

BLAST VALVE
KS-19992 AND KS-20134
OPERATION AND MAINTENANCE

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Warning: The blast valve is a potentially dangerous mechanism. It operates so rapidly that evasive action is impossible. The valve may trip at any time from any position from full closed to full open. All personnel working on or near the valve must be warned regarding the hazard.

1.03 The blast valve is designed to close in 1/20 of a second as a result of an air blast or through interruption of a 24-volt dc electrical control circuit. The blast valve consists of the butterfly valve blade, mounted in a valve housing, with an enclosed spring driven actuator, a tripping mechanism, a resetting means, a shock absorber, and electrical components. The resetting mechanism may be driven by an electric motor or manual operation. Reset drive motors of different list numbers are mechanically interchangeable.

1.04 The KS-19992 turbine exhaust blast valve is designed for installation in the turbine exhaust ducting of hardened underground sites to protect the turbine in the event of an external nuclear explosions. The KS-19992 blast valve is available with the mechanically interchangeable reset motors for the voltages in Table A.

1.05 The KS-20134 ventilation closure blast valves are designed for installation in the ventilation inlet and exhaust system ducts in hardened underground sites to protect equipment and personnel from blast waves in the event of an external nuclear explosion. The KS-20134 blast valves are installed with 1, 2, 3, or 4 valves mounted in a single plane with their shafts connected in line and using only one actuator assembly. The blade/actuator relationship and blade joining sequence are shown in Table B. The reset motor voltages are also listed in Table B.

1. GENERAL

1.01 The KS-20134 ventilation closure blast valve and the KS-19992 turbine exhaust blast valve are butterfly type valves which are used in hardened underground telephone buildings. The valves mount between standard 24-inch pipe flanges and are designed to close within 50 to 100 milliseconds in response to an electrical signal or as a result of an air blast (see Fig. 1).

1.02 This issue does affect the Equipment Test List.

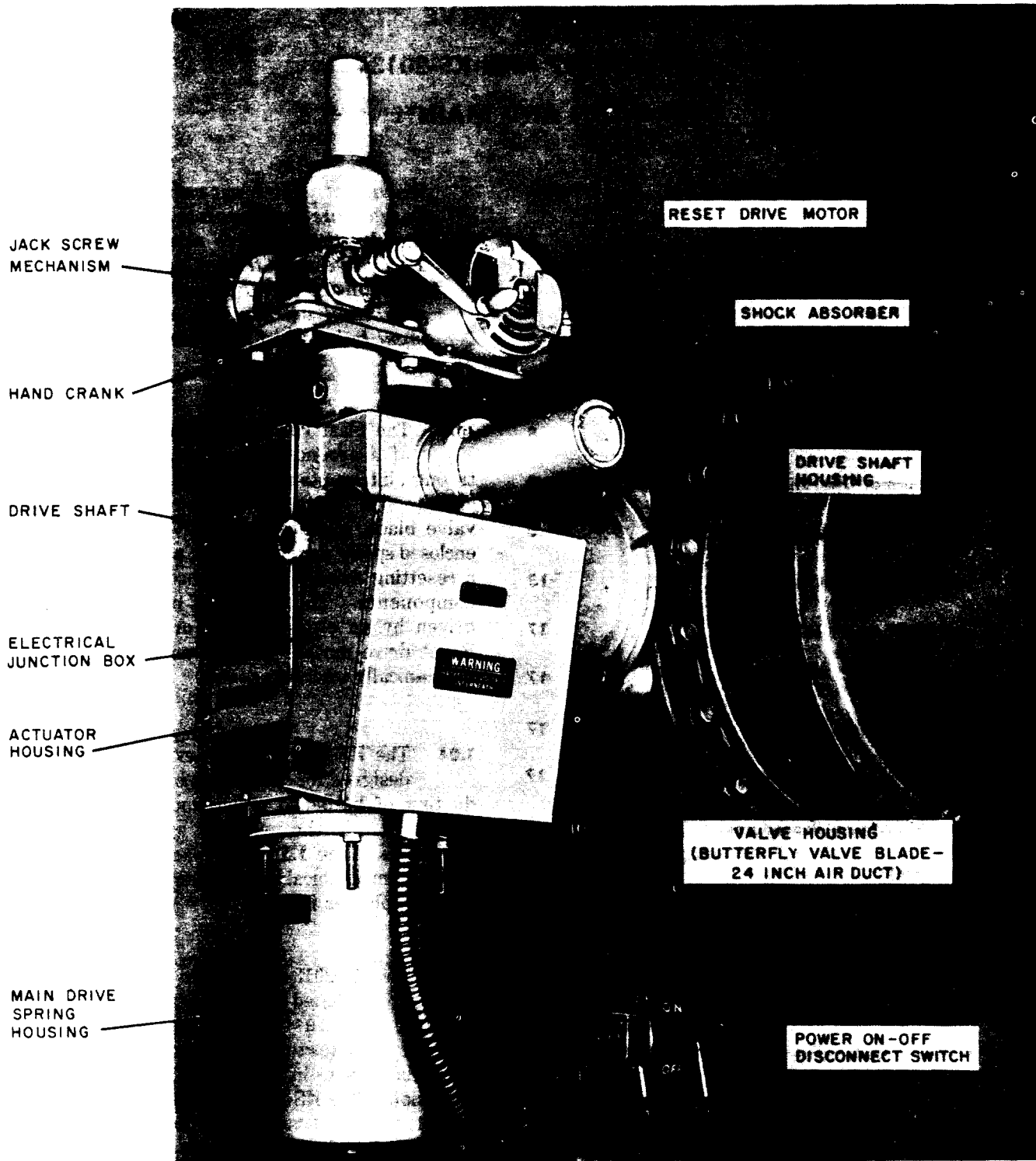


Fig. 1—KS-20134 Blast Valve (Butterfly Type)—Shown in the Inverted Position

TABLE A

KS-19992 TURBINE EXHAUST BLAST VALVE

RESET MOTOR VOLTAGE	CURRENT	ACTUATOR POSITION	WESTERN ELECTRIC LIST NO.	SOLAR NUMBER
19-28	dc	Normal	1	46500-0
125-156	dc	Normal	2	46500-200

Note: For purpose of proper orientation, the valve blade position is specified relative to the actuator. In the "right" position, the blade is on the same side of the actuator as the Bell System nameplate. In the "left" position, the blade is opposite the Bell System nameplate or on the same side as the torque tube. "Tandem" arrangements refer to actuator shaft. The inverted arrangement is rotated 180 degrees about the pipe axis.

1.06 The KS-20134 and KS-19992 blast valves are manufactured by Solar Division of International Harvester Company, San Diego, California.

2. LIST OF TOOLS, MATERIALS, AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	Set of Allen Wrenches
KS-6909	Thickness Gauge Nest
—	3-inch C Screwdriver
—	4-inch E Screwdriver
—	1/4-inch Open-end Wrench
—	3/8-inch Open-end Wrench
—	3/4-inch Open-end Wrench
—	Brush, Soft Bristle
MATERIALS	
KS-7860	Petroleum Spirits
KS-14666	Cleaning Cloth
—	Grease, 260-300P

TEST APPARATUS

KS-14510	Volt-Ohm-Milliammeter
—	Power Supply, 0-30 Volts DC, 5-ampere Output

3. GENERAL DESCRIPTION AND PRINCIPLE OF OPERATION

3.01 The basic components of the valve assembly include:

- The valve blade and valve housing
- Valve actuator
- Reset mechanism
- Electrical control circuit

The valve blade and valve housing, the valve actuator, and reset mechanism are shown in Fig. 1. A complete schematic arrangement of the blast valve actuator is shown in Fig. 2. The electrical control circuits are shown in Fig. 3 and 4, with the physical location of the switches as shown in Fig. 2.

3.02 Valve and Valve Housing: The valve and valve housing assembly consists of an aerodynamically balanced blade mounted in a circular housing. When open, the blade offers minimal resistance to gaseous flow; when closed, the lip of the blade rests on a metal seat machined in the housing. Rotation of the butterfly blade is derived from the actuator.

TABLE B

KS-20134 VENTILATION BLAST VALVE CONFIGURATIONS

RESET MOTOR VOLTAGE	CURRENT	BLADE/ACTUATOR RELATIONSHIP AND BLADE JOINING SEQUENCE	ACTUATOR POSITION	WESTERN ELECTRIC LIST NO.
19-28				
24	dc		Normal	101
24	dc		Normal	102
24	dc		Normal	103
24	dc		Normal	104
24	dc		Inverted	101-1
24	dc		Inverted	102-1
24	dc		Inverted	103-1
24	dc		Inverted	104-1
125-156				
115	dc		Normal	201
115	dc		Normal	202
115	dc		Normal	203
115	dc		Normal	204
115	dc		Inverted	201-1
115	dc		Inverted	202-1
115	dc		Inverted	203-1
115	dc		Inverted	204-1
198-218				
208*	ac		Normal	501
208*	ac		Normal	502
208*	ac		Normal	503
208*	ac		Normal	504
208*	ac		Inverted	501-1
208*	ac		Inverted	502-1
208*	ac		Inverted	503-1
208*	ac		Inverted	504-1
410-462				
440*	ac		Normal	601
440*	ac		Normal	602

TABLE B (Cont)

KS-20134 VENTILATION BLAST VALVE CONFIGURATIONS

RESET MOTOR VOLTAGE	CURRENT	BLADE/ACTUATOR RELATIONSHIP AND BLADE JOINING SEQUENCE	ACTUATOR POSITION	WESTERN ELECTRIC LIST NO.
440*	ac		Normal	603
440*	ac		Normal	604
440*	ac		Inverted	601-1
440*	ac		Inverted	602-2
440*	ac		Inverted	603-1
440*	ac		Inverted	604-1
24	dc		Normal	111
115	dc		Normal	211
208*	ac		Normal	511
440*	ac		Normal	611
24	dc		Inverted	111-1
115	dc		Inverted	211-1
208*	ac		Inverted	511-1
440*	ac		Inverted	611-1

* All 208/440 volt, ac motors are 3-phase, 60 Hz.
 ** Use -1000 instead of -100 if unit is close coupled; i.e., center-to-center distance between valve; 4 ft 11-1/2 in. to 5 ft 1-1/2 in.

3.03 Valve Actuator: The valve actuator shown in Fig. 2 is bolted to the valve housing and contains the mechanism for positioning the valve blade. The energy required to close the valve is stored in two compression springs (main drive springs), one nested inside the other. These main drive springs are located in the upper cylindrical section of the actuator housing. The energy in the springs is controlled by a quick release mechanism referred to as the "trigger". The load supporting portion of the trigger consists of four in-line main trigger rollers stacked one above the other forming a column. This column supports the entire 10,000-pound-load of the main drive springs. In the valve open position, a trigger arm is restrained from moving by a trigger roller shown directly under the trigger arm in Fig. 2. (The trigger roller and the main trigger roller should not be confused, they are separate entities in themselves.) The trigger roller engages a detent in the trigger

arm. The force holding the trigger roller in the detent is provided by a 19- to 26-volt dc solenoid. As long as the solenoid is powered, the trigger arm is restrained from moving.

3.04 Valve Tripping: The closing signal, which initiates the triggering sequence, can be provided by a remote electrical sensor, a manual electrical signal (switch), or a blast over pressure wave impinging on the valve blade.

Warning: *The entire sequence of operation from the time the solenoid releases the trigger arm until the valve is essentially closed is less than 50 milliseconds. Because of the high energies, high velocities, and metal-to-metal contacts, the closing is noisy and startling. Personnel working in the vicinity of the valve should be forewarned of the impending noise to avoid accidents.*

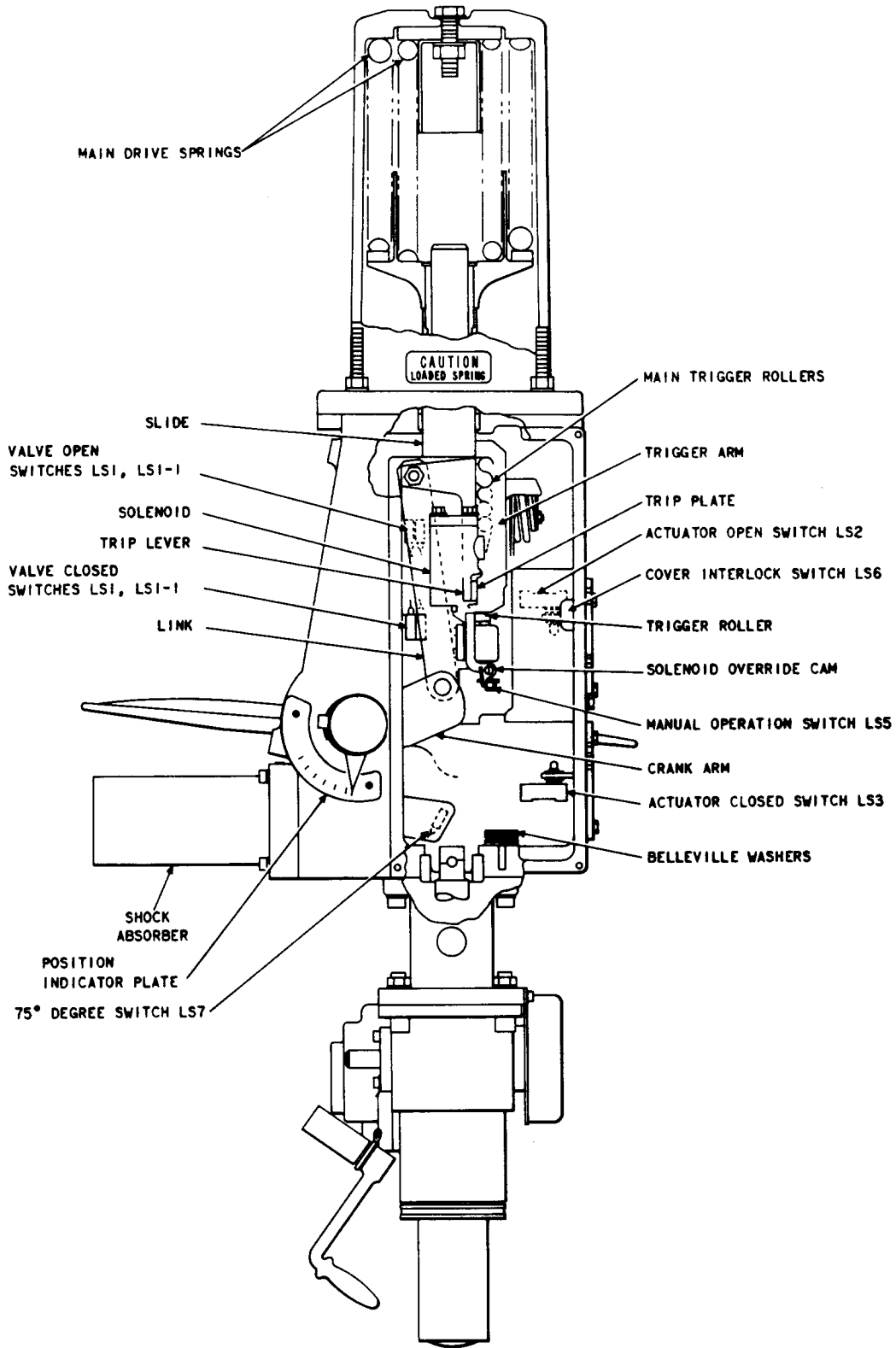


Fig. 2—Schematic Arrangement of the Blast Valve Actuator

(a) **Electrical Tripping:** If the power to the solenoid is interrupted by a signal from a remote sensor; by opening of a manual switch; or by a power failure, the force exerted by the solenoid on the trigger roller quickly decays to zero. This allows the trigger spring to push the trigger over the trigger roller. A finger on the trigger pushes one main trigger roller out of alignment and causes the column to collapse under the 10,000-pound main drive spring load. The drive spring pushes downward on the linkage between the slide and crank arm, which, in turn, rotates the blade to the closed position. At approximately 60 degrees rotation of the blade, the crank arm (bellcrank) contacts a hydraulic shock absorber which dissipates kinetic energy before the valve blade makes contact with the blade seat. The main purpose for dissipating the energy is to prevent the valve blade from rebounding off the seat and momentarily opening.

(b) **Mechanical Tripping:** When a blast over-pressure wave impinges on the butterfly valve blade, the resulting torque causes the trip lever to push against the trigger. This force overrides the trigger roller and starts the trigger moving; the tripping sequence occurs in exactly the same manner as described in (a) for the electrical tripping sequence.

3.05 **Reset Mechanism—Normal Operation:**

(a) **Trigger Reset:** When the blast valve is closed, the trigger reset sequence is automatically initiated. The control switch LS-1 (Fig. 2) is actuated to close the motor circuit through the reverse motor control (RMC) and the lower limit switch LS-3. The electric drive motor then starts in the reverse direction and drives the screw jack to retract the center actuator shaft toward the bottom of the actuator housing. Near the end of the stroke, the main trigger rollers snap into the aligned position, resetting the trigger. Immediately thereafter, the upper limit switch LS-2 opens to stop the drive to the screw jack.

(b) **Opening and Recocking:** The opening and recocking sequence is initiated by depressing the OPEN pushbutton on the KS-20267 control bay. Momentarily depressing the OPEN pushbutton closes the motor circuit through the forward motor control and the upper limit switch LS-2. The electric drive motor then starts in

the forward direction and drives the screw jack to move the entire trigger mechanism upward in the actuator housing and compresses the main drive springs. When the blast valve reaches the fully open position, the upper limit switch LS-2 opens to automatically stop the drive to the screw jack. The opening cycle is now complete and the valve will remain in this position until it receives a closing signal. **However, the valve can be triggered any time during the opening cycle either by an electrical operation or by a blast wave.**

3.06 **Reset Mechanism—Manual Operation:**

In the event of a power failure to the reset drive motor, a handcrank can be assembled on the keyed shaft of the reset mechanism. With the dc control power available, the trigger solenoid is energized and the mechanical resetting sequence is the same as in the normal operation resetting sequence. Rotating the crank clockwise will open the valve and rotating the crank counterclockwise will close the valve. However, if the dc control power is not available, the trigger solenoid is de-energized and the blast valve will trip to the closed position. The trigger mechanism will not latch. In this case, the cover must be removed and the manual cam rotated clockwise to activate the solenoid override mechanism. Manual operation of the blast valve must be performed in accordance with 4.02, **Manual Operation**, and all warnings and precautions must be observed.

Warning: *If power is restored while the handcrank is assembled to the screw jack shaft, the handcrank will start turning. The operator, using the handcrank, must be cautioned regarding the possibility of this happening. The operating personnel should be prepared to take evasive action so that no injury will occur.*

3.07 **Solenoid Override Mechanism:**

If no dc control power is available, the solenoid can not be energized to latch the trigger mechanism and the blast valve can not be opened. A solenoid override mechanism is provided to mechanically latch the trigger mechanism to prevent the valve from tripping. The solenoid override mechanism is used for emergency operation and for routine checks and adjustments. When the solenoid override mechanism is used, the following factors must be remembered:

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- The blast valve can not be tripped by an electrical signal (solenoid circuit open).
- The only means of tripping is to have a blast wave impinge on the blade.
- The valve can be opened and closed manually.
- The blast valve will trip to the closed position if there is mechanically interference while opening or closing the valve.

3.08 Electrical Control Circuit: The electrical schematic for the KS-19992 blast valve is shown in Fig. 3. The electrical schematic for the KS-20134 blast valve is shown in Fig. 4. The electrical control circuit is an intergal part of the blast valve and is used in conjunction with the KS-20267 blast valve control unit which controls all sequences of the blast valve. The reset mechanism is automatically sequenced. The electrical controls consist of switches which operate the indicator lights, control the forward and reverse direction of the motor, and stop the valve at the upper and lower limits of travel. The electrical controls operate on 19- to 28-volts dc. The designations and functions of individual components are given in Fig. 3 and 4.

4. OPERATION

A. Normal Operation

4.01 Opening and Closing the Blast Valves Electrically: The opening and closing of the blast valves is controlled from the KS-20267 control panel.

- (a) **To open the blast valve electrically,** momentarily depress the OPEN pushbutton on the ACTUATOR unit at the KS-20267 control bay. The remote control panel lights should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Approx 83°, 45'
Opening	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
Open	ON	OFF	OFF	Approx 5± 0.5°

Note 1: If a KS-19992 turbine exhaust blast valve is provided, the LOCAL CONTROL pushbutton on the associated ACTUATOR unit must be momentarily depressed to transfer control of the blast valve to the KS-20267 control bay. After the opening or closing of the valve, momentarily depress the LOCAL CONTROL pushbutton to transfer control back to the turbine control circuit.

Note 2: If the blast valve is tripped closed by a sensor signal, there will be either a 3-minute (manned station) or a 30-minute (unmanned station) time delay before the blast valve can be opened electrically.

- (b) **To close the blast valve electrically,** operate the CLOSE CONTROL key switch on the associated DETECTOR unit to the ON position and then momentarily depress the CLOSED pushbutton on the associated ACTUATOR unit. The indicator lights on the ACTUATOR unit should indicate the following sequence:

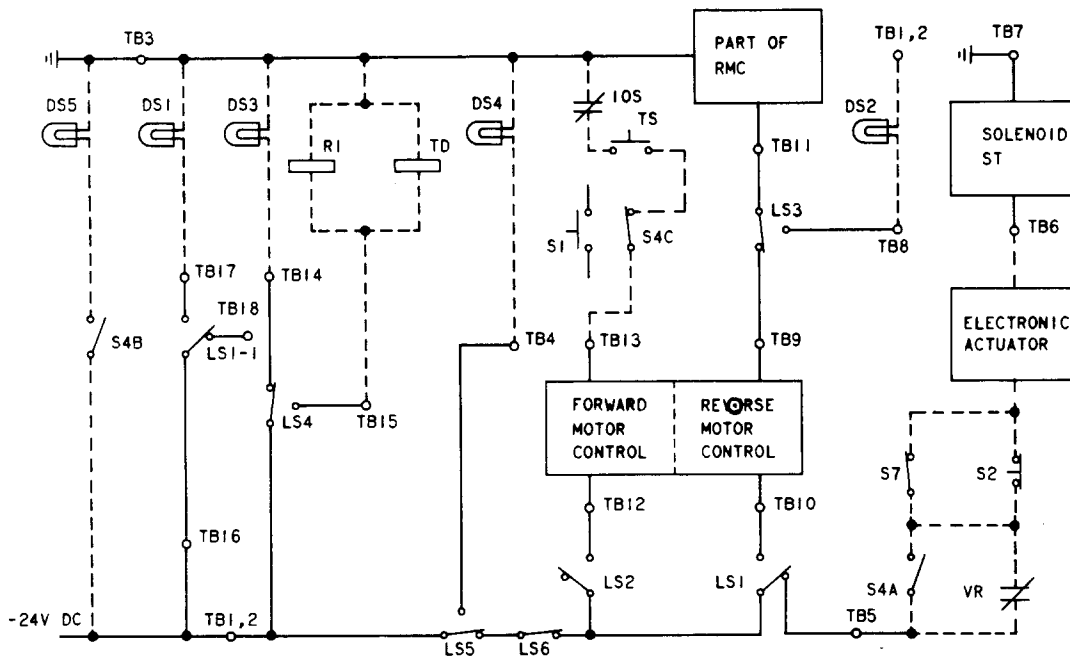
SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	CLOSED	OPEN	RESET	
Open	ON	OFF	ON	Approx 5± 0.5°
Closed	OFF	ON	OFF	Approx 83°, 45'
*Reset/ Closed	OFF	ON	ON	Approx 83°, 45'

* The reset sequence requires approximately 30 seconds for completion.

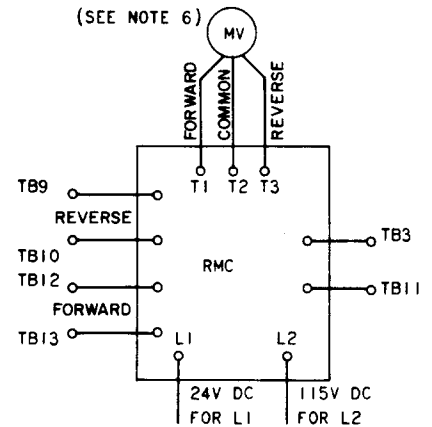
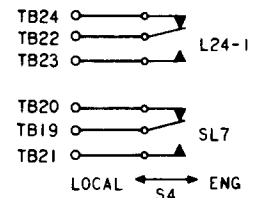
Note: The KS-19992 turbine exhaust blast valve will not close if the associated turbine alternator is running. If the turbine alternator is shut down, there is a 3-minute coast down time delay period before the KS-19992 turbine exhaust blast valve will close.

B. Manual Operation

4.02 General: In the event of a power failure to the reset drive motor or of a mechanical checkout procedure, a handcrank can be assembled on the keyed shaft of the reset mechanism. The procedures in 4.03 and 4.04 must be followed to manually open or close the blast valve. (Approximately 280 turns are required to move the blast valve from the fully closed position to the fully open position.)



DESIG	SEE NOTE	DESCRIPTION	PART SOURCE AND NUMBER	FUNCTION	
LS1	3	MICROSWITCH	HONEYWELL	V3-19	VALVE CLOSED SIGNAL
LS1-1				V3-19	VALVE CLOSED SIGNAL
LS2				BZ-2RQ1	ACTUATOR OPEN SIGNAL
LS3				BZ-2RQ1	ACTUATOR RESET SIGNAL
LS4				V3-19	VALVE OPEN SIGNAL
LS4-1				V3-19	VALVE OPEN SIGNAL
LS5	3			311SM2-T	MANUAL OPERATION WARNING
LS6				2AC4	COVER INTERLOCK
LS7				V3-19	BLADE CLOSED 75 DEGREES
S1	2	SWITCH			OPEN CONTROL
S2					CLOSE CONTROL TRIP
S4					LOCAL CONTROL
S7					CLOSE INHIBIT SWITCH
TS					TURBINE START SWITCH
DS1	2	LAMP		RED	CLOSED VALVE INDICATION
DS2				AMBER	RESET VALVE INDICATION
DS3				GREEN	OPEN VALVE INDICATION
DS4				RED	MANUAL OPERATION WARNING
DS5				RED	LOCAL CONTROL INDICATION
RMC	3				REVERSING MOTOR CONTROL
I05	2	RELAY			INHIBIT OPEN RELAY
R1					VALVE CLOSED INDICATOR RELAY
TD					VALVE OPEN TIME DELAY RELAY
VR	2,5				TURBINE STOP TIMER
ST	3	SOLENOID			VALVE TRIP SOLENOID
MV	3,6	MOTOR FOR VALVE			L2 115V DC RESET
					L1 24V DC RESET

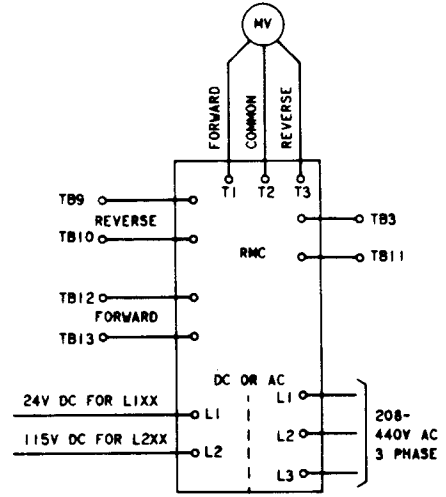
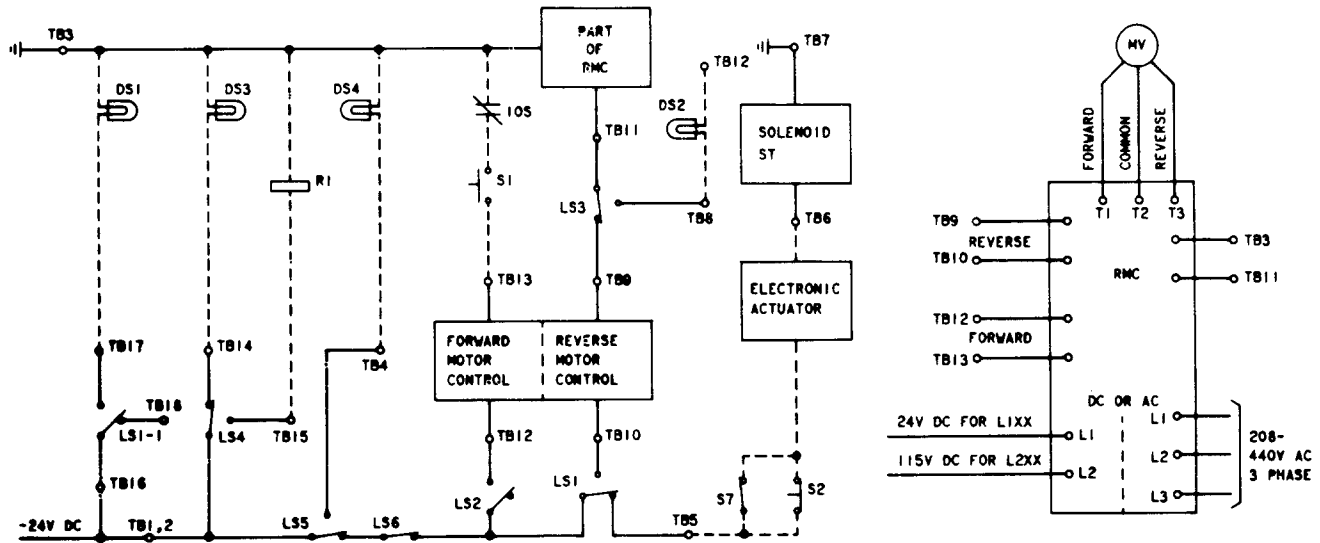


NOTES:

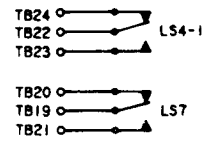
1. ALL SWITCHES ARE SHOWN IN BLADE-OPEN, JACKSHAFT-OPEN POSITION.
2. COMPONENTS NOT PART OF BLAST VALVE, PART OF VALVE CONTROL. (SHOWN DOTTED)
3. COMPONENTS NOT PART OF VALVE CONTROL, PART OF BLAST VALVE. (SHOWN SOLID)
4. LS4, LS4-1 SHALL OPERATE TO POSITION SHOWN BEFORE LS2 OPERATES TO POSITION SHOWN.
5. VR = TURBINE STOP, TIMER CONTACT CLOSES AT COMMERCIAL POWER FAILURE.
6. MOTOR FOR LIST 1 BLAST VALVE SHALL BE 24V DC. FOR LIST 2 BLAST VALVE SHALL BE 115V DC.

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Fig. 3—KS-19992 Blast Valve Electrical Schematic



DESIG	SEE NOTE	DESCRIPTION	PART SOURCE AND NUMBER	FUNCTION	
LS1	3	MICROSWITCH	HONEYWELL	V3-19	VALVE CLOSED SIGNAL
LS1-1				V3-19	VALVE CLOSED SIGNAL
LS2				BZ-2RQ1	ACTUATOR OPEN SIGNAL
LS3				V3-19	ACTUATOR RESET SIGNAL
LS4				V3-19	VALVE OPEN SIGNAL
LS4-1				V3-19	VALVE OPEN SIGNAL
LS5				3115M2-T	MANUAL OPERATION WARNING
LS6	3		2AC4	COVER INTERLOCK	
LS7	3		V3-19	BLADE CLOSED 75 DEGREES	
S1	2	SWITCH		OPEN CONTROL	
S2	2			CONTROL TRIP (CLOSE)	
DS1	2	LAMP		RED	CLOSED VALVE INDICATION
DS2				AMBER	RESET VALVE INDICATION
DS3				GREEN	OPEN VALVE INDICATION
DS4				RED	MANUAL OPERATION WARNING
RMC	3	MOTOR CONTROL		REVERSING MOTOR CONTROL	
IOS	2	RELAY		INHIBIT OPEN RELAY	
S7	2	SWITCH		CLOSE INHIBIT SWITCH	
ST	3	SOLENOID		VALVE TRIP SOLENOID	
R1	2	RELAY		VALVE CLOSED INDICATOR RELAY	
TD	2			VALVE OPEN TIME DELAY RELAY	
MV	3,5	24V DC MOTOR		RESET MOTOR FOR VALVE	
		115V DC MOTOR			
	3,6	208V AC, 60 HZ, 3Ø MOTOR			
		440V AC, 60 HZ, 3Ø MOTOR			



- NOTES:
1. ALL SWITCHES ARE SHOWN IN BLADE-OPEN, JACKSHAFT-OPEN POSITION.
 2. COMPONENTS NOT PART OF BLAST VALVE, PART OF VALVE CONTROL (SHOWN DOTTED).
 3. COMPONENTS NOT PART OF VALVE CONTROL, PART OF BLAST VALVE (SHOWN SOLID).
 4. LS4, LS4-1 SHALL OPERATE TO POSITION SHOWN BEFORE LS2 OPERATES TO POSITION SHOWN.
 5. DC MOTOR FOR BLAST VALVE SHALL BE 24V DC OR 115V DC.
 6. AC MOTOR FOR BLAST VALVE SHALL BE 208V AC - 60 HERTZ, 3Ø OR 440V AC - 60 HERTZ, 3Ø.

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Fig. 4—KS-20134 Blast Valve Electrical Schematic

Warning: If power is restored to the reset motor while the handcrank is assembled to the screw jack shaft, the handcrank will start turning. The operator using the handcrank must be cautioned regarding the possibility of this happening. The operating personnel should be prepared to take evasive action so that no injury will occur.

Caution: Improper use of the handcrank can result in damage to the mechanism. Certain precautions must be observed. Whenever the handcrank is used, the power to the reset motor should be off. If control power is available and the indicator lights on the remote control panel are functioning, follow the procedure given in 4.03(a), Handcranking Procedure with Control Panel Lights Working. If control power is not available and the control panel indicator lights are inoperative, follow the procedure given in 4.04, Handcranking Procedure With Control Panel Lights Inoperative. Read the handcranking procedures thoroughly before starting these procedures.

4.03 Handcranking Procedure With Control Panel Lights Operative: Observe the valve position indicator lamps on the KS-20267 control unit. The blast valve will be in one of four conditions.

CONDITION	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
1	ON	OFF	OFF	5 ± 0.5°
2	OFF	ON	ON	Approx 83°, 45'
3	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
4	OFF	ON	OFF	Approx 83°, 45'

- **For Condition 1:** Do not rotate the handcrank clockwise; counterclockwise rotation is permissible.
- **For Condition 2:** Do not rotate the handcrank counterclockwise; clockwise rotation is permissible.

- **For Condition 3:** It is permissible to rotate the handcrank in either direction.

- **For Condition 4:** Do not rotate the handcrank clockwise; counterclockwise rotation is permissible.

- (a) **To Open:** If the valve is in Condition 3 and the crank is rotated clockwise, the lights will switch to Condition 1 when the valve is fully opened. **Do not go more than one crank turn beyond this point.**
- (b) **To Close:** If the valve is in Condition 3 and the crank is rotated counterclockwise, the light will switch to Condition 2 when the valve is fully closed. **Do not rotate the crank more than three turns beyond this point.**
- (c) **To Reset.** If the valve is in Condition 4, **do not rotate the handcrank clockwise**, counterclockwise rotation is permissible. The lights will switch to Condition 2 just before the trigger resets. Rotate the handcrank three turns more counterclockwise to ensure the trigger is fully engaged. The valve is now in Condition 2.

4.04 Handcranking Procedure With Control Panel Lights Inoperative:

Caution: Do not rotate the handcrank in either direction before removing the actuator housing front cover and determining the position of the mechanism.

Remove the actuator housing front cover. The cover interlock switch LS6 will release to interrupt power to the reset motor and the solenoid. Under normal operating conditions (solenoid override mechanism not activated), the blast valve will close immediately if open. If closed, and the trigger mechanism is reset, the trigger mechanism will release and must be reset before opening. If the solenoid override mechanism is not engaged and this sequence of operations fails to occur, a trouble condition exists (refer to Part 7, TROUBLES). Observe the position of the blast valve mechanism; it should be in one of the following positions.

- Blast valve open, solenoid override mechanism activated.
- Blast valve closed; main trigger rollers reset, solenoid override mechanism activated.

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- Blast valve closed, main trigger rollers not reset.

Caution: Do not rotate the handcrank clockwise if the main trigger rollers are not reset or if the valve is fully open.

(a) **Blast Valve Closed; Main Trigger Rollers Not Reset:** To open the valve, the main trigger rollers must be reset. Proceed as follows.

- (1) Assemble the handcrank on the keyed shaft of the reset mechanism.
- (2) Using a screwdriver, activate the solenoid override mechanism by rotating the cam clockwise until the slot is vertical. The MANUAL OPERATION indicator lamp on the remote control panel will light.
- (3) Rotate the handcrank counterclockwise to lower the saddle of the trigger mechanism toward the bottom of the actuator housing.

Caution: Do not crank the saddle down too far; there must always be some clearance between the Belleville washers and the saddle. If there is no clearance, the washers will stack and the screw jack will overload the actuator center shaft in the down direction and shear the pin coupling the screw jack to the center shaft.

- (4) Continue rotating the handcrank counterclockwise until the main trigger roller assembly snaps into alignment. This can be determined by the loud audible snap and observing that the roller lever assembly rotates to its seated position and, as the saddle continues to lower, the roller lever assembly should rotate no further.
- (5) Observe the caution under (3) and rotate the handcrank three turns more counterclockwise to make sure the trigger is engaged.
- (6) After the main trigger rollers are reset, the valve can be opened by rotating the crank clockwise until the OPEN mark on the VALVE POSITION INDICATOR is reached.

Caution: Do not crank the valve beyond the OPEN mark on the VALVE POSITION

INDICATOR; the mechanism will be jammed against the top of the actuator housing and may be damaged.

- (7) Remove the handcrank from the keyed shaft on the reset mechanism.
- (8) Restore the blast valve to normal operation in accordance with 4.06.

(b) **Blast Valve Closed; Main Trigger Rollers Reset, Solenoid Override Mechanism Activated:** The blast valve can be opened by rotating the handcrank clockwise until the OPEN mark on the VALVE POSITION INDICATOR is reached. Remove the handcrank from the keyed shaft on the reset mechanism.

Caution: Do not crank the valve beyond the OPEN mark on the VALVE POSITION INDICATOR; the mechanism will be jammed against the top of the actuator housing and may be damaged.

Restore the blast valve to normal operation in accordance with 4.06.

(c) **Blast Valve Open; Solenoid Override Mechanism Activated:** In this condition the trigger mechanism is prevented from tripping by the solenoid override mechanism (see 3.07). The valve may be closed by rotating the handcrank counterclockwise until the CLOSED mark is reached on the VALVE POSITION INDICATOR.

Caution: Do not crank the valve beyond the CLOSED position on the VALVE POSITION INDICATOR. There must always be some clearance between the Belleville washers and the saddle of the reset mechanism. If there is no clearance, the washers will stack and the screw jack will overload the actuator center shaft in the down direction and shear the pin coupling the screw jack to the center shaft.

Restore the blast valve to normal operation in accordance with 4.06.

4.05 Manually Restoring the Blast Valve to Normal Operation: The following procedures are to be used if the procedures in 4.03 or 4.04 were used. After the emergency condition is cleared, with power restored to the reset motor

and the control panel, the blast valve must be in the closed position before returning it to normal operation. Proceed as follows.

- (1) Make sure the actuator housing front cover is removed.
- (2) If the blast valve is open, assemble the handcrank on the keyed shaft on the reset mechanism and rotate the handcrank counterclockwise until the CLOSED mark on the VALVE POSITION INDICATOR is reached.

Caution: Do not go beyond the CLOSED mark on the VALVE POSITION INDICATOR.

- (3) Remove the handcrank from the keyed shaft on the reset mechanism.
- (4) Using a screwdriver, de-activate the solenoid override mechanism by rotating the cam 90 degrees counterclockwise (slot is horizontal). The trigger mechanism will release.
- (5) Replace the actuator housing front cover on the actuator assembly. The reset motor will start and reset the trigger mechanism. The blast valve is now ready for normal operation.
- (6) Perform 5.02.

5. ROUTINE CHECKS

5.01 Visual Inspection (Monthly): The blast valve, pipe, and flanges must be inspected to determine that no accumulation of trash (or ice and snow in winter) is present which will interfere with the mechanical operation of the blast valve. Perform the visual check from a safe distance, keeping well away from the blast valve blade. If there is anything which might be considered as a mechanical interference present, DO NOT ATTEMPT TO CLEAR THE OBSTRUCTION. Inform the plant supervisor immediately. At his direction, close the blast valve (either manually or electrically, depending on the obstruction) and remove the obstruction.

Warning: The blast valve is a potentially dangerous mechanism. It operates so rapidly that evasive action is impossible. The valve may trip closed at any time from any position from full closed to full open. All personnel working on or near

the valve must be warned regarding this hazard.

5.02 Functional Check (Monthly): The blast valves should be opened and closed to determine that the valve operation is satisfactory. It is assumed that the blast valve is in the open position for the following check. Proceed as follows.

- (1) Momentarily depress the LOCAL CONTROL pushbutton, if provided, on the KS-20267 control bay. The LOCAL CONTROL lamp lights.
- (2) Operate the CLOSE CONTROL key switch to the ON position.
- (3) Momentarily depress the CLOSED pushbutton on the associated ACTUATOR unit.

Requirement: The blast valve trips and closes immediately. The KS-20267 control panel lamp should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Open	ON	OFF	ON	Approx 5 ± 0.5°
Closed	OFF	ON	OFF	Approx 83°, 45'
*Reset/ Closed	OFF	ON	ON	Approx 83°, 45'

* The reset sequence requires approximately 30 seconds for completion.

Note: The KS-19992 turbine exhaust blast valve will not close if the associated turbine alternator is running. If the turbine alternator is shut down, there is a 3-minute coast down time delay period before the KS-19992 turbine exhaust blast valve will close.

- (4) Momentarily depress the OPEN pushbutton on the ACTUATOR unit.

Requirement: The blast valve begins its opening sequence. The KS-20267 control panel lamps should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Approx 83°, 45'
Opening	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
Open	ON	OFF	OFF	Approx 5 ± 0.5°

- (5) Operate the CLOSE CONTROL key switch to the OFF position.
- (6) Momentarily depress the LOCAL CONTROL pushbutton, if provided. The blast valve is in the normal operating condition.

5.03 Functional Check (Yearly): The mechanical and electrical operation of the blast valve should be checked annually to determine if the mechanical clearance and the settings of the limit and indicator switches are correct. While manually opening and closing the blast valve, observe that there is no mechanical binding or interference between the blade and the valve housing pipe, or flange. If it is determined that any requirement is not met, refer to Part 6, MAINTENANCE, for the adjustment procedures. Perform the checks as follows.

WARNING: *The following procedure should be performed by personnel who are thoroughly familiar with the operational hazards of the blast valve. While operating the blast valve manually, there must be no interference of the blade with the valve housing, flange, or pipe. If there is interference, the valve will self trigger and the blade will close. Operating personnel must stay clear of the blade and valve housing at all times. The closing of the valve is noisy and startling. Personnel working in the vicinity of the blast valve must be forewarned of the impending noise to avoid accidents. If any mechanical interference is observed, do not attempt to clear any interference at this time. Notify the plant supervisor, and proceed at his direction to clear the obstruction or interference.*

- (1) Remove power to the reset drive motor on the blast valve to be checked. Remove fuses or operate circuit breakers as necessary.

- (2) If a KS-19992 turbine exhaust blast valve is being checked, momentarily depress the LOCAL CONTROL pushbutton to transfer control of the blast valve to the KS-20267 control bay. The LOCAL CONTROL indicator lamp will light.

- (3) At the associated DETECTOR unit, operate the CLOSE CONTROL key switch to the ON position.

- (4) Momentarily depress the CLOSED pushbutton on the associated ACTUATOR unit. The blast valve will close immediately and the CLOSED indicator lamp will light.

- (5) At the blast valve, remove the actuator housing front cover. Check that the main trigger mechanism is *not* reset.

- (6) Disconnect the power to the reset drive motor.

- (7) Using a screwdriver, activate the solenoid override mechanism by rotating the manual cam clockwise until the slot is vertical.

Requirement: The manual operation warning switch DS5 is actuated. (The MANUAL OPERATION indicator lamp lights on the associated ACTUATOR unit.)

Warning: *If power is restored to the reset drive motor while the handcrank is assembled to the screw jack shaft, the handcrank will start turning. The operator using the handcrank must be cautioned regarding the possibility of this happening. The operating personnel should be prepared to take evasive action so that no injury will occur.*

- (8) Rotate the handcrank counterclockwise to lower the saddle of the trigger mechanism toward the bottom of the actuator housing.

Caution: *Do not crank the saddle down too far; there must always be some clearance between the Belleville washers and the saddle. If there is no clearance the washers will stack and the screw jack will overload the actuator center shaft in the down direction and shear the pin coupling the screw jack to the center shaft.*

(9) Observe the position of the saddle where the main trigger roller assembly snaps into alignment. This can be determined by the loud audible snap and observing that the roller lever assembly rotates to its seated position. As the saddle continues to lower, the roller lever assembly should rotate no further. The saddle should engage and actuate the lower limit switch LS3 shortly after the main trigger roller assembly is engaged (approximately 3 turns). Stop cranking when the lower limit switch LS3 is just actuated.

Requirement 1: The indication on the VALVE POSITION INDICATOR should be between 82 and 83 degrees.

Requirement 2: The clearance between the bottom of the saddle and the top of the Belleville washer spring assembly must be a minimum of 0.030 inch.

(10) Rotate the handcrank clockwise to open the valve blade approximately 5 degrees (observe the VALVE POSITION INDICATOR).

(11) Slowly rotate the handcrank counterclockwise and stop cranking when the control switches LS1 and LS1-1 are just actuated.

Requirement: The indication on the VALVE POSITION INDICATOR should be between 82 and 83 degrees.

(12) Rotate the handcrank clockwise to move the entire trigger mechanism upward and to compress the main springs. The blast valve will move toward the open position. (Approximately 280 turns are required to move the valve from the fully closed to the fully open position.)

(13) As the valve approaches 6.5 degrees (indicated on the VALVE POSITION INDICATOR), slowly rotate the handcrank clockwise and stop cranking when the control switches LS4 and LS4-1 are just actuated.

Requirement: The indication on the VALVE POSITION INDICATOR should be between 6.5 and 5.5 degrees.

Caution: *Do not crank the valve beyond the OPEN mark on the VALVE POSITION INDICATOR; the mechanism will be jammed against the top of the actuator housing and may be damaged.*

(14) Continue rotating the crank handle clockwise until the upper limit switch LS2 is just actuated.

Requirement: The indication on the VALVE POSITION INDICATOR should be 5 ± 0.5 degrees.

(15) Rotate the crank handle counterclockwise until the blast valve is in the fully closed position. Observe the caution under (8).

(16) Release the INTERLOCK (LS6) switch to remove the -24 volt control voltage from the actuator circuit.

(17) Disconnect the solenoid leads from TB1 terminal 6 and 7. Connect the solenoid leads to the output of the 24-volt dc power supply. Adjust the power supply for 24 volts across the solenoid coil.

(18) Remove the trigger reset assembly (see Fig 2). Note the position of any shims.

(19) Form a loop in a short length of cord and pass the loop around the lower section of the trigger arm. Feed the other end of the cord through the mounting hole in the actuator frame (see Fig. 2). Attach the compression spring gauge to the cord.

(20) Apply the 24 volts to the solenoid for approximately 10 minutes and then reduce the voltage to 20 volts.

(21) Using a screwdriver, de-activate the solenoid override mechanism by rotating the manual cam 90 degrees counterclockwise (slot is horizontal).

(22) Rotate the handcrank clockwise to open the valve approximately 5 degrees (observe the VALVE POSITION INDICATOR).

(23) Apply a slow, steady force in the direction of the arrow in Fig. 2, using the compression spring gauge. Measure the force required to trip the trigger mechanism.

Requirement: The compression spring gauge should indicate between 10 and 15 inch/pounds when the trigger mechanism trips and the valve slams shut.

(24) Remove the cord from the trigger arm.

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- (25) Disconnect the power supply from the solenoid. Reconnect the solenoid leads to TB, terminals 6 and 7.
- (26) Install the trigger reset assembly and shims.
- (27) Repeat (7), (8), and (9). Check that the roller on the trigger reset assembly is on the flat surface of the trigger arm (approximately 0.06 to 0.18 inch from the beginning of the flat surface on the trigger arm.
- (28) Remove the handcrank from the keyed shaft of the reset mechanism.
- (29) Using a screwdriver, de-activate the solenoid override mechanism by rotating the manual cam counterclockwise until the slot is horizontal.
- (30) Install the actuator housing front cover.
- (31) Restore power to the reset drive motor. The reset motor will start and the trigger mechanism will reset.
- (32) At the KS-20267 control bay, the panel indicator lamps should indicate:

INDICATOR LAMP	CONDITION
CLOSED	ON
RESET	ON
OPEN	OFF
MANUAL OPERATION	OFF
*LOCAL CONTROL	ON

*KS-19992 turbine exhaust blast valve.

- (33) Momentarily depress the OPEN pushbutton on the associated ACTUATOR unit. The panel lights should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Approx 83°, 45'
Opening	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
Open	ON	OFF	OFF	Approx 5 ± 0.5°

- (34) Perform the functional check in 5.02.

5.04 Inspection of V-Belt (Yearly): The reset mechanism drive belt should be inspected for wear and adjustment as follows.

- (1) Disconnect power to the reset drive motor (remove fuses or operate circuit breakers, as necessary).
- (2) Remove the 1/4-inch hexagonal nuts and washers holding the shield in place.
- (3) Remove the shield.
- (4) Inspect the V-belt for wear; any indication of wear will be cause for replacement. Refer to Part 6, MAINTENANCE.
- (5) Apply a downward force of 36 ounces at the center of the V-belt span. The span should deflect 0.12 to 0.16 inch. Loosen the motor mounting bolts and adjust the position of the drive motor if it is necessary to adjust the V-belt for the proper tightness. Tighten the motor mounting bolts after adjustment.
- (6) Replace the shield and the 1/4-inch hexagonal nuts and washers.
- (7) Restore power to the reset drive motor.

5.05 Shock Absorber Check (Yearly): In order to check the shock absorber, it must be removed from the actuator assembly. The blast valve should be closed and power removed from the reset motor. Proceed as follows.

- (1) Momentarily depress the LOCAL CONTROL pushbutton, if provided, on the remote control panel. See the note in 5.02.
- (2) Momentarily depress the CLOSED pushbutton on the remote control panel.
- (3) Disconnect the power to the reset drive motor.

Caution: A spring force of approximately 40 pounds is being exerted on the shock absorber; exercise extreme care to avoid injury by the spring force propelling the shock absorber out when the final bolt is loosened and removed.

- (4) Remove the shock absorber from the actuator assembly by removing the 3/8-inch cap screw and washers; maintain pressure on the shock absorber to prevent it from springing out. Observe the position of the shims, if provided.
- (5) Place the shock absorber on a workbench; position the shock absorber in the horizontal plane with the filler port and one of the top bleeder screws uppermost. [If necessary, rotate the outer cylinder by hand (or use a strap wrench) until one of the two bleeder screws is at the top, in line with the filler port.]
- (6) Remove the filler plug and the lower bleeder screw. The fluid level should be just to the level of the lower bleeder screwhole; this will leave sufficient air in the upper portion of the outer cylinder for piston rod displacement when the piston rod is pushed into the shock absorber.
- (7) Refill the shock absorber, if required, with the recommended fluid specified in Part 2. [Refer to 6.04(32) through (36).]
- (8) Replace the filler plug and bleeder screw.
- Caution:** *Make sure the piston rod can be pushed ~~at~~ the way in by hand. Over filling can cause rupture of the outer cylinder.*
- Note:** A small amount of fluid seepage at the piston rod is normal; however if excessive leakage is noted, a set of packing rings and seals should be installed. Refer to Part 6, MAINTENANCE.
- (9) Remount the shock absorber on the actuator assembly, being careful to install the shims, if provided. Tighten the four 3/8-inch cap screws evenly.
- (10) Reconnect the power to the reset drive motor.
- (11) At the KS-20367 control unit, momentarily depress the OPEN pushbutton. The blast valve begins its opening sequence. The remote control panel lamps should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Approx 83°, 45'
Opening	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
Open	ON	OFF	OFF	Approx 5 ± 0.5°

- (12) Perform 5.02 and check that there is minimum rebounding (see Note) of the valve blade against the valve seat when the blast valve closes. Perform this visual check from a safe distance, keeping well away from the blast valve blade.

Note: Rebounding can be judged by comparing the normal closing noise of another butterfly-type blast valve with the closing noise of the blast valve being checked. The closing noise should be one sharp sound—not prolonged or ringing.

6. ROUTINE MAINTENANCE

A. General

6.01 The maintenance and parts replacement procedures should be performed only by personnel who are thoroughly familiar with the operation hazards of the blast valve. Parts should be replaced at the intervals stated in the replacement procedures.

B. Lubrication

6.02 Ball Screw Jack (5-Year Lubrication):

With the valve in the closed position (refer to 4.01), unscrew the lower housing from the screw jack body. Remove the old grease and refill with grease conforming to MIL-G-10924 (260-300P). Reassemble the lower housing on the screw jack body.

C. Replacement Procedures

6.03 V-Belt Replacement (5 Years): The V-belt must be replaced every 5 years regardless of condition. Proceed as follows.

- (1) Close the blast valve (refer to 4.01).

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- (2) Disconnect power to the reset drive motor.
- (3) Remove the 1/4-inch hexagonal nuts and washers holding the shield.
- (4) Remove the shield.
- (5) Loosen the motor mounting bolts and slide the motor forward to release the tension on the V-belt.
- (6) Remove the V-belt from the pulley and pulley drive.
- (7) Install a new V-belt on the pulley and pulley drive.
- (8) Set the pulley until the driven shaft protrudes 0.22 to 0.28 inch from the end of the driven shaft.
- (9) Set the drive pulley, coplanar within 0.030 inch.
- (10) Adjust the V-belt by applying a downward force of 36 ounces at the center of the V-belt span until the V-belt deflects 0.12 to 0.16 inch. Slide the motor backwards or forwards to adjust the tension.
- (11) Tighten the motor mounting bolts.
- (12) Install the shield and the three 1/4-inch hexagonal nuts and washers.
- (13) Reconnect power to the reset drive motor.
- (14) Open the blast valve (see 4.01) and check that the V-belt does not slip on the pulleys.

6.04 Shock Absorber (5-Year Parts Replacement):

The shock absorber must be removed from the actuator assembly and disassembled, cleaned and inspected. Defective parts must be replaced with new or serviceable parts every 5- years.

- (1) Close the blast valve (refer to 4.01).
- (2) Disconnect power from the reset drive motor.
- (3) Open the blast valve manually to 55 degrees.

Caution: A spring force of approximately 40 pounds is being exerted on the shock

absorber; exercise extreme care to avoid injury by the spring force propelling the shock absorber out when the final bolt is loosened and removed.

- (4) Remove the shock absorber from the actuator assembly by removing the 3/8-inch cap screw and washers; maintain pressure on the shock absorber to prevent it from springing out. Observe the position of the shims, if provided (see Fig. 5).
- (5) Close the blast valve manually.

Disassembly

- (6) Place the shock absorber on a workbench; with the filler port and bleeder screw uppermost. See Fig. 6.
- (7) Remove the filler port plug and bleeder screws; drain all hydraulic fluid.

Note: All disassembled parts should be placed on a clean, lint free cloth (KS-14666).

- (8) Remove the snap ring [1] in the cylinder body.
- (9) Remove the piston assembly.
- (10) Drive out the roll pin [2] and remove the rod end [3].
- (11) Carefully remove the packing assembly [5].
- (12) Remove the return spring [6].
- (13) Remove the snap ring [7] from the cylinder body and remove the ring retainer [8] and the outer cylinder [9].
- (14) Remove and discard all O-rings, the rod seal [14], and the scraper ring [15].
- (15) Wash all components with a soft bristle brush and Stoddard cleaning solvent (or equivalent). Dry each part with clean, dry compressed air or a KS-14666 cloth.

Warning: When using cleaning solvent, the cleaning area must be well ventilated. Avoid direct contact of the solvent with the skin and prolong inhalation of fumes.

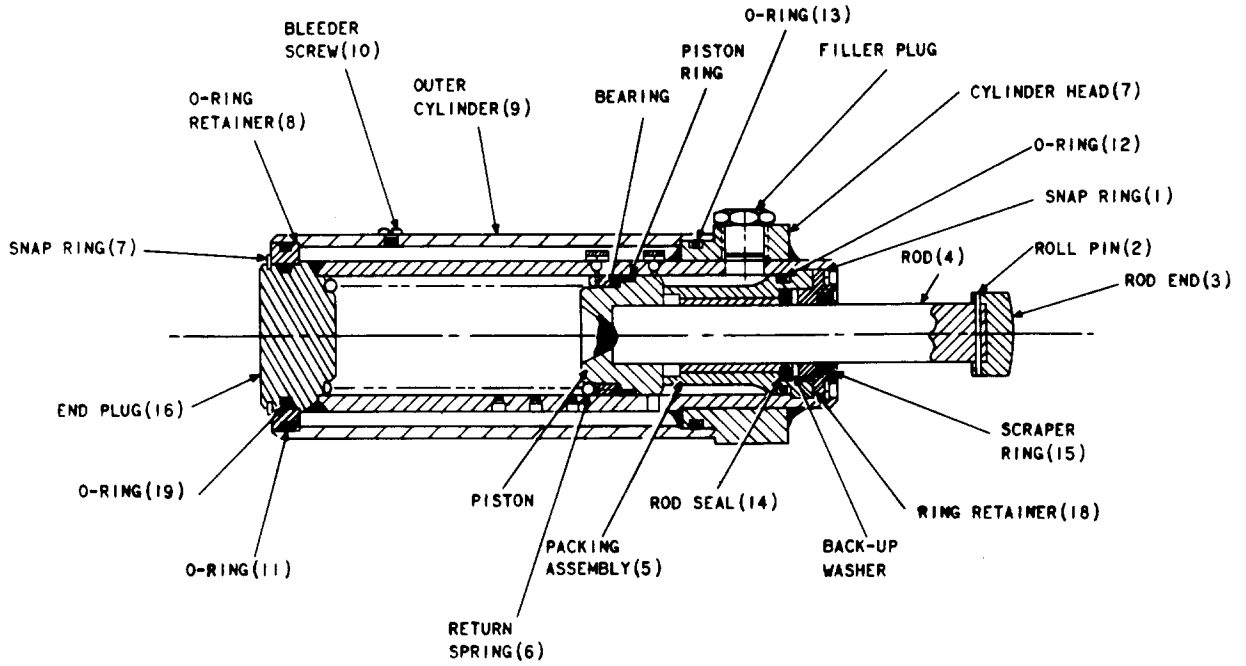


Fig. 5—Schematic Arrangement of the Shock Absorber

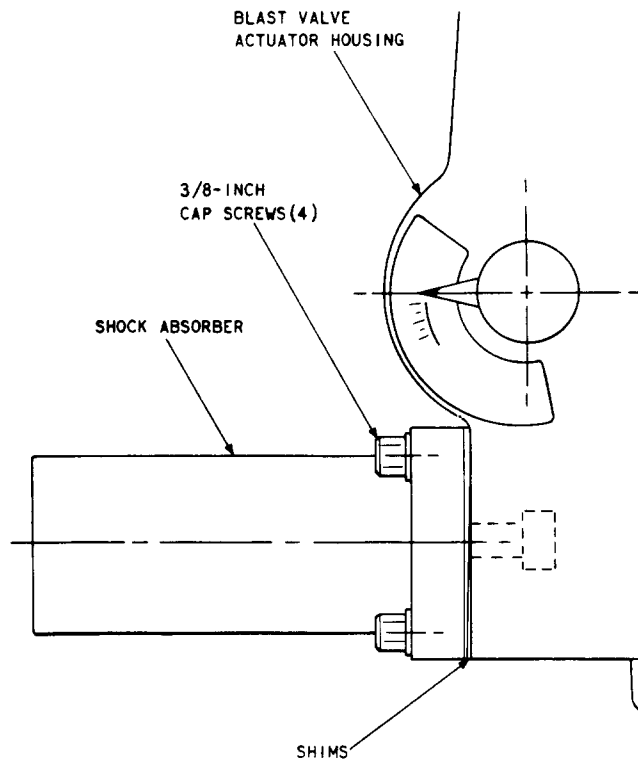


Fig. 6—Removal of the Shock Absorber

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Use the minimum amount of solvent required for the cleaning operation and keep the container closed when not in use. Keep solvent away from open flame.

Inspection

(16) Inspect all parts for visible damage or wear. Check the finish on the piston rod, piston ring, and the piston bearing. The finish should be free of scoring, grooves, nicks, scuffing or minute flat surfaces which might contribute to fluid leakage. The surfaces shall present an evenly polished appearance.

(17) Discard all damaged parts.

Replacement

(18) Replace all defective parts with new or serviceable parts (available from the EFDYN Company).

Assembly

Note: Coat all O-rings with clean shock absorber fluid before installing.

- (19) Install O-rings [11] in position on the retainer [8].
- (20) Install O-ring [13] in position on the cylinder head [17].
- (21) Install O-rings [19] in position on end plug [16].
- (22) Carefully place the outer cylinder [9] in position on cylinder head [17].
- (23) Insert O-ring retainer [8] in position between the outer cylinder [9] and the end plug [16].
- (24) Insert snap ring [7] in position on the end plug [16].
- (25) Place the return spring [6] into position in the cylinder bore and carefully slide the piston, complete with bearing and piston ring, into the bore of the cylinder. Use a piston ring compressor or a tapered insertion sleeve when inserting the piston. Do not break or score the rings.

- (26) Insert O-ring [12] into the packing assembly.
- (27) Slide the packing assembly over the piston rod and into the cylinder bore.
- (28) Carefully place the scraper ring [15] into the ring retainer [18].
- (29) Slide the rod seal [14] into position on the rod [4].
- (30) Retain the rod seal with ring retainer [18] and snap ring [1].
- (31) Place the rod end [3] in position and drive in roll pin [2]. The shock absorber is now ready for filling.

Filling

- (32) With the shock absorber in the horizontal position and the filler port uppermost, rotate the outer cylinder by hand (or with a strap wrench) until one of the two bleeder screws is at the top, in line with the filler port.
- (33) Remove the bleeder screw that ***is not*** at the top of the outer cylinder. (The bleeder screws are off set approximately 30 degrees).
- (34) Slowly introduce the shock absorber fluid into the filler port, at the same time pushing the piston rod in and out until a steady flow of fluid (free of air bubbles) emerges from the lower bleeder screw hole.
- (34) Replace the filler port plug and the bleeder screws and push the piston in and out for approximately twelve full stroke cycles.
- (35) Remove the lower bleeder screw and recheck the oil level to make sure the inner cylinder of the shock absorber is completely filled to the level of the lower bleeder screw hole; this will leave sufficient air in the upper portion of the outer cylinder for piston rod displacement when the piston rod is pushed into the shock absorber.
- (36) Replace the lower bleeder screw.

Caution: Make sure the piston rod can be pushed all the way in by hand. Over filling can cause rupture of the outer cylinder.

- (37) Open the blast valve manually to 55 degrees.
- (38) Remount the shock absorber on the actuator assembly, being careful to install the shims, if provided. Tighten the four 3/8-inch cap screws evenly.
- (39) Close the blast valve manually.
- (40) Reconnect the power to the reset drive motor. The reset drive motor will start to reset the actuator.
- (41) At the KS-20267 control bay, momentarily depress the OPEN pushbutton. The blast valve begins its opening sequence. The indicator lamps on the associated ACTUATOR unit should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Approx 83°, 45'
Opening	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
Open	ON	OFF	OFF	Approx 5° ± 05'

(42) Observe the blast valve when it is tripped closed. There should be a minimum of rebounding of the valve blade against the valve seat. This can best be judged by comparison with another blast valve in working order. The closing sound should be sharp, with a minimum of ringing. Keep well away from the blast valve blade.

D. Adjustment Procedures

6.05 Adjustment Procedures for the Reset

Limit Switches: The lower limit switch LS3 and upper limit switch LS4 are adjusted as follows.

- (1) Close the blast valve (refer to 4.01).
- (2) Disconnect the power to the reset drive motor.
- (3) Remove the actuator housing front cover.

- (4) Using a screwdriver, activate the solenoid override mechanism by rotating the manual cam clockwise until the slot is horizontal.
- (5) Assemble the handcrank on the keyed shaft of the reset mechanism.
- (6) Rotate the handcrank counterclockwise to lower the saddle of the trigger mechanism toward the bottom of the actuator housing.

Caution: *Do not crank the saddle down too far; there must always be some clearance between the Belleville washers and the saddle.*

- (7) Observe the position of the saddle when the main trigger roller assembly snaps into alignment. This can be determined by the loud audible snap and by observing that the roller lever assembly rotates to its seated position. As the saddle continues to lower, the roller lever assembly should rotate no further.
- (8) Continue to rotate the handcrank for three turns past this position. Stop cranking.
- (9) Loosen the mounting bolts on the lower limit switch LS3 and adjust the switch against the lug of the saddle until the switch just operates.
- (10) Tighten the mounting bolts, being careful not to disturb the switch position.
- (11) Check that there is approximately 0.05 inch minimum clearance between the bottom of the saddle and the Belleville washer.
- (12) Rotate the handcrank clockwise to open the blast valve. Adjust the position of the valve until the pointer on the VALVE POSITION INDICATOR is at 5.0 degrees.
- (13) Loosen the mounting bolts on the upper limit switch LS4 and adjust the switch against the lug of the saddle until the switch just operates.
- (14) Tighten the mounting bolts, being careful not to disturb the switch position.
- (15) Using a screwdriver, de-activate the solenoid override mechanism by rotating the manual

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cam counterclockwise until the slot is vertical. The trigger mechanism will trip and the blast valve will close immediately.

- (16) Install the actuator housing front cover.
- (17) Restore power to the reset drive motor. The reset drive motor will start and the trigger mechanism will reset.
- (18) At the KS-20267 control bay, momentarily depress the OPEN pushbutton on the associated ACTUATOR unit. The panel lights should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Approx 83°, 45'
Opening	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
Open	ON	OFF	OFF	Approx 5 ± 0.5°

- (19) Perform the functional check in 5.02.

6.06 Adjustment Procedure for the Position Indicator Switches:

The valve closed position indicator switch (LS1 and LS1-1) and valve open position indicator switch (LS4 and LS4-1) are adjusted as follows.

- (1) Close the blast valve (refer to 4.01).
- (2) Disconnect the power to the reset drive motor.
- (3) Remove the actuator housing front cover.
- (4) Using a screwdriver, activate the solenoid override mechanism by rotating the manual cam clockwise until the slot is horizontal.
- (5) Assemble the handcrank on the keyed shaft of the reset mechanism.
- (6) Rotate the handcrank counterclockwise to lower the saddle of the trigger mechanism toward the bottom of the actuator housing.

Caution: Do not crank the saddle down too far; there must always be some clearance

between the Belleville washer and the saddle.

- (7) Adjust the position of the valve until the pointer on the VALVE POSITION INDICATOR is no less than 82 degrees and no more than 83 degrees.
- (8) Loosen the mounting bolts on the valve closed position indicator switch (LS1 and LS1-1) and adjust the switch against the lug on the saddle until the switch is just operated.
- (9) Tighten the mounting bolts, being careful not to disturb the switch position.
- (10) Rotate the handcrank clockwise to open the blast valve. Adjust the position of the valve until the pointer on the VALVE POSITION INDICATOR is less than 1.5 degrees and more than 0.50 degree.

Note: This position must be before the position at which the blast valve automatically stops during the opening sequence.

- (11) Loosen the mounting bolts on the valve open position indicator switch (LS4 and LS4-1) and adjust the switch against the lug on the saddle until the switch just operates.
- (12) Tighten the mounting bolts, being careful not to disturb the switch position.
- (13) Using a screwdriver, de-activate the solenoid override mechanism by rotating the manual cam counterclockwise until the slot is vertical. The trigger mechanism will trip and the blast valve will close immediately.
- (14) Install the actuator housing front cover.
- (15) Restore power to the reset drive motor. The motor will start and the trigger mechanism will reset.
- (16) At the KS-20267 control bay, momentarily depress the OPEN pushbutton on the associated ACTUATOR unit. The panel lights should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			BLADE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Approx 83°, 45'
Opening	OFF	OFF	OFF	Less than 83°, 45' More than 5.5°
Open	ON	OFF	OFF	Approx 5 ± 0.5°

7. TROUBLES

7.01 Troubles which occur in the KS-19992 or KS-20134 blast valves may not be obvious because of the interfaces between the blast valve and the KS-20267 control bay. The most likely trouble areas of the blast valves are:

- An obstruction in the valve blade and blade housing.
- Failure of the control circuit (out of adjustment or defective parts).
- Mechanical binding.
- Failure of the drive motor circuit.

7.02 If the KS-19992 or KS-20134 blast valves fail to open or close on command from the KS-20267 control bay, the input signals to the blast valves should be checked. Refer to Section 770-225-301 to check for proper open or close signals from the KS-20267 control bay. An examination of the indicator lamps will indicate the approximate position of the valve blades (refer to Part 4). If the valve blades are in an open or partially open position, the blast valve actuator cover should be removed and the actuator and valve examined for obstructions or damage. Before any work is performed on the equipment, the blast valve should be manually operated to the closed position, if possible.

Caution: *Check for obstructions or interference which might cause further damage if the blast valve is operated manually.*

7.03 Trouble Chart: The troubles listed refer only to those in connection with the KS-19992 and KS-20134 blast valves. Troubles in the KS-20267 control bay are covered in Section 770-225-301. Should any of the following troubles occur, check the possible causes listed.

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TROUBLE

POSSIBLE CAUSE

(a) Blast valve fails to open on "OPEN" signal.

(1) Defective KS-20267 control bay — refer to Section 770-225-301.

(2) Open circuit from terminal 2 to terminal 13 on TB1.

MANUAL OPERATION switch, (LS5)
INTERLOCK switch (LS6), ACTUATOR
open switch (LS2), RR relay interlock
VC relay (RMC).

(3) Reset sequence did not occur. Refer to (c).

(4) Blown fuse or tripped circuit breaker in input voltage to the drive motor.

(5) V-Belt broken or slipping.

(6) Defective drive motor.

(7) Defective jack screw mechanism.

(b) Drive motor runs when OPEN switch is depressed but stops when the switch is released.

(1) Defective VC relay (RML).

(2) Open wiring from VC relay contacts to terminal 3 on TB1.

(c) Blast valve fails to reset after closing.

(1) Open circuit from terminal 2 to terminal 3 (ground) on TB1 through the following circuit:

MANUAL OPERATION switch (LS5), INTER-
LOCK switch (LS6), VALVE CLOSED switch
(LS1), VC relay contacts 1 and 2, RR relay coil
ACTUATOR RESET switch (LS3).

(2) Defective reset drive motor.

(3) V-Belt broken or slipping.

(4) Defective jack screw mechanism.

(5) Blown fuse or tripped circuit breaker in input voltage to the drive motor.

(6) Defective jack screw mechanism.

TROUBLE	POSSIBLE CAUSE
<p>(d) Blast valve fails to close on "CLOSED" signal.</p> <p><i>Note:</i> The KS-19992 blast valve will not close the associated gas turbine engine is running.</p>	<p>(1) Defective KS-20267 control bay.</p> <p>(2) Manual cam operated to the activated position to override the solenoid.</p> <p>(3) Blast valve jammed due to foreign material between valve blade and blade housing.</p> <p>(4) Mechanical interference between valve blade and blade housing.</p> <p>(5) Defective trigger assembly — mechanical binding.</p> <p>(6) Defective solenoid assembly.</p>
<p>(e) Blast valve opens on "OPEN" signal but trips to the closed position from a partially open position.</p>	<p>(1) Defective trigger mechanism.</p> <p>(2) Defective solenoid.</p> <p>(3) Mechanical binding between valve and valve housing.</p>
<p>(f) Blast valve has excessive bounce (rebounding) when closed.</p>	<p>(1) Defective hydraulic valve.</p>
<p>(g) Blast valve in fully open position — OPEN lamp does not light on KS-20267 control bay.</p>	<p>(1) VALVE OPEN switch (S4) not actuated.</p> <p>(2) Defective wiring.</p> <p>(3) Defective KS-20267 control bay (refer to Section 770-225-301).</p>
<p>(h) Blast valve in fully closed position — CLOSED lamp does not light on KS-20267 control bay.</p>	<p>(1) VALVE CLOSED switch (S1-1) not actuated or defective.</p> <p>(2) Defective wiring.</p> <p>(3) Defective KS-20267 control bay.</p>
<p>(i) Drive motor runs in wrong direction (ac power).</p>	<p>(1) Reversed phase (change any two leads in motor).</p>
<p>(j) Drive motor runs in wrong direction (dc power).</p>	<p>(1) Reversed wiring on shunt field (reverse leads on shunt).</p>