV) AFTER 10 MINUTES PROVIDED ONLY THE LEAD PUMP IS RUNNING AND FLOW THRU 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 PUMPS 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 DE-ENERGIZE THE BPCV SOLENOID, (OPENING THE BPCV).
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 THRU THE RECEIVING FILTER SEPARATOR'S, 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: THE SECOND PUMP 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 "REFUELING" MODE FROM THE "LOOP FLUSH" MODE, AND ALL FUELING PUMP SELECTOR SWITCHES BACK IN THE "AUTO" POSITIONS.

SYSTEM IN "PANTOGRAPH FLUSH" MODE

UPON ESTABLISHING A REQUIREMENT TO FLUSH THE PANTOGRAPH(S), PERFORM THE FOLLOWING SEQUENCE:

1. PLACE FUELING PUMPS HAND-OFF-AUTO SELECTOR SWITCHES (LOCATED IN CONTROL ROOM) THE "OFF" POSITIONS.
2. PLACE THE MODE SELECTOR SWITCH (LOCATED IN CONTROL ROOM) IN THE "PANTOGRAPH FLUSH" MODE. THIS WILL ENERGIZE THE FLUSHING VALVE (FV) SOLENOID, CLOSING THE VALVE. IT WILL ALSO DE-ENERGIZE THE BPCV SOLENOID (OPENING THE BPCV).
3. POSITION MANUALLY OPERATED VALVES IN THE SYSTEM TO REQUIRED POSITIONS TO DIRECT FUEL THRU THE DESIRED FLOW PATH.
4. CONNECT PANTOGRAPH PRESSURE FUELING NOZZLE TO THE 2-1/2" D-1 NOZZLE ADAPTER.
5. SELECT PUMP TO BE USED FOR FLUSHING. PLACE THE FUELING PUMP'S HAND-OFF-AUTO SELECTOR SWITCH IN THE "AUTO" POSITION, START SELECTED PUMP THRU PUSHBUTTON AT FUELING STATION. OPERATOR HAS TEN(10) SECONDS TO DEPRESS HYDRAULICALLY OPERATED "DEADMAN" CONTROL BEFORE PUMP SHUTS OFF.
6. USING HYDRAULICALLY OPERATED "DEADMAN" CONTROL, FLUSH ONE PANTOGRAPH AT A TIME FOR THE DESIRED INTERVAL.
7. AFTER OPERATOR RELEASE "DEADMAN", STOP PUMP WITHIN TEN (10) SECONDS THRU PUSHBUTTON AT FUELING STATION, OTHERWISE OPERATOR MUST "RESET" AUTOMATIC SHUT-OFF FUELING PUMP AT CONTROL ROOM PUMP CONTROL PANEL.

NOTE: THE ABOVE PROCEDURE (PARAGRAPH 4 THRU 7) SHALL BE REPEATED AT EACH AIRCRAFT DIRECT FUELING STATION.

8. FOLLOWING THE PANTOGRAPH FLUSHING PROCEDURE, PLACE FUELING PUMP'S HAND-OFF-AUTO SELECTOR SWITCH IN THE "OFF" POSITION, POSITION MANUALLY OPERATED VALVES TO THEIR NORMALLY OPENED OR CLOSED POSITION.
9. PLACE THE MODE SELECTOR SWITCH IN THE "REFUELING" MODE FROM THE "PANTOGRAPH FLUSH" MODE, AND ALL FUELING PUMP SELECTOR SWITCHES BACK IN THE "AUTO" POSITIONS.

EMERGENCY OPERATION-MICORPROCESSORS 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 SWITCHES IN THE "HAND" POSITION.

NOTE: OPERATOR IS REQUIRED TO CONTINUOUSLY VERIFY OPERATING TANK(S) FUEL LEVEL TO ENSURE AN ADEQUATE FUEL SUPPLY IS AVAILABE. 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 ACTUATION OF THE FIRE ALARM SYSTEM SHALL STOP FUELING PUMPS AND DE-ENERGIZE THE EMERGENCY SHUT-OFF VALVES SOLENOID 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 THE PUMP CONTROL PANEL. AFTER RESETTING THE INITIAL ACTIVATED EMERGENCY STOP PUSHBUTTON STATION AND/OR FIRE ALARM SYSTEM.

RELEASE OF PANTOGRAPH PRESSURE

OPERATOR MAY RELEASE PANTOGRAPH PRESSURE, BEFORE CONNECTING TO AIRCRAFT AND BEFORE OPENING REFUELING CONTROL VALVE, BY MEANS OF SPRING RETURN HANDLE LOCATED IN BYPASS AROUND PANTOGRAPH PRESSURE CONTROL VALVE (PPCV).

EMERGENCY REFUELING USING RETURN LINE

IN THE EVENT THE 8 INCH FUEL SUPPLY LINE TO THE AIRCRAFT DIRECT FUELING STATION MUST BE SHUT DOWN, EMERGENCY REFUELING THRU THE RETURN LINE CAN BE USED WHILE OPERATING REFUELING PUMP MANUALLY.

1. -CLOSE MANUALLY OPERATED VALVES V-5, V-8, V-11, V-13.
2. -OPEN MANUALLY OPERATED VALVES V-6, V-15

IF SYSTEM CONTAINS ISOLATION VALVE(S), AN ADDITIONAL FLOW PATH FOR EMERGENCY REFUELING THRU RETURN LINE WOULD BE AS FOLLOWS:

1. -CLOSE MANUALLY OPERATED VALVES V-3, V-8, V-9, V-11.
2. -OPEN MANUALLY OPERATED VALVES V-6, V-12.

= SEE SHEET 17 FOR VALVE DESIGNATION NUMBERS.

BACK PRESSURE CONTROL VALVE (BPCV) SOLENOID

CONDITION	VALVE ACTION	SOLENOID
"REFUELING" MODE	ENABLE	ENERGIZED
"LOOP FLUSH" AND "PANTOGRAPH FLUSH" MODES	OPEN	DE-ENERGIZED

FLUSHING VALVE (FV) OPERATION

CONDITION	VALVE ACTION	SOLENOID
"LOOP FLUSH" MODE	OPEN	DE-ENERGIZED
"PANTOGRAPH FLUSH" MODE	CLOSE	ENERGIZED
"REFULEING" MODE	OPEN	DE-ENERGIZED

REVISION	DESCRIPTION	DATE	APPROVED

SUPERSEDES PREVIOUS EDITIONS OF THIS DRAWING

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SUBMITTED BY: DATE: 22-1-80
EIC.
BR.HD.
FYE.
APPROVED: DATE: 1/31/81
EFD FOR COMMANDER WAFAC

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS WARNER ROBINS AIR FORCE
MAINTENANCE AND SUPPLY DIVISION
WARNER ROBINS, GEORGIA

ACCEPTED: DATE: 1-22-81
USAF FUEL FACILITIES ENGINEER

APPROVED FOR CHIEF OF STAFF, U.S. AIR FORCE

CHIEF, ENGINEERING DIVISION
DATE: 1-22-81

AIR FORCE STANDARDS
AIRCRAFT DIRECT FUELING SYSTEM
TYPE IV

UNVERIFIED DRAFT
SCHEME A-
SEQUENCE OF OPERATION

SCALE: AS NOTED
SPEC. NO. 78-24-29-00-AF
SHEET 6
DRAWING NO. AF 78-24-29