

## KS-20267 BLAST VALVE CONTROL UNIT OPERATING METHODS

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### 1. GENERAL

**1.01** The KS-20267 blast valve control unit is designed for use with KS-20368 louver-type blast valves and KS-20134 and KS-19992 butterfly-type blast valves used in L3 and L4 hardened underground communication centers.

**1.02** Among the most vulnerable areas of hardened underground communication buildings are the air intake and exhaust systems. To seal these openings during a nuclear-weapon attack, fast-closing mechanical blast valves are used for the protection of personnel and interior equipment. The KS-20267 control unit is designed to monitor and operate these valves from a central location. The control unit provides for manual operation of individual blast valves; automatic closing of all blast valves upon receipt of a signal from a surface-mounted radiation or pressure sensor; and remote operation, through E-1 telemetry, of blast valves at unmanned sites.

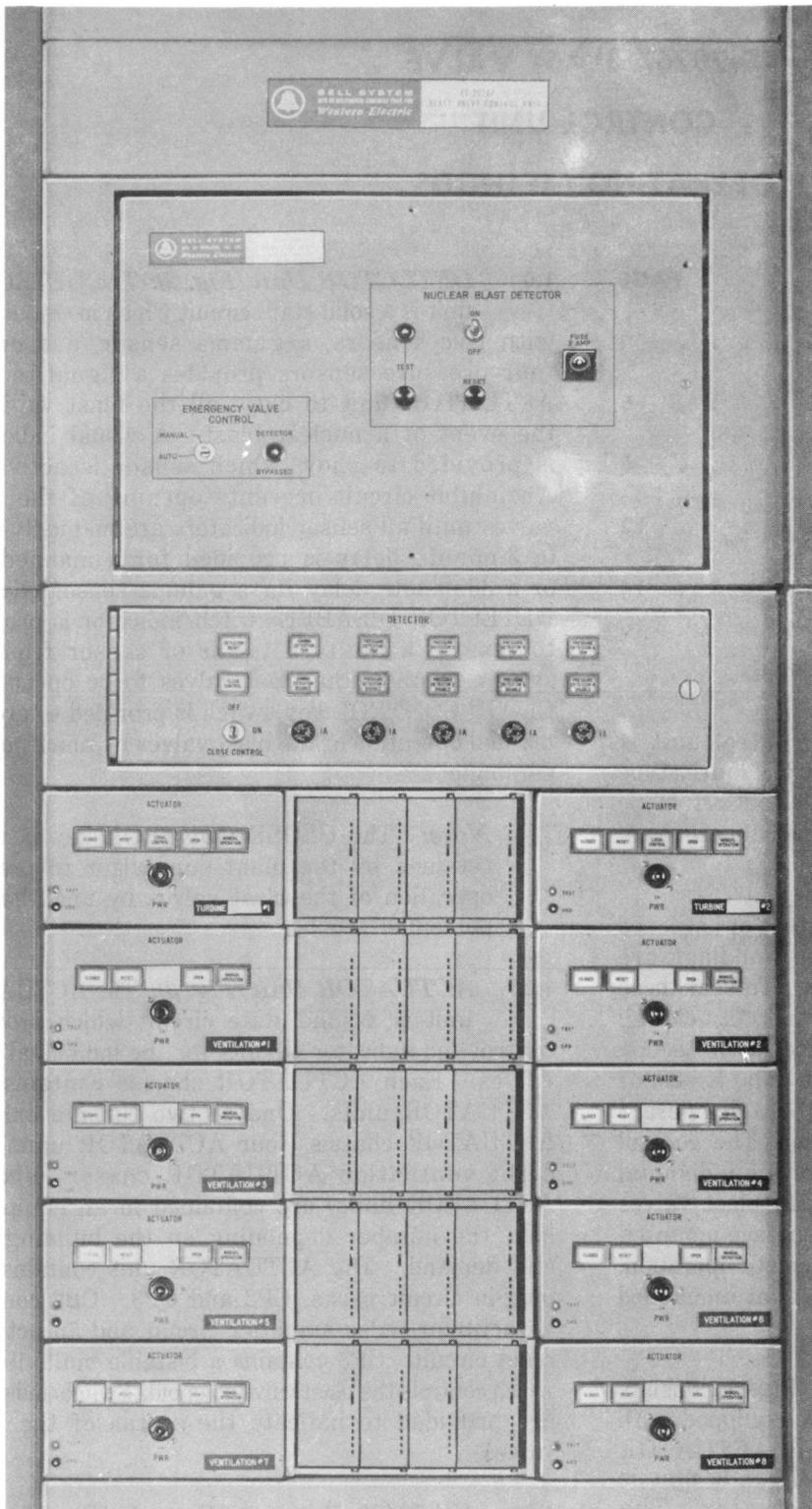
**1.03** The KS-20267 control unit, Fig. 1 consists of a 23-inch equipment rack equipped with one DETECTOR unit and as many ACTUATOR units as are required. One ACTUATOR unit is required for each blast valve actuator. The equipment rack also accomodates the electrical equipment cabinet for the KS-19557 DETECTOR (nuclear blast).

**1.04 DETECTOR Unit (Fig. 2):** The DETECTOR unit is a solid state circuit which in conjunction with five sensors, a gamma sensor, and one to four pressure sensors provides a signal to each ACTUATOR unit to close all the blast valves in the event of a nuclear blast. A visual indication is provided to show which sensor is activated. An inhibit circuit prevents opening of the blast valves until all sensor indicators are manually reset (a 3-minute delay is provided for a manned site or a 30-minute delay for a gamma sensor trip). A DETECTOR DISABLE switch/indicator is provided to remove a faulty detector or sensor from the system to allow the blast valves to be opened. A CLOSE CONTROL key switch is provided to prevent manual operation of the blast valves by unauthorized personnel.

**Note:** The CLOSE CONTROL key is to be retained by the plant supervisor to prevent operation of the blast valves by unauthorized personnel.

**1.05 ACTUATOR Unit (Fig. 3):** The ACTUATOR unit is a solid state circuit which provides control and indicator circuits for the individual blast valves. Each ACTUATOR chassis contains two ACTUATOR units. One or two turbine exhaust ACTUATOR chassis (four ACTUATOR units) and eight ventilation ACTUATOR chassis (sixteen ACTUATOR units) are contained in an equipment bay, the number depending on the building size and demand. The ACTUATOR unit contains two plug-in circuit packs, CP2 and CP3. CP2 contains an actuator pulse amplifier circuit and an actuator reset circuit. CP3 contains a bistable multivibrator which controls the blast valve solenoid. Switch/indicators are provided to indicate the status of the blast valve.

**1.06 KS-20485 Pressure Switch (Fig. 4):** The KS-20485 pressure switch is a pressure sensor device used to detect shock wave pressure from a nuclear explosion. The pressure switch is



KS-19557 DETECTOR  
(NUCLEAR BLAST)  
ELECTRICAL EQUIPMENT  
CABINET

DETECTOR UNIT  
(1 GAMMA AND 4 PRESSURE  
DETECTOR INDICATORS)

ACTUATOR UNIT  
(TURBINE EXHAUST  
CIRCUITS)

ACTUATOR UNITS  
(TURBINE INTAKE,  
VENTILATION AND  
COOLING CIRCUITS)

Fig. 1—KS-20267 Blast Valve Control Unit

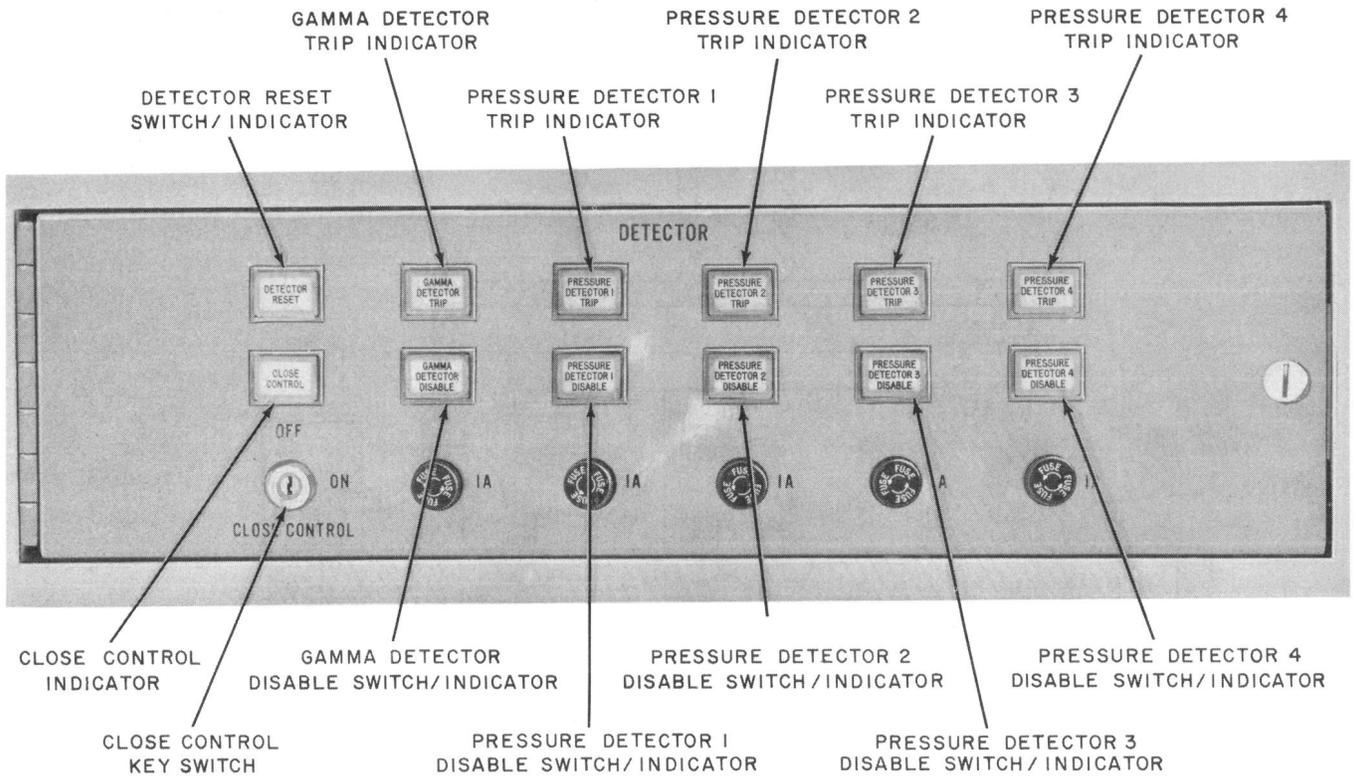


Fig. 2—DETECTOR Unit

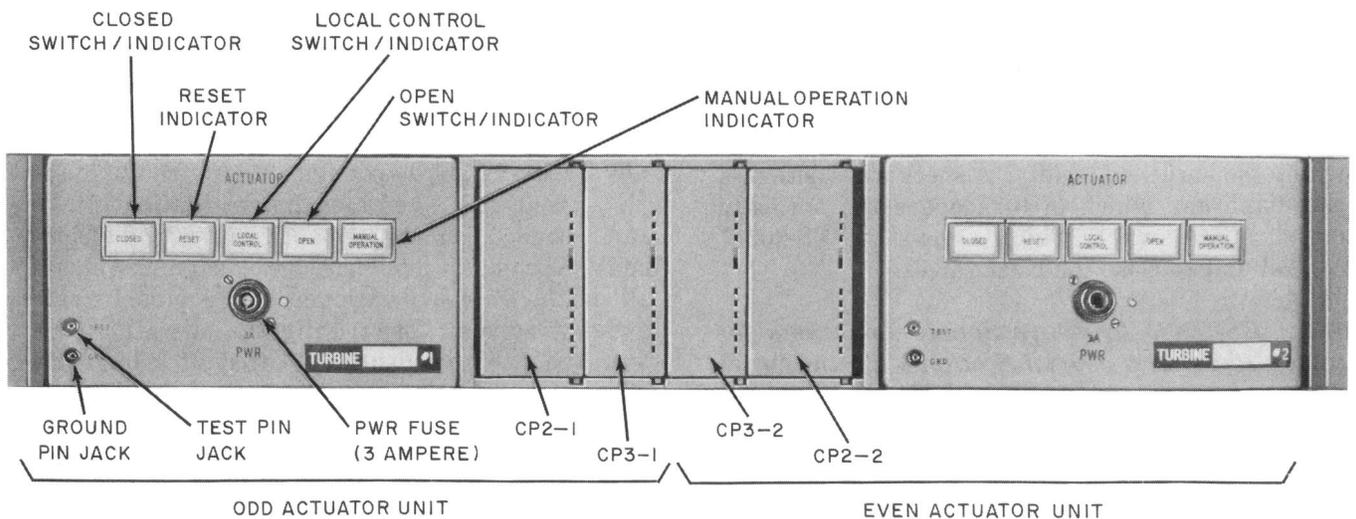


Fig. 3—ACTUATOR Unit

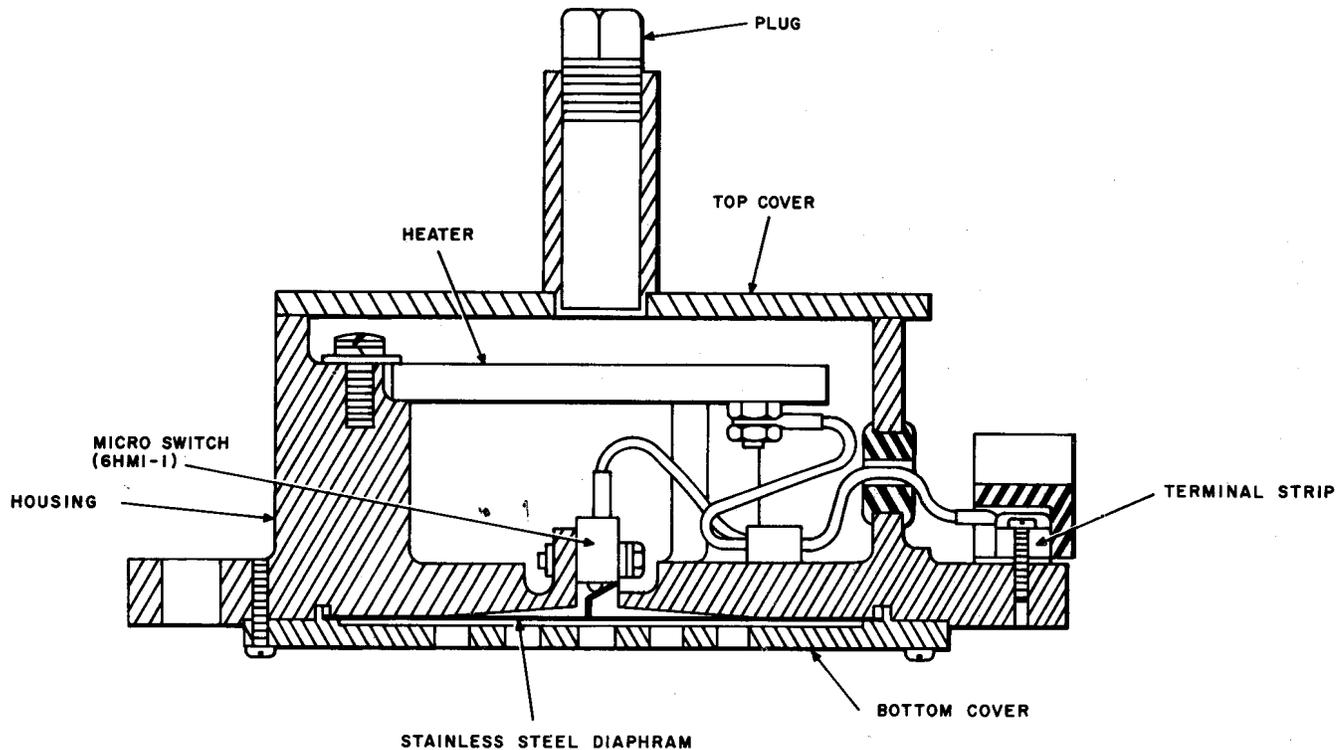


Fig. 4—KS-20485 Pressure Switch Sectional View

shock mounted above ground within an environmental shield. The detector unit consists of a housing cover, a stainless steel diaphragm, a micro switch, a terminal heater, and a terminal board. Either three or four detector units are located approximately 160 feet from the building air shafts to allow sufficient time to signal for closure of the blast valves through the KS-20267 control unit located within the hardened facility. A shock wave activates the diaphragm, which in turn opens the normally closed micro switch, which signals the KS-20267 control unit to close the blast valves.

**1.07 KS-20485 Pressure Sensor Locations for 10-psi and 550-psi Stations:** The minimum distance between a vertical air shaft and associated pressure sensors is calculated for installations with both three and four sensors, at stations hardened for 10 psi and 50 psi. Fig. 5 shows minimum distances for sensor installations, located on concentric circles around the air shaft.  $R_0$ ,  $R_a$ , and  $R_f$  are the distance for an infinite number of sensors, four sensors, and three sensors, respectively. The calculated distances for pressure-sensor locations, with the closing times for blast valves with different

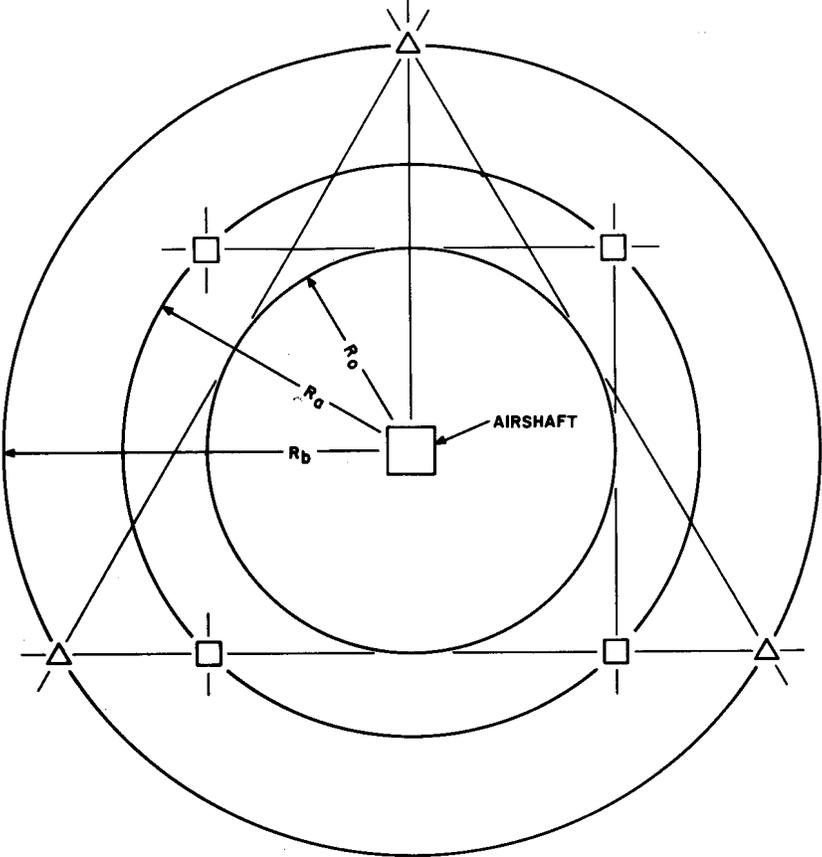
configurations, is given in Table A. The sensors are assumed to be equidistant from each other.

**1.08** If severe property-boundary conditions exist, two or more pressure sensors can be connected in series with the only requirement that the total loop-wire resistance not exceed 10 ohms.

**1.09** The 10 psi-hardened sites with turbines require valves only on ventilation intake and exhaust, cooling intake and exhaust, and turbine intake openings. Sites hardened for 50 psi require all of the valves mentioned above plus turbine exhaust valves. Electrically the operation of a louvered valve is identical to that of a butterfly valve.

**1.10** The KS-20267 control unit operates from a nominal negative 24-volt office battery supply. The dc supply voltage must be between the limits of negative 19 and 28 volts.

**1.11** This issue of the section is based on the following drawing:  
SD-81940-01 Issue 1



- $R_0$  - INFINITE NUMBER OF SENSORS
- $R_a$  - FOUR SENSORS
- $R_b$  - THREE SENSORS

Fig. 5—Spacing of Pressure Sensors 10- and 50-psi Stations

**TABLE A**  
**PRESSURE-SENSOR DISTANCES FROM AIR SHAFT**

VALVE TYPE	CLOSING TIME (MSEC)	MINIMUM DISTANCE (FT)					
		R <sub>0</sub> *	10 PSI		R <sub>0</sub>	50 PSI	
			THREE SENSORS	FOUR SENSORS		THREE SENSORS	FOUR SENSORS
Butterfly:							
One blade	50	74	147	104	117	234	165
Two blades	70	103	206	146	164	327	231
Three blades	80	118	236	167	186	374	264
Four blades	90	133	265	187	210	420	297
Louver	50	74	147	104	117	234	165

\*R<sub>0</sub> — Indicates number sensors.

If this section is to be used with equipment or apparatus that is associated with an earlier or later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and manner in which the section may be affected.

## 2. LIST OF TEST APPARATUS

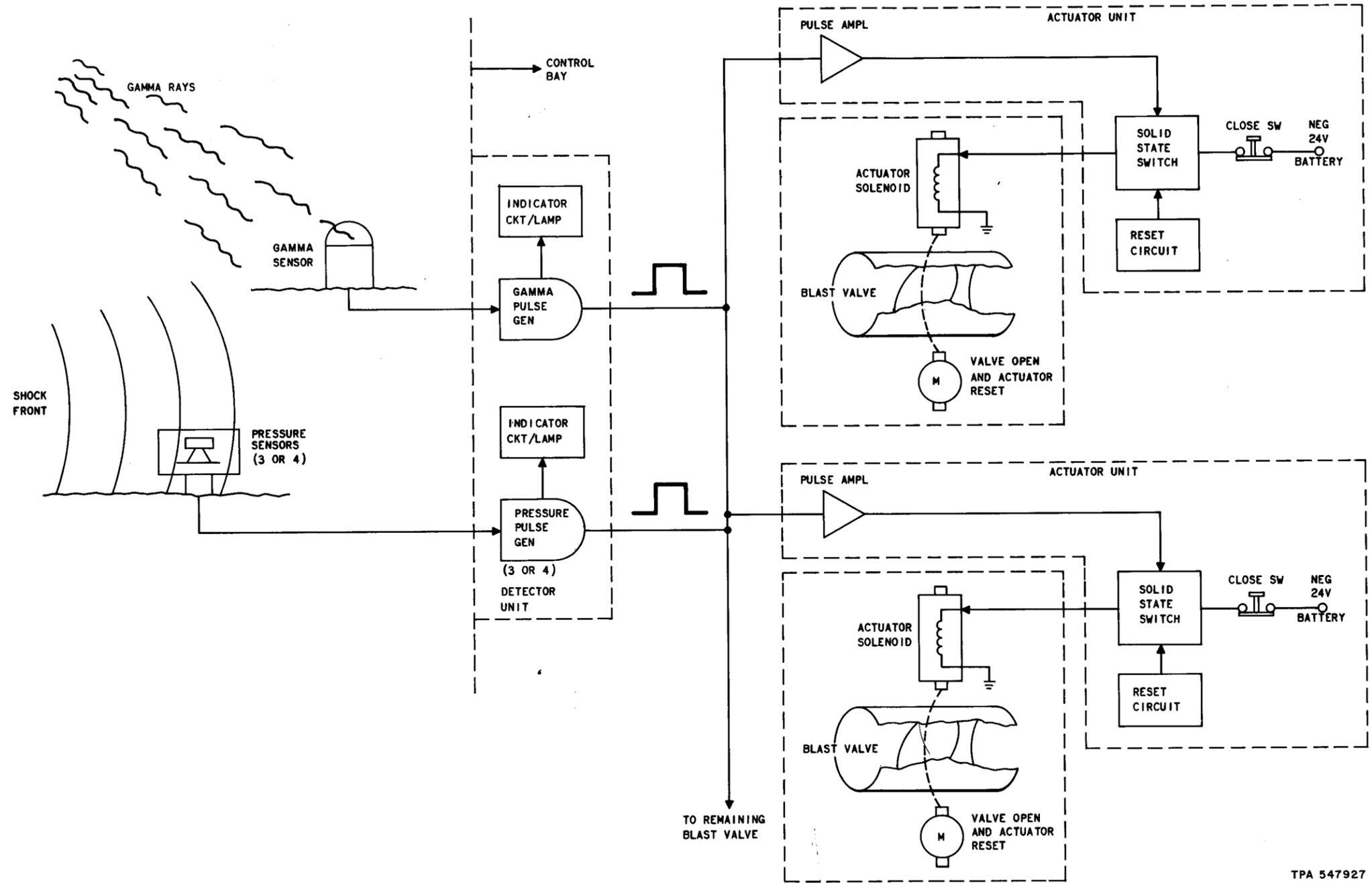
CODE OR SPEC NO.	DESCRIPTION
<b>TEST APPARATUS</b>	
—	Oscilloscope Tektronix Model 545A (or equivalent)
KS-14510	Volt-Ohm-Milliammeter
KS-20777	Tester (Pressure Switch)

## 3. OPERATION

### Description

**3.01 General:** A gamma sensor (KS-19557 detector, Section 480-325-101), mounted on a 6-foot pedestal, detects direct gamma radiation and

provides up to 2 minutes warning before arrival of a shock front (see Fig. 6). Nuclear detonations at or just above ground level may provide no direct gamma radiation on the sensor and radiation produced by scattering may not have the required energy content for detection. To overcome this possible blind condition in the sensing system, a KS-20485 pressure sensor is used to detect the oncoming shock front. Either three or four pressure sensors, depending on the building plot size, are mounted near the periphery of the area. The pressure sensors must be located at a minimum distance from the air shaft to allow the valves to be tripped and closed before the shock front arrives at the shaft and valves. By using solid state devices, the time interval between reception of a sensor signal and reduction of solenoid current to zero is 1.5 milliseconds for the butterfly-type valves and 0.06 millisecond for the louvered valve. The butterfly-type valve then closes in 50 to 90 milliseconds depending on the number of blades driven by each actuator, and the louvered valve closes in approximately 50 milliseconds. The blast valves can be opened electrically, provided certain conditioned are met, or in case of trouble conditions, the blast valves can be opened and closed manually.



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Fig. 6—KS-20267 Blast Valve Control System—Simplified Block Diagram

### 3.02 *KS-20368 Louvered Blast Valve and KS-20134 Ventilation Blast Valve; Operation:*

For normal operation, the blast valves are in the fully opened position. An open blast valve can be closed electrically either by depressing the CLOSED switch on the ACTUATOR panel or by a sensor trip signal from the gamma sensor of the over-pressure sensor. Immediately upon closing, the actuator reset mechanism on the blast valve resets itself in preparation for an open command. The blast valve can be opened electrically by depressing the OPEN switch on the ACTUATOR panel or remotely by telemetry at an unmanned station. Three conditions must be satisfied before the open command will be initiated.

- (a) All sensor indications must be reset if the blast valves were closed by a sensor trip.
- (b) If a gamma sensor trip closes the blast valve, a 3-minute (at manned stations) or a 30-minute (at unmanned stations) time delay from the gamma sensor unit must elapse before the "opening" is possible.
- (c) The mechanism which drives the blast valves open must reset itself; this is a function which is accomplished automatically immediately after the blast valve is closed. When these conditions are satisfied, the blast valves for ventilation, cooling, and turbine intake can be opened.

### 3.03 *KS-19992 Turbine Exhaust Blast Valve; Operation:*

The electrical operation of the KS-19992 turbine exhaust valve is slightly more complex, since the blast valve is also controlled by the operation of the turbine control circuit. If the turbine is not operating, turbine control of the blast valve is removed when the LOCAL CONTROL switch, on the ACTUATOR panel, is depressed. (The LOCAL CONTROL lamp is lit.) In this mode of operation, the operation of the blast valve is the same as that in 3.02. When local control is removed by depressing the LOCAL CONTROL switch again (the LOCAL CONTROL lamp is extinguished), the turbine control circuit has control to both open and close the exhaust blast valve. Before the turbine can open the exhaust blast valve, certain conditions must be met.

- (a) The intake blast valve for that turbine must be open.
- (b) The exhaust 3-minute coast-down time delay must have timed out.

- (c) The LOCAL CONTROL switch/indicator on the ACTUATOR unit must be in the remote position (LOCAL CONTROL lamp extinguished).
- (d) The actuator mechanism on the blast valve must be reset. This is a function which is accomplished automatically immediately after the blast valve is closed.
- (e) All sensor indicators must be reset if the blast valve was closed by a sensor trip.

When these conditions are satisfied, the blast valve is opened on command from the turbine control circuit. The blast valve is closed by the turbine control circuit after the turbine:

- (a) Has shut down.
- (b) The exhaust 3-minute coast-down time delay has timed out.

### Controls and Indicators

**3.04 *DETECTOR Unit:*** Combination switch/indicators on the front panel of the DETECTOR unit (Fig. 2) provide for status and operational functions of the detector circuit. The particular sensor signal initiating a blast valve closure is identified. Detector circuitry inhibits closing and opening of individual valves until certain conditions are satisfied. Information and control are supplied to the E-1 telemetry system for status of TRIP indicators and remote command of the DETECTOR RESET circuit. The function and status of the controls and indicators on the DETECTOR unit, shown in Fig. 2, are given in Table B.

**3.05 *ACTUATOR Unit:*** Combination switch/indicators on the front panel of the ACTUATOR unit provide for individual status and control of blast valves. The opening and closing of blast valves electrically is controlled from the ACTUATOR panel. Remote "open" commands are received through the E-1 telemetry system at unmanned stations. The status function or valve position is transmitted through the E-1 telemetry system of manned stations. A special circuit is available in each ACTUATOR unit for the KS-19992 exhaust turbine blast valve associated with the turbine exhaust system, which permits transfer of blast valve control from the turbine control console to the KS-20267 control unit. This circuit can be left inoperative for blast valves not associated with the turbine exhaust system. The function and

**TABLE B**  
**KS-20267 CONTROL UNIT**  
**CONTROLS AND INDICATORS**

COMPONENT	FUNCTION	NORMAL OPERATION STATUS
GAMMA DETECTOR TRIP PRESSURE DETECTOR ( ) TRIP (indicator lamps)	The indicator lamp lights upon a trip signal from discrete associated sensors. Each lamp remains lit until manually reset. The blast valve should trip closed.	OFF
DETECTOR RESET (switch/indicator)	The switch/indicator lamp lights automatically when any of the sensor TRIP lamps light. Depressing the switch causes the indicator and all sensor TRIP lamps to be extinguished. Any sensor TRIP lamp that does not extinguish indicates a sensor fault, and that sensor unit must be disabled in order to extinguish the DETECTOR RESET lamp. <i>When the DETECTOR RESET lamp is lit, associated circuitry inhibits the blast valve from being opened.</i>	OFF
GAMMA DETECTOR DISABLE (switch/indicator)	The switch/indicator provides for disabling the associated gamma sensor, either for fault or for sensor testing without blast valve closure. The indicator lamp is lit when the switch is depressed, when the gamma sensor circuit pack is removed, or when the fuse (associated with the circuit pack) located below the lamp is blown.	OFF
PRESSURE DET ( ) DISABLE (switch/indicator)	The switch/indicator provides for disabling the associated pressure sensor, either for fault or for sensor testing without blast valve closure. The indicator lamp is lit when the switch is depressed, when the pressure sensor circuit pack is removed, or when the fuse (associated with the circuit pack) located below the lamp is blown.	OFF
CLOSE CONTROL (key switch/indicator)	The indicator lamp lights when the associated key switch is in the ON position. This switch permits closure of individual valves by depressing the CLOSED switch on the appropriate ACTUATOR panel. When the key switch is in the OFF position and the indicator lamp is not lit, the CLOSED switch on the ACTUATOR unit is inhibited. This control prevents accidentally blast valve closure.	OFF

**TABLE B (Cont)**  
**KS-20267 CONTROL UNIT**  
**CONTROLS AND INDICATORS**

ACTUATOR UNIT (Cont)

COMPONENT	FUNCTION	NORMAL OPERATION STATUS
LOCAL CONTROL switch/indicator	The switch/indicator transfers control of a turbine exhaust blast valve from the turbine control console to the KS-20267 control bay. When, in the local control position, the LOCAL CONTROL lamp on ACTUATOR panels not as signed to turbine exhaust valves is lit, the switch is inoperative and can be covered.	OFF

status of the controls and indicators on the ACTUATOR unit, shown in Fig. 3, are given in Table B.

**Normal Operation**

**3.06 Opening and Closing the Blast Valves:**

The opening and closing of the KS-20368 louvered blast valve and the KS-20134 and KS-19992 butterfly-type blast valve is controlled from the KS-20267 control unit.

- (a) **Opening:** To open the blast valve electrically, momentarily depress the OPEN pushbutton on the associated ACTUATOR panel. The panel indicator lights should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			VALVE POSITION
	OPEN	CLOSED	RESET	
Closed	OFF	ON	ON	Closed Partially
Opening	OFF	OFF	OFF	Open
Open	ON	OFF	OFF	Fully Open

**Note:** If the blast valves are tripped closed by a gamma 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. The KS-19992 turbine exhaust actuators have an internal 3-minute delay before the valve can be opened electrically.

- (b) **Closing:** To close the blast valves electrically, operated the CLOSE CONTROL key switch, on the associated DETECTOR panel, to the ON position. Then, momentarily depress the CLOSED pushbutton on the associated ACTUATOR panel. The blast valve will slam shut immediately and the ACTUATOR panel indicator lamps should indicate the following sequence.

SEQUENCE	INDICATOR LAMPS			VALVE POSITION
	OPEN	CLOSED	RESET	
Open	ON	OFF	OFF	Fully Open
Closed	OFF	ON	OFF	Fully Closed
Reset	OFF	ON	ON	Fully Closed

**Note:** It takes approximately 30 seconds for the reset mechanism to complete the resetting sequence.

- (c) **Local Control of the KS-19992 Turbine Exhaust Blast Valve:** 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 (the LOCAL CONTROL indicator lamp will light). The opening and closing of the KS-19992 blast valve is then the same as in (a) or (b). After opening or closing the KS-19992 blast valve, momentarily depress the LOCAL CONTROL pushbutton to transfer the control back to the turbine control circuit (the LOCAL CONTROL indicator lamp is extinguished).

**Caution:** Do not leave the control of the turbine exhaust valve in the LOCAL CONTROL mode of operation. If the KS-19992 blast valve is closed, the gas turbine engine-alternator will not operate. Always transfer the control back to the gas turbine circuitry.

**3.07 Automatic Operation of the Blast Valves:**

The blast valves are held in the open position for normal operation. The blast valve actuator assembly is a spring-loaded actuator mechanism held in the retracted position by a trigger mechanism which in turn is held in place by an energized solenoid. In the event of a nuclear blast, the gamma sensors will transmit a close signal, or failing this, an overpressure sensor will transmit a close signal to the DETECTOR unit. The DETECTOR unit and ACTUATOR unit will then cause the solenoid circuit to open, releasing the trigger mechanism in the blast valve, causing the valve to slam shut immediately. In the event the sensor circuit fails, the blast valve will close when the blast wave passes over the valve blade, causing a torque on the valve blade shaft which overrides the trigger mechanism, causing the trigger mechanism to trip and the valve to slam shut. The reset sequence will occur automatically.

**3.08 Manual Operation of Blast Valves:**

Provision for manual operation of the blast valves is provided to open or close the blast valve in the event of a malfunction or to perform checks and adjustments. Detailed instructions for the manual operation of the KS-20368 louvered blast valve are provided in Section 770-225-309. Detailed instructions for the manual operation of the KS-20134 and KS-19992 butterfly-type valves are provided in Section 770-225-310. All warnings and cautions must be heeded while performing any work on or near the blast valves.

**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. 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.

**3.09 KS-19557 DETECTOR (Nuclear Blast):**

Refer to Section 480-325-101 for the operation of the KS-19557 detector.

**3.10 Removing a Sensor Unit or Detector Unit (CPI-1) From Service:**

In order to perform tests or repairs on a sensor unit, a DETECTOR DISABLE switch can be operated to isolate the sensor unit. In the event a detector circuit cannot be reset by the operation of the DETECTOR RESET switch, the DETECTOR DISABLE switch must be operated to disconnect the associated sensor circuit. This will allow the inhibit open circuit to be reset and the blast valves can then be opened.

**4. ROUTINE CHECKS**

**4.01 Functional Check:** The KS-20134, KS-19992, and KS-20368 blast valves should be cycled closed and open once each week to determine the operational status of each blast valve. Close and open each blast valve in accordance with the instructions in 3.06.

**4.02 Operation Test on the Blast Valve Control System:**

The KS-20267 control unit should be checked for a sensor trip and shutdown of the blast valves once each month. The tripping of the KS-20485 pressure sensor unit should be on a rotation basis, so that each pressure sensor is checked in turn. It is assumed in the following checks that all blast valves are in the operating mode and in the open position with all MANUAL OPERATION lamps extinguished. Proceed as follows.

- (1) Ensure that all blast valves are in the open position (OPEN lamp on the ACTUATOR units lights) and the manual solenoid override is deactivated (MANUAL OPERATION lamps are extinguished).
- (2) At the environmental enclosure for the KS-20485 pressure switch, remove the mounting nuts and remove the top cover.
- (3) Remove the plug from the pipe on the top cover of the KS-20485 pressure switch.

- (4) Mount KS-20777 tester (pressure switch) on the pipe on the top cover of the pressure switch.
- (5) Crank the center shaft of the KS-20777 tester (pressure switch) until the trigger mechanism locks.
- (6) Release the trigger mechanism (press the lower side of the trigger). The pressure tester will release to provide an overpressure of approximately 2 psi.

**Requirement:** The associated PRESSURE DETECTOR TRIP ( ) indicator lamp on the DETECTOR unit lights. All blast valves are tripped and slam shut immediately. The ACTUATOR panel indicator lamps indicate the following sequence:

SEQUENCE	INDICATOR LAMPS			VALVE POSITION
	OPEN	CLOSED	RESET	
Open	ON	OFF	OFF	Fully Open
Closed	OFF	ON	OFF	Fully Closed
Closed/ Reset	OFF	ON	ON	Fully Closed

**Note 1:** It takes approximately 30 seconds for the reset mechanism to complete the resetting sequence.

**Note 2:** The KS-20777 tester (pressure switch) provides approximately 2 psi of overpressure to operate the KS-20485 pressure switch. If the pressure switch fails to operate when the KS-20777 tester (pressure switch) is released, replace the KS-20485 pressure switch with a new unit and repeat the check. Return the defective KS-20485 pressure switch to the manufacturer for adjustments or repairs.

- (7) Remove the KS-20777 tester (pressure switch) from the KS-20485 pressure switch.
- (8) Install the plug in the KS-20485 pressure switch.
- (9) Install the cover to the environmental enclosure and tighten the mounting nuts.

- (10) At the KS-20267 control bay, momentarily depress the DETECTOR RESET switch/indicator on the DETECTOR unit.
- (11) Depress the OPEN switch/indicator on each ACTUATOR unit to reopen the associated blast valves.

**4.03 Blast Valve Closing Time:** The closing time of the individual blast valves should be checked semiannually. To check the closing time, proceed as follows.

- (1) Ensure that the blast valve to be checked is in the open position (OPEN lamp lit) and the manual solenoid override is deactivated (MANUAL OPERATION lamp is extinguished).
- (2) Operate the CLOSE CONTROL key switch to the ON position. The CLOSE CONTROL lamp lights.
- (3) If a KS-19992 turbine exhaust blast valve is to be checked, momentarily depress the LOCAL CONTROL switch/indicator to transfer control of the blast valve to the KS-20267 control unit. The LOCAL CONTROL lamp will light.
- (4) Set the oscilloscope control as follows.
  - Horizontal—50 Msec/cm
  - Vertical—20 volts/cm
  - Trigger—internal positive
- (5) Connect the ground lead of the oscilloscope to the GROUND pin jack on the associated ACTUATOR unit.
- (6) Connect the input lead of the oscilloscope to the TEST pin jack on the associated ACTUATOR unit.
- (7) While observing the oscilloscope presentation, **depress and hold** the CLOSED pushbutton on the associated ACTUATOR panel. The oscilloscope presentation should be similar to Fig. 7. Measure the closing time across the top of the pulse.

**Requirement:** The closing time should be less than the closing time given in Table C.

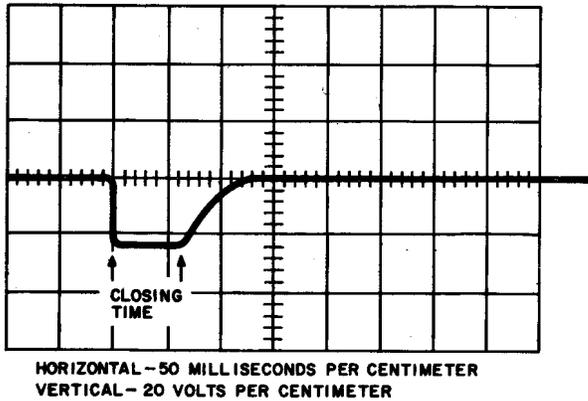


Fig. 7—Blast Valve Closing Time—Four Blade Butterfly Type Shown

TABLE C

BLAST VALVE CLOSING TIME

BLAST VALVE TYPE	CLOSING TIME (MILLISECONDS)
KS-19992 or KS-20134 (Butterfly)	
One Blade	50
Two Blades	70
Three Blades	80
Four Blades	90
KS-20368 (Louver)	50

- (8) Release the CLOSED pushbutton.
- (9) Disconnect the oscilloscope.
- (10) Momentarily depress the OPEN pushbutton on the ACTUATOR unit to open the blast valve (observe that the OPEN lamp lights).
- (11) Momentarily depress the LOCAL CONTROL switch/indicator. The LOCAL CONTROL lamp is extinguished.
- (12) Operate the CLOSE CONTROL key switch to the OFF position. The CLOSE CONTROL lamp is extinguished.

**4.04 KS-19557 DETECTOR (Nuclear Blast):**  
The KS-19557 DETECTOR unit should be checked once a week. Proceed as follows.

- (1) Operate the EMERGENCY VALVE CONTROL-MANUAL-AUTO key switch to the MANUAL position. The DETECTOR BYPASS lamp lights.

- (2) Push and hold the TEST switch.

**Requirement:** The TEST light should flash at approximately 1/2-second intervals.

- (3) Release the TEST switch.

- (4) Operate the EMERGENCY VALVE CONTROL-MANUAL-AUTO key switch to the AUTO position.

## 5. TROUBLES

**5.01** Trouble conditions which may affect the operation of the overall KS-20267 blast valve control system can usually be isolated to the following equipment.

- Sensor Units
- Detector Units
- Actuator Units.

**5.02** Troubles in a faulty sensor unit or detector unit may result in a complete shutdown of the ventilation system of the building and may also inhibit the reopening of blast valves from the KS-20267 control unit. If the trouble is isolated to an individual sensor unit or the detector unit, the circuit pack (CP1) can be isolated and removed from the control system by operating the DETECTOR DISABLE switch/indicator on the DETECTOR chassis. The remaining DETECTOR units can be reset by depressing the DETECTOR RESET switch/indicators and the blast valves can be opened by depressing the OPEN switch/indicator on the ACTUATOR units.

**5.03 Troubles in the Actuator:** Blast valve circuits can be isolated by switching the lower connector on an ACTUATOR unit to another blast valve actuator to determine if the trouble is in the blast valve or in the ACTUATOR chassis. If the blast valve fails to function with a known

good ACTUATOR unit, it can be assumed that the blast valve actuator circuit is defective.

**5.04** A faulty ACTUATOR unit or a defective blast valve or blast valve electrical circuit will not normally affect the rest of the ventilation system.

**5.05** If circuit packs are to be removed or replaced in either the DETECTOR chassis or the ACTUATOR units, the associated fuse should be removed. After the circuit pack is in place, reinstall the fuse.

**5.06** Use the finger tips to remove the front cover of the switch/indicators to gain access to the indicator lamps if replacement is necessary.

**5.07 *Trouble Chart:*** The following troubles pertain to the KS-20267 control unit and the associated pressure sensors. Troubles in the KS-20134 and KS-19995 blast valves are covered in Section 770-225-310 and troubles in the KS-20368 blast valve are covered in Section 770-225-309. Troubles in the KS-19557 detector (nuclear blast) are covered in Section 480-325-101.

TROUBLE	POSSIBLE CAUSE
(a) DETECTOR TRIP lamp remains lighted — DETECTOR unit fails to reset when DETECTOR RESET switch is operated. All blast valves remain closed.	(1) Defective sensor unit — defective switch in sensor unit (normally closed contacts between pins C and D on connector J3 are opened). (2) Open wiring between connector J3 and sensor unit. (3) Defective CP1-( ) in DETECTOR unit.
(b) Blast valve solenoid not energized when OPEN switch is depressed (blast valve trips closed).	(1) Blown PWR fuse on associated ACTUATOR unit. (2) Defective CP3-( ) in associated ACTUATOR unit. (3) Defective CP2-( ) in associated ACTUATOR unit. (4) Open wiring between blast valve solenoid and CP3-( ).
(d) Blast valves fail to trip shut when a KS-20485 pressure sensor unit is actuated (refer to 4.03).	(1) Defective micro switch in the pressure sensor unit. (2) Wires shorted between pins C and D on J3 connector. (3) Defective Q3 on CP1-( ) in associated DETECTOR unit. (4) Defective Q1 or Q2 on CP1-( ) in associated DETECTOR unit.
(e) Blast valves trip shut on a sensor trip signal (refer to 4.03), but DETECTOR trip lamp fails to light.	Defective Q1 or Q2 on CP1-( ) in associated DETECTOR unit.