DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, FIELD AND DEPOT MAINTENANCE MANUAL

SHOP SET, AIRCRAFT MAINTENANCE SEMITRAILER MOUNTED, SET C-11, POWERTRAIN SHOP

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1961

CHANGES

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 7 September 1972

Operator, Organizational, Field
and Depot Maintenance Manual

SHOP SET, AIRCRAFT MAINTENANCE SEMITRAILER
MOUNTED, SET C-11, POWERTRAIN SHOP

TM 55-4920-220-15, 25 September 1961, is changed as follows:

Page 31. Paragraphs 56 and 57 are superseded as follows:

56. Purpose

This chapter furnishes the operator with sufficient information for preparation of the equipment comprising Shop Set, Aircraft Maintenance, Semi trailer Mounted, C11, Powertrain Shop, for shipment and limited storage

57. Methods

The methods outlined herein for shipment and limited storage apply to the shop set as a unit. It is the responsibility of the operator to become familiar with the technical manuals for each item of equipment for shipment and limited storage.

Page 32. Add the following after the title of Section III:

(Refer to TM 750-244-1-4 for demolition instructions.)

Page 32. Paragraphs 60 through 63 are deleted.

By Order of the Secretary of the Army:

BRUCE PALMER, JR.
General, U. S. Army
Acting Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 (qty rqr block No. 94) Organizational Maintenance Requirements for All Fixed and Rotor Wing Aircraft.

TECHNICAL MANUAL

No. 55-4920-220-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 25 September 1961

OPERATOR, ORGANIZATIONAL, FIELD AND DEPOT MAINTENANCE MANUAL

SHOP SET, AIRCRAFT MAINTENANCE, SEMITRAILER MOUNTED,

SET C-11, POWERTRAIN SHOP

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

These instructions are for the information and guidance of operating and maintenance personnel to whom the end item or equipment is assigned. They contain information on the operation, lubrication, detail preventive maintenance services, and maintenance of the equipment, its accessories and auxiliaries; also packing, preservation, storing, and shipping procedures.

2. References

a. Current Technical References. Appendix I lists the technical manuals, lubrication orders, and other technical publications applicable to the equipment as noted in detailed instructions contained herein.

b. Maintenance Allocation.

(1) *Organizational maintenance allocation*. In general, the prescribed organizational maintenance responsibilities will apply in accordance with the extent of disassembly prescribed in the maintenance allocation chart (app. II), for the purpose of cleaning, lubricating, or replacing spare parts. In all cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the using organization, the applicable supporting maintenance unit should be informed so that trained personnel with suitable tools and equipment may be provided or other instructions issued.

(2) *Field and depot maintenance allocation*. The publication herein of instructions for complete disassembly and repair is not to be construed as authority for the performance by field maintenance units of those functions which are the responsibilities of depots. The prescribed maintenance responsibilities will apply as reflected in the allocation of maintenance parts in the applicable manual for the item of equipment. Provisioning of parts listed in Chapters 8 and 9 for the item, will be made to field maintenance only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization.

3. Forms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the commanding officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms normally are utilized to indicate the type, quantity, and condition of material to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of material in the hands of troops and for delivery of material requiring further repair to shops, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the material upon completion of its repair.

b. Authorized forms. Consult the technical manual (app. I) for the item of equipment for listing of forms required. No forms other than those approved for the Department of Army will be used. For a complete listing of all forms, refer to DA Pam 310-2.

c. Field Report of Accidents. The reports necessary to comply with the requirements of the Army Safety Program are prescribed in detail in the AR 385-series. These reports are required whenever accidents involving injury to personnel or damage to material occur.

d. Report of Unsatisfactory of Damaged Equipment or Materials. Any suggestions for improvement in design and maintenance of equipment and repair parts, safety and efficiency of operation, or pertaining to the application of prescribed lubricants and/or preserving materials, or technical inaccuracies noted in Department of the Army publications, will be reported as prescribed in AR 700-38, using DA Form 468 (Unsatisfactory Equipment Report) or DD Form 6 (Report of Damaged or improper shipment) as prescribed in AR 700-58. Such suggestions are encouraged in order that other organizations may benefit. Do not report all failures that occur. Report only repeated failures o1' unsatisfactory design or material. However, reports will always be made when exceptionally costly equipment is involved. Refer also to AR 700-38 and the printed instructions on DA Form 468.

Section II. DESCRIPTION AND DATA

4. Description

a. General. Shop Set, Aircraft Maintenance, Semi trailer Mounted, C-11, Power train Shop, consists of a semi trailer mounted van and necessary tools and equipment for an Army aviation field maintenance shop, operating in the field, performing the functions of a power train facility. The shop set contains 3 systems; electrical, pneumatic, and utility.

(1) Electrical system. A 10 kw generator is mounted on the forward platform of the shop and connected to the shop electrical system by a power cable inserted in the external power receptacle. The generator supplies the shop with 110-220 volt, 60 cycle, single phase, AC current, and 208 volt, 60 cycle, three phase, AC current. The external power receptacle feeds directly to the safety disconnect switch which is provided to enable the operator to discount the power source from the interior of the shop. An electric control panel (fig. 4), is mounted directly above the safety disconnect switch. The control panel contains 14 thermal magnetic circuit breakers which serve as distribution centers for the current supplied to the equipment of the shop. Overhead ceiling receptacles are provided to furnish current for small, electrically operated tools. Heavier equipment such as the drilling machine, bench grinder, lights, and heaters, are connected directly to the electrical control panel. Auxiliary electrical current is supplied to the shop through the external power receptacle when the shop generator is not in operation.

(2) Pneumatic system. The air compressor (fig. 10), is electrically driven with a 5 CFM capacity at 175 PSI. The compressor and air storage tank are mounted separately (figs. 10, 18, and 19). Air lines are installed (fig. 11, 12, and 14), from the compressor to the air storage tank, from the air storage tank to the oil and water separator and regulators, and from the regulators to the ceiling outlets. The pneumatic system controls and instruments (fig. 5), are mounted as a unit. This unit contains an oil and water separator for collecting and draining off accumulated oil and water, a source pressure gage, 2 regulators for

maintaining a steady operating pressure, 2 operating pressure gages, check units, and valves to control or disconnect the air pressure. An auxiliary air supply connection (fig. 13) is provided for receiving air into the air storage tank when the compressor is not in operation, and also may be used as a connection for supplying air pressure to the other shops when the compressor is operating.

(3) *Utility system*. The utility system consists of 4 each, 1 3/4 x 30 x 42 inch maple bench tops; 2 each, 1 3/4 x 30 x 84 inch, maple bench tops; 2 each, 33 x 28 x 42 inch, 4-shelf storage cabinets; and 6 each, 33 x 28 x 42 inch, 12-drawer storage cabinets. The maple bench tops are used as working surfaces and for mounting equipment. The cabinets are used for storing hand tools and small items of equipment (pars. 133-135).

b. Identification. Identification and instruction markings are listed in figures 1, 2, and 3.

c. List of Components. A list of the components is contained in SM 55-4-4920-S46.

d. Deviation in Models. This manual applies only to Shop Set, Aircraft Maintenance, Semi trailer Mounted, C-11, Powertrain Shop, as defined in SM 55-4-4920-S46.

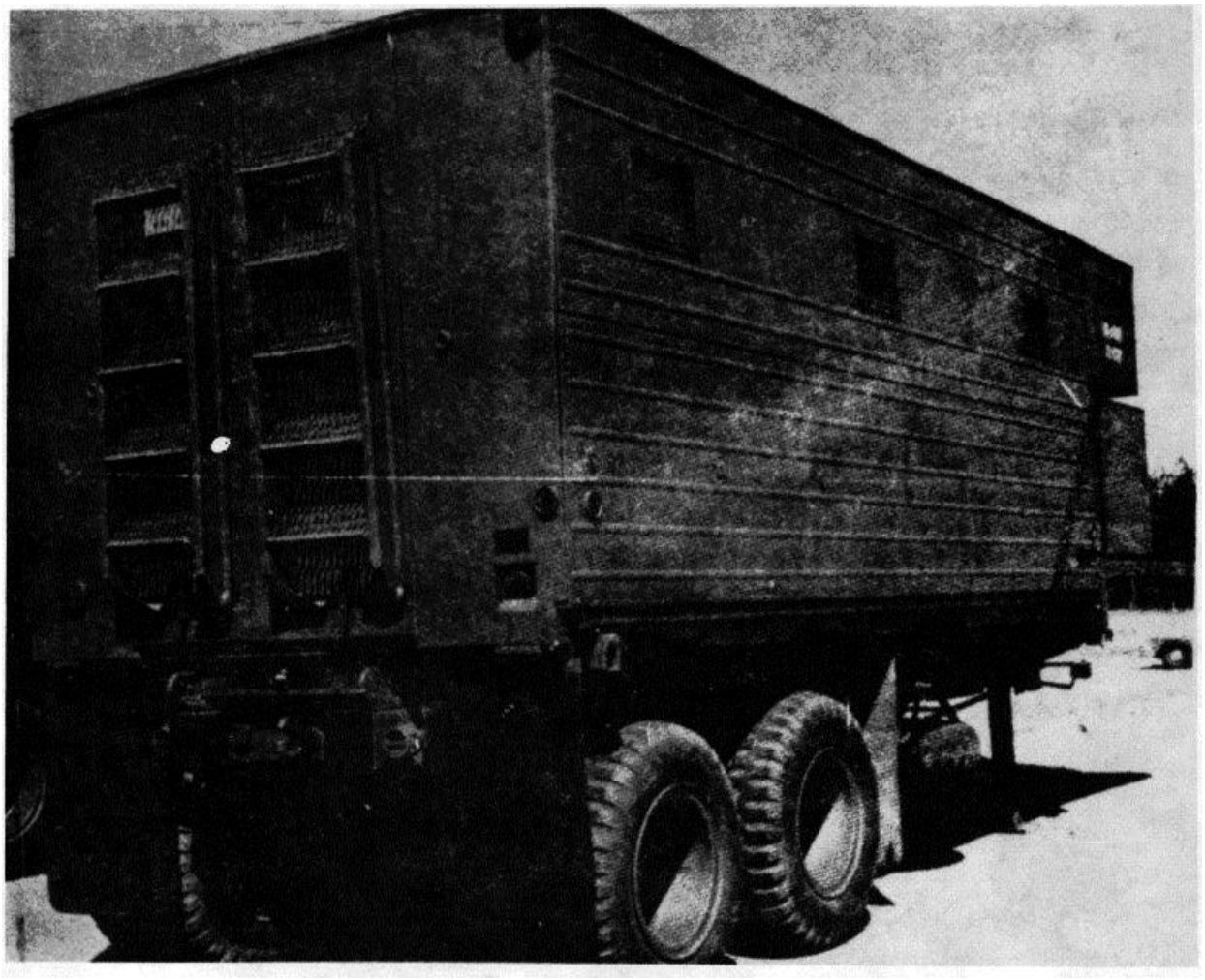


Figure 1. Shop set C-11, powertrain shop.

Figure 2. Identification plates, shop set, C-11.

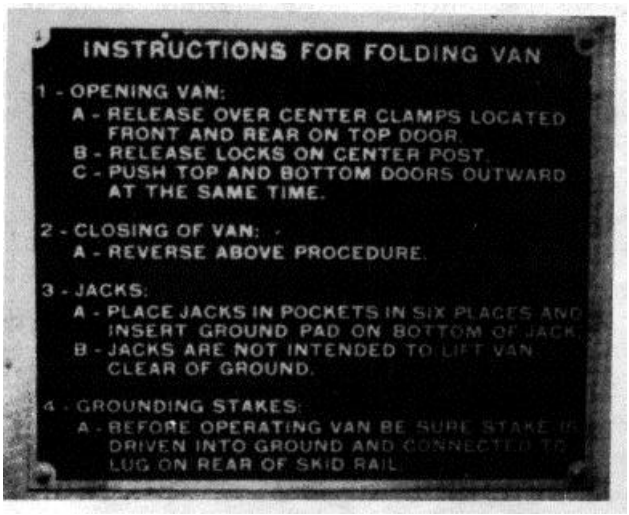


Figure 3. Instruction plate, shop set, C-l11.

5. Tabulated Data

a. Organizational Maintenance Data.

Model	C-I l
Overall dimensions:	
Overall length	323 in..
Overall width	94 1/2 in.
Overall height (loaded)	131 5/8 in.
Height of chassis (loaded)	10 1/2 in.
Overall width with sides folded out 1	66 1/2 in.
Volume	2,288 cubic ft.
Total weight	18,500 lb.

b. Field and Depot Maintenance Data.

(1) Electrical system.

Power source	Generator, gasoline engine driven.
Generator make and model.	Military Specification MIL-G-12373, Type II, Class A.
Generator mounting.	Skid type.
Generator rating.	Single and three phase, 10 kw, 208 v, line-to-line 120 v, line-to-neutral or line to-line, 3 phase, 60 cycle operation; or 10 kw, 120240 v, line-to-line single phase, 60 cycle operation.
Electrical connection, shop.	Power cable, male to female joy plug.
Safety devices	Safety disconnect switch.
Controls	Thermal-magnetic circuit breaker panel; 14 breakers (fig. 4).
Electrical connections, equipment.	Receptacles, (fig. 8), and circuit breakers (fig. 4).

(2) Pneumatic system.

Power source	Air compressor reciprocating, electric motor driven.
Compressor mak and model.	Military Specification MILC-13874, Class A, Style I.
Compressor mounting.	.Bolt down.
Compressor rating.	.5 CFM 175 PSI.
Power supply required.	220 v, AC, three-phase, 60 cycle.
Pneumatic connections, shop.	Quick disconnect, air supply tank.

Safety devices ..... Safety relief valve, refer to TM for the compressor (app. I).
Controls ..... Shutoff valve; oil and water separator, gage, regulators, valves, and check units (fig. 5).
Pneumatic connections equipment-. Quick disconnect fittings (fig. 5).

(3) Utility system.
Type equipment ..... Bench tops, maple, Size A and D; storage cabinets, Types I, II, and III.
Equipment ..... Bench tops-work areas and mounting bases; storage cabinets-storage of hand tools and accessories.
Equipment mounting. Bench top spin top cabinets; Storage cabinets bolt down.

CHAPTER 2
OPERATING INSTRUCTIONS (OPERATOR)

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

6. General

When a new or used shop set is first received by the operator, it is the responsibility of the operator to determine whether the material has been properly prepared for service by the supplying organization and to be sure it is in condition to perform its functions. For this purpose, inspect all assemblies and parts to be sure they are properly assembled, secured, cleaned, adjusted, and lubricated. Refer to Chapter 8, for assembly, location, and mounting details of equipment. Make a record of any malfunctions. Notify the responsible maintenance echelon of any deficiencies for correction as quickly as possible.

7. Before Operation Service

a. Lubrication. Lubricate equipment in accordance with paragraphs 29 and 30.

b. Fueling Instruction. Service equipment with fuel specified in operational and service manuals of the specific item. The fueling Instructions contained in operational and service manuals of the equipment form a part of this manual.

Caution: Serious damage to the equipment can result when the wrong type fuel is used in servicing equipment.

Section II. CONTROLS AND INSTRUMENTS

8. General

This section describes locates, illustrates, and furnishes the operator with sufficient information pertaining to the various controls or instruments provided for the proper operation of the equipment. It is essential that the operator know how to perform every operation the equipment is capable of performing.

9. Electrical Controls and Instruments

An electric control panel is located at the right rear corner of the interior of the shop. This panel is equipped with circuit breakers and an identification list (fig. 4); additional circuits may be installed, when necessary, in the panel. A safety switch is mounted beneath the panel on the incoming line. A layout (wiring diagram) of the control panel is shown in figure 8. An outside power receptacle is mounted on the right rear of the shop exterior.

Caution: Do not modify power receptacle or electrical cable.

10. Pneumatic Controls and Instruments

Pneumatic controls and instruments are mounted as a part of the air lines installation as illustrated in figure 5. These controls and instruments include valves, regulators, separators, gages, and check units. The air line is installed starting at the left front of the bottom of the shop, passing through the floor to the regulators and separators. The air line is divided into two sections after passing the separators, with one section continuing down each side of the shop, along the ceiling. Two check unit couplings are mounted on each side and another one on the outside front at the bottom of the incoming line.

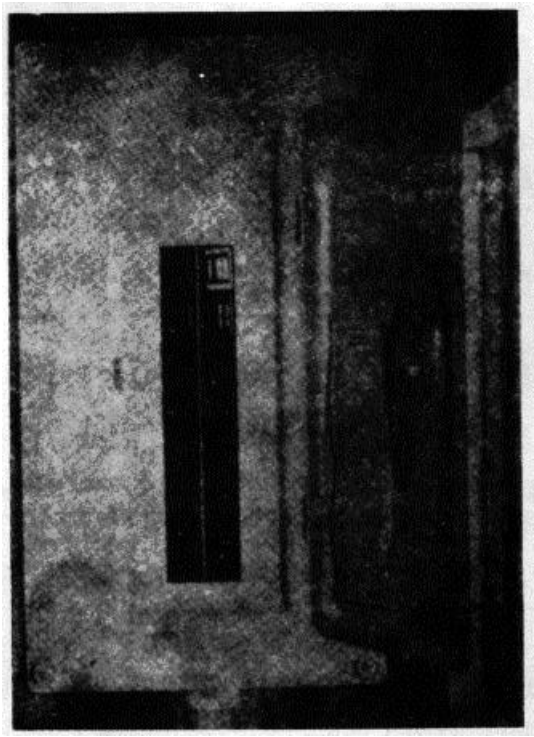
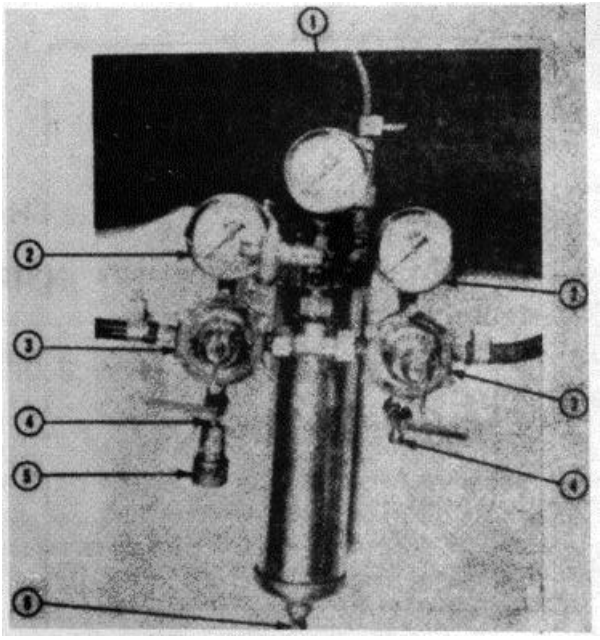


Figure 4. Electrical control panel and identification list.



1. **Source Pressure Gage,**
2. **Operating Pressure Gage,**
3. **Regulator.**
4. **Valve.**
5. **Quick Disconnect**
6. **Drain Plug.**

Figure 5. Pneumatic controls and instruments.

Section III. OPERATION UNDER USUAL CONDITIONS

11. General

Instructions in this section are for the use of personnel responsible for the operation of this equipment. It is essential that the operator know how to perform every operation of which the equipment is capable of performing.

12. Preparation for Starting

a. Perform the "before operation" daily services (par. 31-34).

b. Assure that all equipment control switches are in the OFF position.

c. Start power supply equipment.

Note. When external power is used, check connections before starting equipment.

d. The equipment. comprising Shop Set Aircraft Maintenance, Semi trailer Mounted, C-11 10 Powertrain Stop (par. 4), is now ready for operation.

e. It is essential that the operator(s) be completely familiar with the TM for the equipment.

13. Shut-Down of Shop Set

a. Shutdown instructions for the units comprising the shop set are contained in the TM issued for the individual items. It is essential that the operator understand these instructions.

b. Perform "after operation" daily services (pars. 29 and 30).

14. Operating Details

a. General. These instructions provide the operator with necessary details for operation of the equipment in the shop set.

b. Electrical System.

(1) Start the generator in accordance with the TM for the generator (app.I).

(2) Check generator instruments to assure that proper current is being supplied; adjust controls as necessary.

(3) Ascertain that circuit breakers in electrical panel, are in the ON position for circuits to be used.

(4) Check for loose connections, blown fuses, tripped circuit breakers, and frayed wire covers.

(5) Plug cords of equipment to be operated into receptacles provided.

Note. When external power source is utilized, omit (1) and (2) above.

c. Pneumatic System.

(1) Start the air compressor in accordance with the TM for the compressor (app. I).

(2) Allow sufficient time for buildup of source pressure in the tank, and drain the oil and water separator (fig. 5).

Note. The correct source pressure is 75 to' 150 PSI.

(3) Close drain when water or oil cease to drain from separator.

(4) Adjust controls (fig. 5), to obtain an operating pressure of 75 PSI.

(5) Check connections for leaks, security of fittings, and conditions.

(6) Insert adapters, attached to pneumatic equipment hose, into receptacles provided.

Note. When an external power source is utilized for pneumatic power, omit (1) above.

15. Movement of Equipment

a. Perform "at halt" and "after operations" daily services (table I and pars. 2134).

b. Store all tools and equipment.

c. Install security locking bars on cabinets with drawers (fig. 6).

d. Secure tools or equipment, too large for bin storage, in space provided (fig. 7).

e. Secure equipment in open bins with web straps or special fastenings.

f. Store cable or hose in locations provided.

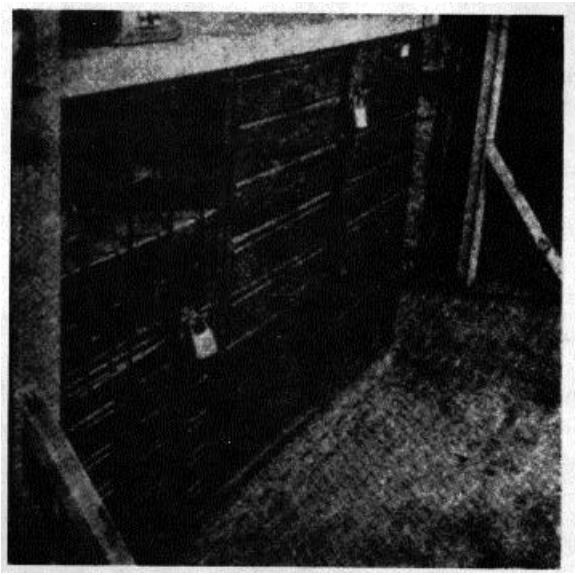


Figure 6. Security locking bars and open bin security fastenings, typical installation.

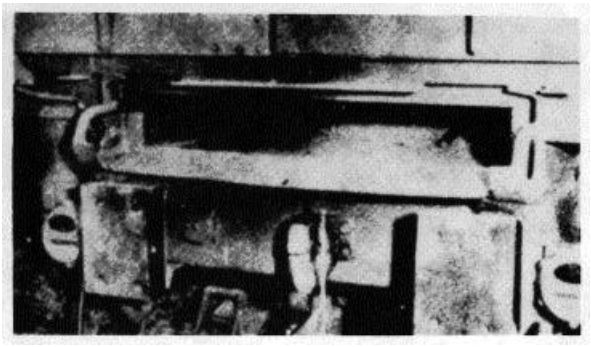


Figure 7. Jack stowage box.

Section IV. OPERATION OF ONE UNIT IN CONJUNCTION WITH ANOTHER ACCESSORY OR AUXILIARY

16. Maintenance and Operating Instructions

Maintenance and operating instructions for the auxiliary equipment to be used in conjunction with this shop set are listed in the separate technical manuals of the auxiliary equipment.

17. Auxiliary Connections

Connections are provided for auxiliary pneumatic and electrical hookups. The location, purpose and description of these auxiliary outlets are described in paragraphs 76 through 78.

Operating instructions for the auxiliary connections are contained in this chapter.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

18. General Conditions

a. In addition to the operating procedures described for usual conditions, special instructions of a technical nature for operating and servicing this equipment under unusual conditions are contained or referred to herein. In addition to the preventive maintenance services; special care in cleaning and lubrication must be observed where extremes of temperature, humidity, and terrain conditions are present or anticipated. Proper cleaning, lubrication, and storage and handling of fuels and lubricants not only insure proper operation and functioning but also guard against excessive wear of the working parts and deterioration of materials.

Caution: It is imperative that the approved practices and precautions be followed. A detailed study of the specific technical manuals is essential for use of this equipment under unusual conditions.

b. When recurrent failure of equipment results from subjection to extreme conditions, report the condition on DA Form 468.

19. Extreme-Cold Weather Conditions

a. General Problems.

(1) Extensive preparation of equipment scheduled for operation in extreme cold weather is necessary. Generally, extreme cold will cause lubricants to congeal, freeze batteries or prevent them from furnishing sufficient current for cold-weather starting, crack insulation and cause electrical short circuits, prevent fuel from vaporizing and properly combining with air to form a combustible mixture for starting, and will cause the various construction materials to become hard, brittle, and easily damaged or broken.

(2) The cooling systems must be prepared and protected for temperatures below plus 32°F., in accordance with instructions in specific manuals on draining and cleaning the systems and the application and checking of antifreeze compounds to suit the anticipated conditions.

Caution: It is imperative that the approved practices and precautions be followed. Refer to specific manuals applicable to the equipment. This must be considered an essential part of this manual not merely an explanatory supplement to it.

b. Fuels, Lubricants, and Antifreeze Compounds (Storage, Handling, and Use).

(1) The operation of equipment at arctic temperatures will depend to a great extent upon the condition of the fuels, lubricants, and antifreeze compounds used in the equipment. Immediate effects of careless storage and handling or improper use of these materials are not always apparent but any deviation from proper procedures may cause trouble at the least expected time.

(2) In arctic operations, contamination with moisture is a source of many difficulties.- Moisture can be the result of snow getting into the product, condensation due to "breathing" of a partially filled container, or moisture condensed from warm air in a partially filled container when a product is brought outdoors from room temperature. Other impurities will also contaminate fuels and lubricants so their usefulness is impaired.

20. Extreme-Cold Weather Operation

a. General.

(1) The operator must always be on the alert for indications of the effect of cold weather on the equipment.

(2) The operator must exercise caution when placing the equipment in operation after a shutdown. Thickened lubricants may cause failure of parts. Warm up motorized equipment thoroughly before operating; check some voltage of electrical equipment to ascertain that sufficient power is available to prevent motor burn outs.

(3) Constantly note instrument readings. If instrument readings consistently deviate from normal, stop the equipment and investigate cause.

b. At Stop.

(1) When halted for short shutdown periods, the equipment should be sheltered from the wind.

(2) When preparing equipment for shutdown periods, place control levers in the neutral position to prevent them from possible freezing in an engaged position. Freezing may occur when water is present due to condensation.

(3) Clean all equipment of ice and condensate as soon as possible after operation. If the canvas covers are not installed, be sure to protect all equipment against entrance of loose, drifting snow during the halt.

(4) If heater is not in operation the storage batteries should be removed and stored in a warm place.

(5) Refuel equipment immediately in order to reduce condensation in the fuel tanks. Prior to refueling, open tank drain cock and drain off any accumulated water.

(6) Immediately after shutdown, start the heater and check to be sure it operates effectively. The heater should eliminate the necessity of removing the batteries to a warm storage, and is designed to operate unattended overnight.

(7) Open drain cocks to remove liquid from water separators and cooling systems; inspect drain cocks for obstructions; remove any foreign material or obstructions from the drain cocks. Leave drain cocks in full open position while equipment is inoperative.

21. Operation in Extreme Hot Weather Conditions

a. General. Operation of the equipment in extreme hot weather condition requires efficient cooling and proper lubrication. Halt the equipment for a cooling off period whenever necessary and conditions permit. Frequently inspect and service cooling units, oil filters, and air cleaners. Check ventilators periodically for cracks and obstructions. Check lubricants for viscosity and lubricating ability.

b. At Stop.

(1) Do not leave equipment in the sun for long periods; place equipment under cover to protect it from the sun, sand, and dust when possible.

(2) Cover inactive equipment with tarpaulins if no other suitable shelter is available.

(3) Equipment inactive for long periods in hot humid weather is subject to rapid rusting and accumulation of fungi growth. Make frequent inspections and clean and lubricate to prevent excessive deterioration. Protect cooling system with rust inhibiter compound. Remove batteries and store in a cool place.

22. Operation in Extreme Wet Climate

Mud, water, and high humidity are enemies of the equipment in this shop set. Particular attention should be paid to formation of rust, mud scale, dirt buildup, and mildew. All equipment exposed to these conditions should be cleaned and oiled frequently in order to preserve the operating efficiency.

23. Operation in Snow and Ice

The precautions listed in paragraphs 19 and 20 apply to operating the equipment in snow and ice.

24. Operation in Salt Water Areas

Corrosion is the major problem presented by operation of the equipment in salt water areas. Particular attention should be given to application of corrosion preventive compounds, cleaning of equipment, storage, and touch-up of painted areas. Remove all traces of salt water and salt water residue from the exterior of the shop by thoroughly washing the equipment with fresh water. After drying, apply a solution of 75 percent lubricating oil and 25 percent corrosion preventive compound, Military Specification MILC-6529, Type I, to all surfaces not protected by paint.

Caution: Do not allow this mixture to come in contact with rubber materials or parts which are exposed to direct flame.

Operating equipment, including hand tools, may be protected by an application, to exterior surfaces, of corrosion preventive compound, Military Specification MIL-C-16173, Grade I.

25. Operation in Extreme Dust Conditions

Operation of the equipment under this condition necessitates the frequent inspection of unprotected surfaces. All lubricated surfaces should be cleaned periodically and the contaminated lubricant replaced with uncontaminated lubricant.

26. Operation at High Altitudes

Overheating of equipment and deviation of instrument readings constitute the major problems of operating equipment at high altitudes. Intake ducts, filters, and water supply must be checked at frequent intervals as a preventive measure for overheating.

Caution: Instruments not compensated for high altitude operation should be adjusted in accordance with instructions contained in the specific TM, by second echelon maintenance personnel.

CHAPTER 3
MAINTENANCE INSTRUCTIONS (OPERATOR)

Section I. SPECIAL ORGANIZATIONAL TOOLS AND EQUIPMENT

27. Special Tools and Equipment Which are Supplied With or Issued for Use With the Equipment

No special tools or equipment are required for operator maintenance of this shop set. Special tools and equipment required for operator maintenance of individual items of equipment are listed in the TM for the item (app. I).

28. On Vehicle Material (OVM)

List of tools and parts attached to the equipment are listed in the TM for the specific item (app. I).

Section II. LUBRICATION

29. General

A lubrication order is issued for each item of equipment and is to be carried with it at all times. Lubrication orders prescribe approved lubrication procedures. The instructions contained therein are mandatory.

30. Detailed Lubrication Instructions

a. Care of Lubricants. When storing and handling lubricants, make certain the containers are clean and securely covered to prevent dirt, dust, or other foreign matter from entering. Be sure that the lubricant is clean before using. Keep lubrication equipment in a place where it will be safe from damage and free from dirt. Paragraphs 18 through 26 contain lubrication instructions for the protection of equipment under unusual conditions.

b. Cleaning. Clean all surfaces surrounding the points to be lubricated before applying the lubricant. Use an approved cleaning solvent to wash the surfaces, wipe off all excess lubricant after lubricating.

c. Points of Application. The points of application are illustrated in the applicable LO (app. I). Follow the detailed lubrication instructions illustrated beneath each lubrication point indicating procedures to be followed at each point. Apply the lubricant indicated on the lubrication order key.

Section III. PREVENTIVE MAINTENANCE SERVICES

31. General

a. Responsibility and Intervals. The primary function of preventive maintenance is to prevent breakdowns and, therefore, the need for repair. Preventive maintenance services which are the responsibility of the operator will be performed before operation, during operation, at halt, and after operation (table I).

b. Before Operation Service. This is a brief service to ascertain that the equipment is ready for operation; it is essentially a check to determine if conditions affecting the equipment's readiness have changed since the last after-operation service.

c. During Operation Service. This service consists of the detection of unsatisfactory performance while the equipment is in operation; the operator should be alert for any unusual noise, vibrations, or irregularities of performance.

d. At Halt Service. This service will consist of a brief visual inspection of equipment for condition, security, and wear; the removal of foreign material from equipment; and the cleaning of equipment that might be damaged by allowing existing conditions to continue.

e. After Operation Service. This service consists of investigating any deficiencies noted during operation and performing certain phases of the "before operation" service as noted in table I. It is the basic daily service for equipment and consists of correcting, insofar as possible, any operating deficiencies; in this manner, the equipment is prepared to operate upon short notice.

f. Inspection. The general inspection of each item is generally a check to see whether the item is in good condition, correctly assembled, secure, and not excessively worn.

g. Definition of Terms. Terms used to describe the inspection requirements of this section are defined as follows:

(1) Good condition. This is usually an external inspection to determine whether the unit is damaged beyond serviceable limits. The term "good condition" is explained further by the following: Not bent or twisted; not chafed or burned; not dented or collapsed; not torn or cut; not deteriorated.

(2) Correctly assembled. This term refers to the inspection of a unit to see that it is in the normal assembled position. It is usually an external visual inspection.

(3) Secure. This is usually an external visual inspection or a check by hand or wrench for looseness. Such an examination must include any brackets, lock washers, lock nuts, locking wires, or cotter pins used.

(4) Excessively worn. This inspection is to determine whether equipment is 16 worn beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection.

32. Specific Procedures for Operator

Table I lists the specific procedure to be performed by the operator in daily service. An X in a column indicates that the procedure opposite it should be performed during that part of the daily service. Refer to appendix I for a listing of technical publications containing daily operator services for individual items of equipment.

33. Cleaning

Any special cleaning instructions required for specific mechanisms or parts are contained in the TM for the equipment (app. I). General cleaning instructions are as follows:

a. Use dry cleaning solvent to clean or wash grease and oil from all metal parts.

b. A solution of one part grease cleaning compound to four parts of dry cleaning solvent may be used for dissolving grease and oil from the shop and equipment other than optical instruments. After cleaning, use cold water on exterior surfaces of the shop, to rinse off any solution which remains. Operating equipment and hand tools, exclusive of optical instruments, may be wiped with a light lubricating oil.

c. When authorized to install new parts, remove any preservative materials, such as rust preventive compound, protective grease, etc.; prepare parts as required (oil seals, etc.); and for those parts requiring lubrication, apply the lubricant prescribed in the lubrication order.

d. Nameplates, caution plates, and instruction plates made of steel rust very rapidly. When they are found to be in a rusted condition, they should be thoroughly cleaned and heavily coated with an application of clear lacquer.

34. General Precautions in Cleaning

a. Dry cleaning solvent is flammable and should not be used near an open flame. Fire extinguishers should be provided when these

materials are used. Use only in well ventilated places.
b. Dry cleaning solvent evaporates quickly and has a drying effect on the skin. If used without gloves, it may cause cracks in the skin and, in the case of some individuals, a mild irritation or inflammation.
c. Avoid getting petroleum products, such as dry cleaning solvent, mineral spirits paint thinner, engine fuels, or lubricants on rubber parts as they will deteriorate the rubber.
d. The use of diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.

Section IV. TROUBLESHOOTING

35. Use of Troubleshooting Section

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the shop set or any of its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

36. Procedure

To correct malfunctioning of equipment, the cause should be systematically isolated in accordance with instructions in the following paragraphs. If the correction of the malfunction is beyond the scope of the operator's functions, refer the discrepancy to the proper maintenance echelon for correction.

37. Electrical Equipment Operates at Slow or Reduced Speed

Probable cause	*Possible remedy*
Loose connectors	Tighten connectors.
One circuit breaker in OFF position (208-220 volt equipment).	Return breaker to ON position.
Cause beyond maintenance scope of operator.	Notify second maintenance echelon.

38. Electrical Equipment Stops During Operation

Probable cause	Possible remedy
Power cord of equipment not properly plugged into receptacle.	Remove plug from receptacle and re-insert into receptacle.
Equipment overheated	Reduce operating speed; allow equipment to cool and re-start.
Probable cause	Possible remedy
Circuit breaker tripped to OFF position.	Re-set circuit breaker to ON position, re-start equipment.
Cause beyond maintenance scope of operator.	Notify second maintenance echelon.

39. Electrical Equipment Will Not Start

Probable cause	*Possible remedy*
Power cord of equipment removed from receptacle.	Insert plug of equipment cord into receptacle.
No power from generator	Check for generator operation; re-start generator.
Circuit brakers in electrical panel in OFF position.	Re-set circuit breakers to ON position.
Safety disconnect switch open.	Close safety disconnect switch.
Cause beyond maintenance scope of operator.	Notify second maintenance echelon.

40. Pneumatic Equipment Operates at Slow or Reduced Speed

Probable cause	*Possible remedy*
Air compressor not operating.	Start air compressor; allow source pressure to reach operational level; re-start equipment.
Air pressure not properly regulated at water separator.	Adjust pressure regulator to proper level (75 PSI).
Loose connection at air hose	quick disconnect adapter. Re-seat adapter.
Water in air -	Drain water separator.
Cause beyond maintenance scope of operator.	Notify second maintenance echelon.

41. Pneumatic Equipment Stops During Operation

Probable cause	Possible remedy
Air compressor stopped	Re-start air compressor.
Equipment overloaded	Reduce feed, pressure, or speed as necessary.
Air line disconnected	Connect air line.
Cause beyond maintenance scope of operator	Notify second maintenance echelon.

42. Pneumatic Equipment Will Not Start

Probable cause	Possible remedy
No air pressure compressor stopped	Start compressor.
Air pressure cut off at pressure regulator.	Adjust pressure regulator to obtain pressure of 75 PSI.
Air hose of equipment not properly connected to adapter.	Remove air hose from supply at quick disconnect; clean adapter and reinstall hose.
Cause beyond maintenance scope of operator	Notify second maintenance echelon.

43. Excessive Vibration of Equipment

Probable cause	Possible remedy
loose mounting bolts	Tighten or replace bolts as necessary.
Equipment load improperly distributed	Readjust load.
Operating speed of equipment too high.	Reduce speed in accordance with TM for equipment (app. I).
Equipment load too heavy	Reduce load to recommended limits in accordance with TM for equipment (app.I).
Cause beyond maintenance scope of operator.	Notify second maintenance echelon.

44. Excessive Noise

Probable cause	Possible remedy
Equipment receiving improper lubrication.	Lubricate in accordance with paragraphs 29 and 30.
Equipment being use(l improperly.	Consult TM for equipment (app. I); use in accordance with recommendations in TM.
Cause beyond maintenance scope of operator.	Notify second maintenance echelon.

Section V. ELECTRICAL SYSTEM

45. General

The electrical system of Shop Set, Aircraft Maintenance Semi trailer Mounted, C-11 Powertrain Shop is a 110-220 volt, single phase and 208 volt, 3 phase system. Electrical power is supplied to the shop from a generator or external source to an electrical distribution panel mounted in the right rear interior corner of the shop (fig. 4). A safety disconnect switch is mounted below the electrical panel in order that the power source may be disconnected from the interior of the shop. The electrical panel contains 14 thermal-magnetic circuit breakers for supplying power to the various circuits. The wiring diagram for the shop set is contained in figure 8.

46. Electrical Generator

Operator maintenance for the generator consists of service and adjustments. The detail maintenance procedures are outlined in the TM for the generator (app. I).

47. Electrical Wiring Installation

a. General. Operator maintenance of the electrical wiring installation consists of service and adjustments.

b. Servicing. Keep electrical power cords clean and free of grease and oil. Do not allow rubber covered power cords to come in contact with grease, oil, fuels, cleaning solvents, or paint thinners. Store detachable electric power cords in space provided when not in use. Wipe

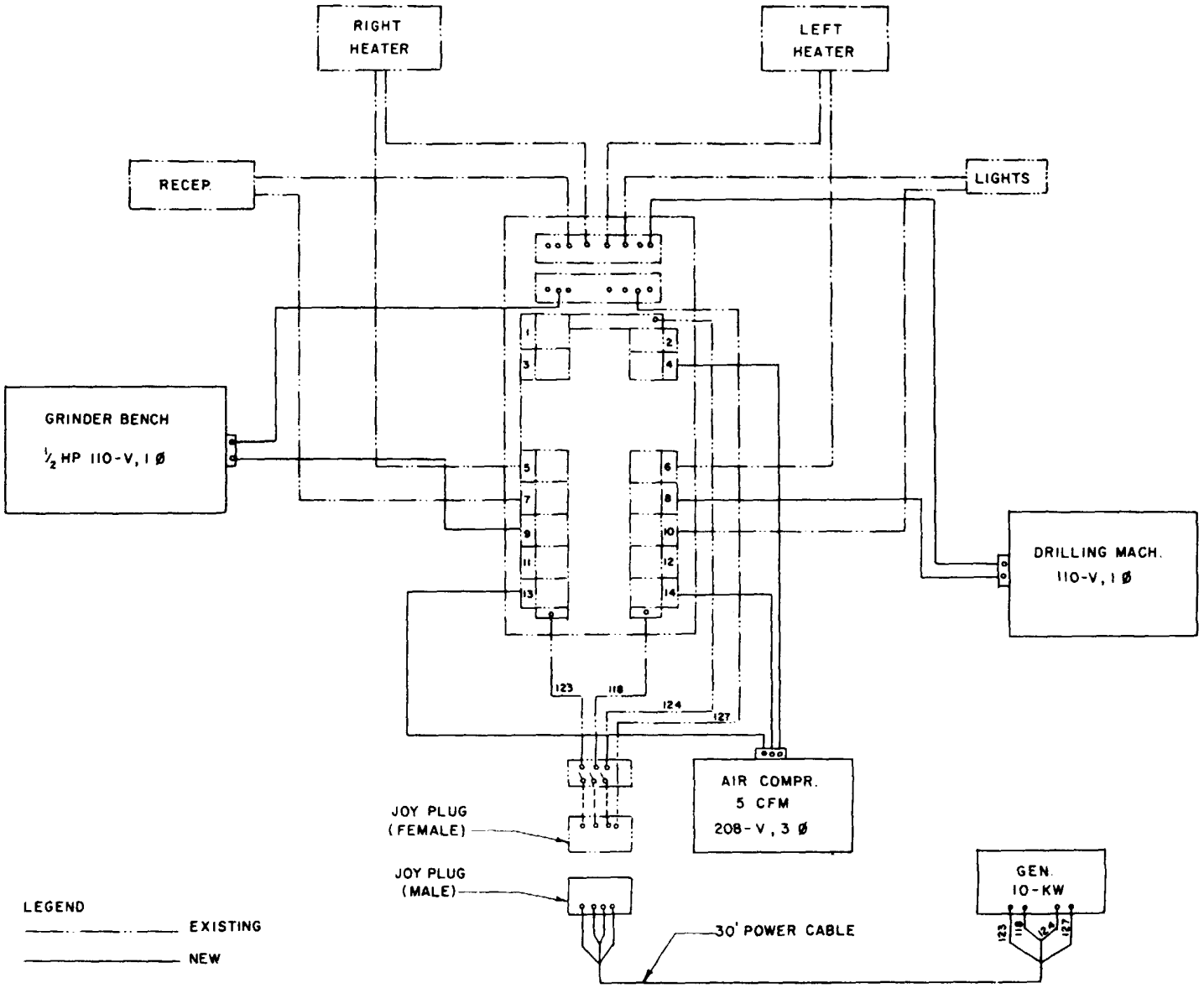


Figure 8. Wiring diagram, shop set C-11.

foreign materials from electrical receptacles before use or when exposed to wind, dust, rain snow, or salt water.

c. Adjustments. Check all male electrical connectors for security and condition before use. Adjust or tighten terminals as necessary. Female electrical connectors and receptacles require few adjustments beyond the tightening of screws. Check all female electrical connectors and receptacles for security and condition before use.

Warning: Disconnect the power source at the safety disconnect switch prior to adjusting female electrical connectors or receptacles.

Section VI. PNEUMATIC SYSTEM

48. General

The pneumatic system of the shop set consists of an air compressor, electric driven motor and an air supply tank, controls and instruments, lines, and connectors. Compressor, tank, controls, and instruments, lines, and connectors are shown in figures 5, 9, and 10. Mounting details are shown in figures 11 through 20.

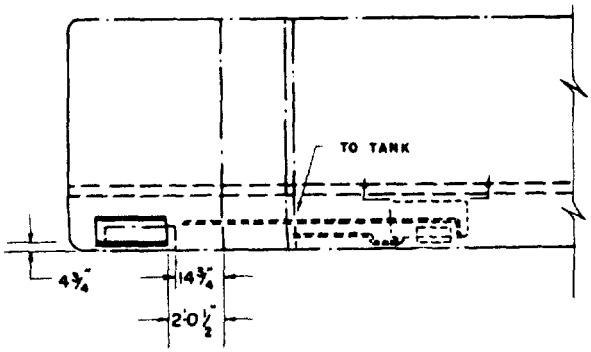


Figure 9. Pneumatic system installation, plan view.

49. Air Compressor

Operator maintenance of the compressor consists of service and adjustments. The TM for the compressor (app. 1) outlines detail maintenance procedures for the operator.

50. Air Supply Tank

The air supply tank is mounted underneath the shop floor at the forward left side of the shop (figs. 18 and 19). Operator maintenance consists of service and adjustments as outlined in the TM for the compressor (app. I).

51. Controls and Instruments

a. General. Controls and instruments for the pneumatic system (fig. 5) consist of pressure gages, oil and water separator, regulators, and valves. The operator is responsible for service and adjustment of the controls and instruments.

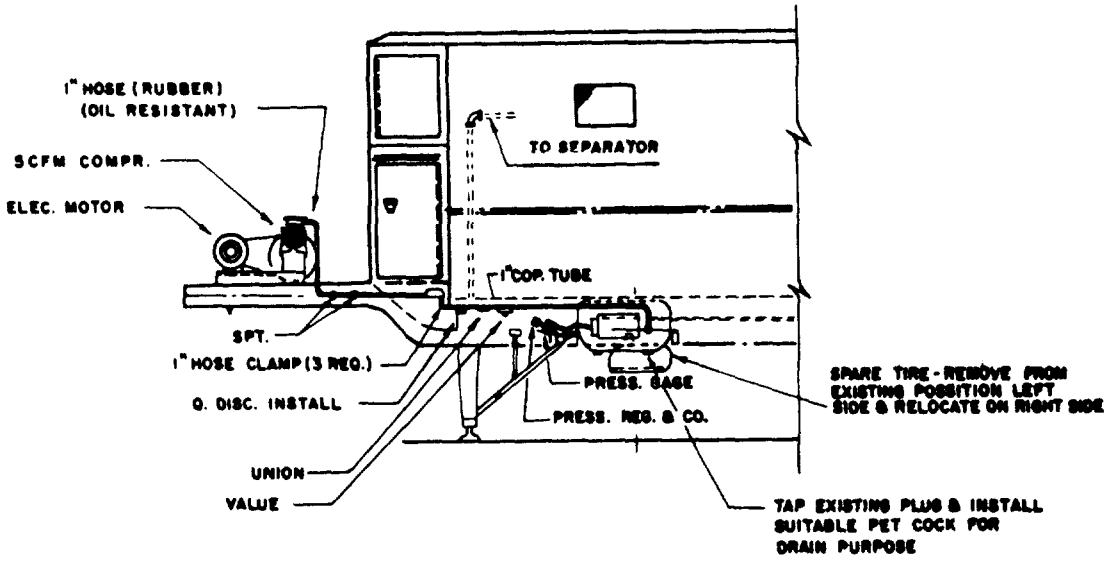
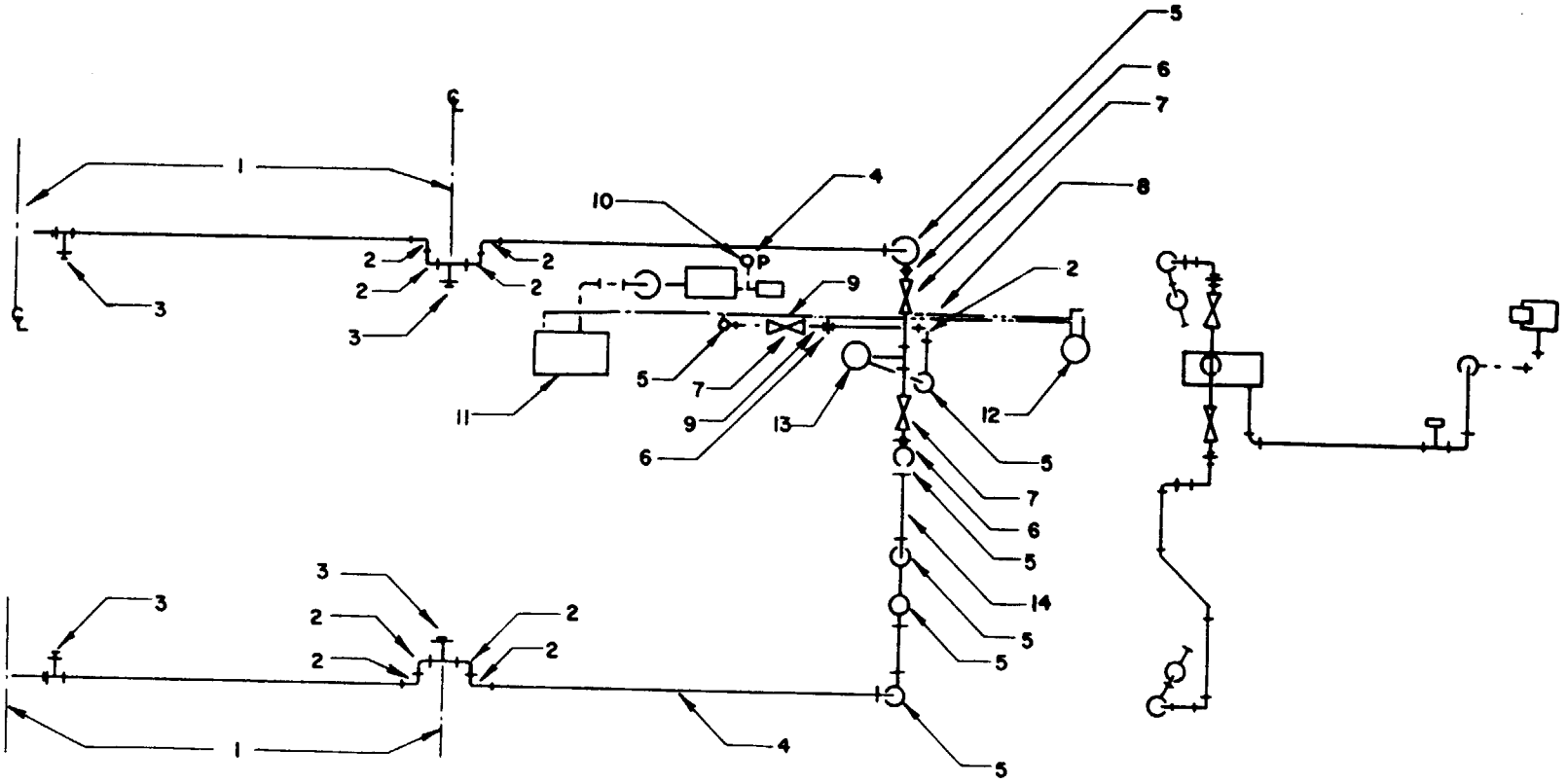


Figure 10. Left ride elevation, pneumatic system.



LEGEND

ELL. 90°	T
ELL. 45°	T. OUT. DN.
ELL. TND. UN.	PL.
ELL. TND.	GLV.
ELL. UNION	ELL. ST. 90°

1. VERTICAL POST
2. 1/4 IN. 90° GALV. STL. ELBOW
3. 1/4 IN. GALV. STL. TEE
4. 1/4 IN. GALV. STL. PIPE
5. 1/4 IN. GALV. STL. ELBOW
6. 1/4 IN. GALV. STL. UNION
7. 1/2 IN. COMB. GLOBE VALVE
8. 1 IN. RUBBER HOSE
9. 1 IN. COPPER TUBING
10. PRESSURE GAGE
11. COMPRESSOR TANK
12. COMPRESSOR
13. OIL AND WATER SEPARATOR
14. 1/2 IN. GALV. STL. PIPE

Figure 11. Air lines layout, top view.

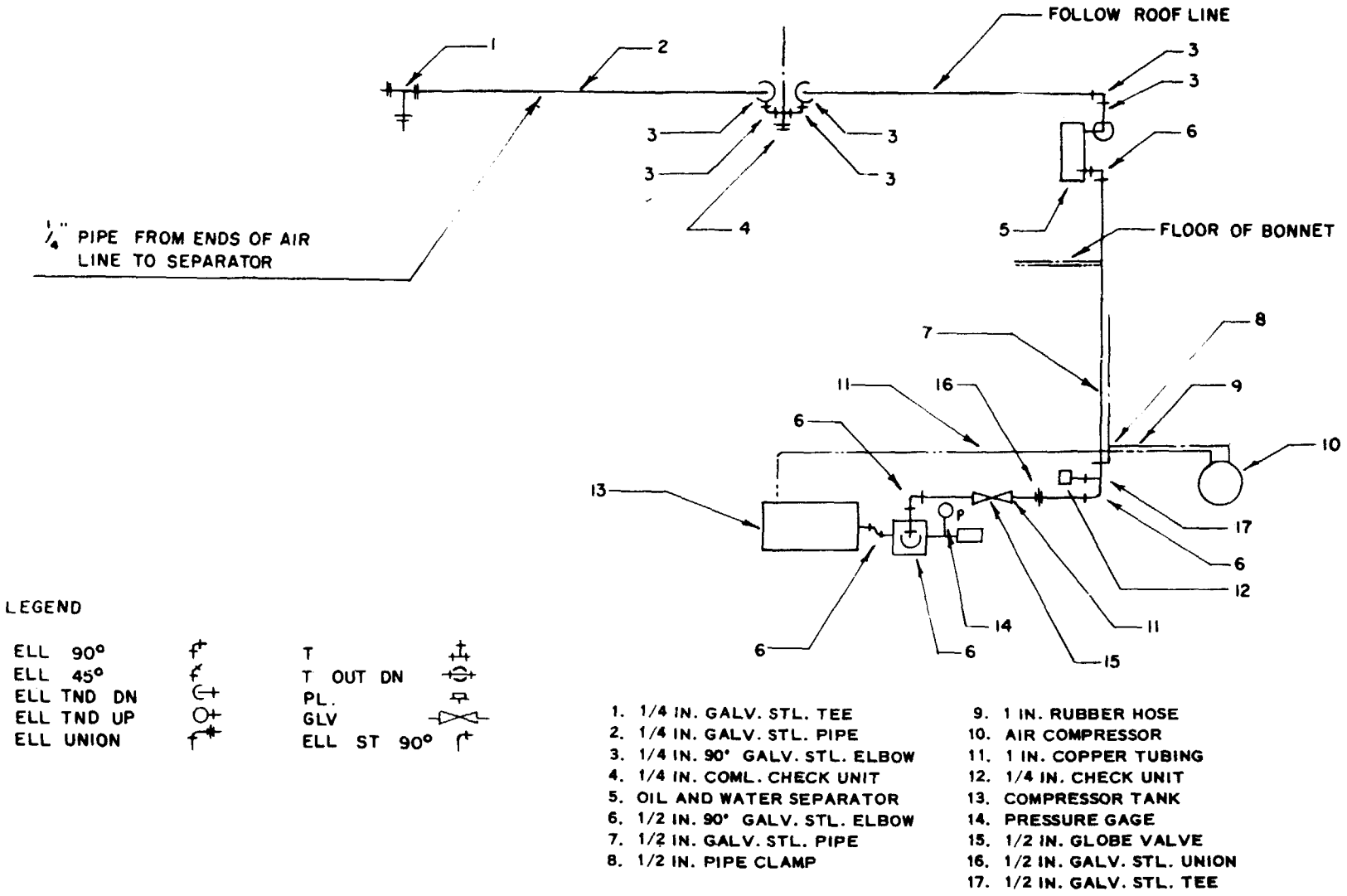


Figure 12.. Air lines layout, side view.

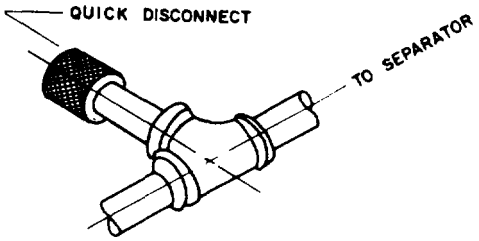


Figure 13. Quick disconnect fitting, compressor tank.

b. Servicing. Keep instrument dial covers and cases clean; avoid the use of oily, gritty, or dirty wiping material for cleaning dial covers and cases. Normally, plain water and a clean rag will suffice for cleaning dial covers and cases. When heavy accumulations of mud, dirt, grime, grease, or other foreign materials are to be removed from dial covers and cases, use a solution of water and a mild soap or detergent. Extreme cases may require the use of more active compounds for the removal of foreign materials. Wipe off all moisture after cleaning.

Caution: Use only approved cleaning compounds.

Follow the directions carefully when applying. Service the controls of the pneumatic system of removing oil, grit, grime, dirt, mud, grease, and other foreign materials before and after operation. Materials to be used in cleaning controls are the same as those used in cleaning instrument dials and cases.

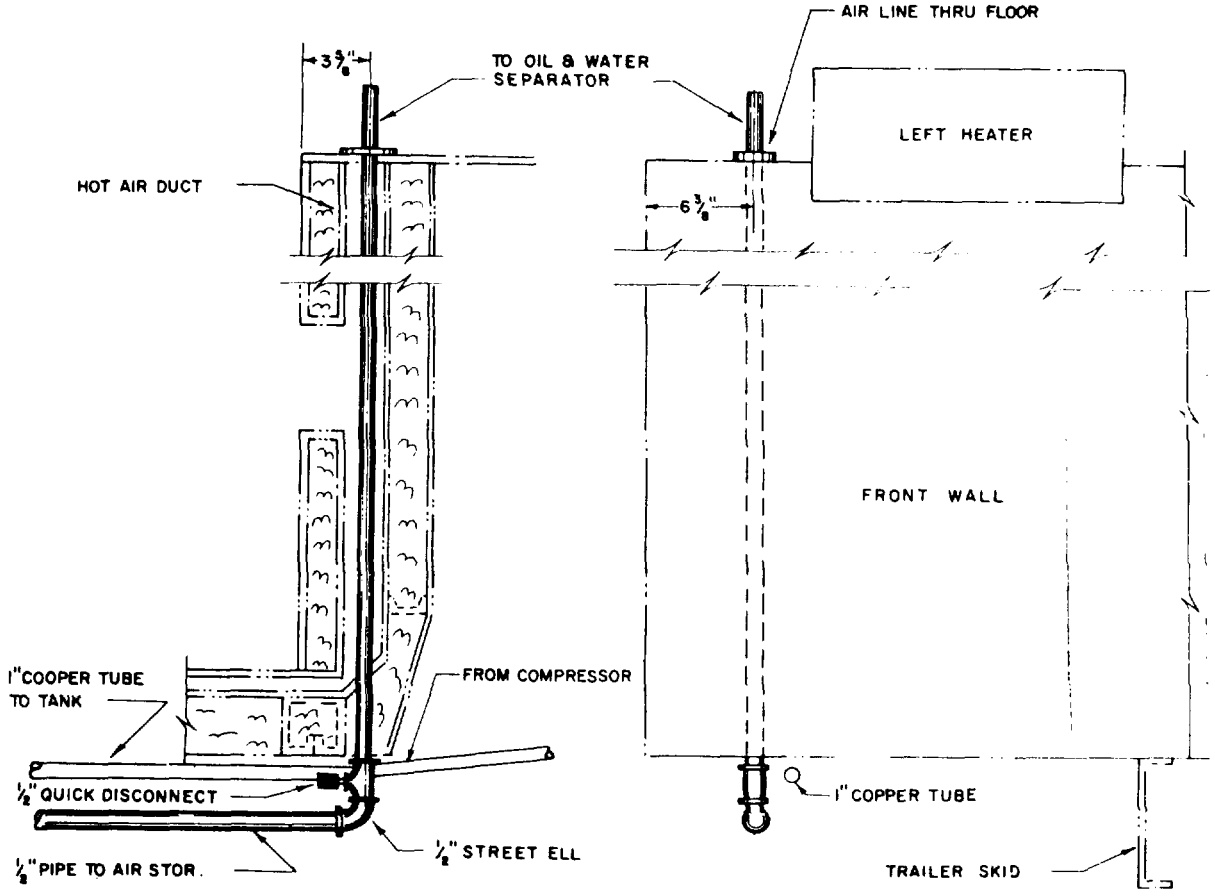


Figure 14. Air line layout, front view.

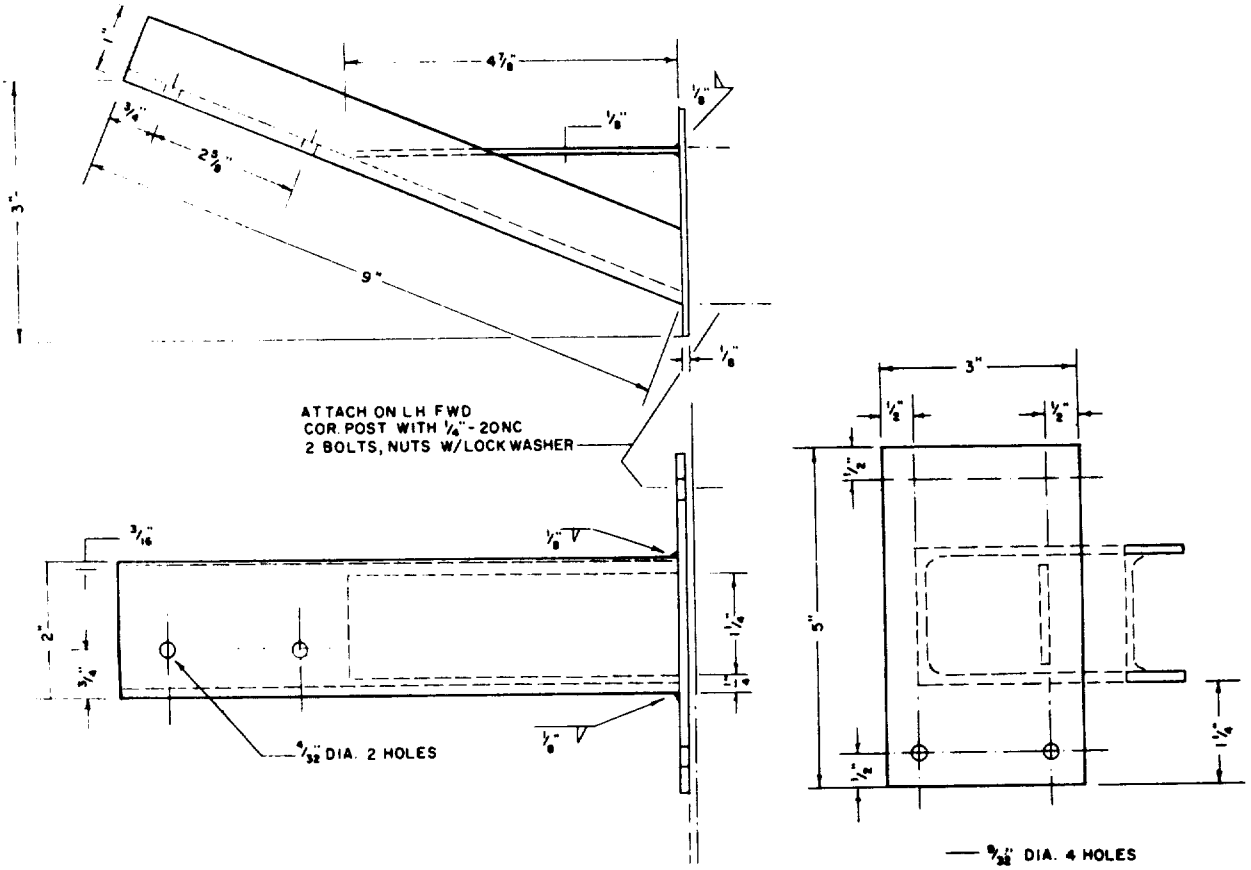


Figure 15. Separator mounting bracket.

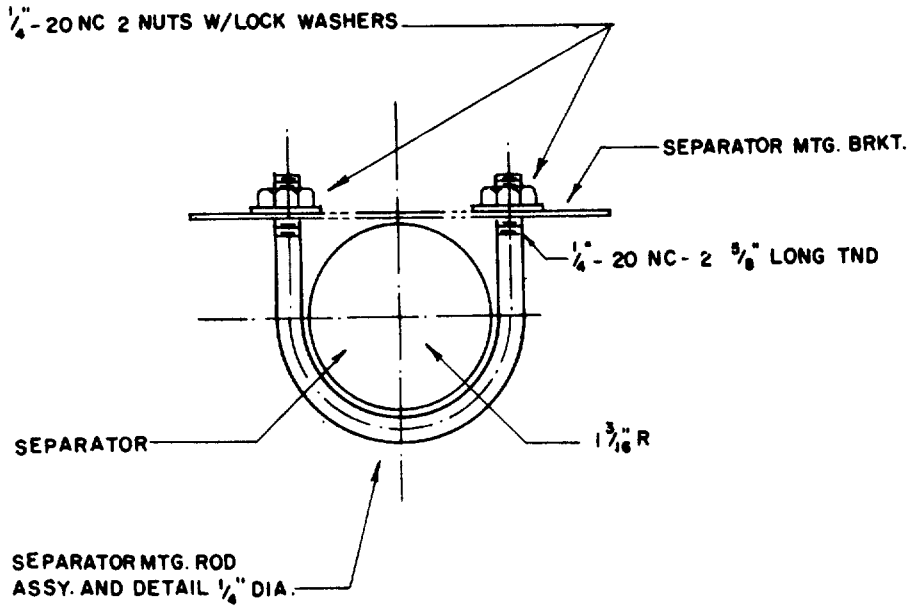


Figure 16. Separator mounting rod.

c. Adjustments. Operator adjustment of instruments is accomplished by use of the controls provided. The operator should not attempt to make adjustments to any instrument except as can be made my use of the controls. Controls in the pneumatic system consist of valves which are used to regulate the air pressure to the tank; to regulate the air pressure to the equipment being used, and to drain the system of condensate. Refer to paragraphs 8 through 10 for location, description and purpose of controls. To regulate the supply of air to the air tank, open or close regulator as necessary. To adjust the supply of air to the equipment being used, turn regulator handle (fig. 5), in or out until an operating pressure of 75 PSI is obtained.

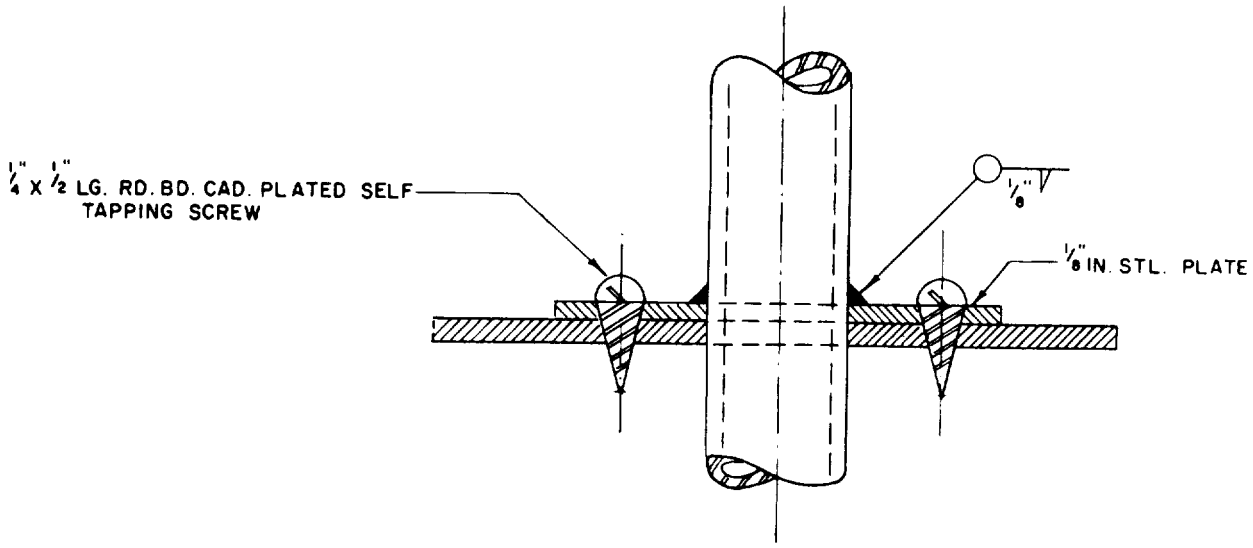


Figure 17. Air line mounting, floor.

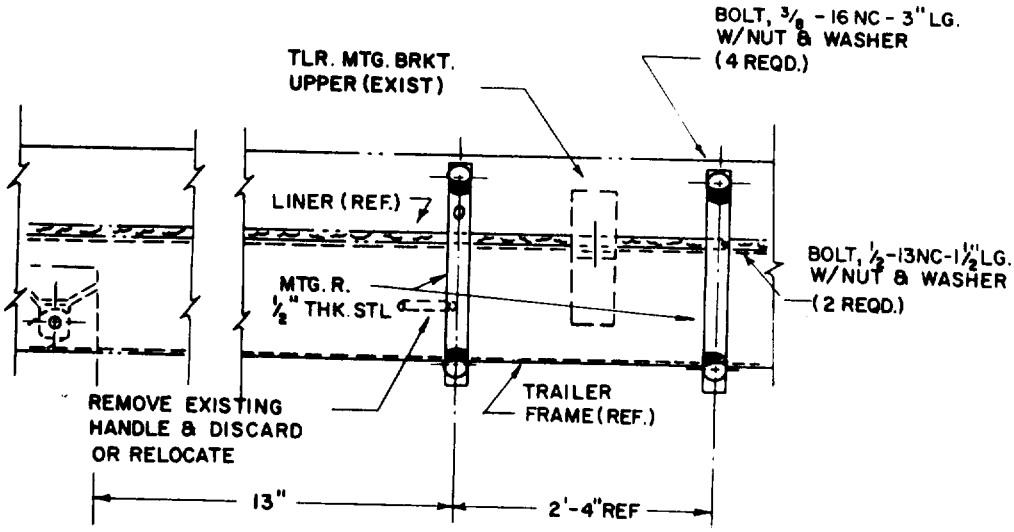


Figure 18. Air compressor tank installation, top view.

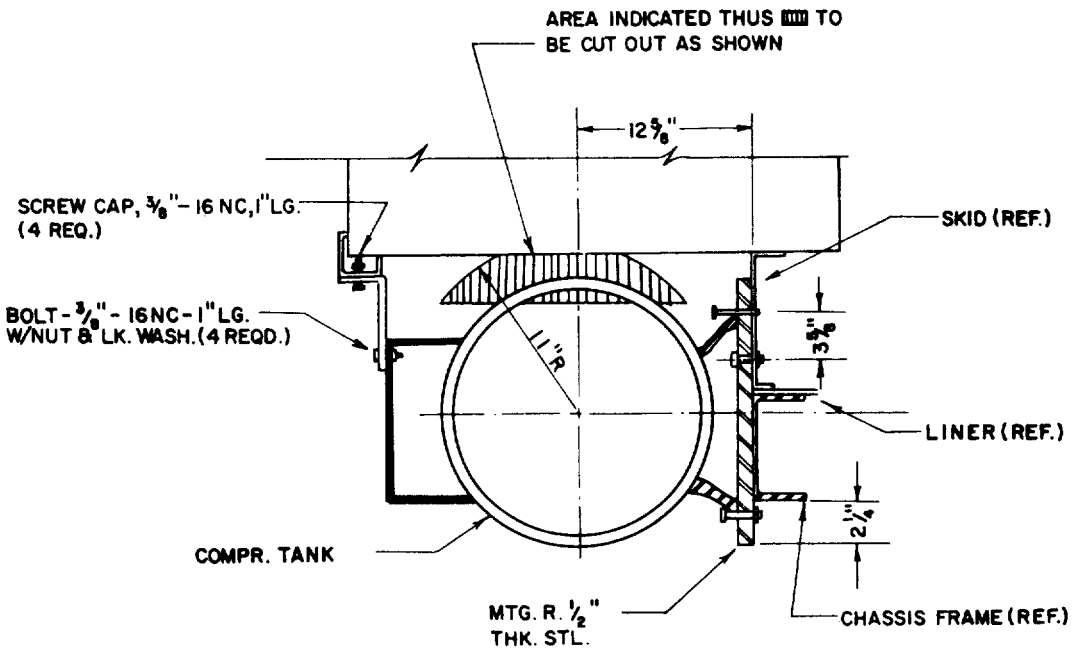


Figure 19. Air compressor tank installation, end view.

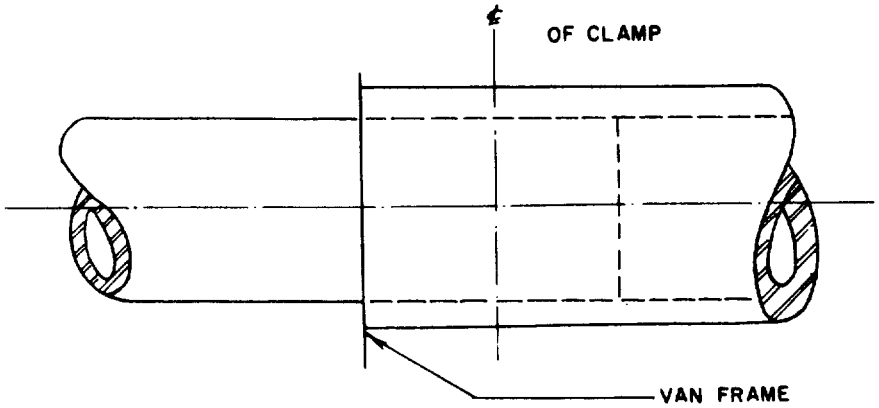


Figure 20. Pipe to hose connection, compressor to tank.

52. Lines and Connectors

a. General. Operator maintenance of the air lines and connectors consist of service and adjustments.

b. Servicing. Keep air lines and connectors away from grease and oil. Remove foreign materials with approved cleaning compounds.

Warning: Use compressed air only for the purpose for which it is intended. Serious injury can result from misuse.

Report all leaks, breakage, or damage of air lines to second echelon maintenance for correction.

Note. Checks for leaks, breakage, and damage should be made before air-powered equipment is put into use.

c. Adjustments. Adjustments of lines and connectors (figs. 11, 12, and 14), by the operator consists essentially of adjusting adapters, or quick disconnect fittings, to obtain a more positive seal to prevent loss of compressed air. These adjustments to adapters or fittings are made by hand and no special tools or equipment are required.

Section VII. UTILITY SYSTEM

53. General

The utility system of Shop Set, Aircraft Maintenance, Semi trailer Mounted, C-11, Powertrain Shop Consists of storage cabinets and bench tops. Layout of the utility of the stop set is shown in figures 21 and 22.

54. Storage Cabinets

Operator maintenance of the storage cabinets is limited to service and adjustments. Service will consist of cleaning, lubrication, and other preventive maintenance services (pars. 3134). Use a solution of water and mild soap or detergent for cleaning purposes under usual operating conditions. Cleaning under unusual operating conditions (pars. 18-26) may require more active cleaning agents such as cleaning solvents. Care should be exercised in application and use of cleaning solvent so as not to damage the finish of the cabinets. Lubricate the cabinets at hinge points, on sliding surfaces, and at points of closing. Use a good grade of light lubricating oil; do not use more lubricant than is required to maintain normal operating conditions; wipe off excess lubricants with a clean dry cloth. Adjustment of cabinets may be accomplished by the operator when disassembly is not required; generally this will consist of aligning hinges, slides, locking bars, and closing points.

Note. Adjustments should be made only when the operating efficiency of the cabinet will be impaired unless the misalignment is corrected.

55. Bench Tops

Operator maintenance of bench tops consists of cleaning and the application of wax or similar preservative. Foreign materials should be wiped from benches with a soft brush whenever there is an accumulation that could mar the surface. Stains, such as marking fluid, grease, oil, or ink, may be removed by washing the bench top with a solution of mild soap and water. Wipe the surface with a clean cloth to remove moisture after cleaning is completed.

Apply wax or similar preservative when cleaning is of such severe nature as to remove protective coating or when the protective coating is marred by scratches, nicks, gouges, or exposure to the elements.

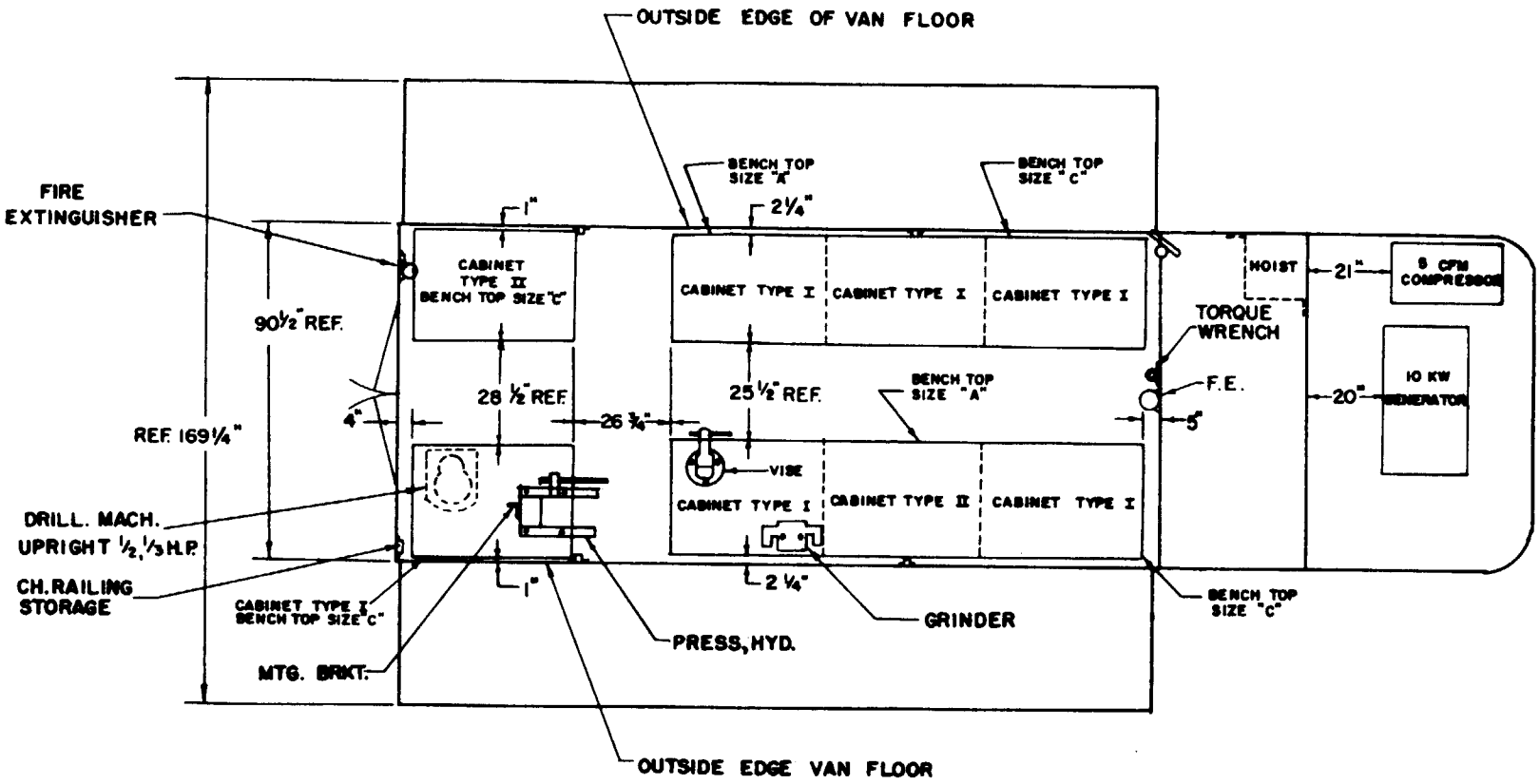


Figure 21. Floor plan top view.

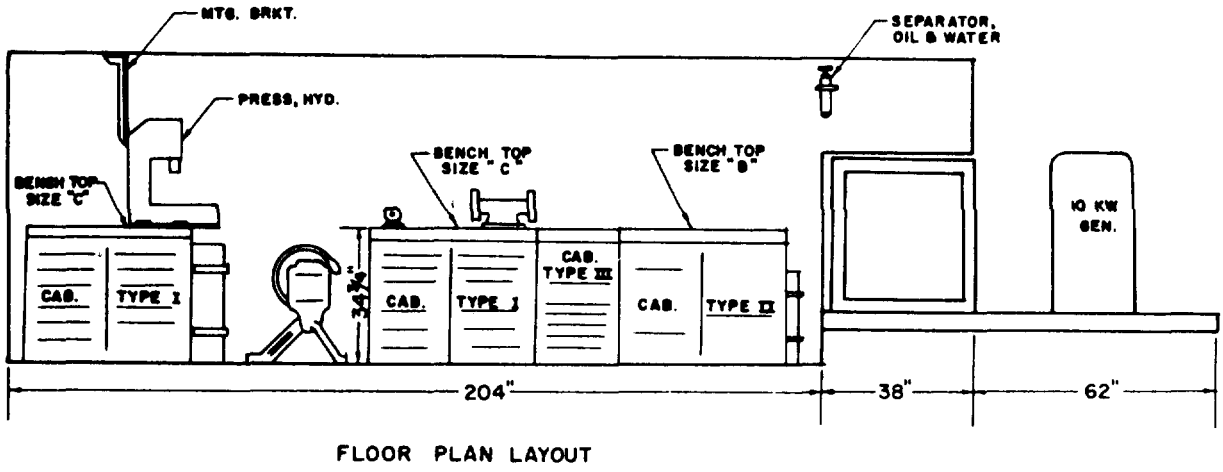


Figure 22. Floor plan, right side view.

CHAPTER 4
SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE (OPERATOR)

Section I. GENERAL

56. Purpose

This chapter furnishes the operator with sufficient information for preparation of the equipment comprising Shop Set, Aircraft Maintenance, Semi trailer Mounted, C-11, Powertrain Shop, for shipment and limited storage. Instructions are also included for demolition of the shop set to prevent enemy use.

57. Methods

The methods outlined herein for shipment and limited storage apply to the shop set as a unit. It is the responsibility of the operator to become familiar with the technical manuals for each item of equipment for shipment and limited storage. The methods outlined for demolition of equipment to prevent enemy use are intended as a guide for the operator.

Section II. SHIPMENT AND LIMITED STORAGE

58. Shipment

The operator is responsible for the initial steps in preparing Shop Set, Aircraft Maintenance, Semi trailer Mounted, C-11, Powertrain Shop, for shipment. These responsibilities consist of the following steps.

a. Perform "at halt" and "before operations" daily services (table I and parts. 31-34).

b. Place tools and equipment in storage bins or drawers provided.

c. Install locking bars in cabinet drawers (fig. 6).

d. Secure equipment in open bins with web straps or special fastenings.

e. Secure wall mounted tools with special fasteners.

f. Store cables and hose in storage boxes.

59. Limited Storage

a. General. A shop set which is temporarily not in use, will be placed in limited storage (not to exceed 6 months), when authorized by major commanders or heads of Department of the Army agencies. The responsibility for Transportation Corps mechanical equipment stored under such authorization will remain with the organization or activity to which issued. Equipment no longer required for accomplishment of the assigned mission will be returned to stock. When the shop set is placed in limited storage it will be preserved as specified. Equipment will not be blocked up and will be so spaced, where practicable, to provide independent access to each item.

Note. When equipment is to be stored for 30 days or less, clean and oil with light lubricating oil, Federal Specification VV-0-526.

b. Operator Responsibility. The operator of the equipment is responsible for certain phases of preparation for limited storage; normally, these responsibilities will coincide with those listed in paragraphs 6 and 7 and paragraphs 60 through 63. Technical manuals for individual items of equipment (app. I) provide the operator with the necessary information required to accomplish limited storage of the equipment.

Section III. DEMOLITION TO PREVENT ENEMY USE

60. General

a. Destruction of the shop set, when subject to capture or abandonment in a combat zone, will be undertaken by the operator only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of. or policy established by, the Arm! commander.

b. The information which follows is for guidance only. Certain of the procedures outline require the use of explosives and incendiary grenades which normally may not be authorized items for the using organization. The issue of these and related materials and the condition under which destruction will be effected, are command decisions in each case, ac(cording to the tactical situation. Of the several means (if destruction, those most generally applicable are

(1) *Mechanical*. Requires ax, pick mattock, crowbar, or similar implement.

(2) *Burning.* Requires gasoline, oil, incendiary grenades, or other flammables.

(3) *Destruction by use of explosives.* Requires suitable explosives or ammunition.

(4) *Gunfire.* Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances, hand grenades may be used.

c. In general, destruction of essential parts, followed by burning will usually be sufficient to render the shop set useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

d. If destruction to prevent enemy use is resorted to, the shop set must be so badly damage that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the material, including essential spare parts, be destroyed or damaged beyond repair. However, 32 when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like material so that the enemy cannot construct one complete unit from several damaged ones.

e. If destruction is directed, due consideration should be given to (1) and (2) below.

(1) Selection of a point of destruction that will cause greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments or ricocheting projectiles which may occur incidental to the destruction.

(2) Observance of appropriate safety precautions.

61. Destruction By Burning

a. Remove and empty portable fire extinguishers.

b. Using an ax, pick mattock, sledge, or other heavy implement, smash all vital elements.

c. Puncture fuel tanks as near the bottom as possible collecting gasoline for use as described in d below.

d. Pour gasoline and oil in and over the entire equipment; ignite by using a gasoline soaked rope for a fuse. If gasoline and oil are not available, use incendiary grenades. Take cover.

Warning: Due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns.

62. Destruction By Use of Explosives

a. Remove and empty portable fire extinguishers.

b. Prepare 4 charges (1 charge = 2 ea. 1 lb. blocks) of EXPLOSIVE, TNT. Place charges as in (1), (2), (3), and (4) below.

(1) Place 1 charge of explosive on the front of the shop on the platform between the generator and the storage compartment.

(2) Place 1 charge of explosive between the axles of the shop, at the approximate midpoint of the axles.

(3) Place 1 charge of explosive on the shop floor at the approximate center width of the shop and approximately 4 ft. from forward wall.

(4) Place 1 charge of explosive on the shop floor at the approximate center width of the shop and approximately 6 feet from the rear wall.

(5) Connect the 4 charges for simultaneous detonation with detonating cord. Provide for dual priming to minimize the possibility of a misfire. For priming, either a non electric blasting cap crimped to at least 5 feet of safety fuse (safety fuse burns at the rate of 1 foot in 30 to 45 seconds; test before using), or an electric blasting cap and detonating cord may be used. If a non electric blasting cap and safety fuse are used, the fuse should be sufficiently long and so-positioned that it may be ignited from outside the shop set. Safety fuse, which contains black powder, and non electric blasting caps must be protected from moisture at all times. The safety fuse may be ignited by a fuse lighter or a match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

Warning: Keep the blasting caps, detonating cord, and safety fuse separated from the charges until required for use.

c. Detonate the charges. If primed with non electric blasting cap and safety fuse, ignite and take cover before firing the charges.

Warning: The danger zone is approximately 250 yards; take cover without delay as an early explosion may result from incendiary fires.

63. Destruction By Gunfire

a. Remove and empty portable fire extinguishers.

b. Destroy the shop set by gunfire, using artillery, machine guns, rifles using rifle grenades, or launchers using antitank rockets. Although one, well-placed direct hit, may render the shop set temporarily useless; several hits are usually required to complete destruction unless an intense fire is started, in which case the shop set may be considered destroyed.

Warning: Firing artillery at ranges of 500 yards or less, should be from cover. Firing rifle grenades or antitank rockets should be from cover.

CHAPTER 5
OPERATING INSTRUCTIONS (SECOND ECHELON)

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

64. General
Shop sets, when received, are to be unloaded, uncrated, depreserved, and inspected by second echelon maintenance personnel.

65. Unloading and Uncrating New Equipment
a. *Unloading*. Remove shoring, blocks, tie downs, and shocks before unloading equipment.

***Warning*: Remove nails and loose strapping from unloading area.**

***Caution*: Lift only at hoisting points provided when equipment is to be unloaded from heights above ground level (TM 9-2330-23814). Do not allow equipment to be dropped while unloading.**

b. *Uncrating*. Unpack crated equipment as close as possible to the point of use; remove nails, straps, and OVM from equipment. Place equipment in position for use.

66. Depreservation
a. Observe all warning tags and instructional guides attached to the equipment.

b. Remove preservatives from exterior surfaces with solvent, Federal Specification P-S661.

c. Preservatives applied to interior surfaces need not be removed except for draining.

d. Examine equipment carefully to detect and remove tape, barrier material, and other packaging materials which may be placed over breathers, vents, and other openings. Particular attention should be given to detection and removal of paper between or under brushes or large electrical motors.

e. Components which are packed separately from the equipment will be installed as directed in the TM for the equipment (app. I), and in chapter 8.

67. Inspection
Inspect all equipment for condition, correctness of assembly, security, and wear (pars. 31-34).

Section II. CONTROLS AND INSTRUMENTS

68. General
This section describes, locates, illustrates, and furnishes second echelon maintenance personnel with sufficient information pertaining to the various controls and instruments provided for operation of the equipment.

69. Electrical Controls and Instruments
These controls and instruments are provided to supply regulate, and distribute the electrical power required to operate the shop. Detailed description, location, and illustrations are contained in paragraphs 8 through 10 and paragraphs 45 through 47.

70. Pneumatic Controls and Instruments
Pneumatic controls and instruments regulate and distribute the compressed air required to operate the pneumatic equipment of the shop. Refer to paragraphs 8 through 10 and paragraphs 45 through 47 for detailed description, location, and illustration of pneumatic controls and instruments.

Section III. OPERATION UNDER USUAL CONDITIONS

71. General

Instructions in this section are for the information and guidance of second echelon maintenance personnel, responsible for the operation of this equipment. It is essential that the operator know how to perform every operation of which the equipment is capable of performing.

72. Preparation for Use of Equipment

a. exterior

(1) Install ground stake, located in compartment below rear doors, by fastening cable to bolt provided with wing nut, on left rear skid, and drive the stake into the ground (fig. 23).

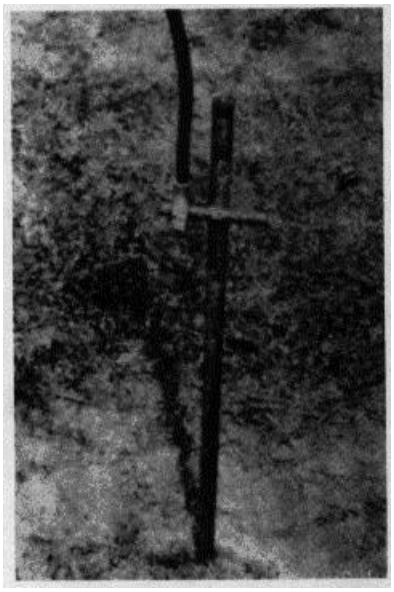


Figure 23. Installation of ground stake.

(2) Position chocks.

(3) Install the stabilizing jacks (fig. 24), and adjust them as necessary.

(4) Remove entrance ladders from rear doors and front storage compartment and position as shown in figure 25.

(5) Open right-rear door (fig. 25 and TM 9-2330-238-14).

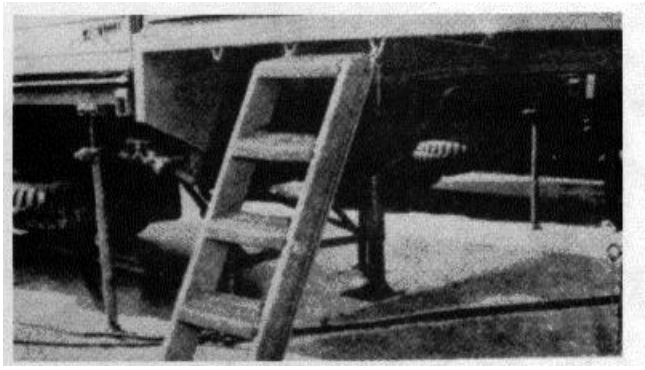


Figure 24. Installation and adjustment of stabilizing jacks. positioning front ladder.

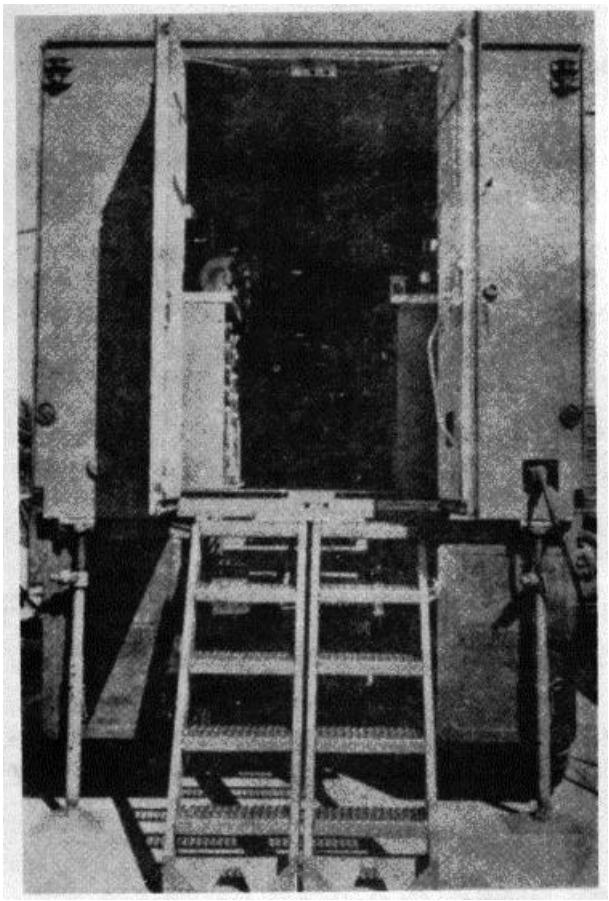


Figure 25. Positioning rear entrance ladders and opening rear doors.

b. Opening of Shop. All folding shop sides open from inside the shop (figs. 26, 27, and 28, and TM 9-2330-238-14).

(1) Release over-center clamps front and repair at top of each door.

(2) Release locks on center post, two on each side (fig. 26) and TM 9-2330238-14).

(3) lush top and bottom doors outward at the same time (fig. 28).

***Caution*: Do not let doors fall free; assistance from outside is necessary.**

(4) Install chain guard railing (fig. 29 and TM 9-2330-238-14).

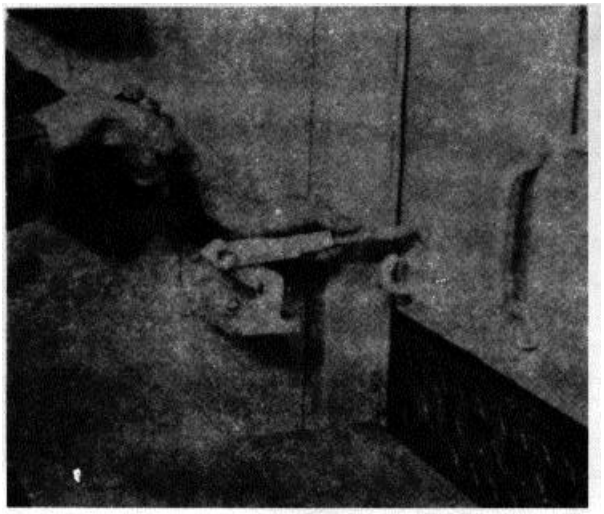


Figure 26. Opening folding shop sides, step I.

73. Shutdown of Shop Set

a. Shutdown instructions for the units comprising Shop Set, Aircraft Maintenance, Semi-trailer Mounted, C-11, Powertrain Shop, are contained in the TM issued for the individual item of equipment (app. 1). It is essential that the operator understand these instructions.

b Disconnect external power source.

c. Close folding shop sides and rear doors (fig. I and TM 9-2330-238-14).

d. Remove and store entrance ladders (fig. 1 and TM 9-2330-238-14).

e. Check security of (chocks.

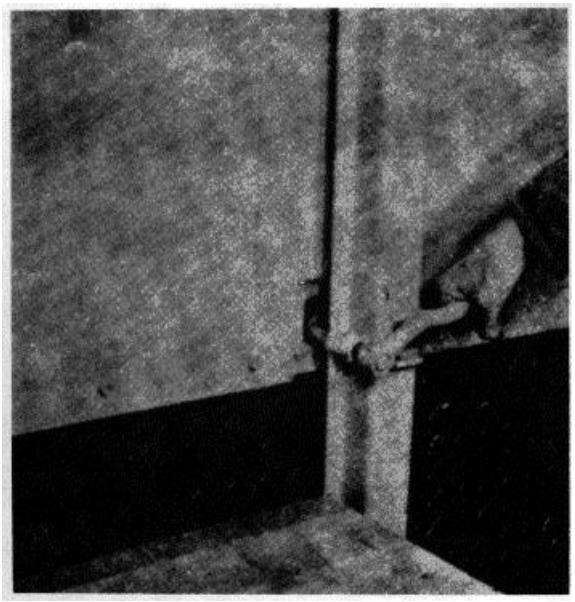


Figure 27. Opening folding shop sides, step II.

74. Operating Details

a. General. These instructions provide second echelon maintenance personnel with the necessary details for operation of the equipment comprising the shop set.

b. Electrical System-Generator Operated.

(1) Remove power cord from stowage container.

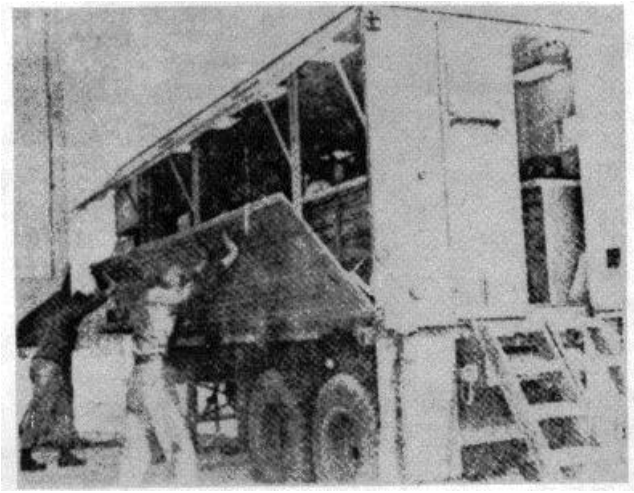


Figure 28. Opening folding shop sides, step III.

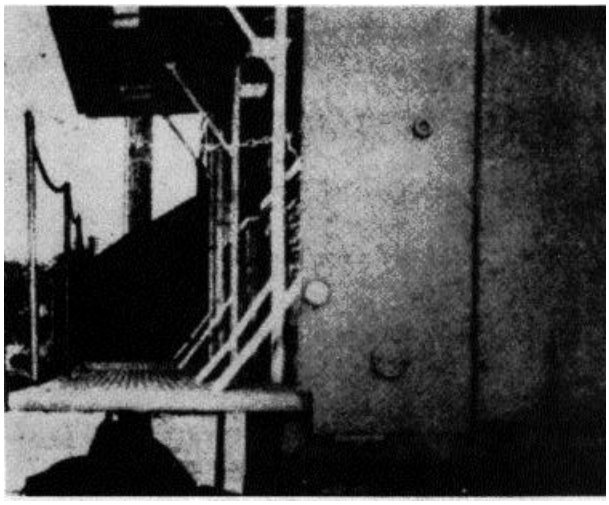


Figure 29. Chain guard railing installation.

(2) Inspect cord for breaks, security of connectors, and frayed cover material.
(3) Install power cord from generator to external power receptacle.
(4) Check operation of generator; refer to the TM for the generator (app. I), for procedure and details of operation.

c. Electrical System--Auxiliary Power Operated.

(1) Inspect auxiliary power cord for breaks, security of connectors, and frayed cover material.
(2) Install auxiliary power cord from auxiliary power source to external power receptacle.

d. Pneumatic System-Compressor Operated.

(1) Inspect lines, connectors, and fittings, for security and condition.
(2) Check operation of air compressor; refer to the TM for the compressor (app. I), for procedure and details of operation.
(3) With compressor running, inspect lines, connectors, fittings, controls, and instruments for leaks, security, and proper operation.

e. Pneumatic System - Auxiliary Power Operated.

(1) Inspect lines, fittings, and connectors for leaks and security.
(2) Install line from auxiliary power supply to air supply tank (fig. 13).
(3) With auxiliary air supply connected, inspect lines, connections, fittings, controls, and instruments for leaks, security, and proper operation.

75. Movement of Equipment

a. Open van in accordance with instructions in paragraph 72.

b. Close van sides and rear doors (fig. 1).

c. Remove and stow entrance ladders (fig. 1).

Caution: This operation must be performed before attaching tractor to semi-trailer.

d. Disconnect external power source(s), electrical or pneumatic.

e. Remove and stow bonding stake.

f. Remove chocks and secure in TRAVEL position.

Section IV. OPERATION OF ONE UNIT IN CONJUNCTION WITH ANOTHER ACCESSORY OR AUXILIARY

76. General

Auxiliary equipment may be operated in conjunction with Shop Set, Aircraft Maintenance, Semi-trailer Mounted, C-11, Powertrain Shop by use of auxiliary electrical connections 38 and by use of an adapter installed on the air supply tank for pneumatic connections.

77. Auxiliary Electrical Connections

An auxiliary outlet at the left rear of the shop is used for incoming or outgoing auxiliary connections.

78. Air Supply Tank Adapter

The adapter connection used to transfer compressed air to an auxiliary shop is located at the front of the air supply tank and is used TM 55-4920-220--15 to connect a hose from the tank to the auxiliary shop.

***Note*. This adapter is the same as is used to receive an external air power source; therefore it is unable only when the compressor is being operated.**

Section V. OPERATION UNDER UNUSUAL CONDITIONS

79. General

This section contains information pertinent to second echelon maintenance operation of Shop Set, Aircraft Maintenance, Semi-trailer Mounted, C-11, Powertrain Shop, under unusual conditions. (Refer to paras. 18-26 for additional information.) Report recurrent failure of equipment resulting from operation under unusual conditions on DA Form 468.

80. Removable Canvas Sidewalls

The removable canvas sidewall has four sections. The sidewalls are fastened at the top with snap-type fasteners. The bottoms are attached with web belting, incorporating quick releases and belt-tightening features. The bottom edges also have 1/2-inch grommets so that rope may be used in lieu of the web straps when needed. Attached to the bottom side doors are cleats for use with either the web strapping or the rope (fig. 30).

***Caution*: Canvas should not be stored when wet.**

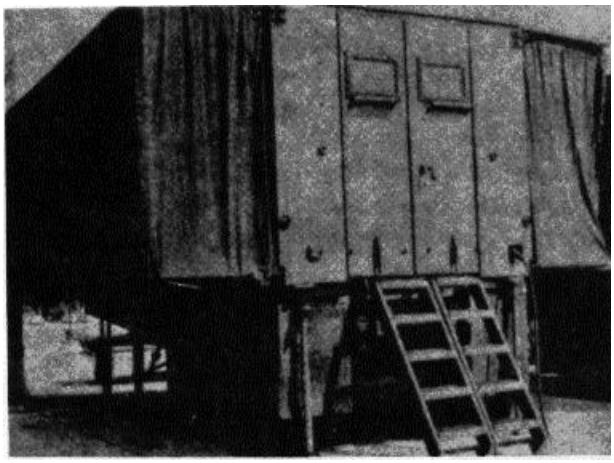


Figure 30. Canvas sidewalls installation.

81. Extreme Cold Weather Conditions

Special equipment is provided for the protection of equipment in extreme cold weather conditions (below 0°F.). Individual items of equipment should be protected in accordance with the TM for the item (app. I). Refer to TM 9-2330-238-14 for specific information concerning the van which houses the shop.

82. Extreme Hot Weather Conditions

Frequent inspections of bearings, cooling systems, and lubricants should be accomplished in extreme hot weather to insure proper operation of the equipment. Refer to paragraphs 18 through 26 for additional instructions regarding operation of equipment in extreme hot weather conditions.

83. Operation in Extreme Wet Climate

Inspect bearings and other lubricated surfaces for possible washing away of lubricants.
These inspections should be made prior to starting and at halt of equipment. Additional precautionary instructions for operation in extreme wet climate are listed in paragraphs 18 through 26.

84. Operation in Salt Water Areas

Wash exterior of shop with fresh water to remove salt water residue. Accomplish salt water residue removal as often as is necessary to keep equipment clean and to combat corrosion. Treat unprotected surfaces of tools and equipment, which are in contact with salt water, as directed in paragraphs 6 and 7.

85. Operation in Extreme Dust Conditions

Inspect machined surfaces, bearings, and lubricated surfaces for dust accumulation. Clean bearings and surfaces as directed in paragraphs 29 through 34.

86. Operation at High Altitudes

Inspect intake ducts, filters, cooling systems, and pneumatic equipment at frequent intervals to insure proper operation at high altitudes. Observe precautions listed in paragraphs 29 and 30 and in the TM for the item of equipment (app. I).

CHAPTER 6
MAINTENANCE INSTRUCTIONS (SECOND ECHELON)

Section I. SPECIAL ORGANIZATIONAL TOOLS AND EQUIPMENT

87. General

No special tools or equipment are required by second echelon maintenance personnel to maintain the shop as a unit. Any special tools or equipment required for maintenance of individual items of equipment are listed in the TM for the item (app. I).

88. Parts Required for Maintenance

Parts required by second echelon maintenance personnel for maintenance of the shop are listed in chapters 8 and 9.

Section II. LUBRICATION

89. General

This section provides second echelon maintenance personnel with lubricating instructions for the shop. Lubrication orders, listing lubricants by type required for each application, are prepared for each item of equipment and are contained in the TM for the item (app. I).

90. Special Lubrication Instructions

Refer to paragraphs 6 and 7, 29 through 34, 71 through 75, and 79 through 86 for detailed lubrication procedures for the shop.

Section III. PREVENTIVE MAINTENANCE SERVICES

91. General

Preventive maintenance is performed by organizational maintenance personnel at weekly and monthly intervals. The weekly intervals will be equivalent to a maximum of 60 hours of use. The monthly intervals will be equivalent to 4 weeks or a maximum of 240 hours of use, whichever occurs first. The preventive maintenance services to be performed at these regular intervals are listed and described in this section. The maintenance function appearing in the columns opposite each service referred to in table II indicates that a report of the service should be made at the interval indicated. These maintenance functions appear in the second column and the interval at which the service is to be performed appears in the fourth and fifth column. The first column, "Item Inspected", is provided for the information of the personnel performing the inspection. A listing in this column indicates that an inspection should be made of a list of items in accordance with the instructions given in the text opposite. The indicated items and instructions constitute minimum inspection requirements for the equipment.

92. Weekly and Monthly Preventive Maintenance Service

The services listed in table II are minimum requirements and will be performed in accordance with the instructions therein.

Section IV. TROUBLESHOOTING

93. Use of Troubleshooting Section

This section contains troubleshooting information useful to second echelon personnel in diagnosing and correcting unsatisfactory operation or failure of the shop set or any of the components.

94. Procedure

Troubleshooting is a systematic isolation of defective components by means of any analysis of the shop set trouble symptoms, testing to determine the defective component, and applying the remedies. To correct malfunctioning of equipment, the probably cause should be systematically isolated in accordance with instructions in the following paragraphs.

95. Electrical Equipment Operates at Slow or Reduced Speed

Probable cause	*Possible remedy*
Loose connectors	Tighten connectors.
Low voltage	Check incoming voltage.
Improper source of voltage.	Check source voltage for specified requirements.
Cause beyond repair scope of operator	Notify supporting field maintenance unit.

96. Electrical Equipment Stops During Operation

Probable cause	*Possible remedy*
Power source disconnected	Check generator, external power cable, cords, and circuit breakers.
Overheating of equipment	Check equipment for speed setting and voltage as necessary; allow equipment to cool and restart.
Overloading	Adjust feed or speed of equipment as necessary.
Cause beyond repair scope of operator.	Notify supporting field maintenance unit.

97. Electrical Equipment Will Not Start

Probable cause	*Possible remedy*
Power cord disconnected	Check rear power outlet for proper installation of power cord for generator or auxiliary power source.
One or more circuit breakers inoperative.	Check circuit breakers and replace as necessary.
Corroded insert or loose connection at power receptacle.	Clean insert and check connectors and plug for tightness.
Cause beyond repair scope of operator	Notify supporting field maintenance unit.

98. Pneumatic Equipment Operates at Slow or Reduced Speed

Probable cause	*Possible remedy*
Low air pressure	Check air pressure gages, and regulators; adjust as necessary.
Leak in air line (s) or loose connector (s).	Check air pressure at equipment; retrace air line (s); check for leaks and loose connector (s).
Cause beyond repair scope of operator	Notify supporting field maintenance unit.

99. Pneumatic Equipment Stops During Operation

Probable cause	*Possible remedy*
Failure of source of power	Check compressor for operation; check incoming auxiliary line for pressure.
Overloading	Reduce feed, pressure on work, or speed as necessary.
Cause beyond repair scope of operator	Notify supporting field maintenance unit.

100. Pneumatic Equipment Will Not Start

Probable cause	*Possible remedy*
Source of power disconnected	Check connections at points of installation.
Faulty check valves	Check air pressure at regulators; replace check valves as necessary.
Break in air hose of equipment	Check air hose and replace as necessary.
Cause beyond repair scope of operator	Notify supporting field maintenance unit.

101. Excessive Vibration of Equipment

Probable cause	*Possible remedy*
Loose mounting bolts	Check mountings for security; tighten or replace bolts as necessary.
Equipment improperly loaded	Reduce loads, readjust load, or reduce speed as necessary.
Cause beyond repair scope of operator	Notify supporting field maintenance unit.

102. Excessive Noise

Probable cause	*Possible remedy*
Lack of lubrication	Lubricate equipment in accordance with paragraphs 29 and 30.
Improper use of equipment	Check specific TM of equipment (app. I), for proper use.
Cause beyond repair scope of operator	Notify supporting field maintenance unit.

Section V. RADIO INTERFERENCE SUPPRESSION

103. Purpose

a. Radio interferences suppression is the elimination or minimizing of the electrical disturbances which interfere with radio reception or disclose the location of the equipment to sensitive electrical detectors. Therefore, it is very important that equipment with, as well as equipment without, radios be suppressed properly to prevent interferences with radio reception of surrounding equipment, or disclosing locations.

b. Suppression in the equipment is accomplished by the use of resistor suppressors and capacitors. In addition, metal parts of the equipment are formed into a shield by use of braided bond straps and toothed washers, confining electrical disturbances so they cannot disturb receiving equipment.

104. Inspection

Second echelon maintenance personnel are responsible for the inspection of radio interference suppressors and the correction or reporting of any discrepancies discovered. Those sections of technical manuals (app. I), which contain detailed instructions for radio interference suppression form a part of this manual.

It is the responsibility of all responsible personnel to familiarize themselves with these manuals and to perform the inspections listed therein.

Section VI. ELECTRICAL SYSTEM

105. General

A detailed description of the electrical system is contained in paragraphs 45 through 47.

106. Electrical Generator

Second echelon maintenance for the generator consists of inspection and replacement of parts in accordance with the TM for the generator (app. I), and paragraphs 91 through 102.

107. Electrical Wiring Installation

a. General. The electrical wiring installation (fig. 8), is comprised of—

(1) Power cord for connecting generator

or auxiliary power source to the external power receptacle of the shop.

(2) Conduit incased wires connecting the external power receptacle with the safety disconnect switch and continuing to the control panel.

(3) Wiring from the control panel to the various receptacles which supply current to the equipment to be operated.

Note. The power cord of the electric motor of the air compressor is connected directly to the control panel and does not pass through a receptacle.

b. Second Echelon Maintenance. Inspect and replace, as necessary, wiring, connector, receptacles, and conduit in accordance with paragraphs 91 through 102 and instructions in appendix II.

***Warning*: Disconnect power source (generator or auxiliary), before servicing.**

108. Electrical Switches and Circuit Breakers

a. General. Electrical switches and circuit breakers are installed in the electrical system (fig. 4) to allow individual control of circuits, distribute current, and as safety devices.

b. Second Echelon Maintenance. Inspect and replace switches or circuit breakers, as necessary, in accordance with paragraphs 91 through 102 and instructions in appendix II.

109. Lighting System

Inspect and replace inoperative lighting tubes or bulbs in accordance with paragraphs 91 through 102 and instructions in appendix II.

***Note.* For details of shop lighting system, refer to TM 9-2330-238-14.**

Section VII. PNEUMATIC SYSTEM

110. General

A detailed description of the pneumatic system is contained in paragraphs 48 through 52.

111. Air Compressor

Second echelon maintenance for the air compressor consists if inspection and replacement of parts in accordance with the TM for the compressor (app. I),. and paragraphs 91 through 102.

112. Air Supply Tank

Inspect and replace parts of air supply tank in accordance with the TM for compressor (app. II), and paragraphs 91 through 102.

113. Lines and Hose

Second echelon maintenance of air lines and air hose (figs. 11, 12, and 14), will consist of inspection and replacement of parts in accordance with paragraphs 91 through 102 and instructions in appendix II. Replacement parts are listed in chapters 8 and 9.

114. Controls and Instruments

Controls and instruments (fig. 5) will be maintained by second echelon maintenance personnel to the extent authorized in appendix II and in accordance with paragraphs 91 through 102. Refer to paragraphs 68 through 70 for description, location, and illustration of controls and instruments.

115. Second Echelon

Maintenance Inspect and replace parts in accordance with the TM for the compressor (app. I), and paragraphs 91 through 102.

Section VIII. UTILITY SYSTEM

116. Storage Cabinets

Second echelon maintenance of storage cabinets consists of inspection and replacement of parts as authorized by appendix II. Inspect and replace parts in accordance with paragraphs 91 through 102. Refer to chapter 9 for replacement and repair parts.

117. Bench Tops

Second echelon maintenance for bench tops will consist of inspection and replacement of damaged or missing parts as authorized by appendix II.

CHAPTER 7
SHIPMENT AND LIMITED STORAGE (SECOND ECHELON)

Section I. SHIPMENT WITHIN CONTINENTAL U.S.

118. General

Before shipment of the shop set, within the Continental U.S., perform the procedures for limited storage listed in paragraphs 126 through 132.

119. Preparation for Shipment

In addition to the instructions in paragraphs 58 and 59, perform the preparation listed in TM 9-2330-238-14.

120. Hoisting, Handling, and Loading

Refer to TM 9-2330-23814.

121. Securing

Refer to TM 9-2330-238-14 and paragraphs 11 through 15.

122. Methods of Transportation

Use flatcars, boxcars, or vehicular transportation for transporting the shop set.

123. Shipping Documents

Prepare all Army shipping documents accompanying the shop set in accordance with instructions in the TM for the item of equipment (app. I).

***Warning*: The height and width of shop sets, when prepared for rail transportation, must not exceed the limitations indicated by the loading table in the applicable Army Regulation.**
Local transportation officers must be consulted about limitations of the particular railroad lines to be used for the movements in order to avoid delays, dangerous conditions, or damage to equipment.

Section II. SHIPMENT OUTSIDE CONTINENTAL U.S.

124. General

The procedures for shipment outside Continental U.S. are essentially the same as those listed in paragraphs 118 through 123. Exceptions are in the methods of preparation for shipment; marine transportation will normally be used and the shop set will be secured in cargo holds or on decks of ships. Refer to TM 9-2330-238-14 for methods of securing, net handling, and boom procedures.

125. Preparation for Shipment

Waterproof the shop set, using methods outlined in TM 9-2330-238-14, and in paragraphs 126 through 132. Refer to paragraphs 18 through 26 and paragraphs 79 through 86 for basic procedures to be followed when the equipment is exposed to salt water. Additional requirements consist of spraying taped areas and adjacent surfaces of the van with strippable plastic material conforming to Military Specification MILB-12121 or Military Specification MILC-16555. The coating thickness should be uniform and range from 0.030 to 0.040 inch thick.

Section III. LIMITED STORAGE

126. Inspection Before

Storage Make a complete inspection of the shop set to determine its condition. Deficiencies will be corrected prior to placement of equipment in limited storage. Technical inspection will be performed on unboxed items.

127. Cleaning

Prior to application of any preservative or paint, thoroughly clean all surfaces. Scrub or wipe with a clean bristle brush or cloth soaked in cleaning solvent. When possible, subject the exterior surfaces of the shop to a stream of steam-with or without added cleaning compound-followed by dry steam. Wire brush, buff, sand, or scrape if steam is not available. Immediately after cleaning, dry with dry compressed air or with a clean, dry wiping cloth.

> ***Caution*: Solvents are highly destructive to natural rubber and electrical insulation, and must not be used on these materials. Protect all electrical components during cleaning. Protect sensitive components from steam cleaning by sealing openings with pressure sensitive tape, Federal Specification PP-T-60, or by disassembling and removing components when protection cannot otherwise be accomplished.**

128. Complete

Lubrication Refer to paragraphs 91 and 92.

129. Preservative

Application Coat precision machined surfaces with preservative conforming to Military Specification MIL-P-21260, Grade 2, or with preservative conforming to Military Specification MILC6259 Type I, mixed with lubricating oil, in proportion of 1 part of preservative to 3 parts of lubricant.

130. Protection of Generator and Compressor

When the generator or compressor is stored outside or otherwise subjected to rain or dust it will be protected by covering with barrier material, Military Specification MILB-121 46 Grade A, in addition to the normal storage procedures outlined in the TM for the item (app. I).

131. Moisture proofing

a. Hang one humidity indicator, MS-20003, inside a window in such a manner as to be visible from the outside.

b. Place 213 units of desiccant, Military Specification MILB-3464, inside the shop set.

> ***Caution*: Do not place desiccant in contact with finished surfaces of tools or equipment.**

c. Close shop sides and rear doors.

> ***Caution*: Sides and one door should be closed and taped before desiccant is removed from airtight containers and installed in van. It takes on moisture rapidly.**

d. Seal all openings with tape, Federal Specification PPP-T-60.

132. Inspection of Equipment in Limited Storage

When equipment has been placed in limited storage, all scheduled preventive maintenance services, including inspection will be suspended and preventive maintenance will be performed as specified herein.

> ***Note*. Vans should not be opened for entry unless humidity indicator shows an unsafe condition. In that event, tape seals should be checked for leakage, desiccant replaced, and doors resealed.**

a. Inspection Criteria. All equipment in limited storage will be inspected for any unusual conditions, such as damage, rusting accumulation of water, pilferage, and leakage of lubricants and fuels.

b. Worksheet and Preventive Maintenance. DA Form 460 and DD Form 314 will be executed on each major item of the equipment when equipment is initially placed into limited storage and every 30 days thereafter. Required maintenance will be performed promptly to insure that equipment is mechanically sound and ready for immediate use.

CHAPTER 8
OPERATING INSTRUCTIONS (FIELD AND DEPOT MAINTENANCE)

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

133. General

Shop sets, when received are to be unloaded, uncrated, depreserved, and inspected by field and depot maintenance personnel.

134. Unloading and Uncrating New Equipment

a. Unloading. Remove shoring blocks, tiedowns, and chocks before unloading equipment.

> ***Warning*: Remove nails and loose strappings from unloading area.**
>
> ***Caution:* Lift only at hoisting points provided when equipment is to be unloaded from heights above ground level (TM 9-2330-23814).**

b. Uncrating and Servicing New Equipment. Uncrating and servicing procedures normally will be those outlined in paragraphs 64 through 67. Additional information required for unloading specific items are contained in the TM for the item.

c. Depreservation. Procedures for depreservation of new equipment normally will be as outlined in paragraphs 64 through 67.

d. Removal of Compound and Devices. Remove rust preventive compounds, protective grease, or other coatings from new parts prior to installation. Prepare new parts by presoaking or by other method as necessary. Lubrication of new parts will be as prescribed in the appropriate lubrication order.

135. Installation

a. Location of Handtools. Following is a typical alphabetical listing of the location of common tools and equipment in drawers and storage cabinets provided. Cutout sections designed to fit and hold particular tools may be inserted in drawers. These inserts protect the tools, serve as an aid in location, and hold them securely during transit. Drawers and open bins are numbered from 1 to 49, chronologically, from top to bottom in rows, counterclockwise, around the interior of the shop, starting at the right rear.

Tool and Equipment Drawer Location Semi Trailer Mounted, Powertrain Set C-11

Storage drawer No.	Nomenclature	Total
66	Adapter, Lubricating Gun	2
	Adapter Socket Wrench	
Sq	Male End in Sq Female End In.	
7	1/2 ... 3/4	2
7	3/4 ... 1/2	2
1	Apron, Battery Worker's	2
2	Bar, Telescopic	1
3	Blade, Hand Hacksaw	12
1	Brush, Dusting Bench	1
2	Caliper, Micrometer, Inside	1
2	Caliper Set, Micrometer, Outside	1
66	Coupling, Grease Gun	2
5	Coupling Half, Quick Disconnect	4
5	Coupling Half, Quick Disconnect	4
5	Coupling Half, Self-Sealing, Straight	
3		
1	Dresser, Abrasive Wheel, Hand	1
11	Drill, Electric, Portable	1
10	Drill Set, Twist	1
10	Drill Set, Twist	1

Tool and Equipment Drawer Location Semi Trailer Mounted, Powertrain Set C-l1-Continued

Storage drawer No.	Nomenclature	Total
66	Extension, Adapter	2
10	Extractor Set	1
1	Faceshield, Industrial	2
8	File, Hand: American pattern, flat type,double cut, bastard cut	1
8	File, Hand: Flat type, double cut, smooth cut faces, single cut, smooth cut edges	1
8	File, Hand: half-rd type, bastard cut	1
8	File, Hand: half-rd type, smooth cut	1
8	File, Hand: mill type, single cut	1
8	File, Hand: rd type, double cut, bastard cut	1
8	File, Hand: rd type, single cut, smooth cut	1
8	File, Hand: sq type, double cut, bastard cut	1
8	File, Hand: sq type, double cut, bastard cut	1
8	File, Hand: three sq type, double cut, smooth cut	1
3	Frame, Hand Hacksaw	1
1	Gloves, Rubber	4
66	Grease Gun, Hand	3
62	Gun, Air Blow	2
63	Hammer, Hand	2
	Handle, File, Wood Size Hand Grip Dia Lg Over All	
8	Large 1 ½ 5 1/2	5
8	Medium 1 1/4 4 1/2	5
	Hose, Rubber Lg ft	
18	25	2
18	50	1
19	Indicator, Dial	1
7	Key Set, Socket Head Screw	1
18	Light, Extension	2
5	Nipple, Pipe	2
66	Oil Gun, Pneumatic	1
66	Oil Gun, Pneumatic	1
69	Pliers, Retaining Ring: external, flat jaws	2
69	Pliers, Retaining Ring: external, flat jaws	2
69	Pliers, Retaining Ring: external, flat jaws	2
69	Pliers, Retaining Ring: external, flat jaws	2
69	Pliers, Retaining Ring: external, flat jaws	2

Tool and Equipment Drawer Location Semi Trailer Mounted, Powertrain Set C-11 -Continued

Storage drawer No.	Nomenclature	Total
69	Pliers, Retaining Ring: internal, rd jaws	2
69	Pliers, Retaining Ring: internal, rd jaws	2
49	Puller, Mechanical	1
49	Puller Kit, Mechanical	1
7	Ratchet Attachment, Socket Wrench: 3/8 in. sq end	1
7	Ratchet Attachment, Socket Wrench: 1/2 in. sq end	1
10	Stud Remover and Setter	1
20	Wheel, Abrasive	1
20	Wheel, Abrasive	1
1	Wheel, Buffing	2
21	Wrench, Box: double head, angular offset	1
21	Wrench, Box: double head, double offset	1
21	Wrench, Box: single head, offset	2
21	Wrench, Crowfoot	2
	Wrench. Torque Sq Male Drive In.	
22	3/8	1
22	1/2	1

b. Location of Mounted Equipment. In some instances, tools, equipment, or instruments are mounted on walls, floor, or benches of the shop. These items are either too large for cabinet storage, or their use makes cabinet storage impractical. Refer to figures 21 and 22 for floorplan of shop set.

c. Bench Mounted Equipment. The machinist's vise, upright drilling machine, utility bench grinder, and 10-ton arbor press are bench mounted (fig. 21). Mounting details are shown in figures 31 through 34.

d. Oil and Water Separator. The oil and water separator is mounted in the left forward corner of the shop interior (fig. 21). Mounting details are shown in figures 15 and 16.

e. Generator, 10 kw. The generator is mounted on the forward platform (fig. 22) of the shop. Mounting details are shown in figures 35 and 36.

f. Compressor, Reciprocating; Power Driven. The compressor and electric motor are

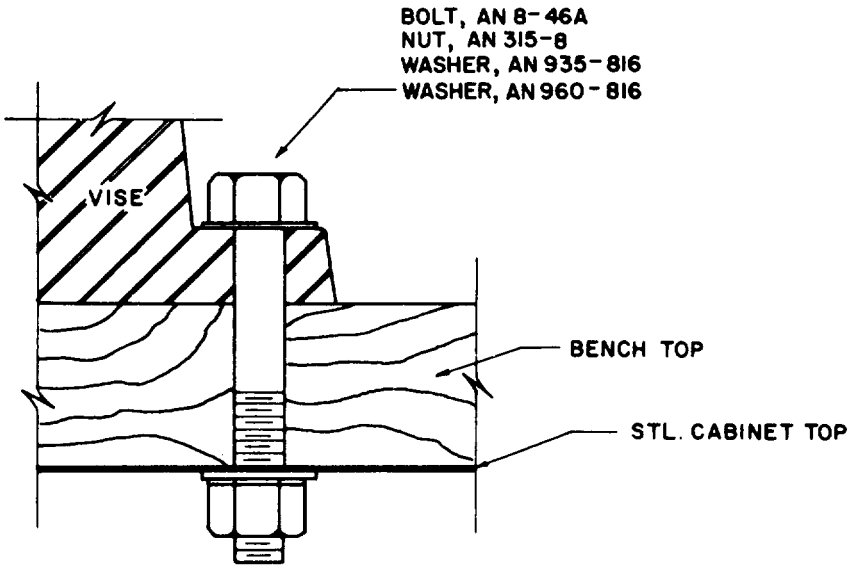


Figure 31. Typical bench mounting, vise.

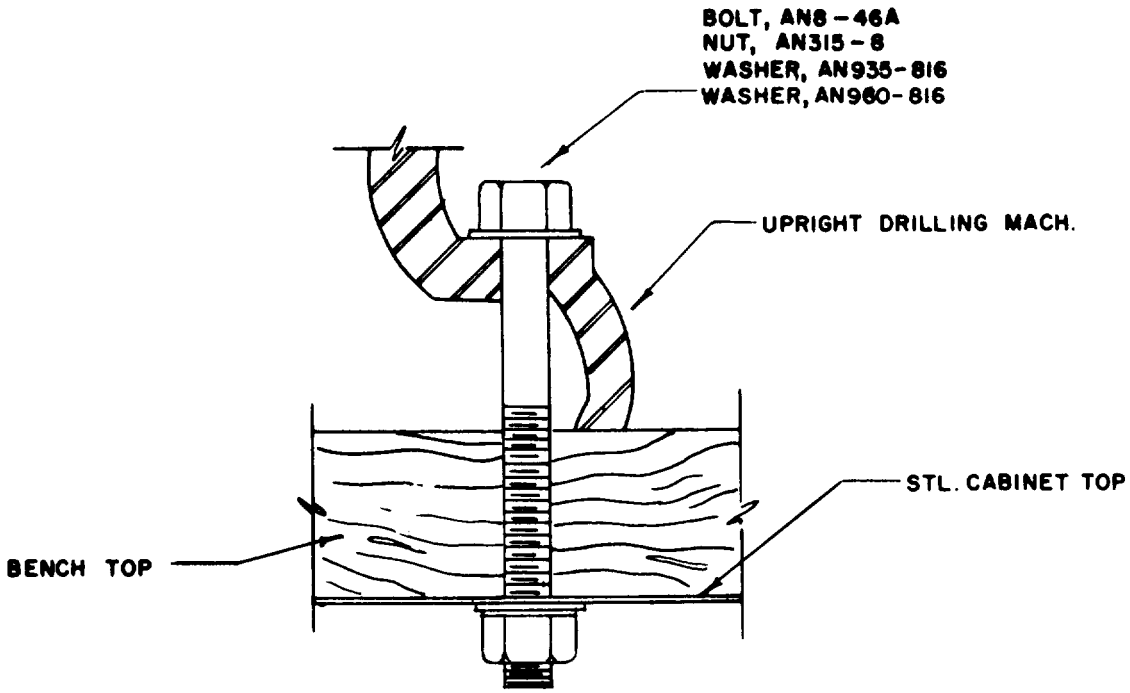


Figure 32. Typical bench mounting, upright drilling machine.

mounted on the forward platform of the shop (fig. 21). Mounting location is shown in figures 9 and 10. Fabrication of mounts is shown in figure 37. The air tank for the compressor is mounted underneath the forward floor of the shop (figs. 18 and 19). Fabrication of mounts and mount installation are shown in figures 38 and 39.

g. Bench Tops. Bench tops are mounted on the top of the storage cabinets. Lag screws are installed to mount the bench tops as shown in figure 40. Additional security of the bench

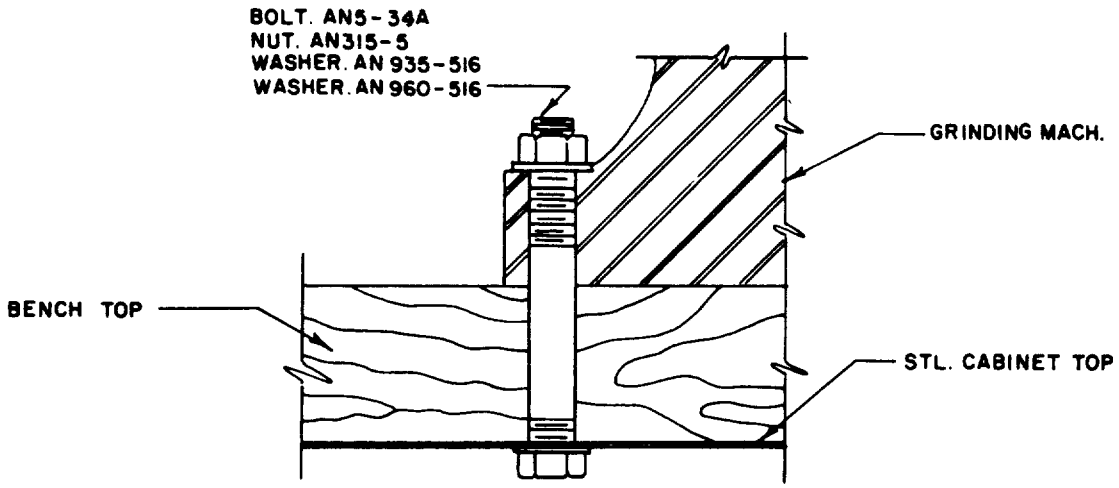


Figure 33. Typical bench mounting utility grinding machine.

tops is obtained when bench mounted equipment is installed as the mounting bolts for the equipment pass through the bench top and the top of the storage cabinet (figs. 31-34).

h. Cabinets, Storage. Storage cabinets are floor mounted and bolted together when adjacent. Typical mounting details are shown in figures 41 and 42.

i. Chain Guard Railing. Refer to TM 92330-238-14. The chain guard railing is installed on the outer edges of the folding shop doors when doors are in the down position. Installation of the chain guard railing is shown in figure 29.

j. Ventilation. The shop is provided with adequate ventilation facilities for normal operating conditions. Ducts, vents, and ventilating equipment should be checked periodically for cracks, dents, obstructions, and functioning of equipment. When the equipment is operated in extreme hot weather, ventilation equipment should be inspected as often as practical to insure proper operation of the equipment and the operator's comfort. Details of ventilation facilities are shown in TM 9-2330-238-14.

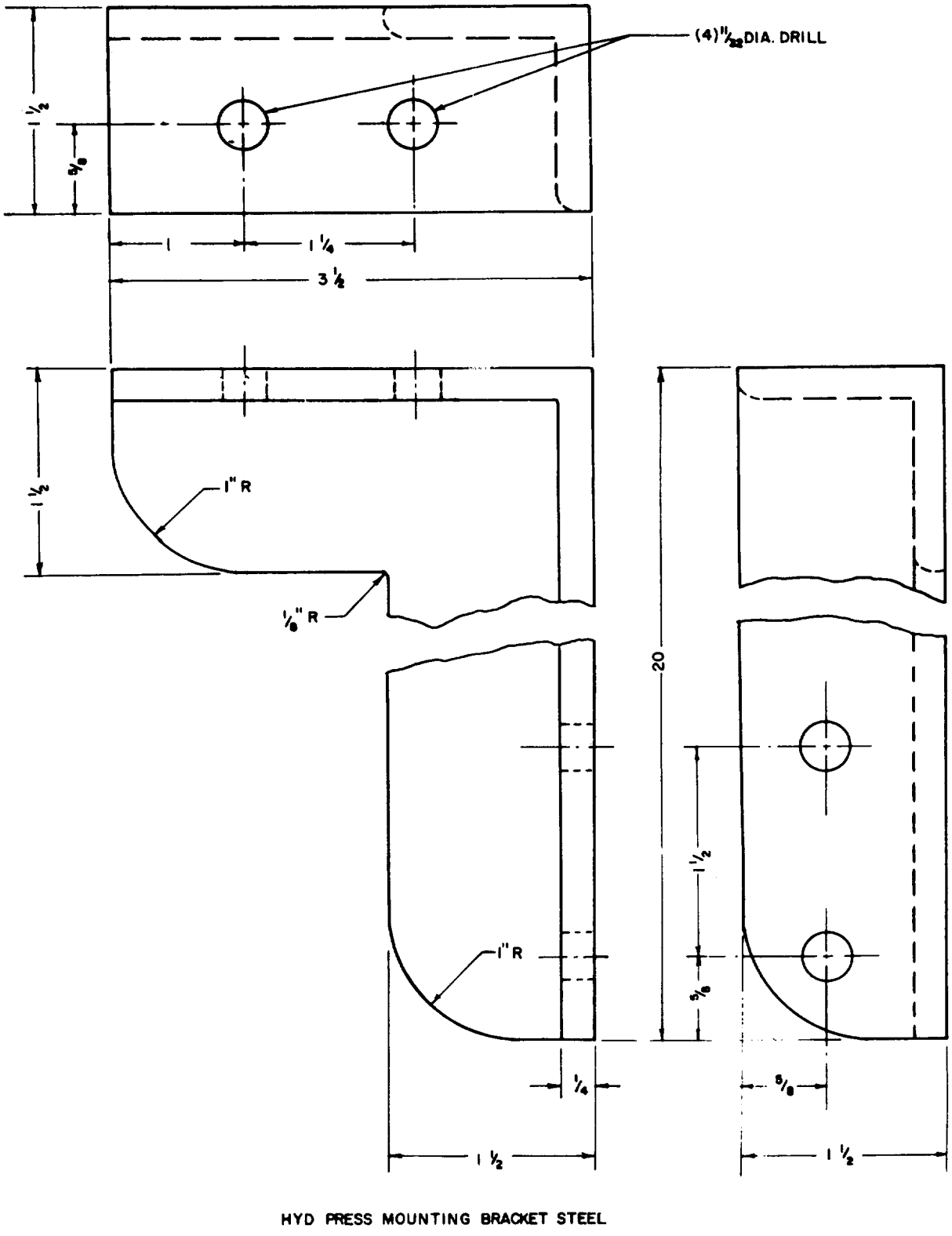


Figure 34. Typical hydraulic press mounting bracket.

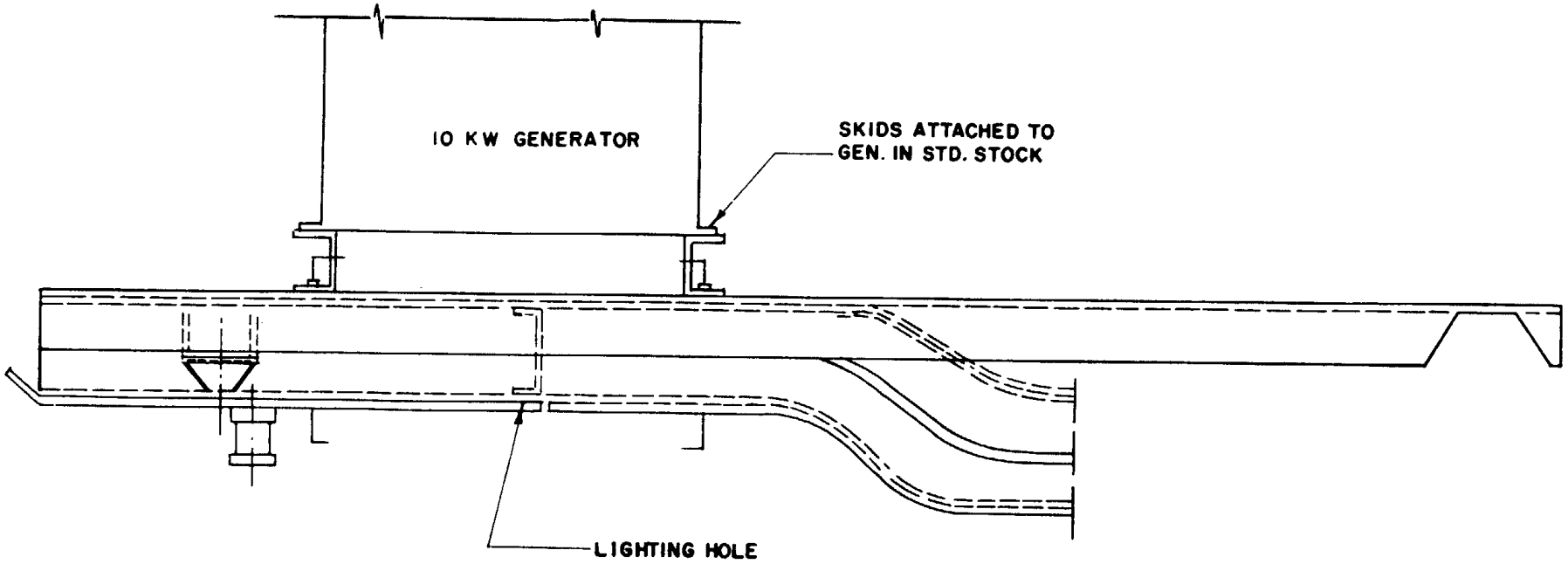


Figure 35. Generator mounting, plan view.

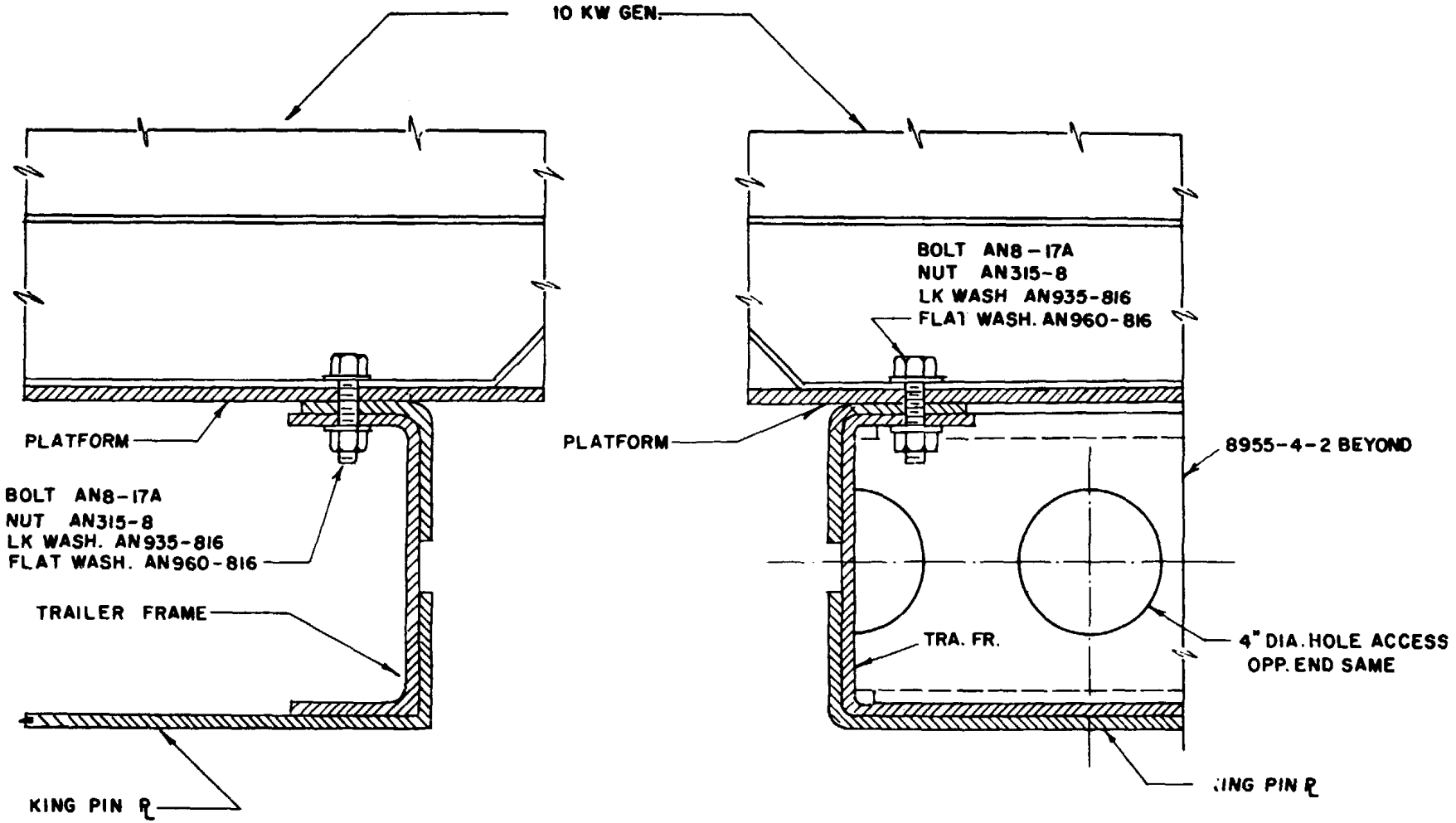


Figure 36. Generator mounting details.

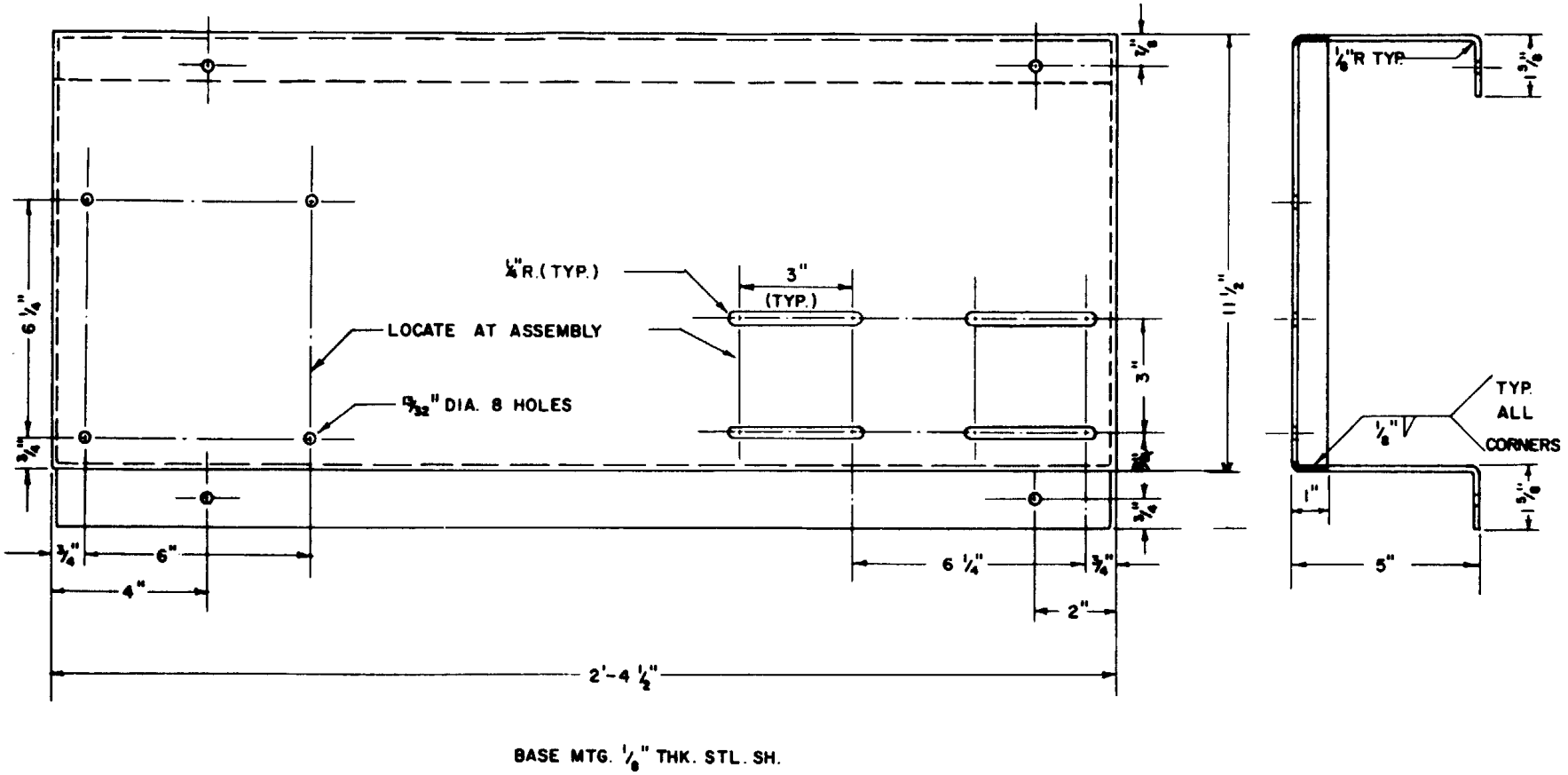


Figure 37. Details compressor, mounting.

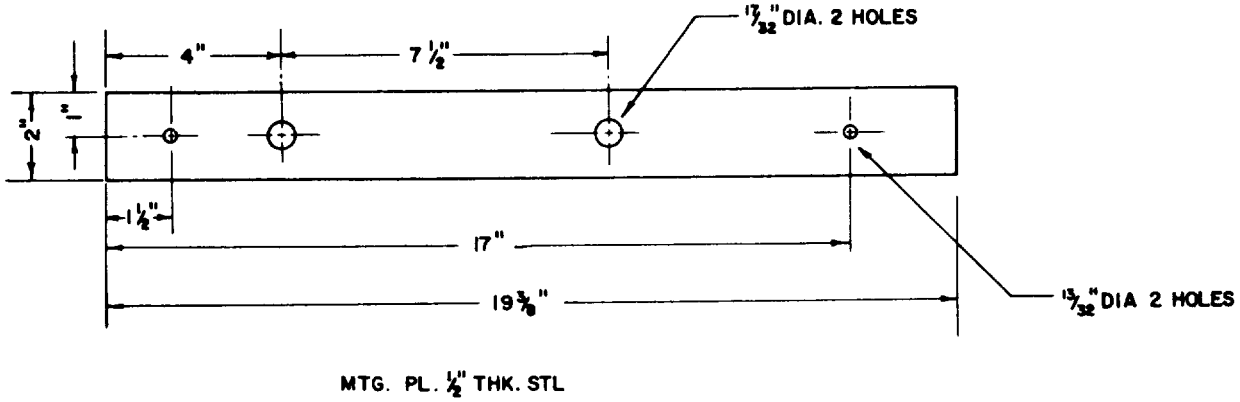


Figure 38. Mounting plate, compressor tank.

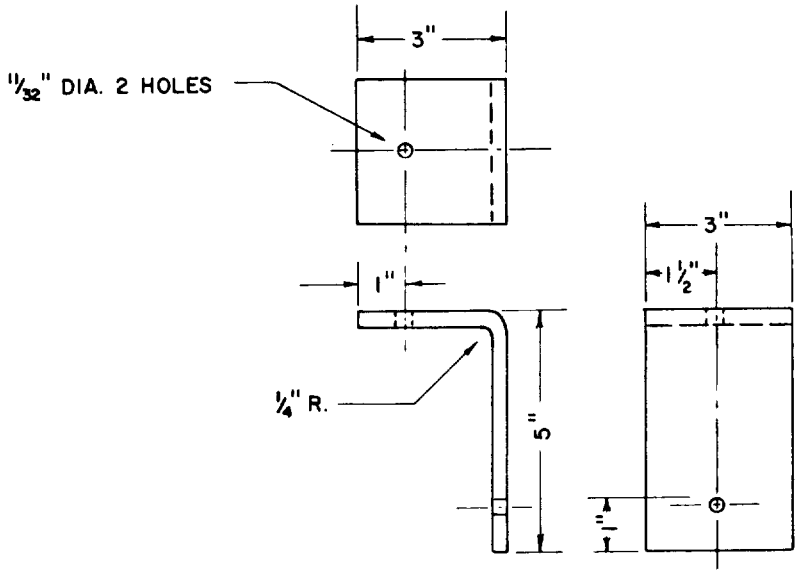


Figure 39. Mounting bracket, compressor tank.

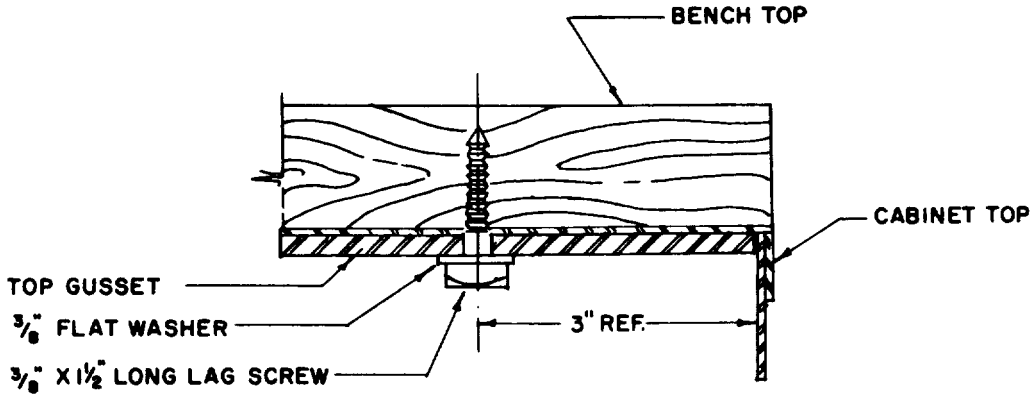


Figure 40. Bench top mounting, typical installation.

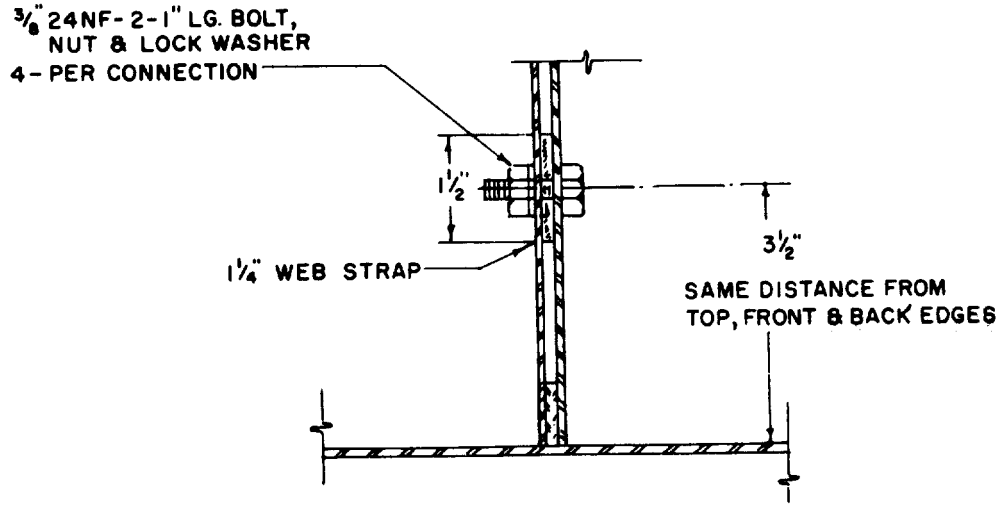


Figure 41. Mounting adjacent cabinets.

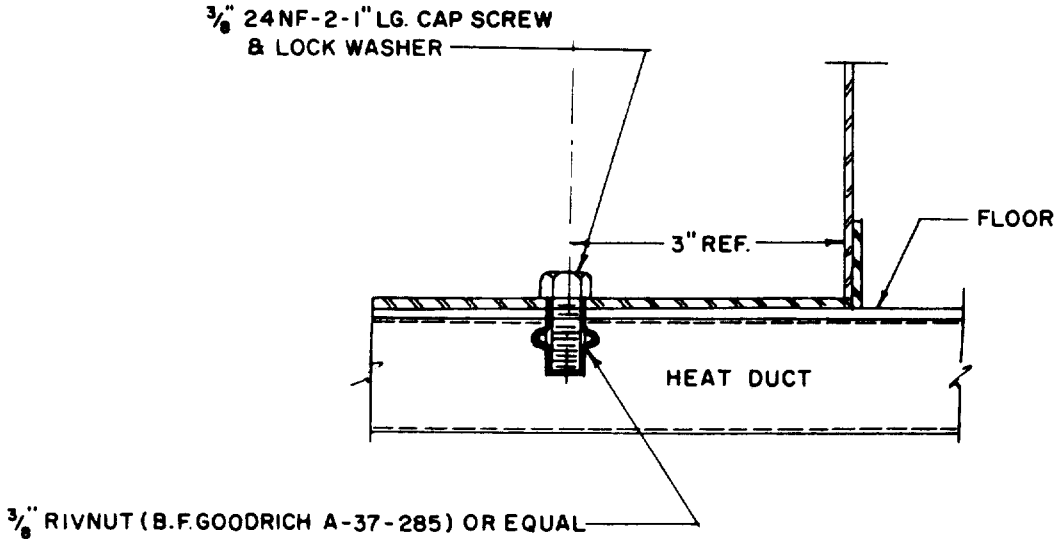


Figure 42. Cabinet mounting, floor.

Section II. CONTROLS AND INSTRUMENTS

136. General

This section describes, locates, illustrates, and furnishes the operator with sufficient information pertaining to the various controls or instruments provided for the proper operation of the equipment.

137. Electric Controls and Instruments

Refer to paragraph 9.

138. Pneumatic Control and Instruments

Refer to paragraph 10.

CHAPTER 9
MAINTENANCE INSTRUCTIONS (FIELD AND DEPOT MAINTENANCE)

Section I. SPECIAL FIELD AND DEPOT MAINTENANCE TOOLS AND EQUIPMENT

139. Special Tools and Equipment

Special tools or equipment are not required for field and depot maintenance of the shop set as a unit. Special tools and equipment required for field and depot maintenance of individual items of equipment are listed in the TM for the item (app. I).

140. Replace or Repair Parts

Replacement or repair parts required for field and depot maintenance of the shop set are listed in figures 31 through 56.

Section II. LUBRICATION

141. Lubrication Instructions

Lubrication Instructions for the shop set are contained in the LO which is a part of the TM for the item of equipment, in paragraphs 29, 30, and 89, and 90.

142. Special Lubrication Instructions

Refer to paragraphs 18 through 26, and 79 through 86 for special lubrication requirements under unusual conditions.

Section III. PREVENTIVE MAINTENANCE SERVICE

143. General

Preventive maintenance services to be performed by field and depot maintenance personnel consists of lubrication, preservation, painting, anodizing, alodizing, and application of rust preventive compounds prior to shipment of an assembled shop set to the using organization.

144. Preventive Maintenance Service At Time of Major Repair

When a shop set is returned to field or depot maintenance' for major repair, preventive maintenance services performed at time of shipment to the using organization should be repeated as necessary to insure the efficient operation of shop in the field.

145. Cabinets, Storage, Type I, and Type III

a. Repair. Fabrication and assembly of components which may be required for repair and replacement are shown in figures 43 through 56. These components will be fabricated in accordance with these figures when required.

b. Disassembly. Disassemble in reverse order of assembly.

c. Inspection. Inspect cabinet for sticking drawers, bent or distorted panels, sharp edges, security of assembled details, condition, and wear. Replace or replace components as necessary.

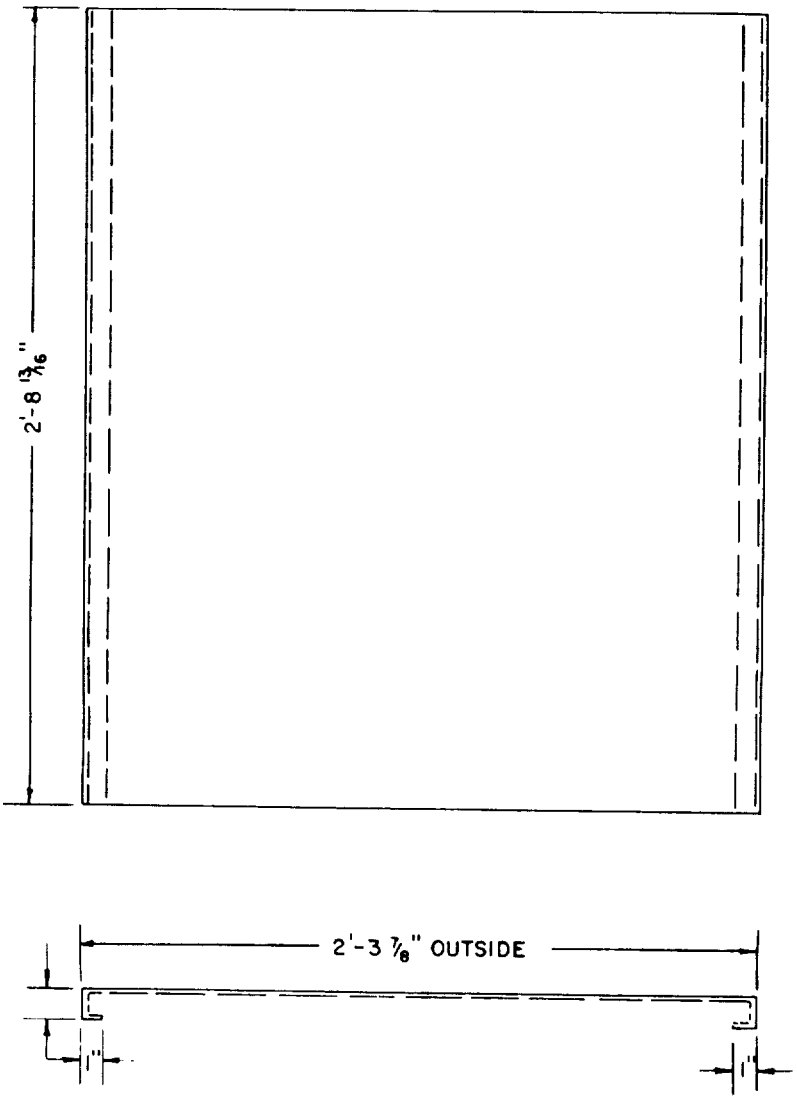


Figure 43. Typical cabinet side, type 1.

146. Bench Top, Size A and C

a. Repair. Fabrication and assembly of components which may be required for repair and replacement will be on an "as required" basis.

b. Inspection. Inspect for nicks, scratches, gouges, condition and wear. Repair or replace as necessary.

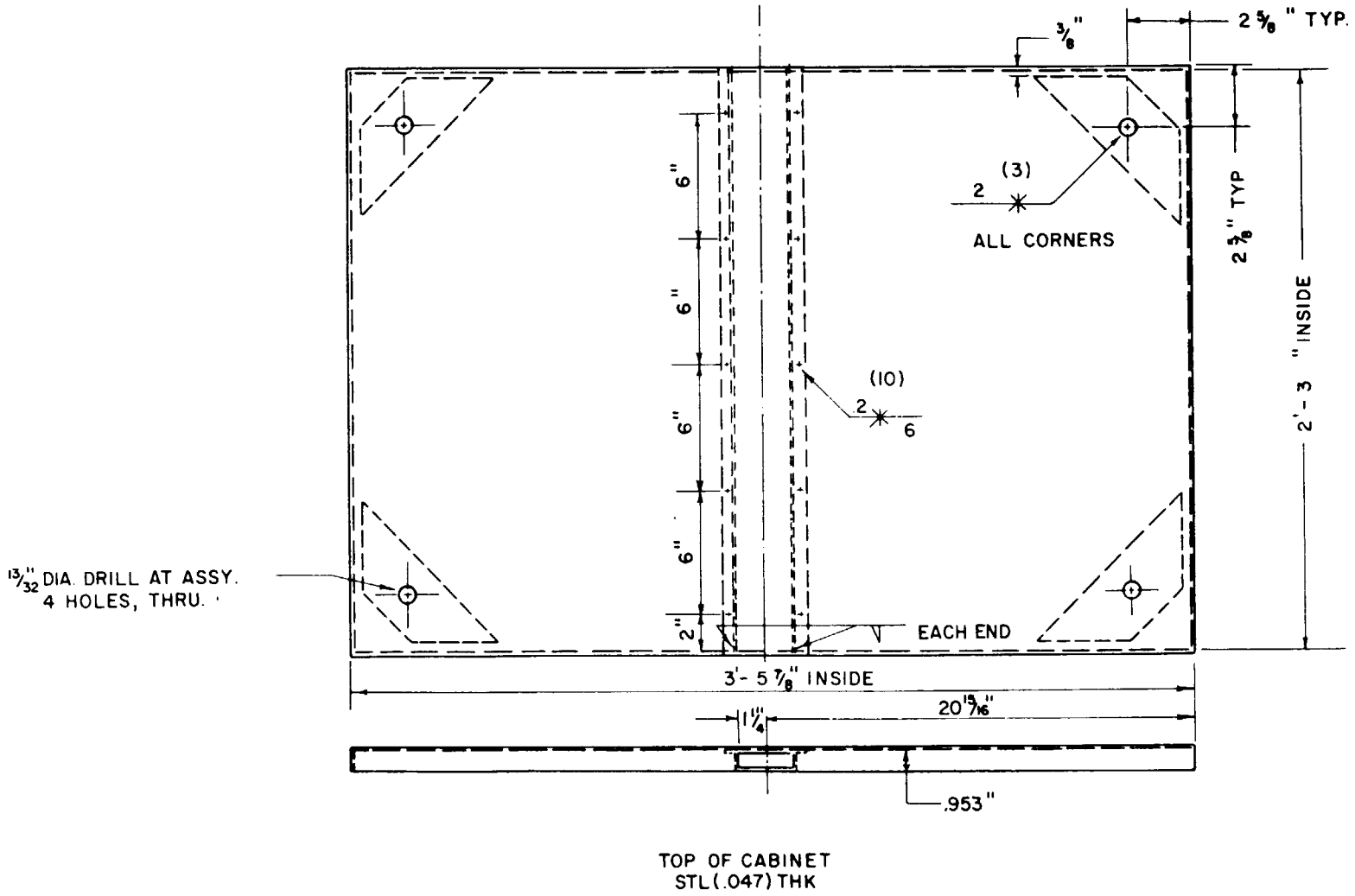


Figure 44. Typical cabinet top, type I.

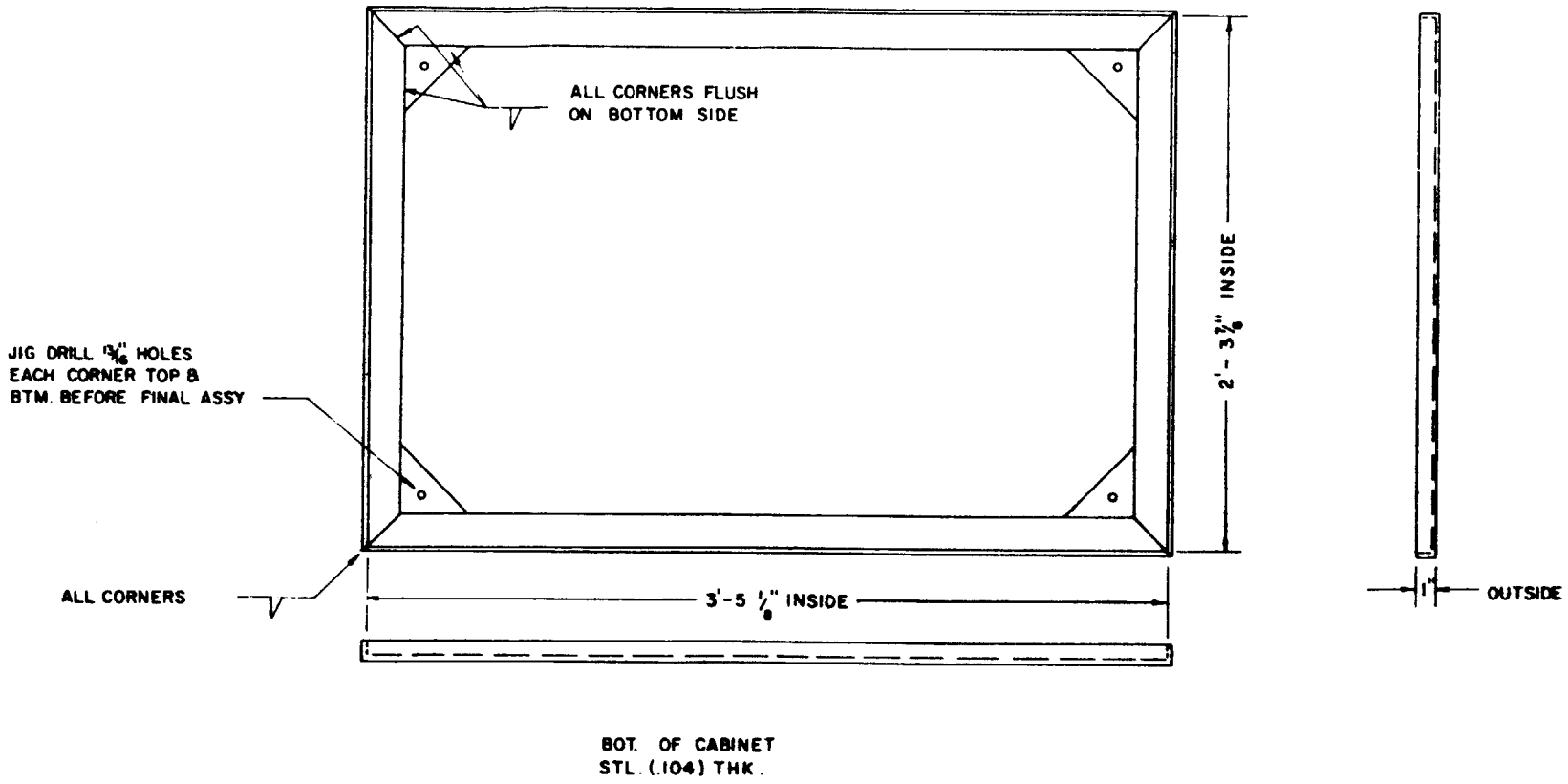


Figure 45. Typical cabinet bottom, type I.

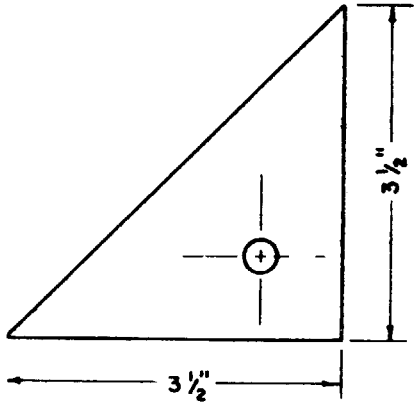


Figure 46. Typical cabinet bottom corner gusset, type I.

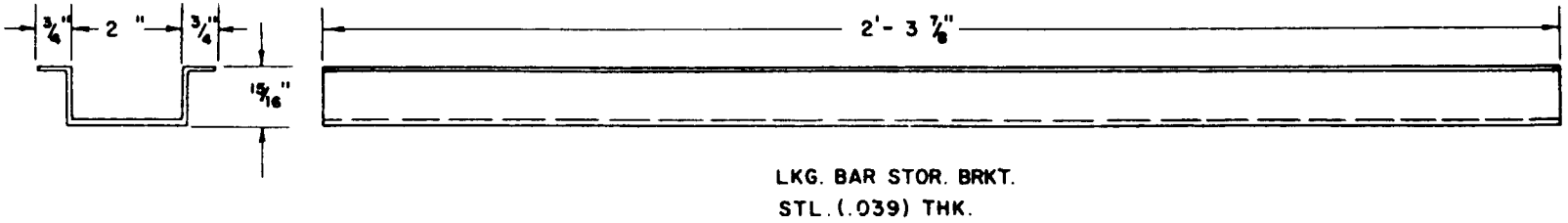


Figure 47. Typical locking bar storage bracket, type I.

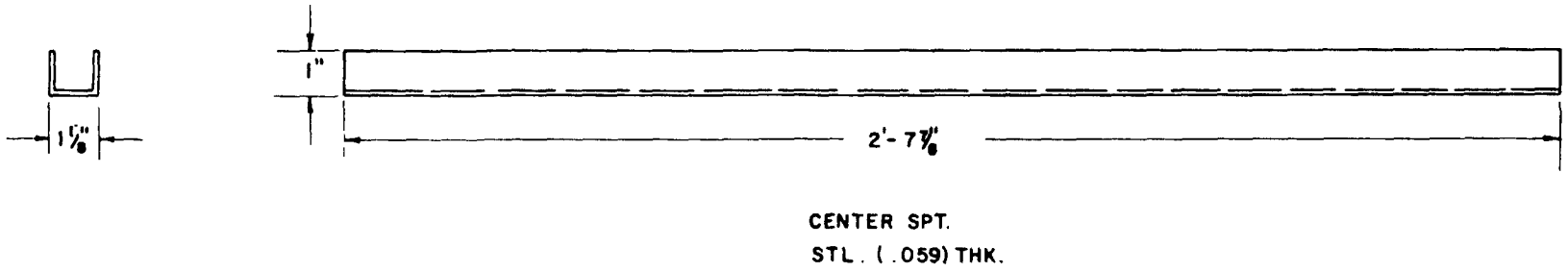


Figure 48. Typical Cabinet center support, type I.

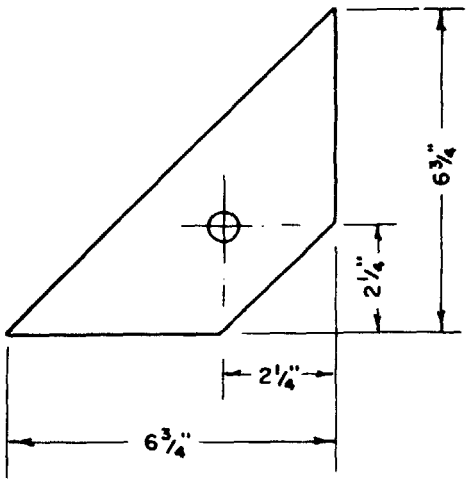


Figure 49. Typical cabinet top gusset, type I.

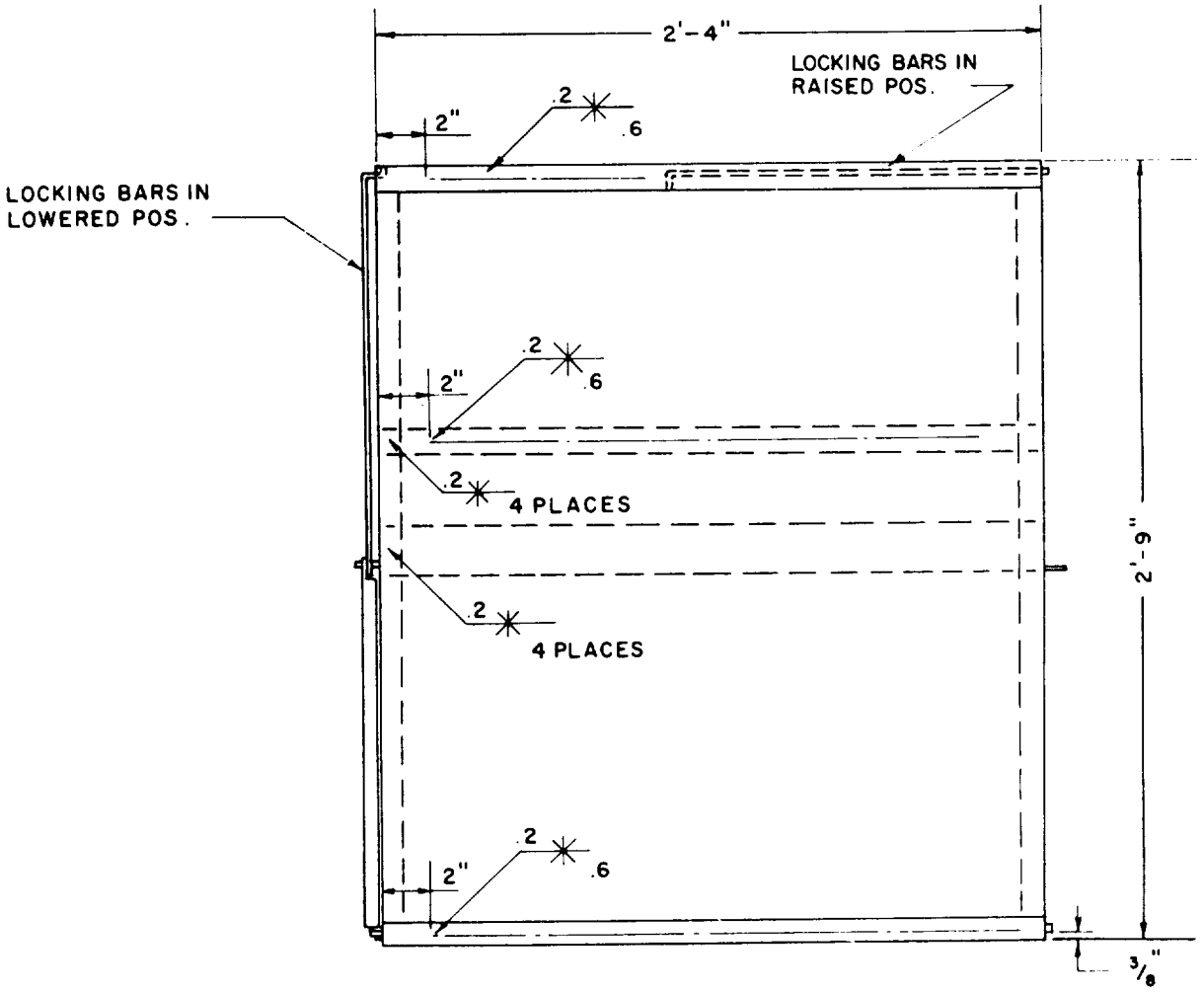


Figure 50. Typical cabinet side, type III.

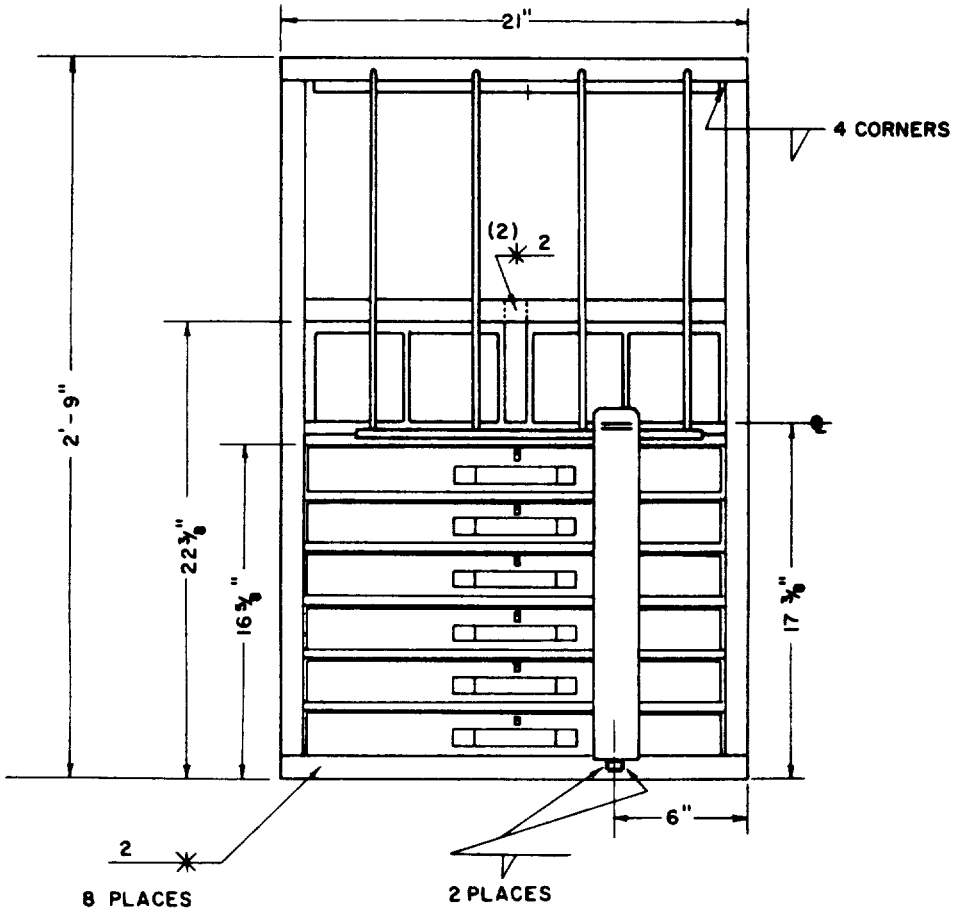


Figure 51. Front view, cabinet, type III.

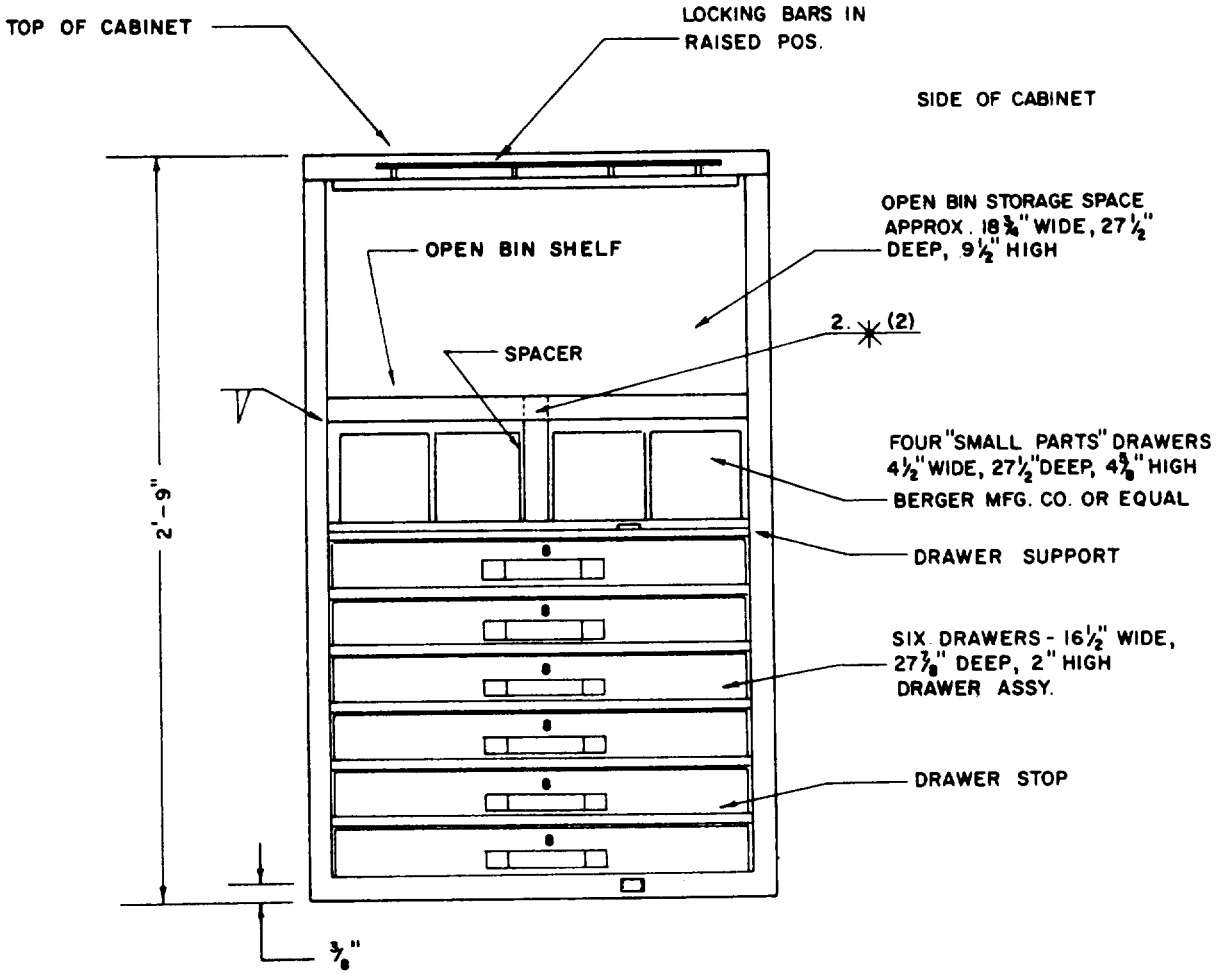


Figure 52. Rear view, cabinet, type III.

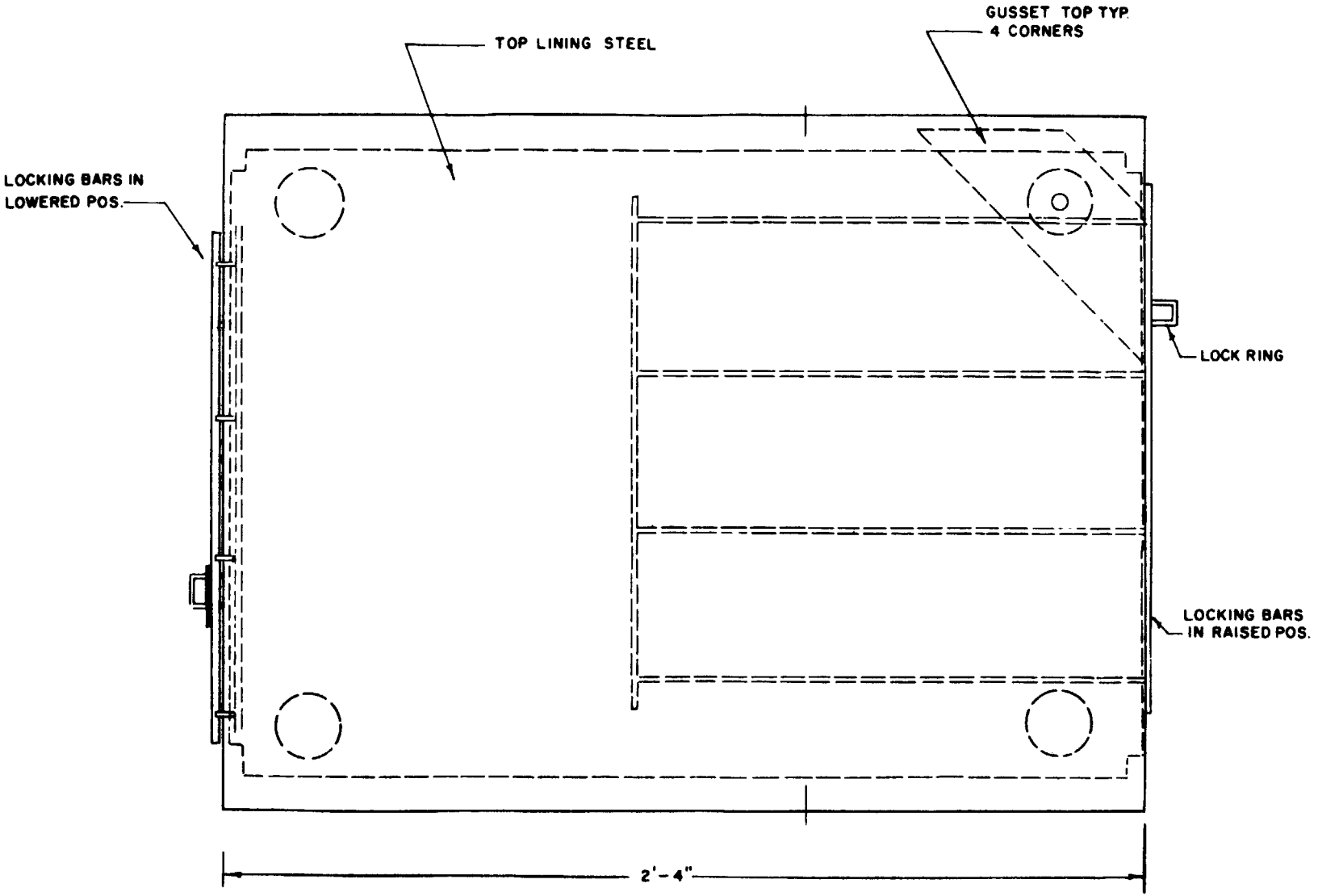


Figure 53. Top view, cabinet type III

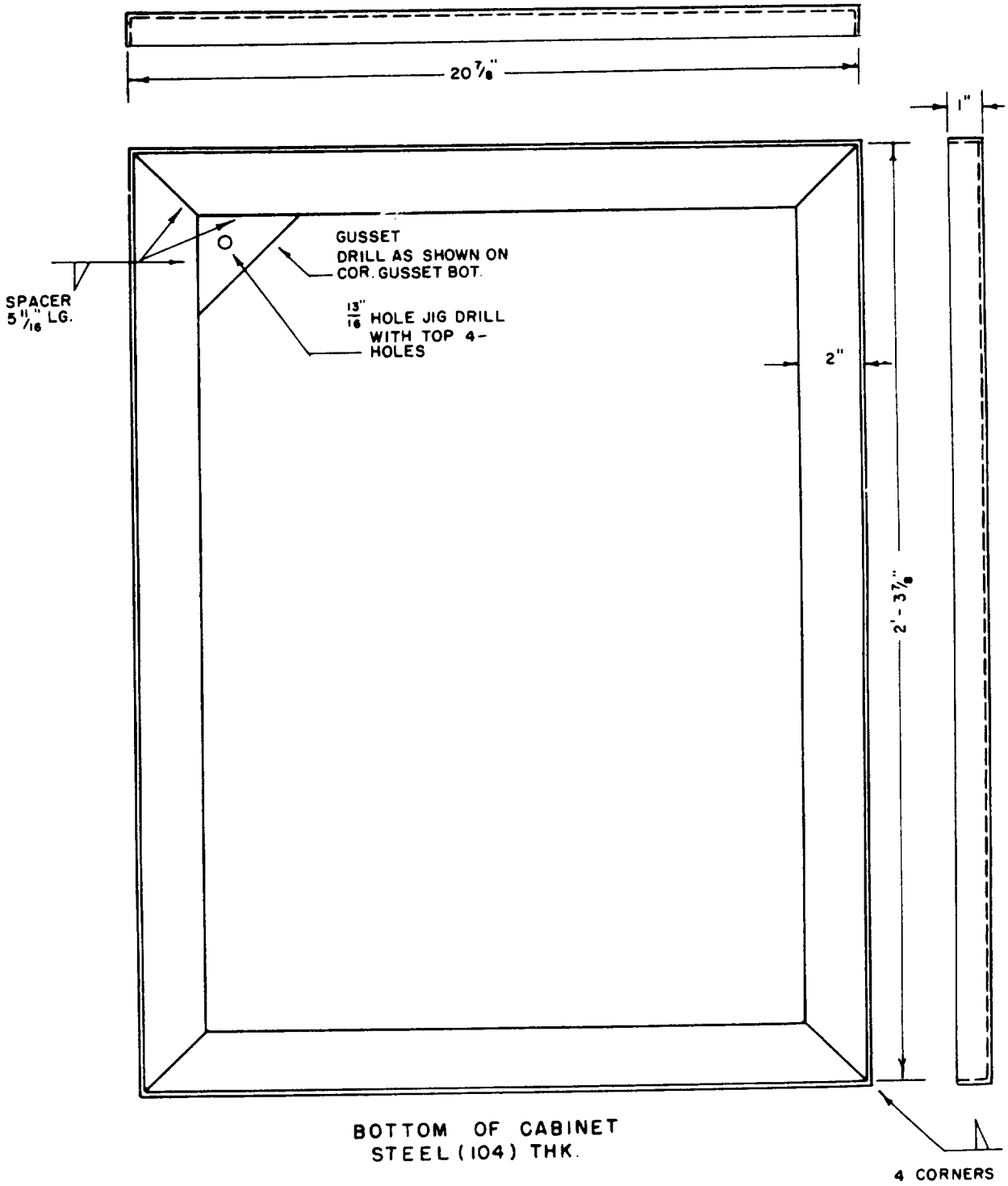


Figure 54. Bottom view cabinet, type III.

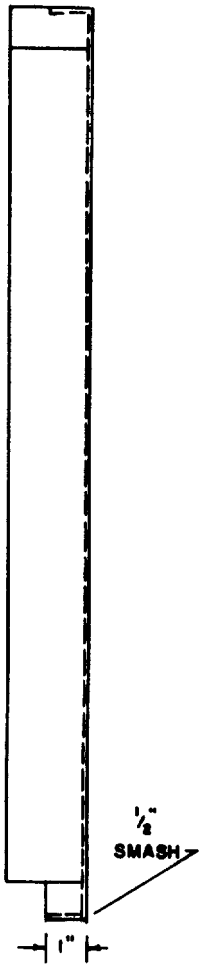


Figure 55. Open bin shelf, type III, front view.

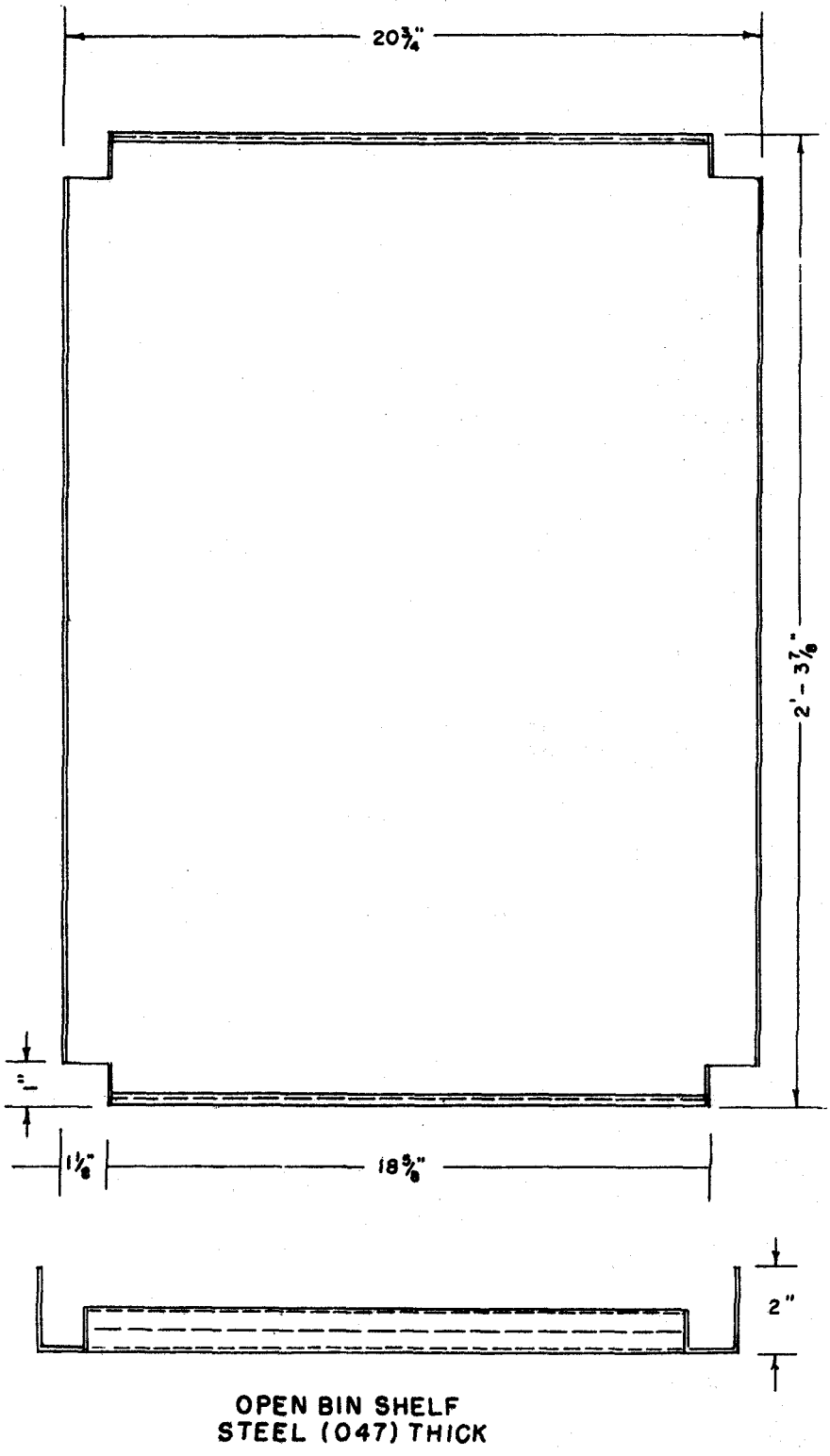


Figure 56. Open bin shelf, type III, top and side view.

Section IV. TROUBLESHOOTING

147. General

This section contains troubleshooting information useful to field and depot maintenance personnel in diagnosing and correcting unsatisfactory operation or failure of the shop set or any of its components.

148. Procedure

Troubleshooting is a systematic isolation of defective components by means of an analysis of the shop set trouble symptoms, testing to determine the defective component, and applying the remedy. To correct malfunctioning of equipment, the probable cause should be systematically isolated in accordance with instructions in the following paragraphs.

149. Electrical Equipment Operates at Slow or Reduced Speed

Probable cause	*Possible remedy*
Internal break in conductor inside conduit	Remove wire from conduit; splice or replace.
Improper grounding	-Inspect for corrosion at ground connections-repair or replace as necessary.
Contact points or circuit breaker dirty or corroded.	Clean points, reinstall circuit breaker.
Improper connections in control panel	Check control panel; position leads (fig. 8).

150. Electrical Equipment Stops During Operation

Probable cause	*Possible remedy*
Broken power cord	Remove power cords; inspect, repair, or replace.
Circuit breaker burned out	Replace circuit breaker.
Short circuit in system	Check system with volt-ohm meter; repair short circuit.

151. Electrical Equipment Will Not Start

Probable cause	*Possible remedy*
External power receptacle inoperative	Replace receptacle.
Power cord broken	Repair or replace power cord.
Circuit breakers burned out	Replace circuit breakers.
Safety disconnect switch contacts corroded	Clean contacts

152. Pneumatic Equipment Operators at Slow or Reduced Speed

Probable cause	*Possible remedy*
Partial stoppage in air line or hose.	Remove obstruction from air line or hose
Damaged air line	Replace air line.
Controls stuck	.Repair or replace controls

153. Pneumatic Equipment Stops During Operation

Probable cause	*Possible remedy*
Obstruction in air lines	Remove obstruction.
Broken air lines	Replace line

154. Pneumatic Equipment .,lll Not Start

Probable cause	*Possible remedy*
Power source not functioning correctly.	Refer to power source TM for procedure
Check valve inoperative	Repair or replace check valves
Controls stuck	Repair or replace controls

155. Excessive Vibration of. Equipment

Probable cause	*Possible remedy*
Broken mountings	Replace mountings
Equipment improperly mounted	Remount equipment correctly.

156. Excessive Noise

Probable cause	*Possible remedy*
Mounting not secure	Reposition and secure mounting
Equipment assembled improperly.	Resemble correctly.

Section V. ELECTRICAL SYSTEM

157. General

Refer to paragraphs 105 through 109 for detailed description of the electrical system.

158. Electrical Generator

Field and depot maintenance responsibilities for the generator are listed in the TM for the generator (app. I).

159. Electrical Wiring

Installation Breakers Field and depot maintenance personnel are responsible for performing tests and correcting discrepancies in the electrical wiring system as authorized by appendix II. Refer to paragraphs 147 through 156 for troubleshooting procedures. Detailed description of electrical wiring system is listed in paragraphs 105 through 109.

160. Electrical Switches and Circuit

Refer to paragraphs 105 through 109 -for description of circuit breakers and switches.
Field and depot maintenance personnel maintenance responsibilities consist of testing or replacing switches and circuit breakers in accordance with appendix II. Refer to paragraphs 147 through 156 for troubleshooting procedures.

161. Lighting System

Refer to paragraphs 105 through 109 for description of lighting system. Field and depot maintenance responsibilities consist of testing or replacing defective components of lighting system in accordance with appendix II.

Section VI. PNEUMATIC SYSTEM

162. General

A description of the pneumatic system is contained in paragraphs 110 through 115.

163. Air Compressor

Field and depot maintenance of the air compressor consists of mounting in accordance with chapter 8 and testing in accordance with the TM for the compressor (app. I). Repair or replacement mounting parts are listed in the TM for the compressor and in chapter 8.

164. Air Supply

Tank Field and depot maintenance of the air supply tank consists of mounting in accordance with chapter 8 and testing in accordance with the TM for the compressor. Repair or replacement mounting parts are listed in chapter 8 and in the TM for the compressor.

165. Lines and Hose

Field and depot maintenance of air lines and hose consists of mounting, testing, repair, and replacement. Refer to paragraphs 162 through 166 for procedures.

166. Controls and Instruments

Field and depot maintenance of controls and instruments consist of mounting in accordance with chapter 8 and testing in accordance with the applicable TM (app. I).
Section VII. UTILITY SYSTEM 167. General Field and depot maintenance responsibilities for the utility system consist of inspection, repair, and replacement of parts.

168. Parts

Repair or replace parts of the utility system in accordance with appendix II. Refer to figures 43 through 56 for listing of replacement parts.

Table I. Operator Daily Service.

Intervals				Procedure
Before oper	During oper	At halt	After oper	
				USUAL CONDITIONS
X	--	X	X	*Visual inspection of equipment*. Inspect for condition, security and wear.
			X	*Cleaning of equipment*. Wipe dirt, oil, rust, corrosion, and debris from equipment. Refer paragraphs 31 through 84, for cleaning instructions.
X	--	X	X	*Operating units*. Check all units for correct assembly and loose mounting. Adjust as necessary.
X	--	--	X	*Power supplies*. Check for loose power supply connections; check for frayed or cracked insulation.

Table I. Operator Daily Service Continued

Intervals				Procedure
Before oper	During oper	At halt	After oper	
				USUAL CONDITIONS-Continued.
	X	--	--	*Operation*. While equipment is operating, check for unusual sounds, vibrations, or malfunction.
X	--	--	X	*Lubrication*. Lubricate in accordance with paragraphs 29 and 30.
				UNUSUAL CONDITIONS (paras. 18-26)
X	X	X	X	*Extreme cold*
X	X	X	X	*Extreme heat*.
X	--	X	X	*Extreme wet.*
X	X	X	X	*Snow and ice*.
X		X	X	*Salt water.*
X		X	X	*Dust.*
X	X	X	X	*High altitude.*

Table II. Electrical System, Preventive Maintenance Services

Item Inspected	Inspect for	Services required	Intervals Weekly	Intervals Monthly
GENERATOR	Operation and function.	See TM listed in appendix I.	X	
WIRING AND POWER CORDS.	Cracked protective covers.	Wrap cracked areas with electrical tape or replace as required.	X	
	Loose connections	Tighten screws; replace connections	X	
	Damaged plugs	Replace plugs.	X	
	loose wires	Return wire to proper position.	X	
	Frayed wiring	Wrap with electrical tape or replace as required.	--	X
	Deterioration	Remove deteriorated sections, splice and wrap with electrical tape.	--	X
	Broken conductors.	Splice; wrap splices with electrical tape.	X	
CIRCUIT BREAKERS, SAFETY SWITCHES, RECEPTACLES.	Condition	Replace broken knobs, handies, cover, missing screws; etc.	X	
	Security	Tighten clamps screws, knobs, and covers.	X	
	Damage	Replace if major damage, repair minor damage.	--	X

Table II. Electrical System, Preventive Maintenance Services--Continued.

Item Inspected	Inspect for	Services required	Intervals	
			Weekly	Monthly
CIRCUIT BREAKERS, SAFETY SWITCHES, RECEPTACLES (continued).	Operation	Operate breakers, repair or replace as necessary. Operate switches; repair or replace as necessary. Check receptacle with equipment cords plugged in; repair or replace inoperative receptacles.	--	X
LAMPS	Inoperative tubes and bulbs; inoperative starters	Replace	X	
	Inoperative ON, OFF switches.	Replace	X	

Table III. Pneumatic System, Preventative Maintenance Services

Item Inspected	Inspect for	Services required	Intervals	
			Weekly	Monthly
COMPRESSOR LINES AND HOSE.	Operation. and function.	In accordance with TM for compressor (app. I).	X	
	Leaks	Tighten or replace fittings, hose, or lines.	X	
	Security	Tighten mounting clamps or install new clamps.	X	
	Damage	Repair or replace damaged sections.	X	
QUICK DISCONNECT FITTINGS.	Leaks	Replace seals, seats, or fittings, as necessary.	--	X
	Ease of operation.	Replace plugs	--	X
CONTROLS	Sticking and binding.	Lubricate, repair replace as necessary.	X	
	Leaks	Replace packing rings.	X	
	Damage	Repair or replace as necessary.	X	
INSTRUMENTS	Cracked dial covers	Replace	--	X
	Accuracy	Remove for repair or calibration.	X	
	Damage	Repair or replace as necessary.	--	X

Table IV. Utility System, Preventative Maintenance Services

Item Inspected	Inspect for	Services required	Intervals	
			Weekly	Monthly
STORAGE CABINET DRAWERS.	Sticking, binding and distortion.	Lubricate (paras. 89 and 90) aline or straighten as necessary.	--	X
STORAGE CABINET HINGE POINTS.	Alinement, ease of operation, and condition.	Aline hinges, lubricate (paras 89 and 90) or replace as necessary.	--	X

Table IV. Utility System, Preventative Maintenance Services--Continued

Item Inspected	Inspect for	Services required	Intervals	
			Weekly	Monthly
STORAGE CABINET EXTERIORS.	Corrosion, rust chipped, or peeling paint.	Remove corrosion and rust (paras. 29 and 30), touch-up or repaint as necessary.	--	X
STORAGE CABINET LOCKING DEVICES.	Security, ease of operation, and alinement.	Tighten bolts, realine, re position, or replace as necessary.	--	X
STORAGE CABINET MOUNTINGS.	Security	Tighten or replace mounting bolts as necessary.	--	X
BENCH TOP SURFACE.	Nicks, gouges scratches.	Sand out, refinish (ch. 6).	--	X
BENCH TOP MOUNTINGS.	Security	Tighten or replace screw or bolts as necessary. -	--	X

APPENDIX I
REFERENCES

1. Publication Indexes

Department of the Army Pamphlets of the 310-series should be consulted frequently for the latest changes or revision of references given in this appendix and new publications relating to the material covered herein.

2. Technical Manuals

5-5260	Generator Set, electric portable, gasoline driven, skid mounted, 10 kw, 60 cycles, 120-208 volts, 3 phase, 4 wire, 120 volt, single phase, 2 wire, 120-240 volt, single phase, 3 wire, Hollingsworth Model CE-100 AC/WK 4 (less engine).
5-6115-204-10	Operator's Manual: Generator Set, electric, gasoline driven, skid mounted, 10 kw, AC, 120-208 volt, 3 phase, 60 cycle, convertible to 120-240 volt, single phase, 60 cycle (John Reiner Model GGC-10-AC-2, with Continental Model FS 162, Specification 6026 engine).
5-6115-204-20	Organizational Maintenance, Generator Set, electric, gasoline driven, skid mounted, 10 kw, AC, 120-208 volt, 3 phase, 60 cycle, convertible to 120240 volt, single phase, 60 cycle (John Reiner Model GGC-10-AC-2, with Continental Model FS 162, Spec. 6026 engine.
5-6115-204-35	Field and depot Maintenance; Generator Set, electric, gasoline driven, skid mounted, 10 kw, AC, 120-208 volt, 3 phase, 60 cycle, convertible to 120-240 volt, single phase, 60 cycle, (John Reiner Models, GGC-10AC-2, and 3, with Continental Model FS-162; Specification 6026, and 6037 engines.
5-6115-204-35P	Field and Depot Maintenance repair parts and special tool lists for Generator Set, electric, gasoline driven, skid mounted, 10 kw, AC, 120-208 volt, 3 phase, 60 cycle, convertible to 120-240 volt, single phase, 60 cycle (John Reiner Models, GGC-10-AC-2, and 3, with Continental Model FS-162; Specification 6026, and 6037 engines (Serial Nos. 11115 through 12710).
5-6115-232-10	Operator's Manual: Generator Set, gasoline engine; 10 kw, AC, 120V, 1 and 3 phase, 120/240V, single phase, 120/208V, 3 phase, 60 cycle; skid mounted (Hol-Gar Model CE-105-AC/WK8 W/Hercules engine Model IXB3ER (FSN 6115-631-6811).
9-2330-238-14	Operators, Organizational and field maintenance for Semi trailer, Van; Shop, 6-ton, 4-wheel, Folding sides, M447.

3. Technical Bulletin

5-5261-1	Preventive Maintenance Services: Generator Set, electric, portable, gasoline driven, skid mounted 10 kw, 120-208 volt, 60 cycle, 4 wire, Reiner Model GGC-10-AC (less engine).

4. Lubrication Orders

5-5260	Generator Set, electric, portable, gasoline driven, skid mounted, 10 kw, 60 cycles, 120-208 volt, 3 phase, 4 wire; 120 volt, 1 phase, 2 wire; 120 volt, 3 phase, 3 wire; Hollingsworth, Model CE-100-AC/WK-4.
5-6115-204-20	Generator Set, electric, gasoline driven, skid mounted, 10 kw., AC 120-208 volt, 3 phase, 60 cycle, convertible to 120-240 volt, single phase, 60 cycle (John Reiner Model GGC-10-AC-2, with Continental Model FS 162, Spec. 6026 engine.)

5. Army Regulations

AR 700-38	Unsatisfactory equipment.
AR 700-58	Report of damaged improper shipment.
AR 750-6	Maintenance planning, allocation and coordination.
AR 385-Series	Army safety policy.

6. Supply Manual

55-4-4920-S46	Shop Set, Aircraft Maintenance, Semi trailer Mounted, C-11, Powertrain Shop.

7. Indexes and Forms

DA PM 310-1	Index of Administrative Publications.
DA PM 310-2	Index of Blank Forms.
DA PM 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders and Modification Work Orders.
DA PM 310-22	Index of Supply Manuals Transportation Corps.
DA Form 460	Preventive Maintenance Roster.
DA Form 468	Unsatisfactory Equipment Report.
DD Form 6	Report of Damaged or Improper Shipment.
DD Form 314	Preventive Maintenance Schedule and Record.

APPENDIX II
MAINTENANCE ALLOCATION

1. Purpose

This maintenance allocation chart provides all activities with a description of maintenance functions to be performed at each echelon of maintenance.

2. Definition of Terms

a. Service. To clean, to preserve, and to replenish fuel and lubricants.

b. Adjust. To regulate periodically to prevent malfunction.

c. Inspect. To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

d. Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment, such as gages, meters, etc.

e. Replace. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

f. Repair,. To restore to a serviceable condition by replacing unserviceable parts or by any other action required, utilizing tools, equipment, and skills available, to include welding, grinding, riveting, straightening, adjusting, etc.

g. Rebuild. To restore to a condition comparable to new by disassembling the item to determine the condition of each of its component parts and reassembling it using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

h. Minor Disassembly. That disassembly where only subassemblies are removed, not entire system, and replacement does not require alinement.

Maintenance Allocation Chart

COMPONENTS AND RELATED OPERATIONS	1st ech.	2nd ech.	3rd ech.	4th ech.	5th ech.	Spec. Tools req'd
ELECTRICAL:						
CIRCUIT BREAKERS:						
Service	X					
Adjust	X					
Inspect	X					
Test	--	X				
Replace	--	--	X*			
Repair	--	--	--	X		
Rebuild	--	--	--	--	X	
WIRING:						
Service	X					
Test	--	--	--	--	X	
Inspect	X					
Replace	--	--	X*			
Repair	--	--	X			
Rebuild	--	--	--	--	X	
PNEUMATIC:						
AIR SUPPLY SYSTEM:						
Service	X					
Adjust	X					
Inspect	X					
Test	--	X				
Replace	--	--	X*			
Repair	--	--	--	X		
Rebuild	--	--	--	--	X	
UTILITY:						
CABINETS:						
Service	X					
Adjust	X					
Inspect	X					
Replace	--	X				
Rebuild	--	--	X			
Rebuild	--	--	--	--	X	

*Only those items requiring minor disassembly.

BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-5 requirements for literature of a general nature.

*U.S. GOVERNMENT PRINTING OFFICE: 1994 - 300-421/81983

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 013977-000