BLAST DETECTOR FUNCTION DESCRIPTION

For Underground L-3 Coaxial Cable Bldgs.

Paris RS, Missouri

AMERICAN TELEPHONE & TELEGRAPH CO.
LONG LINES DIVISION
MIDWESTERN AREA

INDEX

Note: See Memorandum for Figures 5, 7, 10 and 14 and B995320

Memorandum KS 19557 Detector

Description

The KS 19557 Detector consists of two units connected with a special electrical cable as shown in Figure 1. The detection unit is mounted above ground in a blastproof shield capable of withstanding the environment in the vicinity of a nuclear blast. The electronics cabinet is located in the hardened underground facility and is wall mounted. The effects of radiation on the detection unit electronics is described in Item 2 of the Bibliography.

A block diagram of the detector is shown in Figure 2. When a gamma ray interacts with the plastic scintillation material in the detection unit, a flash of light is emitted. The light is detected by a photomultiplier tube which converts it to an electrical signal and then amplifies the signal. The photomultiplier feeds a pulse amplifier which acts as an impedance transformer to feed the cable. The signal is transmitted over the cable to the underground building, where it trips a monostable multivibrator. The multivibrator switches to its unstable state and deactivates the output relay. The relay then locks itself in this position. A pair of contacts on the relay open and are the output of the detector. The current rating of this contact is 2 amps for a non-inductive load. In the event of a D.C. power failure in the facility, the output relay contact will also open and remain open. The detector can be reset only after waiting approximately three minutes. This prevents resetting and opening the blast valves into the face of an approaching shock front. For an emergency or failure of the detection system, a key lock Emergency Valve Control switch is provided which will bypass the detector and allow opening of the blast valves at any time. The control circuitry provides a method of testing the operation of the electronics without affecting the output. A complete schematic (B-995320) of the electronics is shown in Figure 3.

Photomultiplier

The detection unit electronics are mounted on two printed circuit boards as shown in Figure 4. The large circular board (TB1) contains the 4441A photomultiplier tube with its associated bleader network, R1 to R11. This board is shown unpotted in the photograph; however, in use the board is potted. Figure 5 is the schematic of this board. The tapering voltage divider with the voltage increasing toward the final dynode provides best linearity. The cathode to first dynode voltage is high in order to provide an improved signal to noise ratio. The mu-metal shield provides both magnetic and electrostatic shielding for the photomultiplier tube. Since the cathode of the tube is deposited on the inside of the glass envelope, the glass tends to assume cathode potential. In order to avoid any discharge between the metallic shield and the glass envelope, the shield is operated at cathode potential.

Capacitors C1 to C11 bypass the voltage divider and supply the surges of current required by the dynodes without changing the bias voltages. The output is taken from dynode number 10 across the load resistor R12 and brought out to terminal E2.

The RCA 4441A photomultiplier tube has an anode sensitivity between 10 and 300 amps/lumen when measured at 1000 vdc across a divider providing 1/6th of the voltage between cathode and dynode #1, 1/12th of the voltage between each succeeding dynode and 1/12th of the voltage between dynode #10 and the anode. For use in the system, this variation is restricted by ordering tubes with an anode sensitivity between 10 and 50 amps/lumen when measured with the above voltage divider. The tubes are burned in for 150 hours to eliminate any initial sensitivity change. The complete photomultiplier board is then calibrated by measuring the anode current produced by a one microlumen light source with a wave length of 4000 angstroms.

The required anode sensitivity to be used is determined by the altitude of the station at which the detector is to be used. At altitudes above 4500 feet, a reduced anode sensitivity is necessary. This is due to an increase in cosmic radiation, which otherwise could produce false triggering, at these altitudes. Figure 6 shows the proper high voltage setting and value of R35 to provide an anode sensitivity of .043 amps/lumen for detectors below 4500 feet and .022 amps/lumen for detectors above 4500 feet.

Also mounted on the photomultiplier tube board is a neon lamp (DS1) and associated flashing network (C13, R13) which is used for testing the electronics.

Pulse Amplifier

The pulse amplifier is on the semicircular board (TB2) shown in Figure 4. It is a base and collector boot-strapped Darlington connected emitter follower amplifier as shown on the schematic in Figure 7. Inductor L1 and capacitors C14 and C15 provide a filter for the power supply. To prevent R16 from shunting the input impedance, capacitor C16 is used to bootstrap the base by feeding back the output voltage to the junction of the R16 and R17. R16 then has an equivalent A.C. resistance of

$$R_{eq} = \frac{R16}{1-Av}$$

where Av is the voltage gain from the base of Q1 to the emitter of Q2. The voltage gain Av is approximately 0.97; there, R16 has an equivalent A.C. resistance of 3.3 megohms.

In order to prevent the collector resistance of the transistor Q1 from shunting the input, it is also bootstrapped by feeding the output voltage back to the collector through the Zeiner diode CR1. This diode also provides the D.C. bias voltage for the collector of Q1.

The input impedance of the amplifier is approximately 500K ohms. The voltage gain when driven from a 10K ohm source is .97. The amplifier acts as an impedance converter to couple the high impedance output of the photomultiplier to the low impedance cable.

The photomultiplier and pulse amplifier electronics shown in Figure 4 are mounted inside the aluminum canister shown in Figure 8. The truncated cone at the left contains the plastic scintillation material. This aluminum canister is then mounted within an environmental shield.

Cable

The cable connecting the detection unit and the electronics cabinet is a special design cable consisting of two shielded twisted pairs and a coax within an outer silicon rubber sheath. The coax supplies the high voltage for the photomultiplier using the ground return in the signal pair. One shielded twisted pair carries the signal from the pulse amplifier and is the common ground return for all power. The second pair is for +24 volts and the test pulse. The conductor insulation is silicon rubber and can operate in a 200° C environment. The attenuation of the signal is less than 1 db for 500 feet of cable.

Monostable Multivibrator

The multivibrator acts as a pulse stretcher to stretch the short input pulse into a pulse long enough to control a relay. Figure 10 is a schematic of the monostable multivibrator. In normal operation, transistor Q3 is OFF and Q4 is ON. The collector of Q3 is at 23 volts. This voltage applied through R23 and Q5 keeps Q6 in the ON position. The coil of the output relay (K1) is connected between +24 volts and E2. Since Q6 is ON, the output relay is energized. When a positive pulse is applied to E3, Q3 turns ON, thus driving Q4 OFF. The collector of Q3 is then at +3 volts. This voltage is insufficient to keep Q6 ON. Q6 therefore, turns OFF and deactivates the output relay. The release time of the output relay is less than 5 milliseconds. The output relay then locks itself OFF. After 30 milliseconds, capacitor C20 charges sufficiently to turn Q4 back ON. Q3 then turns OFF and the circuit is back to its stable state. Diodes CR2, CR4, CR7 and resistors R26, R25, determine the input voltage level at which Q3 will turn OFF. The multivibrator will switch to the unstable state with a 3.8 volt input pulse. Diode CR5 prevents the base to emitter diode of Q4 from breaking down under the high reverse bias produced in the switching transient. The multivibrator is mounted in the electronics cabinet behind the panel marked TB3 as shown in Figure 11. Figure 12 shows the multivibrator wave shapes when triggered by a 1/2 microsecond 4 volt pulse.

Control Circuitry

Figure 13 shows the control panel on the electronics cabinet and Figure 14 is a schematic of the control circuitry. When power is applied, transistor Q6 is energized by the multivibrator. This holds one end of relay K1 at ground potential. The TEST light comes on and the time delay relay K2 begins timing. After three minutes, relay K2 pulls in, thus closing contact K2-1. The RESET switch S3 contacts 1.2 are jumpered, permitting relay K1 to pull in automatically thereby closing contacts K1-1, K1-2 and K1-4 and opening contacts K1-3 and K1-5. Contact K1-2 holds K1 energized when relay K2 is released. The opening of K1-3 causes the TEST light to go out while the closing of K1-1 produces continuity between the output terminals.

In the event of a nuclear explosion, Q6 turns OFF, thereby deactivating K1. Contact K1-1 then opens, breaking continuity between the output terminals. The TEST lamp lights through the closed contact K1-3 and the reset time delay relay K2 begins timing. Contact K1-2 is open, thereby preventing relay K1 from becoming energized when Q6 turns back ON. After a time delay of three minutes for K2, the circuit will automatically reset.

The Emergency Valve Control switch is normally in the AUTO position. When this switch is put into the Manual position, it lights the Detector Bypassed Light and guarantees continuity between the output terminals.

Self Testing

Self testing is accomplished by flashing a neon lamp in the detection unit to simulate the light output of the scintillation material. In this manner, everything except the scintillation material is tested.

The neon lamp flashing circuit is shown in Figure 15. The flashing of the lamp is controlled by R13 and C13. Capacitor C13 charges through R13 until the capacitor voltage is sufficient to flash the neon lamp. R38 and C28 are used to limit the rise time of the 150 volt pulse caused by closing the TEST switch. This is to prevent crosstalk between the lead carrying this pulse and other circuits. Resistor R36 discharges C28 after the Test Switch is opened and prevents C28 from discharging through R13 and C13 and causing the neon lamp to flash again after the TEST switch is open. The neon lamp used (NE-86) contains a radioactive additive to produce a uniform flashing voltage in a dark environment.

In normal operation, relay K1 is energized and all other relays are deactivated, see Figure 14. Under these conditions, pushing the TEST switch does two things. First, it activates relay K3 through the closed contact K1-4. Contact K3-1 then closes, guaranteeing output continuity, while the closed contact K3-2 keeps voltage applied to relay K1. Second, the TEST switch applies voltage to flash a neon lamp in the detection unit. The time required to charge the capacitor in the flashing circuit guarantees that K3 is pulled in before the lamp flashes. The light flash is detected by the photomultiplier tube which in turn, shuts off transistor Q6. Relay K1 therefore, drops out and K1-3 closes, lighting the TEST lamp. After 30 milliseconds, Q6 turns ON, pulling in relay K1 and turning the TEST lamp off. This process is repeated as the capacitor recharges and again flashes the neon lamp. When relay K1 drops out, the opening of contact K1-4 causes K3 to release. However, the contacts on K3 stay closed for a 1-second time delay. Since Q6 turns back ON in 30 milliseconds, relay K3 is reactivated before its contacts open. The TEST lamp continues to flash as long as the TEST switch is held. When the TEST switch is released, contact K1-1 may be in either position (open or closed). However, K1-1 will close within 30 milliseconds due to Q6 automatically turning on within that time. The delay of one second in the opening on contact K3-1 guarantees that output continuity is maintained.

Power Supply

The detector is designed to operate from 24 volt D.C. negative battery. The unit draws approximately 0.9 amps.

FL1 is an input filter used to clean up the input D.C. voltage and to attenuate voltage feedback to the D.C. input line due to the switching action of the D.C. to D.C. converters. DD2 is a 24 volt D.C. to D.C. converter, the purpose of which is twofold, (1) to provide +24 volts regardless of the polarity of the input and (2) to provide additional isolation between the line and the 24 volts used in the detector. Resistor R37 guarantees that the converter is never operated at less than 10% of rated load. Jumpers on TS3 from terminal 1 to 3 and from 2 to 4 make the required connections for the negative 24 volt supply voltages.

Converter DD1 produces the high voltage necessary to operate the photomultiplier tube. The output voltage of the converter is variable from 930 to 1040 volts D.C. Resistor R35 limits the transient shock current in the event personnel come in contact with the high voltage. R35 is also used to provide additional attenuation of the high voltage if required by the photomultiplier tube. Resistors R27, R28 and R29 are a voltage divider which produce the voltage required to flash the neon lamp and also provide a test point (TP1) to check the operation of the high voltage converter. The test point voltage is 0.161 times the high voltage supplied to the photomultiplier tube. All the high voltage components are located in an enclosed compartment in the upper left hand corner of the electronics cabinet, as shown in Figure 11.

Conclusions

Testing was performed to verify the minimum radiation level at which the detector would operate. A 600 KV X-ray machine provided a pulsed gamma ray source. The detector with the present gain settings was capable of detecting doses less than 1 rad/sec. supplied as 0.2 microsecond pulse.

In order to determine the number of false hits due to cosmic radiation, three field trial models, in the production configuration, have been built and installed in Long Lines facilities at Airmont, New York, Flagstaff, Arizona and Kingman, Arizona. The detector at Airmont was installed March 10, 1965 and the two in Arizona on May 11 and 12, 1965.

The KS 19557 Detector is presently being manufactured by Regulators Incorporated, under contract to the Western Electric Company.

HWO

August 25, 1966

KS-19557 DETECTOR

(NUCLEAR BLAST)

DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the KS-19557 Detector intended for use at any hardened communications facility to provide warning of the detonation of a nuclear device prior to the arrival of the associated shock wave.

1.02 The detector basically consists of a radiation sensitive detection unit installed in a blastproof enclosure above ground level with the associated electronic equipment installed in a hardened facility below ground level. The detection unit and associated electronic equipment are connected by signal lines and dc power lines enclosed in one specially designed cable.

1.03 The KS-19557 Detector is designated list numbers 1 through 16 and 28 through 43. The list number to be used at any given facility is determined by the available dc supply voltage, whether the electrical equipment cabinet is to be wall or rack mounted, whether the facility is manned or unmanned, and whether the facility is situated above or below an elevation of 4500 feet. Each of the list numbers 1 through 16 and 28 through 43 identify a complete detection system. List numbers 17 through 27 and 44 through 47 identify the components of the system. List numbers 1 through 16 are for use at facilities located below 4500 feet in elevation and list numbers 28 through 43 are for use at facilities located above 4500 feet in elevation. List numbers 44 through 47 are special electrical equipment cabinets that are used in the high elevation detection systems of list numbers 28 through 43. All other components are interchangeable for high or low elevation systems.

1.04 The detector operates on power supplied by the facility batteries which prevent loss of protection provided by the detector should commercial power fail. The detection system is designed to operate on any one of the following: +152V dc, +130V dc, +48V dc, −48V dc, +24V dc, or −24V dc. For voltages other than ±24V dc, a separate voltage regulator unit is provided as a part of the detection system.

1.05 The electrical equipment cabinet can be mounted either in a 19-inch or larger equipment bay or on a wall. If mounted in the bay, shock mountings are not required on the electrical equipment cabinet since the entire equipment bay will be shock mounted in accordance with standard hardening procedures. For wall mounting, a special bracket with shock isolators is used.

1.06 For manned facilities, the detector is designed for manual reset after triggering. A three-minute time delay on reset is incorporated to prevent opening the blast valves as a shock wave is approaching. For unmanned facilities, automatic reset, after a 30-minute delay, is provided. For both manned and unmanned facilities, a key lock switch is provided to bypass the entire detector system allowing the blast valves to be opened if they have closed due to a failure in the detection equipment and also to allow the blast valves to be opened in an emergency. The key lock switch is designed so the key cannot be removed when the switch is in the MANUAL (by-pass) position but can be removed with the switch in the AUTO position. Under normal operating conditions the key should be removed from the switch to prevent the detection system from inadvertently being bypassed.

2. DESCRIPTION

2.01 The KS-19557 Detector is a nuclear explosion detection system activated by the gamma radiation pulse released by the detonation of a nuclear device. The detection system consists of a detection unit, an electrical equipment cabinet, and a connecting cable.

2.02 The detection unit (Fig. 1) is shock mounted within a shield assembly (Fig. 2) which is shock mounted above ground. The detection unit and shield assembly are designed to withstand repeated blast overpressures of 50 pounds per square inch. The shield also provides adequate insulation to prevent high temperatures from damaging the scintillation plastic in the detection unit. The scintillation plastic can withstand temperatures up to 60°C for extended periods; however, the temperature of the plastic must never exceed 70°C.

2.03 Activation of the detection unit is caused by a gamma radiation pulse. The radiation pulse reacts with the scintallation plastic producing a light pulse which is picked up by a photomultiplier tube. After converting the light pulse to an electronic pulse, the tube and associated printed circuit board components amplify the signal and send it to the electrical equipment cabinet (Fig. 3) where an output relay is deactivated.

2.04 When the output relay opens, devices (blast shields, alarms, etc.) connected to the detection system will operate to protect the facility. A fail-safe system is provided to ensure operation of the devices, should a dc power failure occur. The contact on the output relay is rated at a continuous 2-ampere resistive load at 250V dc.

2.05 The general location of the components of the KS-19557 Detector is shown in Fig. 4 which depicts a typical hardened communications facility. Detailed installation information for the detector is given in KS-19557 Nuclear Blast Detector Installation Drawing, B-995326.

Fig. 1 — Detection Unit

Fig. 2 — Upper and Lower Shield Assembly

3. OPERATION

3.01 The following controls are provided on the front panel of the electrical equipment cabinet:

(a) ON-OFF switch — Controls all power to the detector.

(b) RESET switch — Following the proper time interval, resets the circuit after it has been tripped.

(c) TEST switch — Provides circuit test.

(d) TEST light — Flashing light when TEST switch is operated indicates proper functioning of detector. Continuous operation of the light indicates detector has tripped.

(e) EMERGENCY VALVE CONTROL, MANUAL-AUTO — A key lock switch that is operated to the AUTO position for normal operation. In the MANUAL position, the detector is bypassed ***and is no longer protecting the facility.***

(f) DETECTOR BYPASSED light — When lighted, indicates detector is bypassed.

(g) Indicating fuse — When operated, indicates overload or short circuit in equipment.

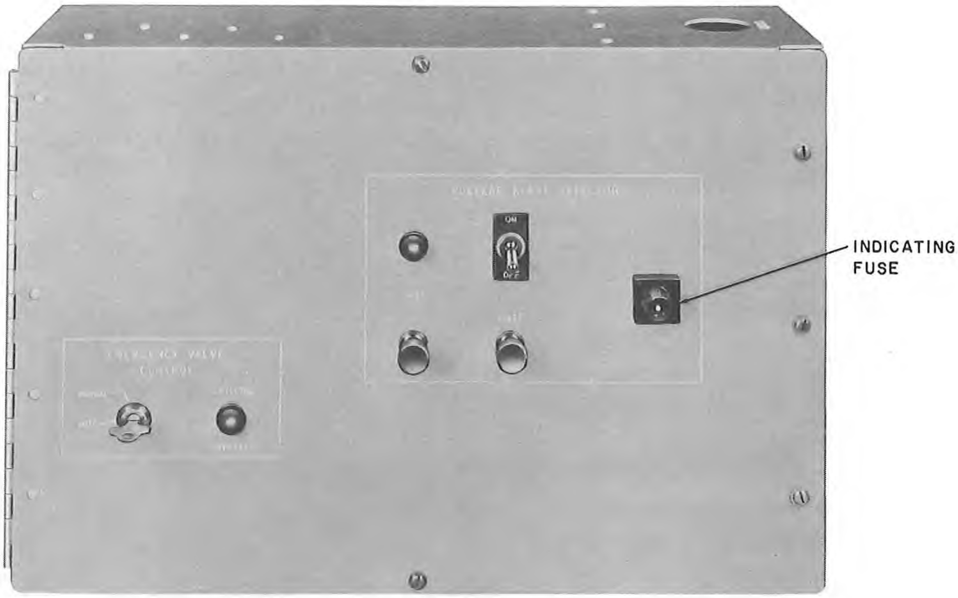


Fig. 3 — Electrical Equipment Cabinet

3.02 *Operational Test on Detector System after Installation:*

(1) Test is to be performed prior to the attachment of station equipment that is to be detector controlled.

(2) Check to be sure B-995325 cable connecting the electrical cabinet to the detection unit is properly connected.

(3) Install the proper fuses in the electrical equipment cabinet and in the facility power distribution board at the designated location.

(4) EMERGENCY VALVE CONTROL switch should be in the AUTO position.

(5) Operate the detector ON-OFF switch to the ON position. The TEST light should light and glow continuously.

(6) After approximately 3 minutes, on most models, push the RESET switch. The TEST light should go out. In detectors wired for automatic reset, this step will be performed automatically by the equipment after a 30-minute interval rather than the 3-minute interval.

(7) Push and hold TEST switch. The TEST light should flash at approximately 1/2-second intervals.

(8) Operate the EMERGENCY VALVE CONTROL key lock switch to the MANUAL position. The DETECTOR BYPASSED light should light. Return the switch to the AUTO position.

(9) Station equipment may now be attached to the detector output.

4. TROUBLESHOOTING

4.01 Operate detector ON-OFF switch to the ON position. The TEST light should glow continuously. If it does not light, there is no power to the detector, the fuse is open, or the bulb is burned out.

4.02 Wait approximately 3 minutes then push RESET switch. (On the appropriate model, a 30-minute wait will be required). If the detector fails to reset or if the TEST fails [see 3.02 (7)] after resetting is accomplished, proceed to the following steps:

(1) Keep the power on the detector.

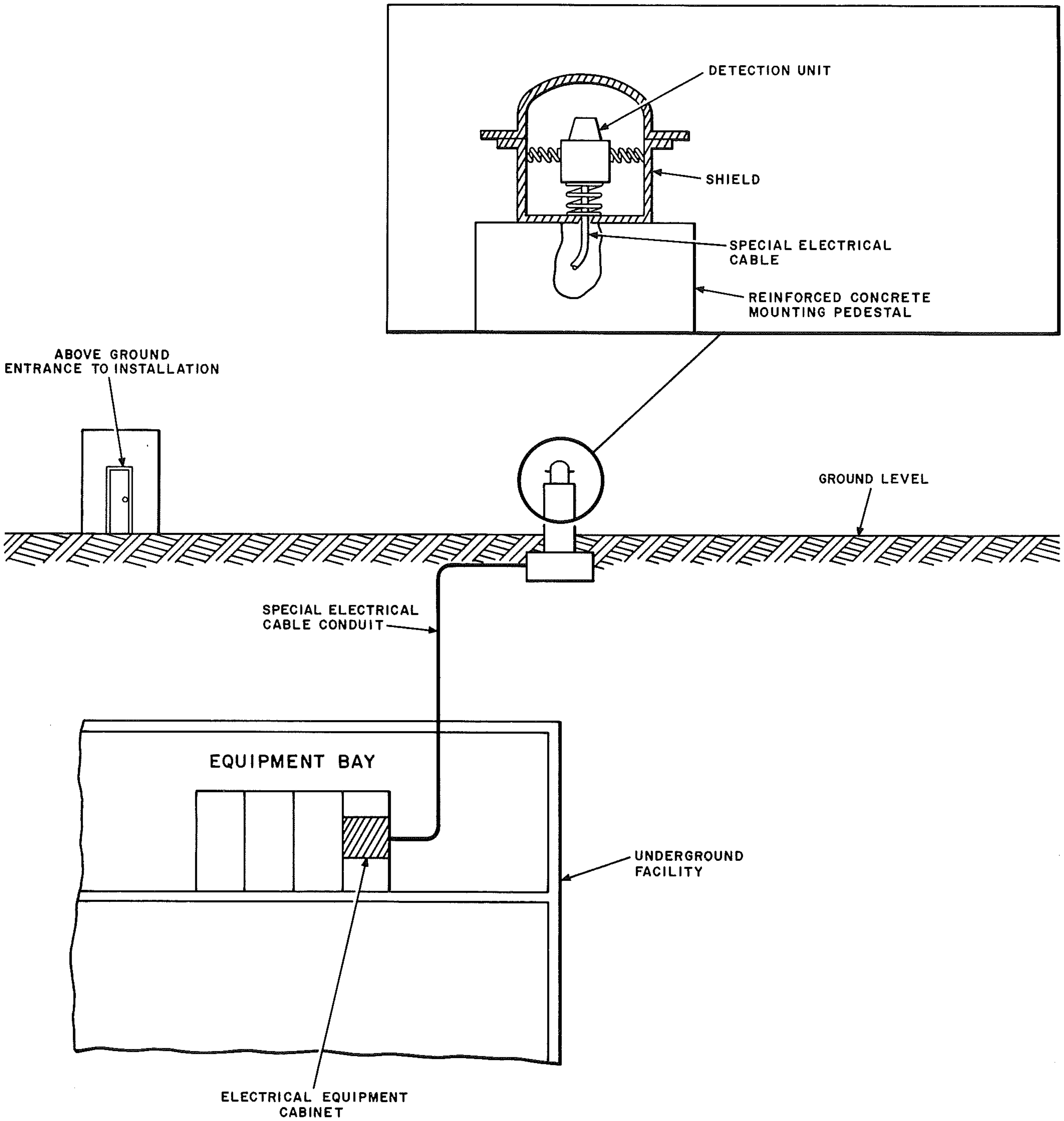


Fig. 4 — Typical KS-19557 Detector Installation

(2) Set a VOM or VTVM to measure +24V dc.

(a) Connect the positive lead to TS2 terminal 1. Connect the negative lead to the chassis. If the voltage is 21 to 28 volts, the proper power is reaching the detector input.

(b) Move the positive lead to TS1 terminal 1. The voltage should be 22 to 26V dc.

Note: If the voltages [Steps (2) or (3)] are incorrect,disconnect the cable that goes to the detection unit and remeasure the voltages. If the proper readings are then present, the cable, its connectors, or the detection unit are at fault.

(3) Set a VOM to the 250V dc scale. Connect the negative lead of the meter to TP1 located on the side of the high voltage compartment. Connect the positive lead to the chassis. For detectors designed for high elevation use, the meter should indicate between 119 to 137V dc. Voltages for all other detectors should be between 121 to 152V dc. The voltage for a given detector system is determined by the detection unit. One specific voltage is required for each detection unit [see 6.28 (5)]. If the meter indication is correct, the proper high voltage is being generated.

(4) Set a VOM to measure —130V dc. Connect the negative lead to the lower terminal of resistor R38. Resistor R38 is located on the bracket next to switch S4, on the inside of the front panel. It is the resistor farthest away from the switch. Connect the positive lead to the chassis. Depress the TEST button. The meter should indicate greater than 90V dc.

4.03 If the tests in 4.01 and 4.02 are satisfactorily completed and an oscilloscope is available, perform the following:

(1) Set oscilloscope as follows:

Horizontal — 100 μsec/cm

Vertical — 5 volts/cm

Trigger — internal positive

(2) Connect the ground lead to the chassis and the input lead to TB3 terminal E3.

(3) Depress and hold the TEST switch. The observed pulse should be at least 3.5V dc. If this pulse is present, the detector trouble is probably in the multivibrator circuit or the output relay (K1). If this pulse is not present, the trouble is in the cable or connectors to the detection unit or the detection unit itself.

5. MAINTENANCE OF ENVIRONMENTAL SHIELD

5.01 For the detector to function properly should a nuclear explosion occur, the flame sprayed aluminum surfaces of the environmental shield must be kept clean.

5.02 The flame sprayed aluminum surfaces may be cleaned with soap and water and a soft bristled brush. Under no circumstances should these surfaces be given an organic finish.

6. PROCEDURE FOR DETECTION UNIT REPLACEMENT

6.01 Should it become necessary to replace a detection unit, ***the operating voltage required by the new unit should be recorded.*** The required operating voltage is stamped on the side of the detection unit directly below the serial number. The high voltage converter located in the electrical equipment cabinet must be adjusted to the new voltage prior to the use of the detector system. Since each detection unit has a different voltage requirement, it is imperative that the proper adjustment be made as covered in 6.28.

6.02 ***List of Tools and Materials Required for Detection Unit Replacement:***

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
R-2812	3/16-Inch Allen Wrench
R-1060	Putty Knife
—	1-1/8 Inch Socket Wrench
—	Ratchet Wrench
—	6-Inch Screwdriver, Captive Type (see note)
—	Automobile Bumper Jack
—	P Long-Nose Pliers

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	Torque Wrench (capable of measuring 106 foot pounds)
—	Wood Blocks 3- by 1- by 1/4-inch thick (approximately) 2 required.
	Note: If a captive type screwdriver is not available use a 6-inch C screwdriver and a 606 Screw-Starter.
MATERIALS	
—	Heavy gauge plastic, cardboard, or other similar material to be used for padding on the lifting jaw of the bumper jack. Also, a large enough piece of the same material to be placed on the ground and used as a mat to protect the flame sprayed surface of the upper shield from chipping after it has been removed.
—	EC-1020 Sealer, Minnesota Mining and Mfg. Co., St. Paul, Minn.
—	8451 "O"-Ring, 15.50-inch O.D., Minnesota Rubber Co., Minneapolis, Minn. or Parker Seal Co. equivalent.
—	Protect-Sorb 121 Silca Gel, two 8-unit Lantuck Bags, Davison Chemical Co., Baltimore, Maryland.

REMOVING THE DETECTION UNIT

6.03 Remove the twelve 3/4-inch bolts.

6.04 Place a protective pad under one of the four handhold lugs of the upper shield and emplace the bumper jack with its lifting jaw under the lug.

6.05 Slowly jack up the upper shield until there is enough clearance to emplace the wooden blocks.

6.06 Remove jacks.

Caution:* *When handling the upper shield exercise care to prevent chipping the flame sprayed surface. The shield cannot function properly under nuclear blast conditions unless its surface is clean and free from defects.

6.07 Partially lift out the upper shield and detection unit assembly and rest it at an angle in the lower shield to allow removal of the cable through the 4-1/2 inch hole in the bottom of the inner container. If properly placed, the operator should be able to see the connectors through the hole. Disconnect the two connectors and the ground wire.

6.08 Lift out the upper shield and detection unit assembly, invert, and place on the protective mat.

6.09 Remove the 15.50-inch "O"-ring and discard.

6.10 Remove silica gel packets. They can be reactivated for later use or discarded.

6.11 Clean off the majority of the EC-1020 with a putty knife.

6.12 Through the hole in the bottom of the inner container, remove the five screws holding the detection unit to the 5-inch diameter spring. Save the screws.

6.13 Remove and save the 12 socket head screws from the upper shield, then remove and invert the inner container.

6.14 Release the 6 springs by applying the long-nose pliers on the loop at the detection unit end of the spring. Use care so as not to crush the insulation since it is easily damaged.

6.15 Remove detection unit. Do ***NOT*** lift using scintillator cone.

REPLACING THE DETECTION UNIT

6.16 Place the detection unit on the large spring properly oriented so the 8-pin connector is located next to the spring plate cutout.

6.17 Engage the 6 springs.

6.18 Place the inner container carefully on its side and secure the detection unit to the

5-inch diameter spring using the screws removed in 6.12.

6.19 Place the inner container on the inverted upper shield and attach it with the 12 socket head screws. Two 1/4-20 setscrews placed 180 degrees apart can be used to orient the container for easier assembly. They need not be removed if their height is equal to or less than the head height of the socket screws they replace.

6.20 Place a new 15.50-inch diameter "O"-ring in the groove on the lower shield.

6.21 Place the EC-1020 sealant on the lower shield.

6.22 Position the assembly at an angle as in 6.07 and attach the ground wire and connectors.

6.23 Remove the two 8-unit silica gel bags from their foil wrap and place in the bottom of the lower shield in the well created by the lower mounting ring.

6.24 Check the EC-1020 unit placement.

6.25 Lower the upper shield assembly carefully into the lower shield orienting the bolt holes properly. Once the two surfaces meet with the entire weight of the upper shield it will be impossible to reorientate them without again using the bumper jack as a lifting aid. (EC-1020 may also have to be replaced.)

6.26 Tighten the 3/4-inch bolts to 106 foot pounds of torque.

6.27 Check to be sure that the EC-1020 has squeezed out uniformly all around flange. Surface areas of the flange, which are not coated with the sealant, will rust since they contain no other protective coating.

ADJUSTING THE HIGH VOLTAGE CONVERTER

6.28 After replacing a detection unit, adjustment of the high voltage converter in the electrical equipment cabinet is necessary. The method of adjusting the high voltage converter is given in the following steps:

(1) Operate the ON-OFF switch on the front panel to the OFF position.

(2) Remove fuse from the front panel.

(3) Remove the screws and open the front panel.

(4) Remove the screws from the high voltage compartment cover located in the upper left hand corner of the electrical equipment cabinet, and remove the cover. The high voltage compartment is illustrated in Fig. 5.

(5) Refer to the correct detection unit voltage as stamped on the new unit. In some instances adjusting the electrical cabinet high voltage may require changing resistor R35. Check the value of R35. The following list shows values for R35 based on the required detection unit voltage and the limits of the high voltage converter.

R35 IN OHMS	DETECTION UNIT VOLTAGE
56,000	740 through 830
33,000	830 through 910
10,000	910 through 960

If necessary, change resistor R35.

(6) Remove the cap from the adjusting screw of DD1.

(7) Push out the adjusting hole plug in the right side of the compartment.

(8) To determine the correct voltage at TP1, multiply the high voltage required by the detection unit by 0.161. For example, a detection unit requiring 850V dc will produce a test point reading of 137V dc. Set the meter accordingly. Connect the negative lead of a DC Voltmeter to TP1. Connect the positive lead to the chassis.

(9) Insert an insulated tool through the hole in the right side of the compartment and into the alignment screw in DD1. The tool should have a 1/8-inch wide screwdriver type end.

(10) Replace the high voltage compartment cover in order to engage the interlock.

(11) Replace the front panel fuse.

(12) Operate the ON-OFF switch to the ON position.

(13) Adjust DD1 by turning the insulated tool slowly until the meter indicates the correct test point voltage. (Turn clockwise to increase voltage.)

(14) Operate the ON-OFF switch to the OFF position.

(15) Remove high voltage compartment cover and replace the cap on the adjusting screw in DD1.

(16) Replace the plug in the side of the compartment.

(17) Replace the high voltage compartment cover.

(18) Replace the front panel.

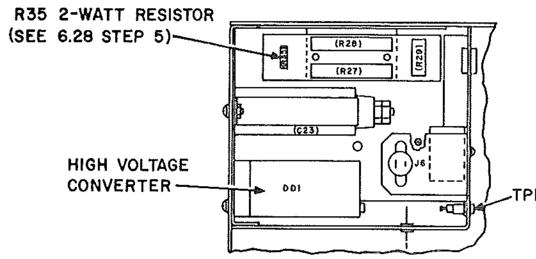


Fig. 5 — High Voltage Compartment — Cover Removed

7. SCHEMATIC AND WIRING DIAGRAM

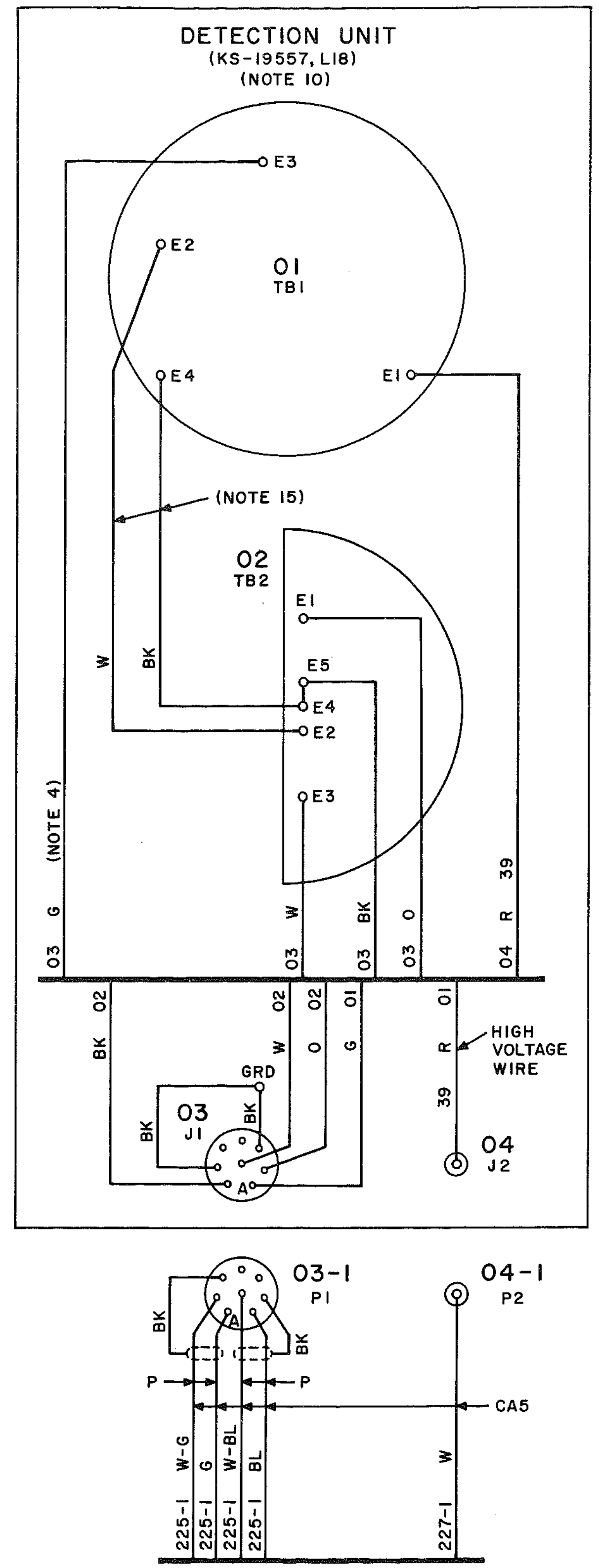
7.01 Fig. 6 and 7 give the schematic and the wiring diagram for the KS-19557 Detector, respectively.

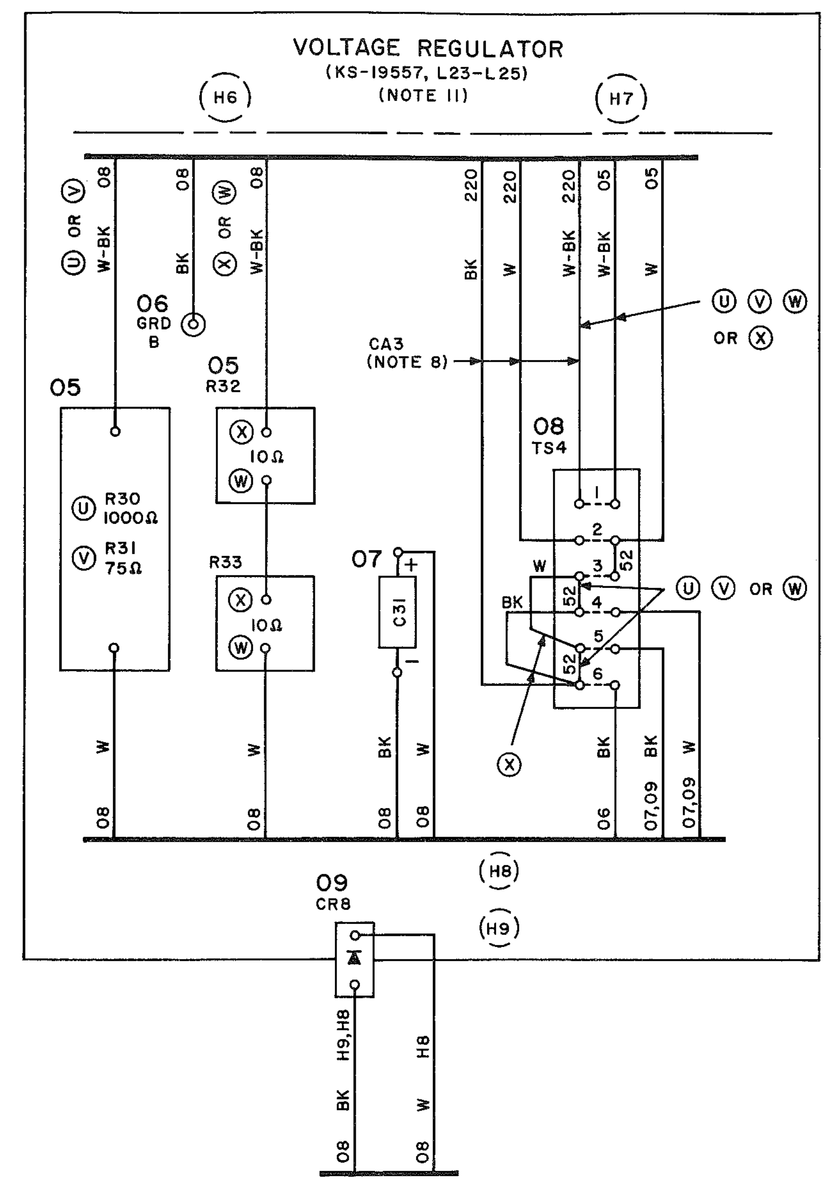
NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS. INDUCTANCE VALUES ARE IN MILLIHENRIES.
2. SEE STOCK LIST OF ASSEMBLY DRAWINGS B-876946 FOR INFORMATION CONCERNING COMPONENTS REFERRED TO BY REFERENCE.
3.

FEATURE OR OPTION		PROVIDE		
		FIG.	APP OR FIG.	QUANTITY
MANUAL RESET		1	S	1 PER CKT
AUTOMATIC RESET			T	
AVAILABLE INPUT VOLTAGE AT INSTALLATION	+152V		U	1 PER CKT MFR SUPPLIED, PROPER CONN TO BE MADE AT INSTALLATION
	+130V		V	
	+48V		W	
	−48V		X	
	+24V		Y	
	−24V		Z	

Fig. 6 — KS-19557 Detector (Nuclear Blast) — Schematic Diagram





NOTES:

1. ITEM NUMBERS AND REFERENCE DESIGNATIONS SUCH AS C1, CA1, R1 ETC. REFERRED TO ARE SHOWN IN STOCK LIST OF ASSEMBLY DRAWINGS B-876946, B-995280, B-995281, B-995285, B-995294, B-995297 AND B-995327.
2. ALL WIRING NOT IN CABLE SHALL BE DRESSED AGAINST MOUNTING SURFACE.
3. P—PAIR
4. LENGTH OF WIRE SHALL NOT EXCEED 5.50 INCHES.
5. PT-LEADS FURNISHED WITH COMPONENT.
6. (H1, H2) ETC-WIRES RUN THROUGH CORRESPONDING DESIGNATED HOLES.
7. ( ) - SHIELD CONNECTION.
8. WIRES DESIGNATED AS (CA3) SHALL BE CONNECTED DURING INSTALLATION. SITE TO SUPPLY 22 AWG WIRE.
9.

FEATURE OR OPTION		PROVIDE		
		FIG.	APP OR FIG.	QUANTITY
MANUAL RESET			S	1 PER CKT
AUTOMATIC RESET			T	
AVAILABLE INPUT VOLTAGE AT INSTALLATION	+152V	1	U	1 PER CKT MFR SUPPLIED, PROPER CONN TO BE MADE AT INSTALLATION
	+130V		V	
	+48V		W	
	−48V		X	
	+24V		Y	
	−24V		Z	

10. UNLESS OTHERWISE SPECIFIED ALL WIRING IN DETECTION UNIT KS-19557, L18 SHALL BE ITEM 34.
11. UNLESS OTHERWISE SPECIFIED ALL WIRING IN VOLTAGE REGULATOR KS-19557, L23-L25 SHALL BE ITEM 49. ALL CONNECTIONS TO TS4 SHALL TERMINATE WITH ITEM 54.
12. UNLESS OTHERWISE SPECIFIED ALL WIRING IN ELECTRONIC EQUIPMENT CABINET KS-19557, L19-L22 SHALL BE ITEM 118. ALL CONNECTIONS TO TS2 AND TS3 SHALL TERMINATE WITH ITEM 138.
13. ITEM 136 SHALL BE USED ON ALL COMPONENT LEADS OF L3.
14. ITEM 134 SHALL BE USED ON ALL COMPONENT LEADS OF CR6.
15. KEEP THESE LEADS AS SHORT AS POSSIBLE.
16. LEADS TO C23 SHALL TERMINATE WITH ITEM 139.
17. TERMINATE SHIELDS USING ITEMS 118, 140 AND 141.

Fig. 7 — KS-19557 Detector (Nuclear Blast) — Wiring Diagram (Sheet 1 of 2)

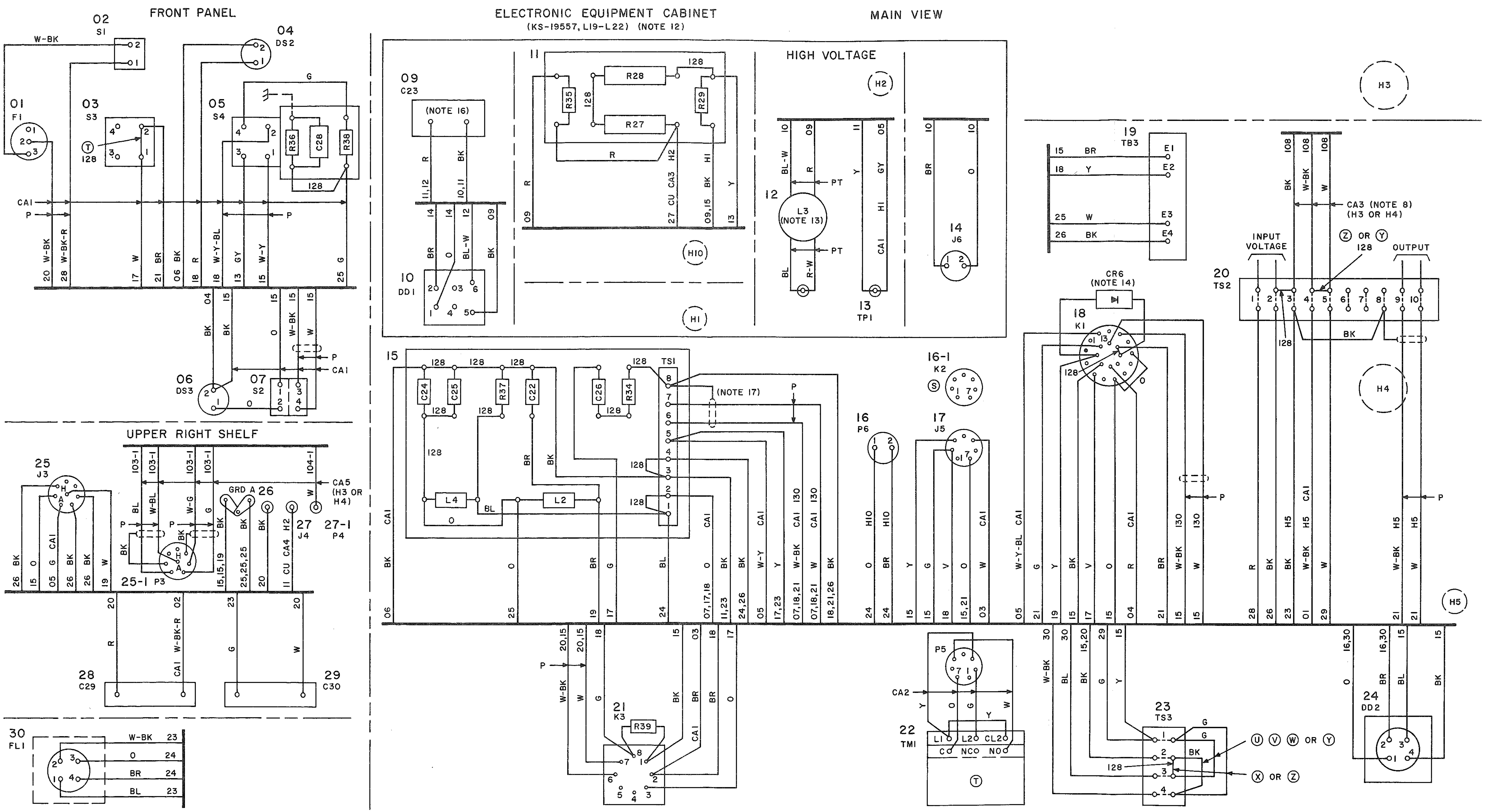
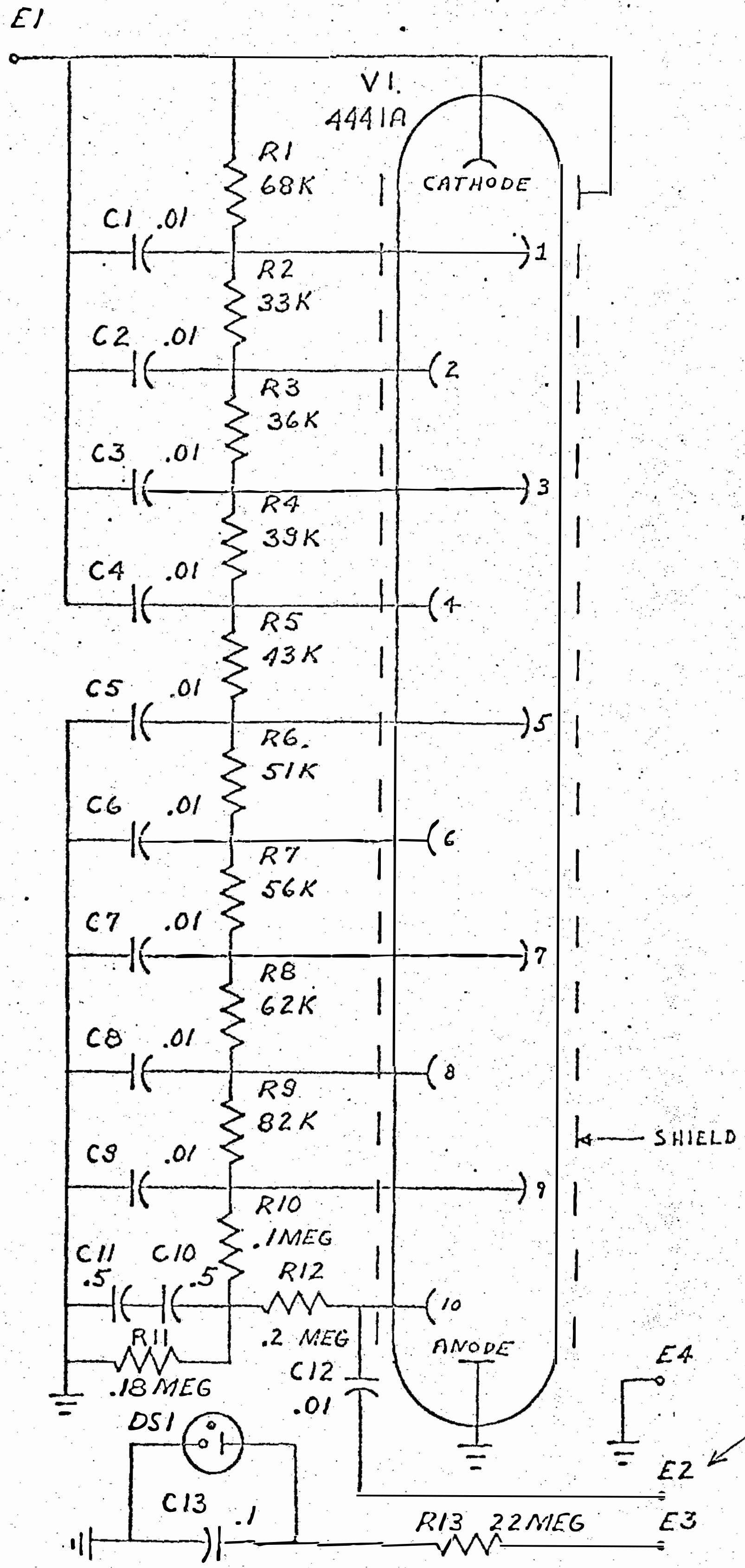
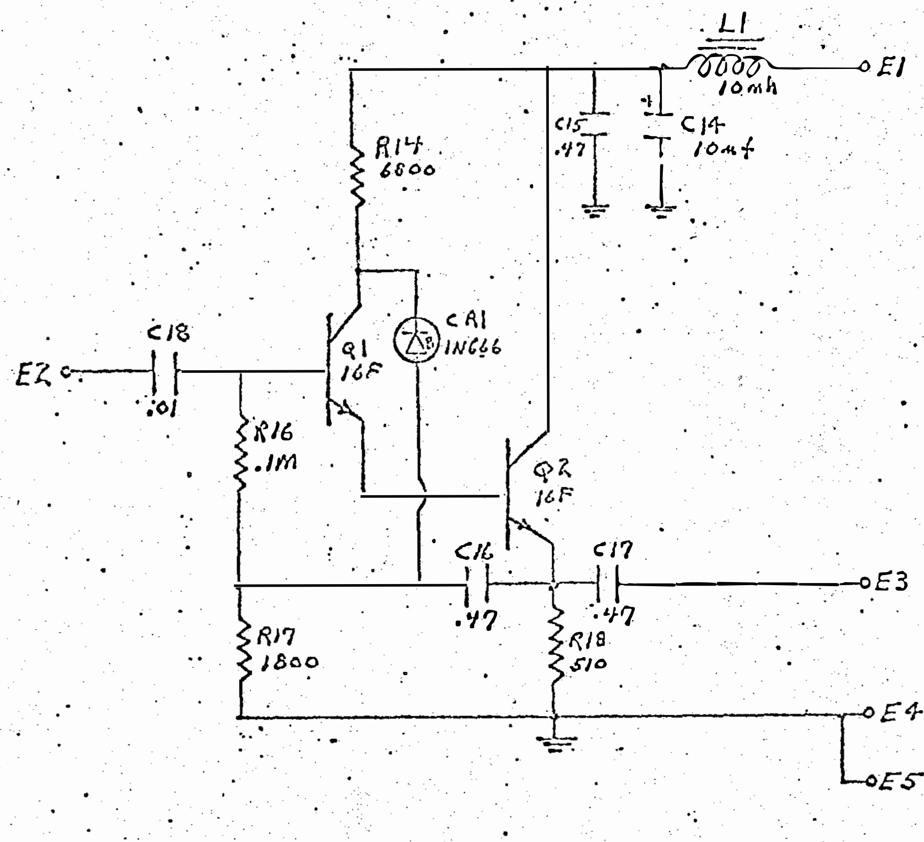


Fig. 7 — Continued (Sheet 2 of 2)



ISSUE 8/30/65	ENGR HWO DRAWN HWG	TITLE FIGURE 5 PHOTOMULTIPLIER TUBE SCHEMATIC	BELL TELEPHONE LABORATORIES INCORPORATED SHEET NO. OF SHEETS PER SET

PRINTED IN U.S.A.
E-1812-A-1 (1-61)



ISSUE 3/14/65

ENGR HWG

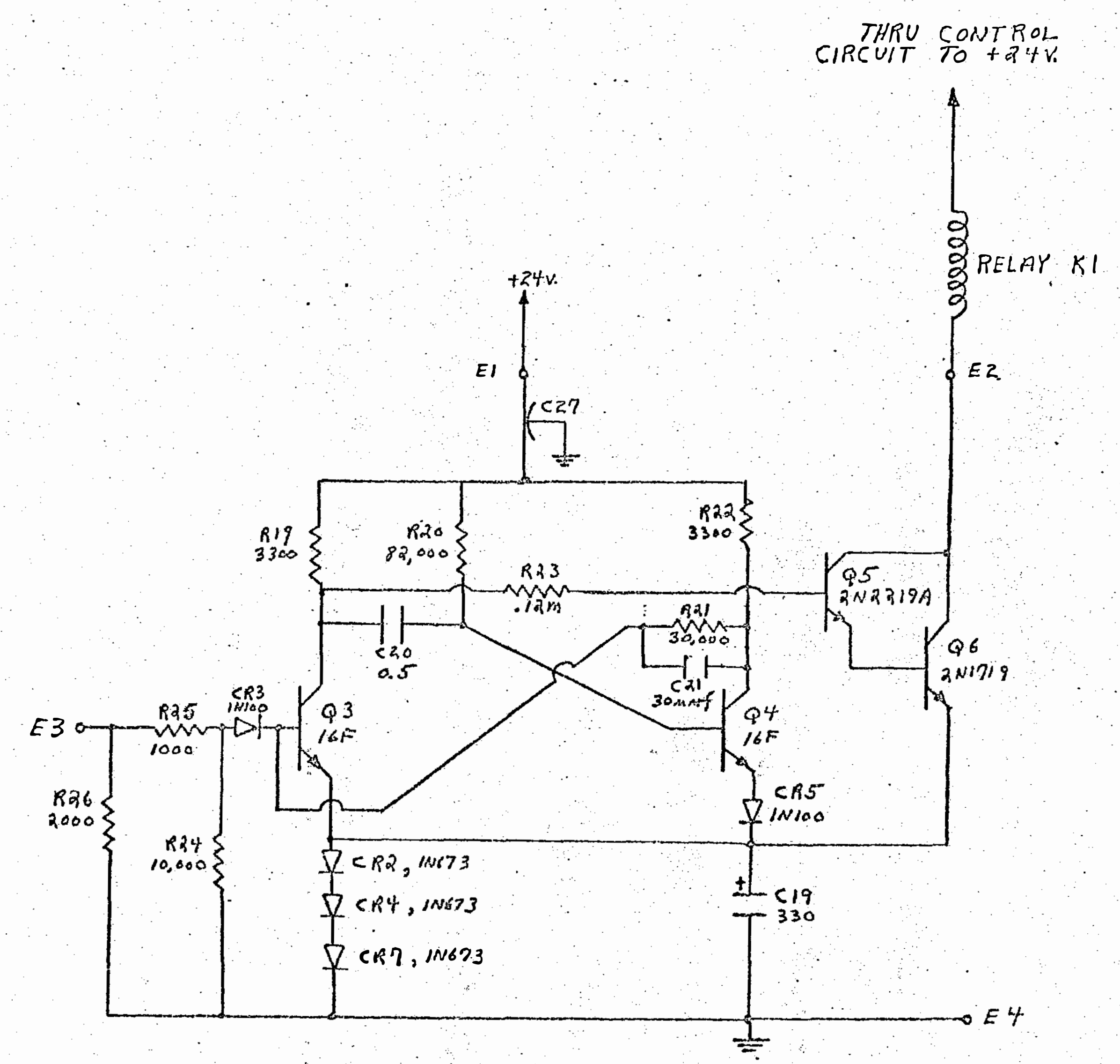
DRAWN HWG

TITLE FIGURE 7 PULSE AMPLIFIER SCHEMATIC

BELL TELEPHONE LABORATORIES INCORPORATED

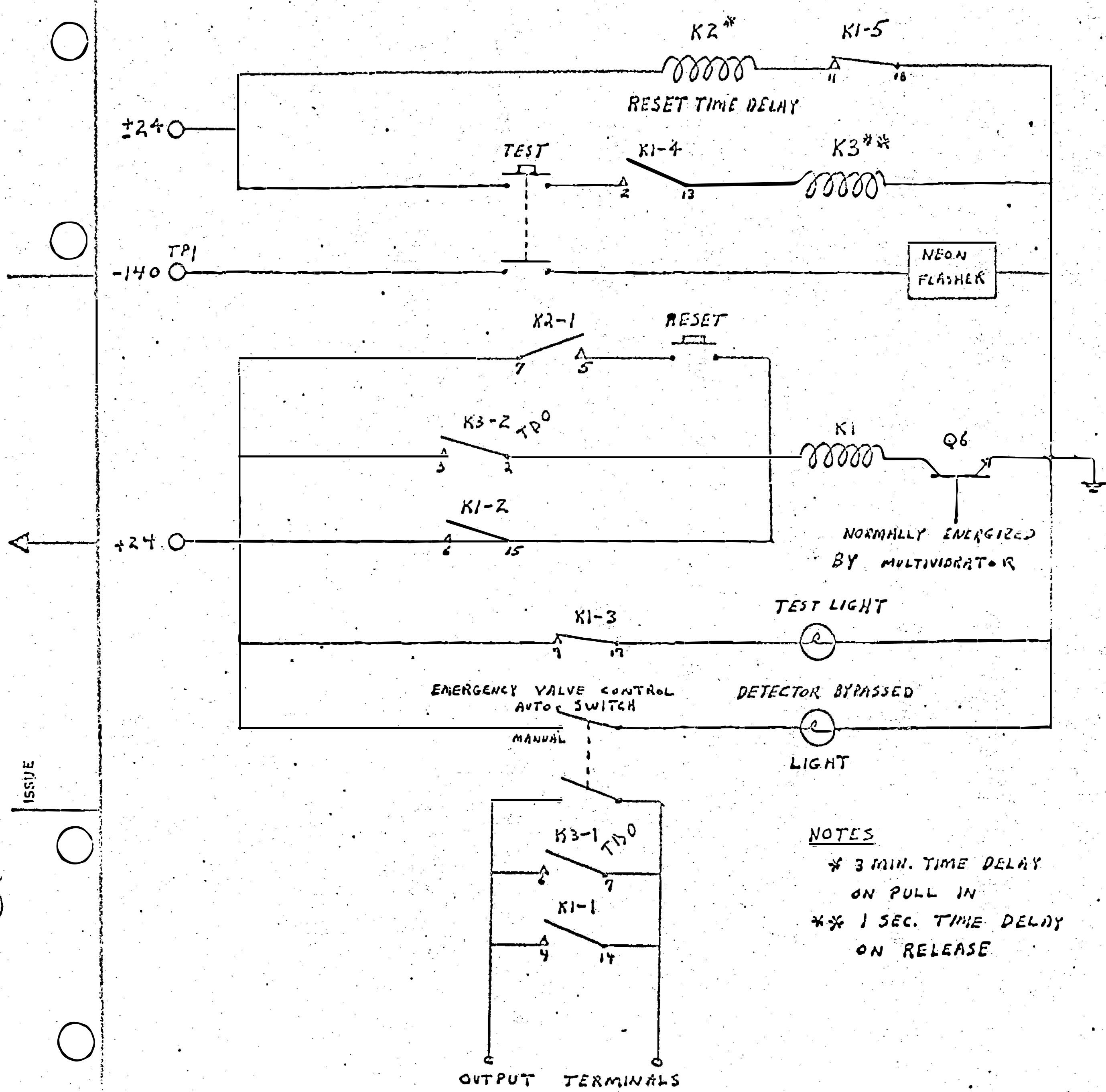
SHEET

NO. OF SHEETS PER SET



3.8 volt pulse to E3 turns Q3 ON which drives Q4 OFF. The collector of Q3 is then at +3 volts, insufficient to keep Q6 ON. When Q6 turns OFF Relay K1 ground is broken and K1 is deactivated.

ISSUE 3/5/65	ENGR HWO / DRAWN HWO	TITLE FIGURE 10 MONOSTABLE MULTIVIBRATOR SCHEMATIC	BELL TELEPHONE LABORATORIES INCORPORATED / SHEET / NO. OF SHEETS PER SET



ISSUE 3/15/65

ENGR NWO

DRAWN NWO

TITLE FIGURE 14

CONTROL CIRCUITRY

BELL TELEPHONE LABORATORIES

SHEET

NO. OF SHEETS PER SET

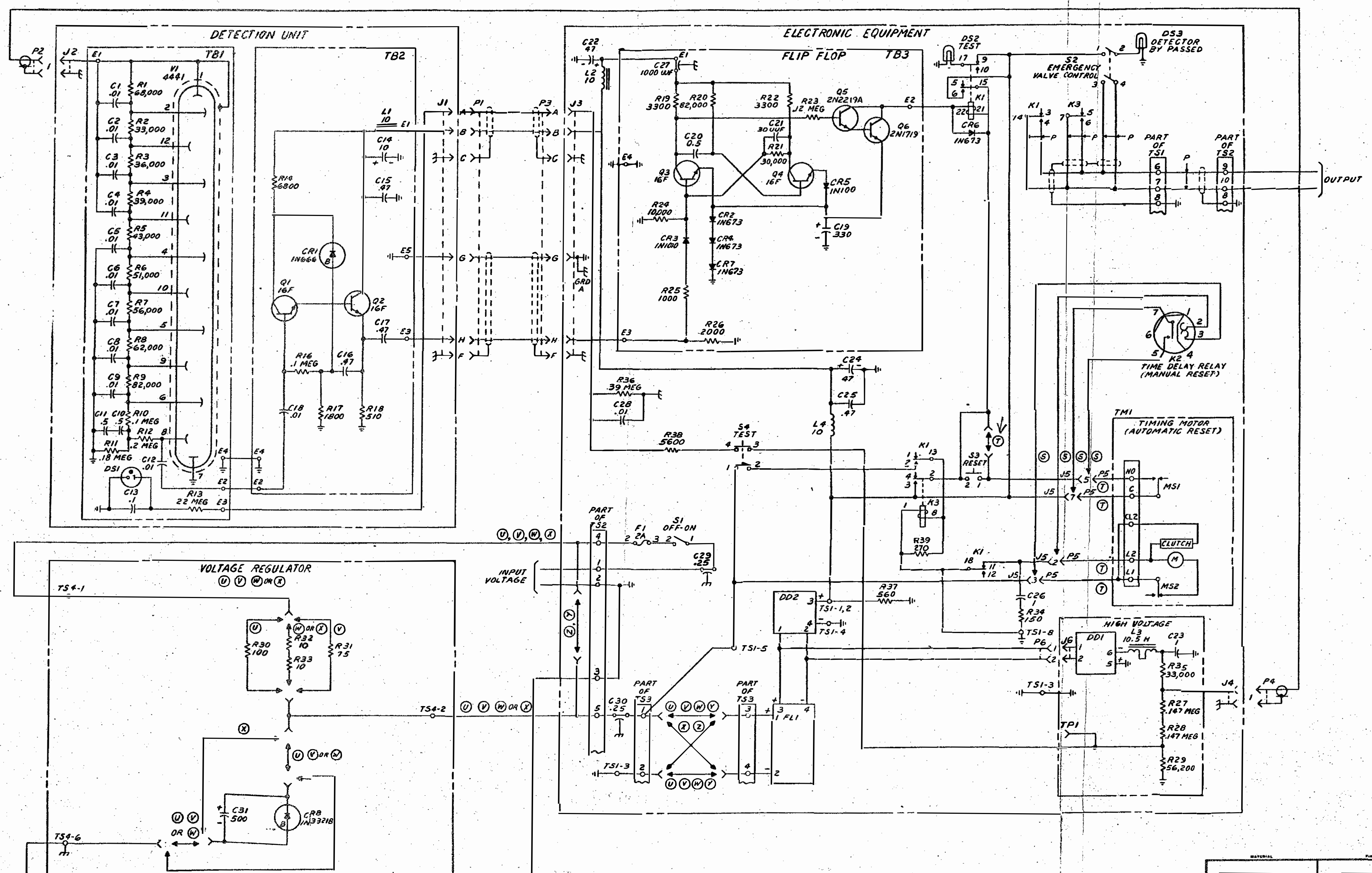
3.

FEATURE OR OPTION		FIG.	PROVIDE: APP OR FIG.	PROVIDE: QUANTITY
MANUAL RESET			S	1 PER CKT
AUTOMATIC RESET			T	
AVAILABLE INPUT VOLTAGE AT INSTALLATION	+152V	1	U	1 PER CKT MFR SUPPLIED, PROPER CONN TO BE MADE AT INSTALLATION
	+130V		V	
	+48V		W	
	-48V		X	
	+24V		Y	
	-24V		Z	

NOTES:

1. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS. INDUCTANCE VALUES ARE IN MILLIHENRIES.
2. SEE STOCK LIST OF ASSEMBLY DRAWINGS B-876946 FOR INFORMATION CONCERNING COMPONENTS REFERRED TO BY REFERENCE.

P-
H. OTT
11-10-64 ISSUE 1
CHANGED CONNECTION FROM TS1-5 TO TS3-1 WAS FROM TS1-5 TO TS3-3 & FL1-3; R39 WAS CR9-1N673; TM1 TERM. CL2 WAS L3; Q1, Q2, Q3 & Q4 WERE 16A'S; Q5 WAS 2N1051; R32 WAS 5Ω
4-15-65
2



KS-19557 | B-876946
USED ON | DWG

DETECTOR (NUCLEAR BLAST) SCHEMATIC

MATERIAL | FINISH

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES. NONLIMITED DIMENSIONS OTHER THAN THOSE OF RAW MATERIAL SHALL BE HELD AS FOLLOWS WHEN EXPRESSED
TO 2 DECIMAL PLACES ±
TO 3 DECIMAL PLACES ±
ON ANGLES ±

DWG SIZE X8S

WESTERN ELECTRIC CO. INC

BELL TELEPHONE LABORATORIES INCORPORATED

B-995320
P-

American Telephone and Telegraph Company
Long Lines Department
Engineering Department

MA 68753 CD
Issue 1
June 15, 1968
Drawing MA 68753
Issue 1

CIRCUIT DESCRIPTION

Control Circuit for Blast Detector at the Paris RS, Missouri Building.

1. PURPOSE OF CIRCUIT

1.1 To provide a break on alarm contact to initiate the closing operation of the building closure blast valves; and to shut down or prevent start-up of the diesel engine driven emergency alternators; and to shut down the refrigeration compressors and associated air cooled condensers; and to provide make on alarm dry contacts for initiating an alarm signal for a local blast alarm which is extended to the Bl alarm system.

2. REFERENCE DRAWINGS

MA 68753 - Underground Coaxial Power Feed Building - Blast Detection Installation - Wiring Plan and Details

MA 68754 - Underground Coaxial Power Feed Building - Refrigeration System Shutdown by Blast Valve

B995320 - Detector Schematic Diagram KS 19557, List 22

Fig. 5 - Photomultiplier Tube Schematic

Fig. 7 - Pulse Amplifier Schematic

Fig. 10 - Monostable Multivibrator Schematic

Fig. 14 - Control Circuit Schematic

SD 81532-01 - Power Systems 900 Type Plants Automatic Diesel Engine - Alternator Circuit 225 KW, 3-Phase, 208 Volt, KS 15929

WA 99101 - L3 Coaxial Power Feed Building - HVAC Control Diagrams

WAS 41278-01-21 - North American Iron & Steel Co. - Electric Wiring Diagram and Layout for Blast Valves - Diagram 9061-8

3. GENERAL FUNCTION

The sensor in the detection unit initiates a pulse from the photomultiplier tube. The pulse amplifier places this signal on the cable which interconnects the concrete pedestal mounted, environment shielded, detector unit installed near the building and the electronics cabinet on the Equipment Room wall in the building.

3.1 The monostable multivibrator breaks the ground connection of a break on alarm self-locking relay. The manually actuated reset switch has been jumpered to provide automatic resetting of the break on alarm self-locking relay, after a time delay of 3 minutes.

3.2 De-energization of the self-locking alarm relay opens its contact in the coil circuit of the interface relay. The interface relay de-energized closes a contact which makes the trip circuit of the blast valve circuits for Area A (Engine Room Exhaust Shaft), Area B (Structure Fresh Air Shaft), Area C (Condenser Room Air Intake) and Area D (Condenser Room Exhaust Shaft). This is the same tripping operation accomplished by depressing the Master (Red) button on the MBVCD (Master Blast Valve Control Panel). The leads from an electrically isolated make on alarm contact of the interface relay are extended to a separate junction box from which they are available for connection to the local blast alarm and extension to the Bl alarm.

3.3 A limit switch (LS-4) on one of the blast valves in Area A makes a contact when that blast valve closes. This contact makes the circuit to a red indicating light at the MBVCP and energizes Relay BVR.

3.31 Relay BVR when energized breaks contacts on the coil circuits of Relays 5-1 and 5-2.

3.32 Relay 5-1 (5-2) de-energized:

3.321 Breaks a link in the Diesel Engine Driven Alternator (DEDA) control circuit at Terminals 70 and 71 to de-energize the engine TSCV (Throttle Solenoid Control Valve) which shuts down the engine, or prevents the engine from firing at start-up.

3.322 Breaks a link in the DEDA control circuit at Terminals 72 and 73 to prevent closing the alternator circuit breaker if the engine starting sequence has been initiated.

3.323 Makes a connection in the DEDA control circuit at Terminals 74 and 75 by passing the hold overtimer (HOT 15) contacts which normally delay making a link in the alternator Circuit Breaker Opening Relay (CBOR) coil circuit.

3. GENERAL FUNCTION (Continued)

3.324 Makes a link in the CBOR coil circuit at Terminals SD-1 and SD-2. When CBOR is energized and trips the alternator circuit breaker, an auxiliary ("a") switch opens releasing the control relays, excepting the voltage failure relays.

3.325 Breaks a link in the Circuit Breaker Closing Relay (CBCR) coil circuit at DEDA control circuit Terminals MB1 and MB2 preventing the alternator circuit breaker from closing (if the alternator is in the starting sequence).

3.326 Breaks a link in the Emergency Transfer Relay (4-1 or 4-2) coil circuit at DEDA control circuit Terminals 76 and 77 preventing initiation of a starting sequence for the backup DEDA.

3.4 A limit switch (LS-4) on one of the blast valves in Area C (Condenser Room Air Intake) completes the circuit to the red indicating light on the MBVCP and also the coil circuit of the Refrigerant Shut Down Relay. When energized this relay breaks the control circuit of the time delay start relay for each refrigeration compressor. This time delay relay when de-energized breaks the compressor control circuit shutting down its associated compressor if running and prevents starting if not running. The normal function of this time delay relay is to sequence the starting of refrigeration compressors when power is restored following a power outage. Shut down of the compressors when air flow through the air cooled condensers is stopped by closure of the blast valves provides prompt shut down rather than allowing the compressors to shut down on the high head pressure safety with the attendant hazard of operation of the Freon System relief valve.

3.41 When the refrigeration compressor shuts down an auxiliary contact on its motor starter breaks the control circuit of the associated air cooled condenser fan shutting down that fan.

3.5 The blast valve operating mechanism control for each Area (A - Engine Room Exhaust Shaft; B - Structure Fresh Air Shaft; C - Condenser Room Air Intake; D - Condenser Room Exhaust Shaft) includes an adjustable time delay relay TR. Limit switch (LS-1) makes a link in this time delay relay coil circuit when the associated blast valve is closed. When relay TR has timed the valve opening mechanism is energized and the blast valves for that area are opened against spring pressure and latched open.

3.51 Timing relay TR should be adjusted for approximately 8 minutes delay.

3. GENERAL FUNCTION (Continued)

3.52 The blast valve operators for Areas A and B are actuated by 152 vdc and the timing interval is initiated when the associated blast valves close. When Area A blast valves reopen relay BVR is de-energized and BVR contacts which close when it is de-energized (NC - normally closed) complete the circuits to Relay 5-1 and 5-2 coils. Relays 5-1 and 5-2 when energized permit the DEDA to start in case of a commercial power outage.

3.53 The blast valve operators for Areas C and D are supplied by 120/208 volt A.C. power. Hence the initiating of the associated TR timing relays will occur as soon as A.C. power is again available.

4. DETECTOR OPERATION

4.1 The Pulse Amplifier is a part of the detection unit in the environmental shield outside the building.

4.11 Normally Q1 of the Pulse Amplifier is OFF. 24 volt D.C. positive is supplied at Terminal E1. This supply is filtered (by L1, C15 and C14). Diode CR1 provides a bias voltage of 15-18 volts to Q1 collector. Q1 gets a forward bias (base 1.5-2.5 volts and emitter 1.0 - 1.6 volts) from the photomultiplier pulse.

4.12 Normally Q2 of the Pulse Amplifier is OFF. 24 volt D.C. positive is supplied at Terminal E1. This supply is filtered (L1, C15 and C14), and placed on Q2 collector. Q2 has a reverse bias (base zero and emitter .6-.9 volts).

4.13 A pulse output from photomultiplier tube 4441A (positive) supplied at Terminal E2 will place forward bias on Q1 and Q2 base and the positive pulse output at Terminal E3 is placed on the cable.

4.2 The Monostable Multivibrator is in the electronics cabinet in the building.

4.21 Normally Q3 is OFF. (a) The collector is at 23 volt through R19. (b) The base is at ground through R25 and R26. (c) The emitter is at the Q6 emitter voltage.

4.22 Normally Q4 is ON. (a) The collector is at 23 volt through R22. (b) The base is at less than 23 volt through R20. (c) The emitter is at ground.

4.23 Normally Q5 is ON. (a) The collector is at 24 volt through relay K1 coil. (b) The base is at 24 volt through R19 and R23. (c) The emitter supplies Q6 base.

4. DETECTOR OPERATION

4.24 Normally Q6 is ON. (a) The collector is at 24 volt through relay K1 coil. (b) The base is connected to Q5 emitter. (c) The emitter is at ground (CR2, CR4 and CR7). (d) With Q3 OFF its collector is at 23 volt. This voltage applied through R23 and Q5 keeps Q6 as in the ON condition.

5. OUTPUT RELAY CONTROL

5.1 Relay K1 coil ground connection is provided through Q6 in the ON condition.

5.11 A pulse from the photomultiplier to Terminal E2 amplified through the Pulse Amplifier should place a 3.8 volt positive pulse on Terminal E3 of the Monostable Multivibrator (one shot) raising the Q3 base and turning Q3 ON.

5.2 The voltage to the Q4 emitter, limited by CR5, is raised and Q4 turns OFF.

5.3 When Q3 turns ON its collector voltage is then 3 volts which is insufficient to keep Q5 ON. CR2, CR4 and CR7 control the Q3 emitter voltage.

5.31 When Q5 turns OFF voltage to Q6 base obtained from Q5 emitter is lost and Q6 turns OFF.

5.4 When Q6 turns OFF the ground connection for Relay K1 is lost and K1 is de-energized.

5.5 When Q4 turned ON its collector voltage is reduced below Q3 emitter voltage and Q3 turns OFF. The pi attenuator dissipates the pulse.

5.6 When Q3 turns OFF its collector voltage returns to 23 volts turning Q5 ON bringing Q6 base voltage above its emitter voltage. However when K1 coil ground was broken K1 N.O. contact K1-2 (15,6) was broken. K1 can be re-energized by reset switch S-3 but only after time delay relay K2 has timed (3 minutes) and contact K2-1 (7,5) has closed. Note switch S-3 terminals 2, 1 are jumpered to provide automatic reset at the end of relay K2 timing interval (3 minutes).

6. OUTPUT RELAY NOT IN ALARM CONDITION

One side of relay K1 coil is linked to plus 24 volt D.C. through its contact K1-2 (6,15). The other side of K1 coil is linked to ground through Q6.

6. OUTPUT RELAY NOT IN ALARM CONDITION (Continued)

6.1 System energized 24 volt D.C. negative and relay K1 energized. When switch S-1 (power supply) is closed test lamp DS-2 will light, relay K2 will be energized and start timing.

6.11 Reset switch S-3 (Dwg. B995320) terminals 1 and 2 have been jumpered for Automatic Reset.

6.12 After relay K2 has timed (3 minutes) its contact K2-1 (7,5) closes the link in relay K1 coil connecting it it to 24 volt positive. Transistor Q6 when ON makes the ground link connecting relay K1 coil to ground. Relay K1 coil energized its:

6.121 Contact K1-1 (14,4)("N.O." contact open when relay K1 is de-energized) is closed. This is the BREAK ON ALARM output contact.

6.122 Contact K1-2 (15,6) (N.O.) seals in relay K1 coil on the positive side.

6.123 Contact K1-3 (17,9) ("N.C." contact closed when relay K1 is de-energized) breaks the test lamp positive.

6.124 Contact K1-4 (13,2) (N.O.) makes a link in relay K3 coil circuit. The final link in relay K3 coil circuit is the test switch S-4 (1,2).

6.125 Contact K1-5 (10,11) (N.C.) breaks timing relay K3 timing element circuit.

7. OUTPUT RELAY IN ALARM OR TEST POSITION

Transistor Q6 turned OFF by pulse from the photomultiplier tube releases relay K1 coil K1 de-energized its:

7.1 Contact K1-1 breaks the output link in the interface relay coil (152 volt D.C.) circuit.

7.2 Contact K1-2 breaks the relay K1 coil seal which will not be remade until relay K2 times and momentarily closes its contact K2-1.

7.3 Contact K1-3 makes the final link in the test lamp circuit.

7.4 Contact K1-4 completes a link in the K3 coil circuit.

7.5 Contact K1-5 completes timing relay K2 coil circuit.

8. ROUTINE TEST RESPONSE

Operation of the test switch S-4 energizes the circuit to the neon test lamp DS-1 (at the detection unit). And completes the circuit to the relay K3 coil (through relay contact K1-4 (N.O.) link made when relay K1 is energized. The time to charge C13, at the neon lamp, allows relay K3 to be energized before the neon lamp flashes initiating the pulse to turn OFF Q6 de-energizing relay K1.

8.1 When relay K3 is energized contact K3-1 (7,6) bypasses relay contact K1-1 (output). This avoids releasing the interface relay which would give the impulse to close the blast valves, block out DEDA operation and initiate the remote alarm when testing the blast detector system. Contact K3-1 opens with a one second delay after K3 coil is de-energized.

8.2 Relay K3 contact K3-2 (2,3) (N.O.) now maintains the positive connection to relay K1 coil (which was broken when seal in contact K1-2 (15,6) opened). Contact K3-2 opens with a one second delay after relay K3 coil is de-energized.

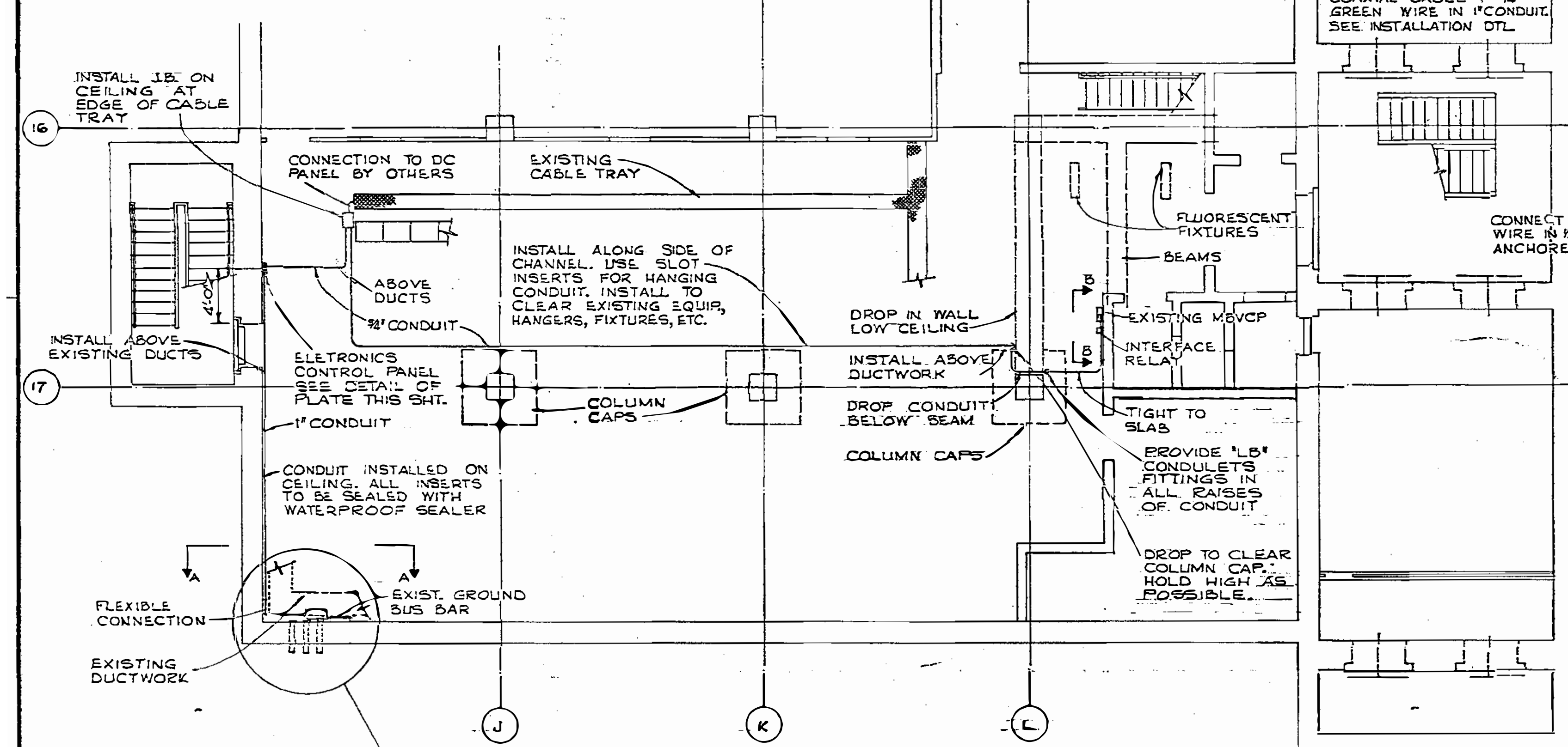
8.3 The pulse initiated by the neon test lamp causes Q6 to turn OFF releasing relay K1 coil.

8.31 When contact K1-3 opens the test lamp is extinguished. Contact K1-4 opens de-energizing relay K3 coil. However, contact K3-2 delays opening for one second, during which interval Q6 turns ON (after 25 milli-seconds) and relay K1 coil is again energized through the link of relay K3 contacts K3-2 and its sealing contact K1-2 closes.

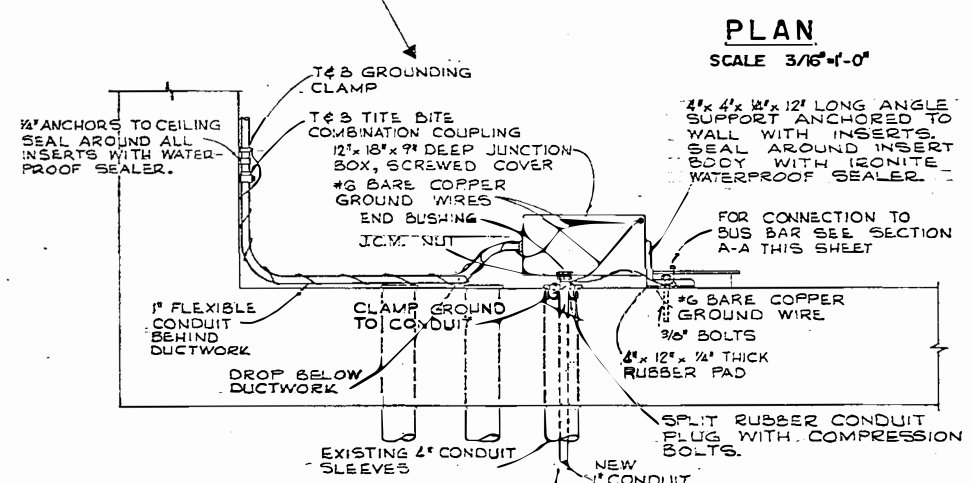
8.4 The flashing sequence of the test lamp continues while the test button is depressed. When the test button is released, relay K1 coil will be energized and sealed in or if not energized will be energized through relay K3 contact K3-2 as soon as Q6 turns ON.

NOTES:

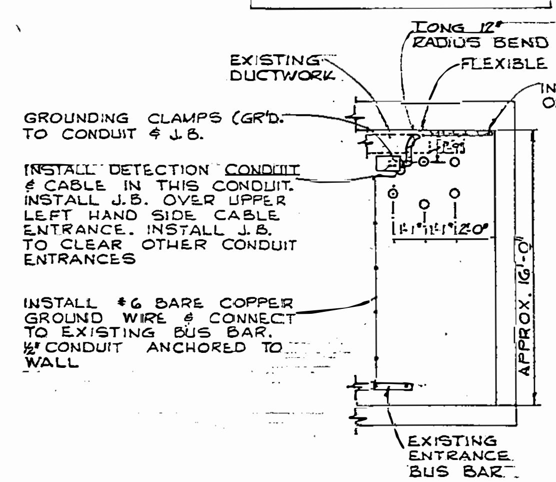
1. IDENTIFY ALL WIRING AT EACH TERMINAL BLOCK WITH NUMBER TO CORRESPOND TO TERMINAL NUMBER. USE BRADY PERMA CODE WIRE MARKERS.
2. REMOVE GREEN LIGHTS & INSTALL RED LIGHTS ON ALL FIRING PANELS.
3. STENCIL INTERFACE RELAY & NUMBER ALL TERMINALS & LEADS.
4. GROUND ENCLOSURE OF NEW INTERFACE RELAY & CEILING MOUNTED TERMINAL J-BOX.
5. ALL FUSES TO BE REMOVED & INSTALLED BY LOCAL TELEPHONE COMPANY PERSONNEL.
6. INTERFACE RELAY PLYWOOD BACK TO BE PAINTED WITH ONE PRIMER & TWO FINISH COATS OF LEAD & OIL PAINT, LIGHT GREY IN COLOR.
7. THE DETECTOR END CONNECTOR IS FACTORY INSTALLED ON THE CABLE. THE CABLE SHALL BE PULLED FROM THE OUTSIDE INTO THE BUILDING THROUGH CONDUIT & CUT TO PROPER LENGTH FOR CONNECTION TO E.C.P. COAXIAL CABLE CONNECTIONS TO BE FIELD CONNECTED AT E.C.P. END. ALL NECESSARY PARTS WILL BE SHIPPED LOOSE WITH CABLE. WORK TO BE PREFORMED BY WORKMEN EXPERIENCED IN COAXIAL CABLE WORK.
8. INSTALL NEW PLEXIGLASS COVER OVER EXISTING MBVCP. SEE DETAIL.
9. CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS INCLUDING DIMENSIONS, SIZES, LOCATIONS, BEAMS, CONSTRUCTION, EACH & EVERY ITEM EFFECTING THE INSTALLATION OF THIS SYSTEM & INCLUDING ALL REQUIREMENTS IN THIS CONTRACT.
10. FRONT CONNECTED RELAY COIL RATED 145VDC MIN. P.U. 125V. AND WITHSTAND 165V. 2 NC CONTACTS.



PLAN
SCALE 3/16"=1'-0"

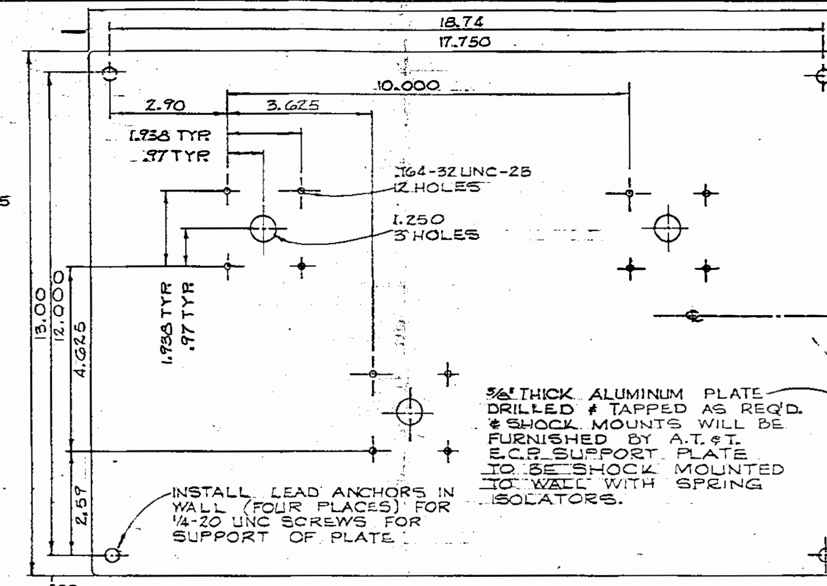


DETAIL 1
NO SCALE

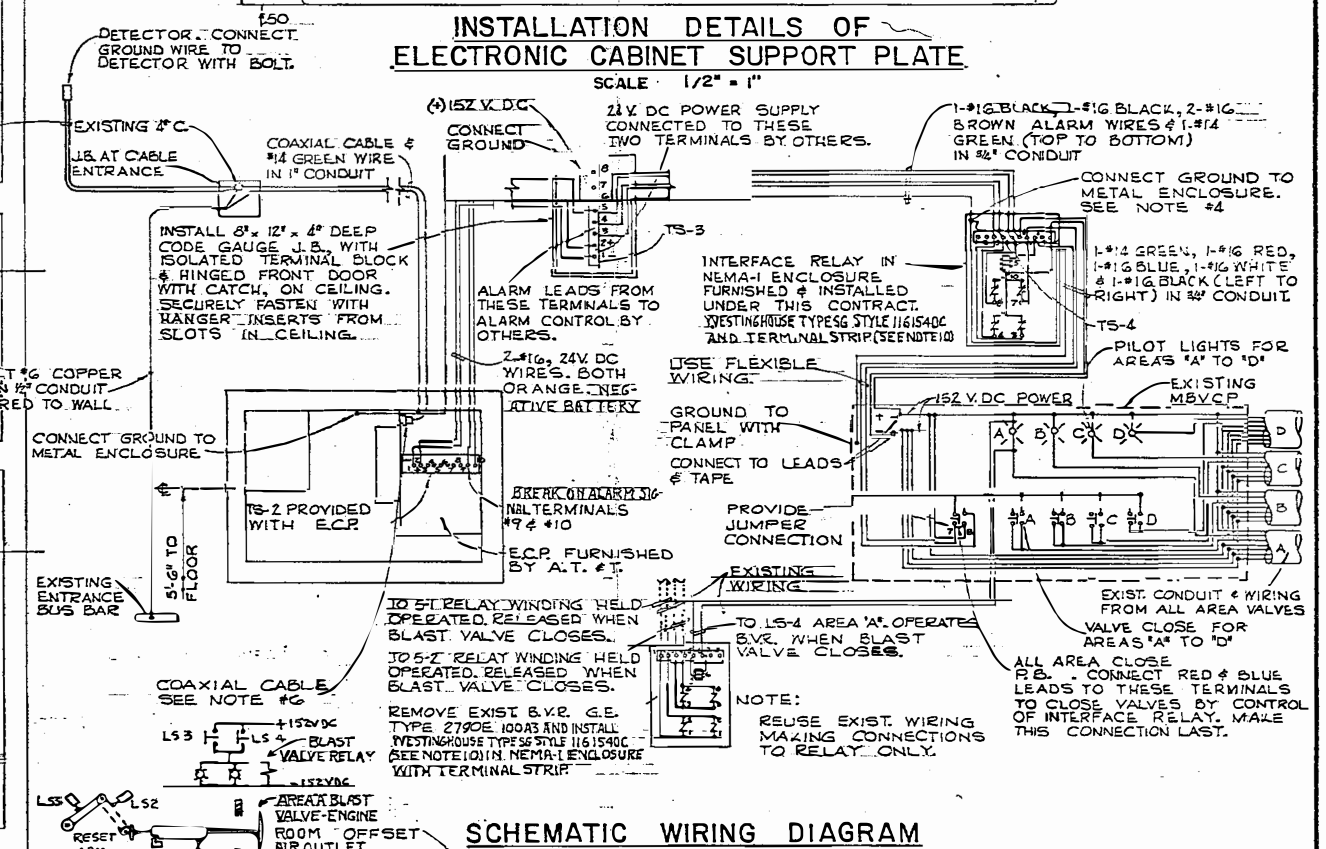


SECTION A-A
NO SCALE

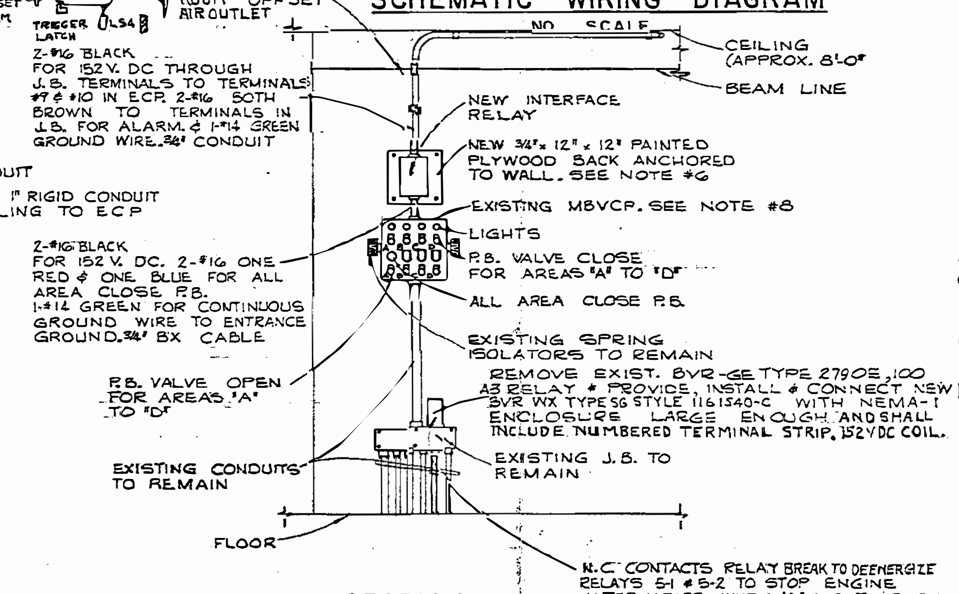
NOTE:
2-DECIMAL PLACE±.01
3-DECIMAL PLACE±.005



INSTALLATION DETAILS OF ELECTRONIC CABINET SUPPORT PLATE
SCALE 1/2" = 1"



SCHEMATIC WIRING DIAGRAM
NO SCALE



SECTION B-B
NO SCALE

SCALE 3/16"=1'-0"
0 4' 8' 16'

SCALE 1/2"=1"
0 1" 2" 3" 4" 5" 6"

ISSUE	
AS BUILT CONDITION PER SPEC MA 47098 10-10-68	1
	2

PARIS RS, MISSOURI K

UNDERGROUND
COAXIAL POWER FEED BUILDING
BLAST DETECTION INSTALLATION

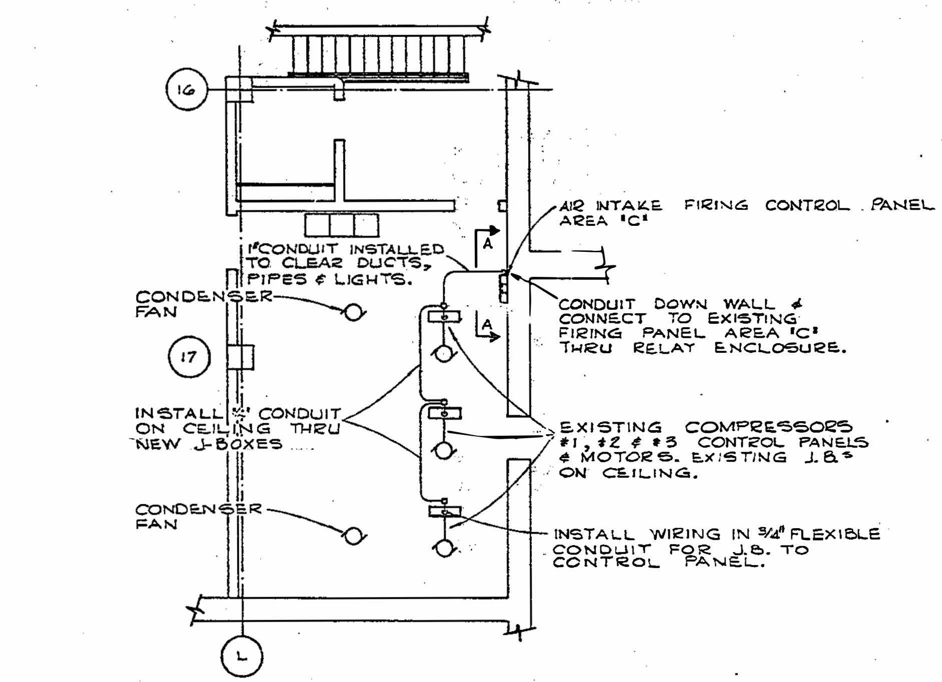
WIRING PLAN AND DETAILS

INITIAL PROJ.	DRAWN BY	CHECKED BY	DATE
MB 256	B.L. & M.	JRT	1 AUG 67

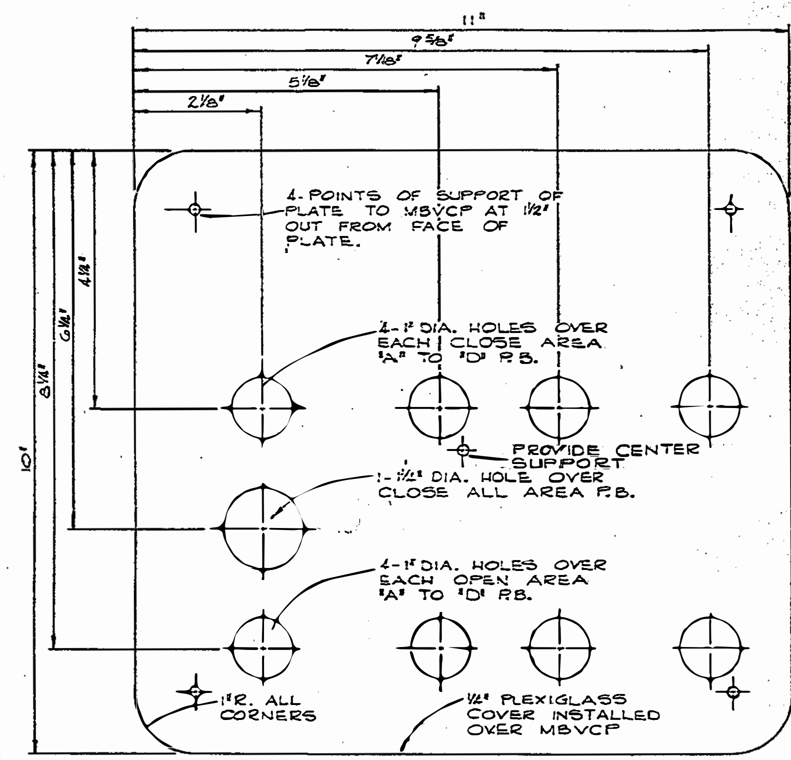
AMERICAN TEL. AND TEL. CO.
LONG LINES ENG. DEPT.
WESTERN AREA

MA 68753

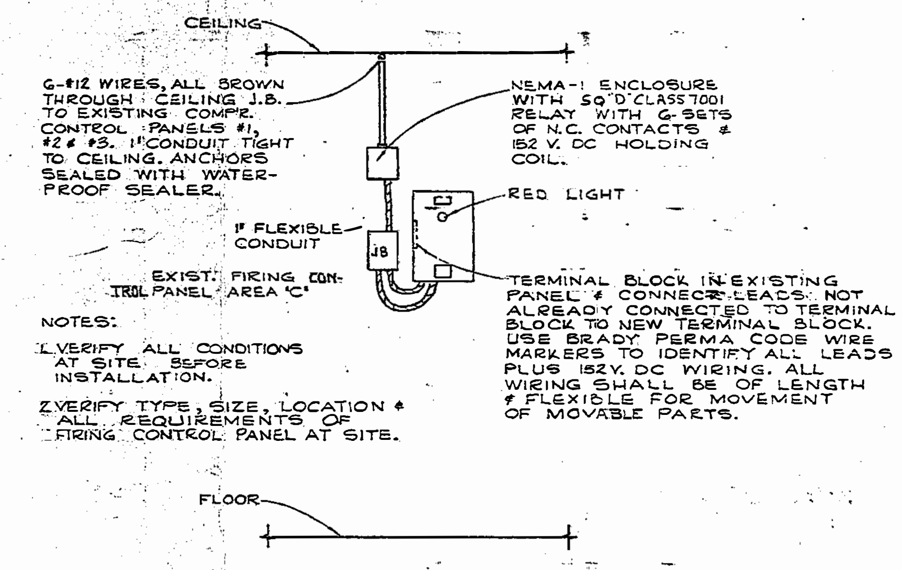
MA 68753



PARTIAL MEZZANINE PLAN
SCALE 3/16"=1'-0"



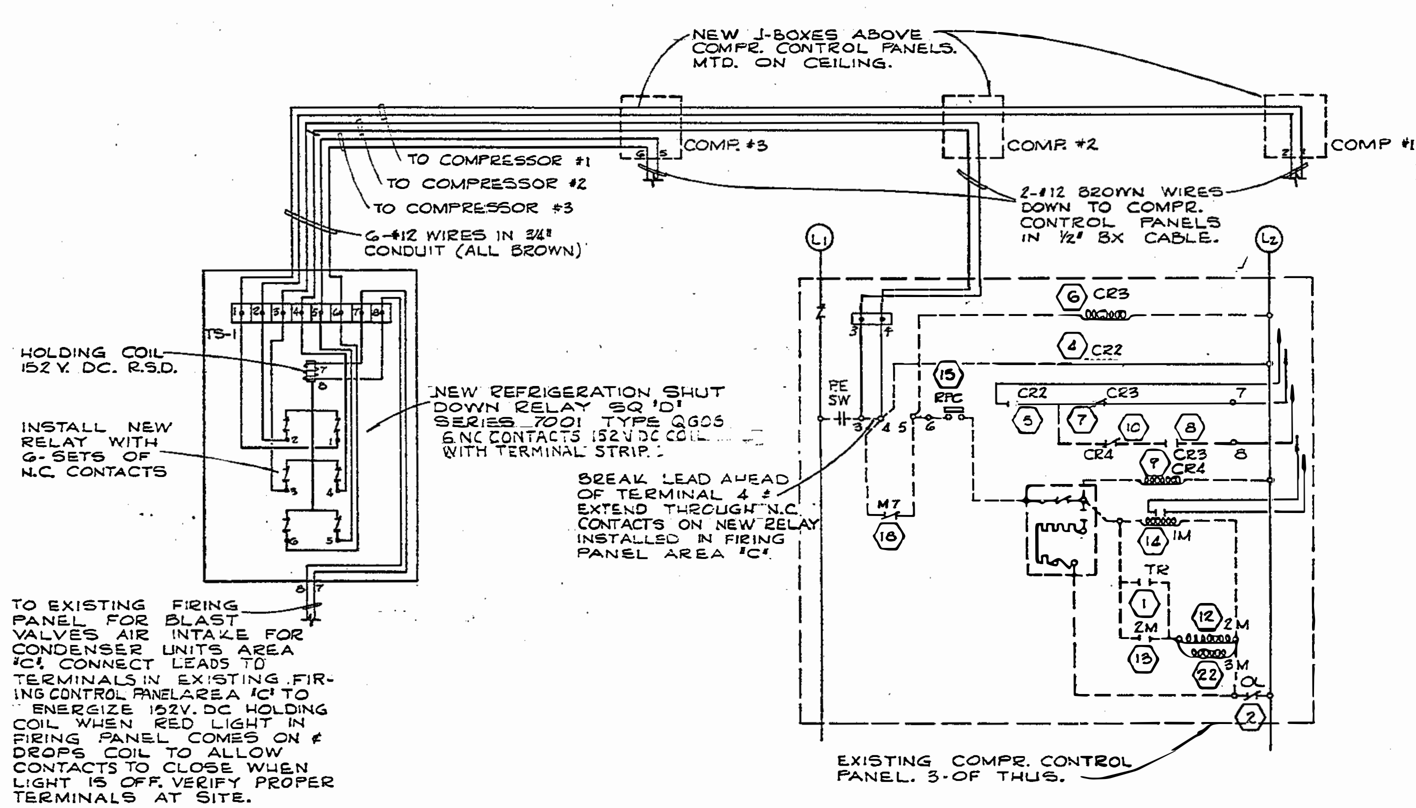
MBVCP COVER PLATE
SCALE 3/4"=1'-0"



NOTES:

1. VERIFY ALL CONDITIONS AT SITE BEFORE INSTALLATION.
2. VERIFY TYPE, SIZE, LOCATION & ALL REQUIREMENTS OF FIRING CONTROL PANEL AT SITE.

SECTION A-A
NO SCALE



SCHEMATIC WIRING DIAGRAM
NO SCALE

SCALE 3/16"=1'-0"
0 4' 8' 16'
SCALE ¾"=1"
0 1" 2" 4"

K

PARIS RS, MISSOURI

UNDERGROUND
COAXIAL POWER FEED BUILDING
BLAST DETECTION INSTALLATION

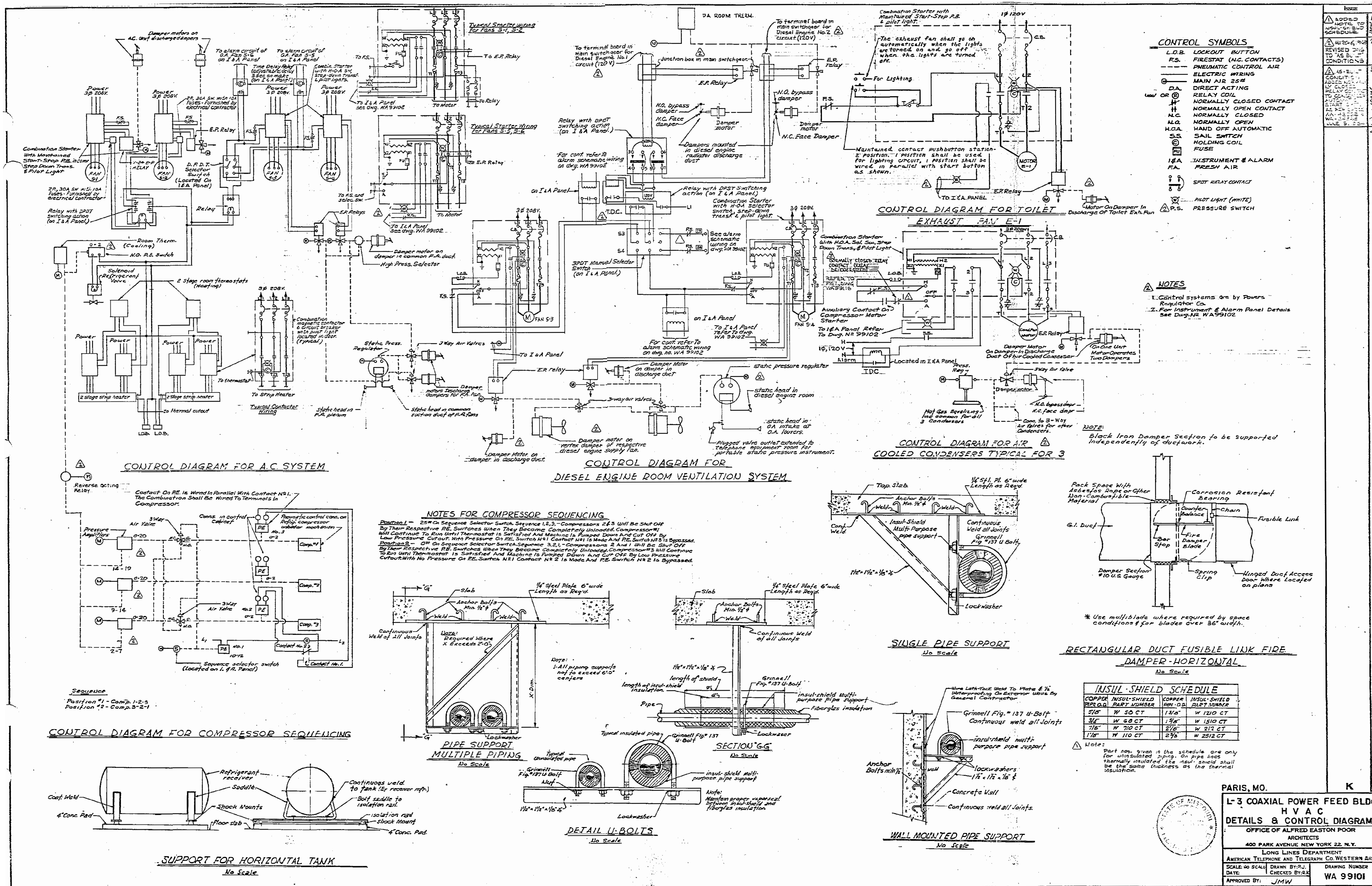
REFRIGERATION SYSTEM
SHUTDOWN BY BLAST VALVE

INITIAL PROJ.	DRAWN BY	CHECKED BY	DATE
MB 257	B.L. & M.	J R T	1 AUG 67

AMERICAN TEL. AND TEL. CO. LONG LINES ENG. DEPT. WESTERN AREA

MA 68754

MA 68754



INSUL-SHIELD SCHEDULE

COPPER PIPE O.D.	INSUL-SHIELD PART NUMBER	COPPER PIPE O.D.	INSUL-SHIELD PART NUMBER
5/8	W 50 CT	1 3/8	W 1210 CT
3/4	W 68 CT	1 5/8	W 1510 CT
7/8	W 710 CT	2 1/8	W 212 CT
1 1/8	W 110 CT	2 5/8	W 2512 CT

Note: Part nos. given in the schedule are only for uninsulated piping. On pipe lines thermally insulated the insul-shield shall be the same thickness as the thermal insulation.

PARIS, MO. K

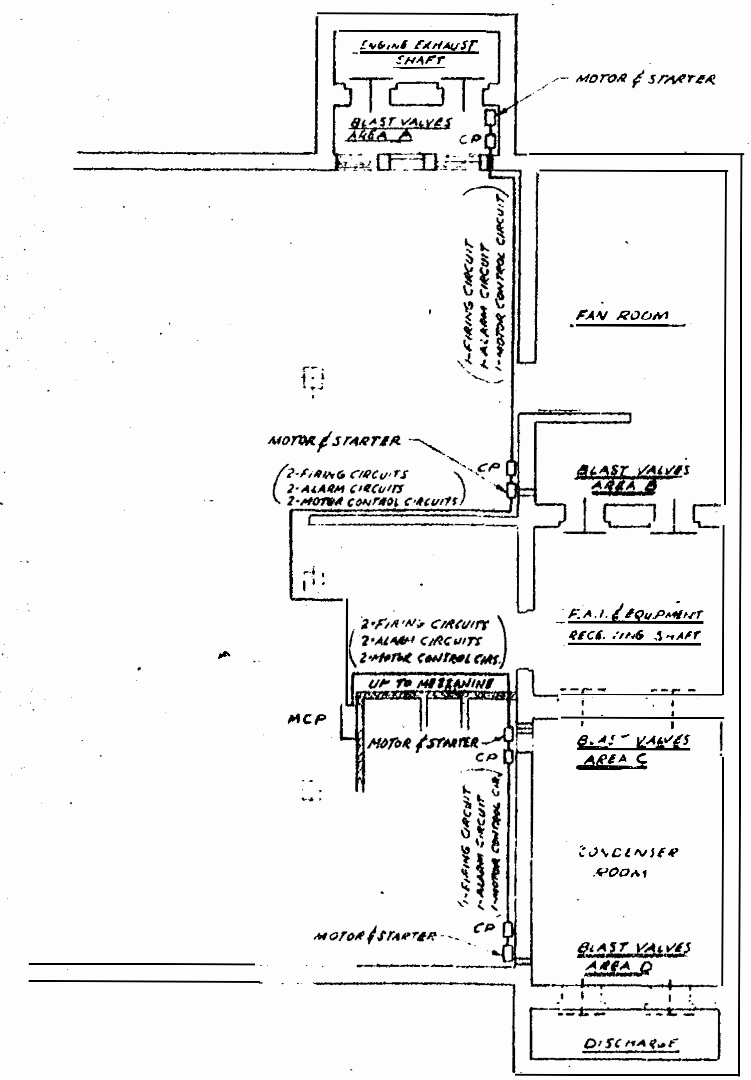
L-3 COAXIAL POWER FEED BLDG
H V A C
DETAILS & CONTROL DIAGRAMS

OFFICE OF ALFRED EASTON POOR
ARCHITECTS
400 PARK AVENUE NEW YORK 22 N.Y.

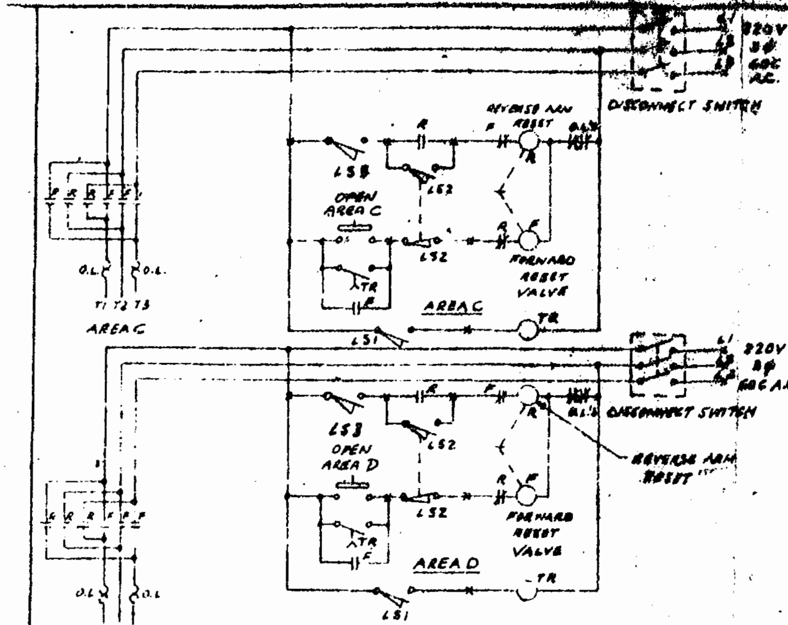
LONG LINES DEPARTMENT
AMERICAN TELEPHONE AND TELEGRAPH CO. WESTERN AREA

SCALE: NO SCALE DATE:	DRAWN BY: P.J. CHECKED BY: R.B.	DRAWING NUMBER WA 99101
APPROVED BY: JMW		

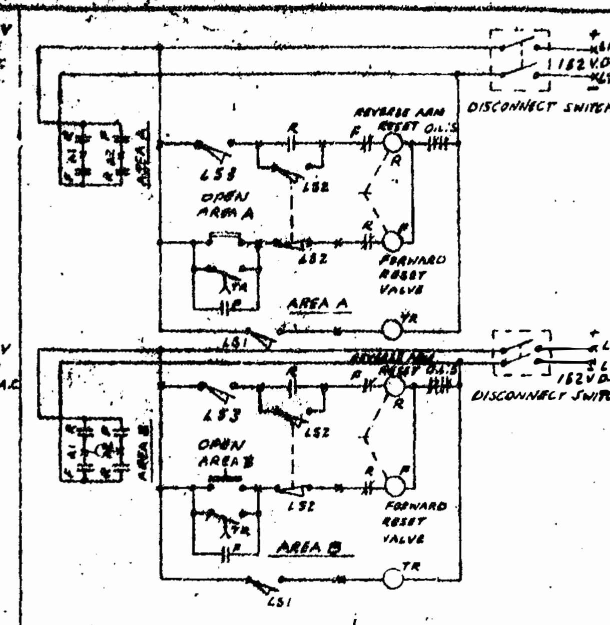
FOR BLAST VALVE ASSEMBLY AREA B SEE CONT.#9061 DWG #3
FOR BLAST VALVE ASSEMBLY AREA C SEE CONT.#9061 DWG #4
FOR BLAST VALVE ASSEMBLY AREA D SEE CONT.#9061 DWG #5
FOR BLAST VALVE ASSEMBLY AREA A SEE CONT.#9061 DWG #6



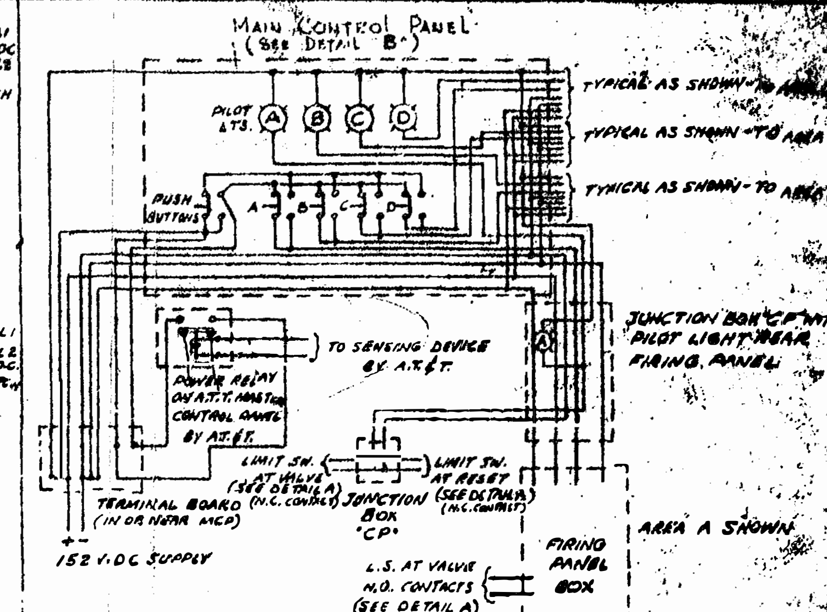
PLAN
SCALE 1/8" = 1'-0"



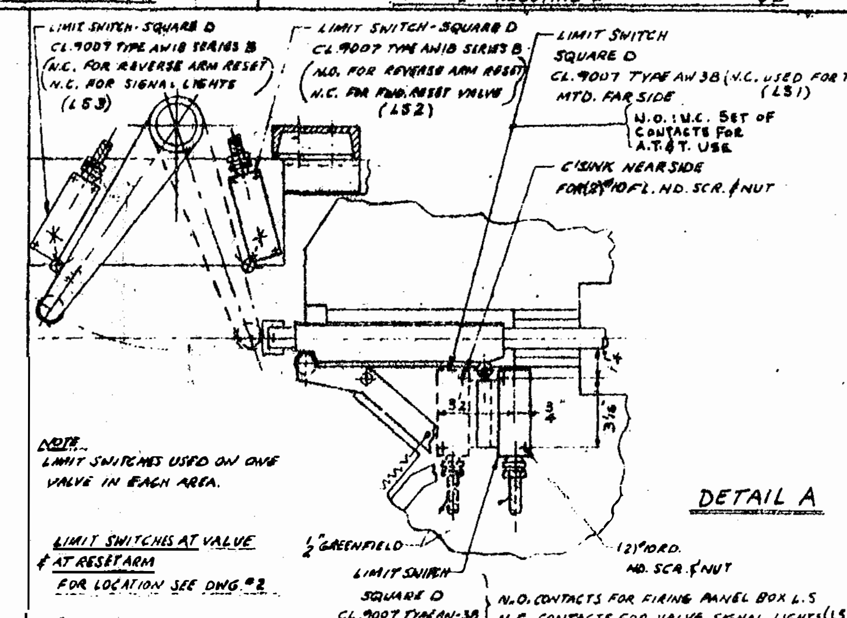
SCHEMATIC WIRING DIAGRAM (VALVES NORMALLY OPEN) FOR VALVE RESETING DEVICES - AREAS C & D



SCHEMATIC WIRING DIAGRAM (VALVES NORMALLY OPEN) FOR VALVE RESETING DEVICES - AREAS A & B



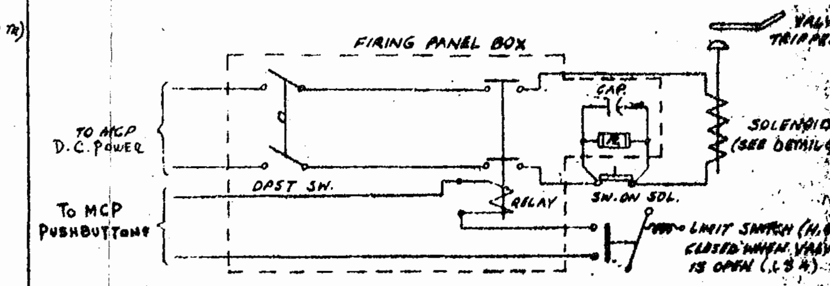
BLAST VALVE WIRING
ALARM CIRCUIT & FIRING MECHANISM



NOTE: LIMIT SWITCHES USED ON ONE VALVE IN EACH AREA.

LIMIT SWITCHES AT VALVE & AT RESET ARM
FOR LOCATION SEE DWG #2

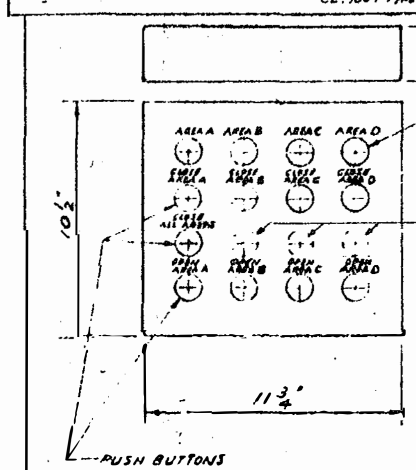
DETAIL A



SCHEMATIC WIRING DIAGRAM FOR FIRING PANEL BOX
CONDITION SHOWN - VALVE CLOSED
SW. ON SOL. - CLOSED WHEN POWER IS ON

BILL OF MATERIAL
1 - G.E. SOLENOID #CR 9500-C 207A3A 125 V.DC
1 - G.E. RELAY # IC 2820A20A3F 125 V.DC
1 - SQUARE D LIMIT SWITCH #CL 9007 TYPE AW-38 125 V.DC
1 - D.P.S.T SWITCH - P&S NO. 1312 DT DESPARD FLUSH MTD. SWITCH

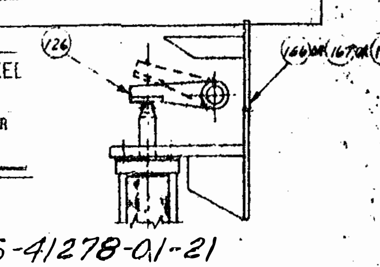
AMERICAN TELEPHONE AND TELEGRAPH COMPANY
LONG LINES DEPARTMENT - WESTERN AREA
CHECKED BY AEP-CTP DATE 5-21-62
APPROVED [illegible] DATE [illegible]
APPROVED AS NOTED
APPROVED FOR DESIGN ONLY
RESUBMIT



MAIN CONTROL PANEL
DETAIL B

SQUARE D	CLASS	TYPE	QUAN
PANEL BOX	9001	TY-80	1
BLANKS	9001	TO-1	3
PILOT LIGHT	9001	TP 1966	4
PUSH BUTTON	9001	TR11A	1
PUSH BUTTON	9001	TR1A	8
LEGEND PLATE	9001	TN1 MARKED AREA A	1
LEGEND PLATE	9001	TN1 MARKED AREA B	1
LEGEND PLATE	9001	TN1 MARKED AREA C	1
LEGEND PLATE	9001	TN1 MARKED AREA D	1
LEGEND PLATE	9001	TN3 MARKED CLOSE AREA A	1
LEGEND PLATE	9001	TN3 MARKED CLOSE AREA B	1
LEGEND PLATE	9001	TN3 MARKED CLOSE AREA C	1
LEGEND PLATE	9001	TN3 MARKED CLOSE AREA D	1
LEGEND PLATE	9001	TN3 MARKED CLOSE ALL AREAS	1
LEGEND PLATE	9001	TN3 MARKED OPEN AREA A	1
LEGEND PLATE	9001	TN3 MARKED OPEN AREA B	1
LEGEND PLATE	9001	TN3 MARKED OPEN AREA C	1
LEGEND PLATE	9001	TN3 MARKED OPEN AREA D	1

DRAWING CHECKED
Date 5-14-62
HERBERT W. LANGER
General Contractor
BY [illegible]



WAS-41278-01-21

SOLENOID AT CAM SHAFT LEVER
FOR LOCATION SEE DWG. #3,4,5 & 6
FOR ASS'Y SEE DWG. # D29A
DETAIL C

FOR APPROVAL

CP - REMOTE FIRING PANEL - JUNCTION BOX TO BE PROVIDED WITH PILOT RECEPTACLE FOR RESET ALARM.
MCP - MASTER FIRING PANEL
NOTE: CONDUIT RUNS SHOWN APPROX. LOCATION. REVISE FOR FIELD CONDITIONS.

CONDITIONED AIR CORPORATION
2501 Bell Avenue
DES MOINES 15, IOWA

PARIS, MO.
ITEM 67-2
L-3 Coaxial Power Feed Building
A. T. & T., Paris, Missouri

NORTH AMERICAN IRON & STEEL CO.
INCORPORATED
CONTRACTORS
FIRST AVE. & FIFTY-EIGHTH ST. - BROOKLYN, N. Y.

PROJECT A.T.&T. COAXIAL POWER FEED BLDG.
TITLE ELECTRIC WIRING DIAGRAM & LAYOUT FOR BLAST VALVES
CONTRACTOR HERBERT W. LANGER
MADE BY W.H. DATE 4-21-62 CHECKED BY D.B. DATE [illegible]
BLUEPRINTS REVISIONS
8 APP.
CONTRACT NO. 9061
DRAWING NO. [illegible]

American Telephone and Telegraph Company
Long Lines Engineering Department
811 Main Street
Kansas City, Missouri 64141

"AS BUILT" Addendum to
Specification MA 47098
and all Numbered Addenda
Estimate 4W-K994
File 1555-777
October 10, 1968

COVER SHEET
THIS "AS BUILT" ADDENDUM FOR
ADDITION TO AND ALTERATION OF THE
EXISTING UNDERGROUND POWER FEED BUILDING
PARIS RS, MISSOURI
FOR A BLAST DETECTOR INSTALLATION

(MIDWESTERN AREA)

DRAWINGS AND PARAGRAPHS REFERRED
TO IN THIS ADDENDUM CORRESPOND TO
DRAWINGS AND PARAGRAPH DESIGNATIONS
IN THE ORIGINAL SPECIFICATION

By direction of Mr. E. L. Taylor
the Telephone Company's Representative,
all questions should be referred to:

Mr. P. S. Russell, Staff Supervisor
Area Code 816 / EXeter 1-2451
Kansas City, Missouri

Specifications by: Mr. B. F. Meador

Paris RS, Missouri

1. The following items change, clarify, delete or add to items on Specification MA 47098 dated August 1, 1967. This addendum is issued for "As Built" construction.

2. List of Drawings included ("As Built" issue added except for reference drawings.)

Drawing Number	Issue	Title
WA-17705	1	Location Sketch
MA-68743	1	Basic Exterior Layout
MA-68744	1	Detection Housing Lower Shield Installation
MA-68745	1	Mounting Plate for Electronic Cabinet
MA-68746	1	Electronics Cabinet Assembly on Mounting Plate
MA-68747	1	Cable Assembly Electronics Cabinet End
MA-68748	1	Cable Assembly Electronics Cable End
MA-68749	1	Electronics Cabinet Interior Terminal Block Location
MA-68750	1	Electronics Cabinet Section D-D Connectors J3 & J4
MA-68751	1	Electronics Cabinet View J-J Reset Switch S3 Jumper for Automatic Reset
MA-68752	2	Site Plan and Support Details
MA-68753	2	Wiring Plan and Details
MA-68754	2	Refrigeration System Shutdown by Blast Valve