TM 5-4310-339-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT
AND DEPOT MAINTENANCE MANUAL

COMPRESSOR, RECIPROCATING, AIR;

15 CFM, 175 PSI;

ELECTRIC MOTOR DRIVEN

(INGERSOLL-RAND MODEL 242D7-½)

FSN 4310-143-9280

HEADQUARTERS, DEPARTMENT OF THE ARMY
DECEMBER 1969

TM 5-4310-339-15
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CHANGE
NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC *19 August 1974*

Operator, Organizational, Direct and General Support, and Depot Maintenance Manual

COMPRESSOR, RECIPROCATING, AIR; 15 CFM, 175 PSI; ELECTRIC MOTOR DRIVEN (INGERSOL-RAND MODEL 242D7-½) FSN 4310-143-9280

TM 5-4310-339-15, 29 December 1969, is changed as follows:

Reverse of Cover. Add the following Warnings:

WARNING

This compressor is NOT SUITABLE for the supply of air for charging cylinders with BREATHABLE AIR.

WARNING

Cleaning solvent, PD-680, is POTENTIALLY DANGEROUS CHEMICAL. Do not use near open flame.

Page 1-1, paragraph 1-1.1, the lines 5 through 9 are changed to: Commander, US Army Troop Support Command, ATTN: AMSTS-MMP, 4300 Goodfellow Boulevard, St. Louis, MO 63120.

Page 3-1, paragraph 3-3, add:

WARNING

This compressor is NOT SUITABLE for the supply of air for charging cylinders with BREATHABLE AIR.

Page 3-2, paragraph 3-6, add:

WARNING

Cleaning solvent, PD-680, used for cleaning is POTENTIALLY DANGEROUS CHEMICAL. Do not use near open flame. Flash point of solvent is 100-138° F. (38-59° C.).

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

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

Distribution:
To be distributed in accordance with DA Form 12-25A (qty rqr block No. 18), Organizational maintenance requirements for Air Compressors, 15 CFM.

Change
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *31 August 1973*

Operator, Organizational, Direct and General Support and Depot Maintenance Manual

COMPRESSOR, RECIPROCATING, AIR; 15 CFM, 175 PSI; ELECTRIC MOTOR DRIVEN

(INGERSOLL-RAND MODEL 242D7-1/2)

FSN 4310-143-9280

TM 5-4310-339-15, 29 December 1969, is changed as follows:

Page i. The following is added to Section I below "Introduction": Reporting of Errors; Paragraph 1-1.1; Page 1-1.

Page iii. Appendix B title is superseded as follows: Basic Issue Item List and Items Troop Installed or Authorized.

Page 1-1. Paragraph 1-1.1 is added:

1-1.1. Reporting of Errors

You can improve this manual by calling attention to errors and by recommending improvements, using DA Form 2028 (Recommended Changes to DA Publications), or by a letter, and mail directly to Commander, U.S. Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Boulevard St. Louis, MO. 63120. A reply will be furnished directly to you.

Page B-1. Appendix B is superseded as follows:

APPENDIX B
BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

B-1. Scope

This appendix lists basic issue items, items troop installed or authorized which accompany the compressor and are required by the crew/operator for operation, installation, or operator's maintenance.

B-2. General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List - Section II. Not applicable.

b. Items Troop Installed or *Authorized List - Section III.* A list in alphabetical sequence of items which at the discretion of the unit commander may accompany the end item, but are NOT subject to be turned in with the end item.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR): Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR Code	(2) Federal stock number	(3) DESCRIPTION Ref No. & mfr code / Usable on code	(4) Unit of meas.	(5) Qty auth
	7520-559-9618	CASE, MAINTENANCE AND OPERATION MANUAL	EA	1
	4210-555-8837	EXTINGUISHER, FIRE	EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS,
General, United States Army,
Chief of Staff.

Official:

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

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To be distributed in accordance with DA Form 12-25A (qty rqr block no. 18), Organizational maintenance requirements for Air Compressors 15 CFM.

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TECHNICAL MANUAL

HEADQUARTERS

DEPARTMENT OF THE ARMY

NO. 5-4310-339-15

WASHINGTON, D.C.,29 December 1969

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

COMPRESSOR, RECIPROCATING, AIR: 15 CFM, 175 PSI; ELECTRIC MOTOR DRIVEN, (INGERSOLL-RAND MoDEL 242D7-½)

FSN 4310-143-9280

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SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION. This manual covers the installation, operation and maintenance of the Model 242 D7-1/2 Air Compressor.

The instructions contained herein are for the guidance of personnel responsible for the operation and maintenance of the equipment.

1-2. GENERAL DATA.

Manufacturer's Name . . . . . Ingersoll-Rand Company

Manufacturer's Model No. 242D7-1/2

Manufacturer's Serial No. . . . . X30T275953 through X30T276025 inclusive

Capacity, CFM(cubic feet per minute). 15

Pressure, PSIG (pounds per square inch gauge) 175

Speed of Shaft, RPM (revolutions per minute) 1040

Motor Horsepower 7.5

Working Pressure, PSIG

First Stage 35-40

Second Stage 195

Safety Valve Pressure Setting, PSIG

First Stage 60

Second Stage 200

Contract No DAAK-69-C-1735

Federal Stock No 4310-143-9280

Maintenance Forms and Records. . . . . Maintenance forms, records, and reports which are to be used by maintenance personnel at all levels are listed in and prescribed by TM 38-750.

1-3. ASSOCIATED COMPONENTS. Refer to Section VI for the details of the following components:

Drivcr . . . . . General Electric

Controller . . . . . General Electric

Air Pressure Switch . . . . . Square D

First Stage Safety Valve. . . . . .KunkleValve

Second Stage Safety Valve... . . . . .Kunkle Valve

1-4. WEIGHTS.

Controller, Lb (Pound) 6

Recievcr, Lb 360

Motor, Lb 127

Compressor -Dry, Lb..... 170

1-5. OVERALL DIMENSIONS.

Width, In. (Inches) 24.5

Height. In 41.0

Length, In 63.0

1-6. DESCRIPTION OF COMPONETS

1-7. GENERAL DESCRIPTION. The Model 242 D7-1/2 Air Compressor described by this manual is a two stage. air cooled reciprocating air compressor, capable of continuous operation at a rated capacity of 15 CFM at a discharge pressure of 175 PSIG when operating at a speed of 1040 RPM. The Model 242 D7-1/2 Air Compressors compact package consisting of several major components. These components are as follows: Model 242 Compressor, induction motor with magnetic controller, belt guard assembly, receiver, and an air hose assembly with inflator gauge. Refer to Figures 1-1 and 1-2.

1-8. MODEL 242 COMPRESSOR. The Model 242 Compressor (Figure 1-3) is a 2-3/4-inch stroke, two cylinder, single acting, air cooled compressor. The cylinder bore diameter of the first stage cylinder is 4 inches and that of the second stage cylinder is 2-1/2 inches. The compressor assembly comprises a totally enclosed crankcase which supports a counterweighted crankshaft and a balanced fan-type flywheel, an oil f'iller, a pilot valve and centrifugal unloader, two compressing cylinders, an intercooler assembly and an aftercooler assembly. The crankcase also serves as a sump for the lubricating oil. The crankshaft supports

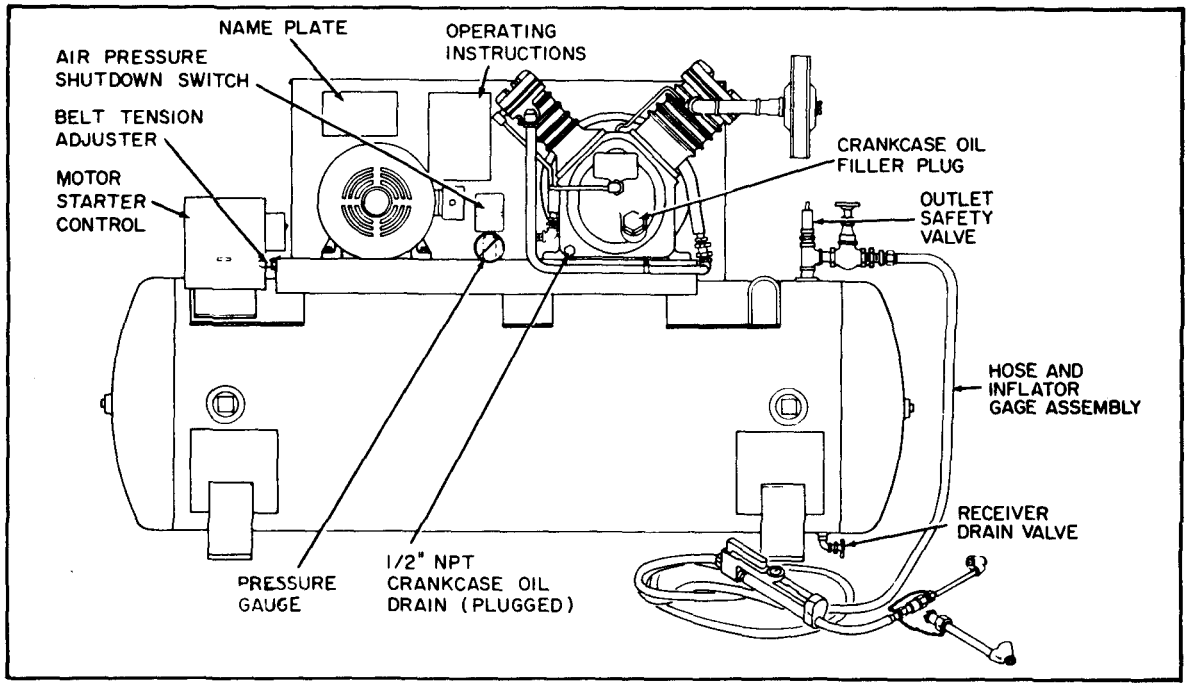


Figure 1-1. Model 242D7-1-1/2 Compressor, Front View

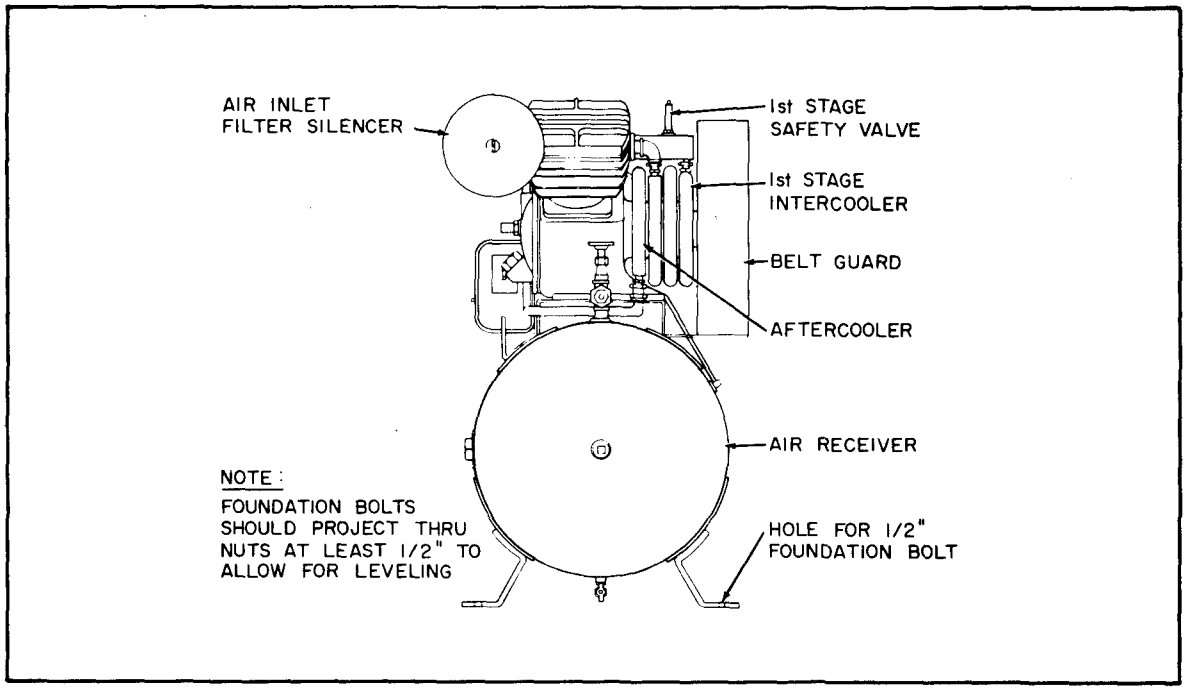


Figure 1-2. Model 242D7-1/2 Compressor, End View

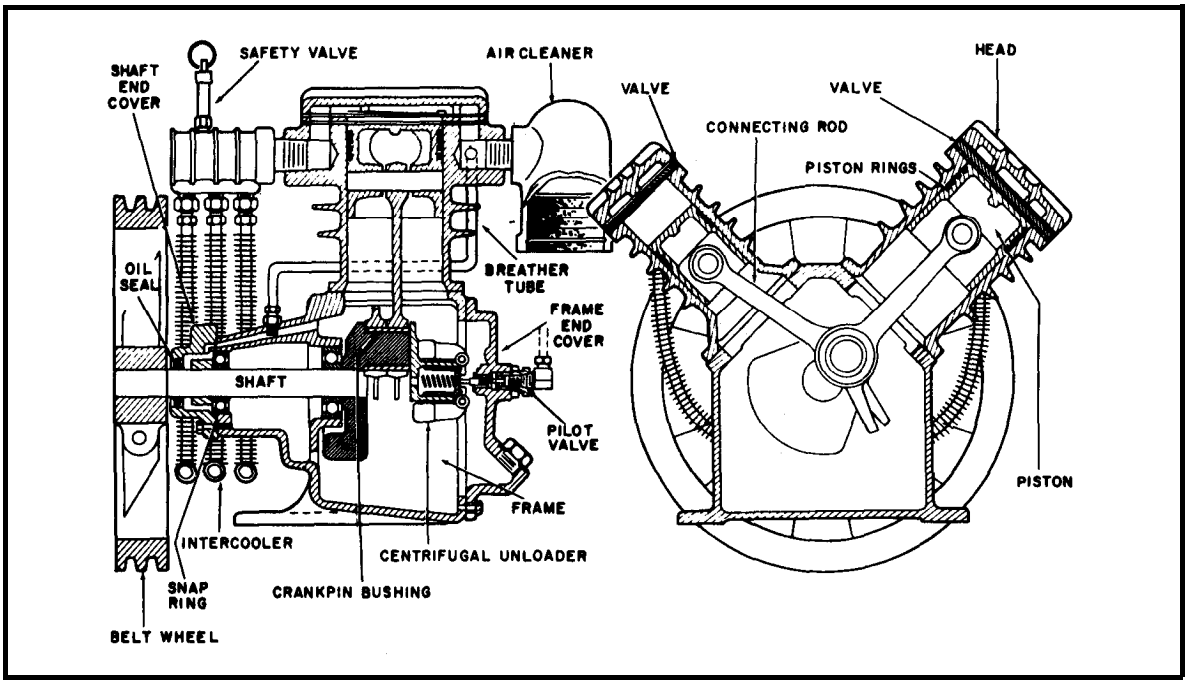


Figure 1-3. Typical Compressor Sectional Assembly

solid end connecting rods that are connected to trunk-type pistons by hardened steel piston pins. The separately cast cylinders, individually bolted to the crankcase, facilitate inspection and maintenance when required. Air from the fan-type flywheel circulates across the intercooler tubing and around each cylinder to remove much of the heat of compression. Mounted on each of the cylinders is a valve and air head assembly. The valves are readily accessible for maintenance without disturbing piping. Safety valves are provided for each stage of compression.

1-9. INDUCTION MOTOR. Complete details of the driving motor and its magnetic controller will be found in Section VII.

1-10. BELT GUARD ASSEMBLY. The belt guard (Figure 1-2) is the totally enclosed type, providing protection front and back as well as at the top and sides.

1-11. SUBBASE AND RECEIVER ASSEMBLY. The compressor, motor and belt guard assemblies are securely attached to a rugged, channel-section type, steel subbase which is welded to an 80 gallon receiver {Figure 1-2). Installation of the complete Model 242D7-1/2 Air Compressor is readily made by bolting the receiver feet to a substantial base. The receiver has a rated Working Pressure of 200 psig at -25 to +600°F.

1-12. CRANKCASE ASSEMBLY. The compressor crankcase (Figure 1-3) is a one-piece casting enclosed by two end covers. Two bearings within the crankcase support the crankshaft. The flywheel end cover is equipped with' an oil seal to prevent leakage of oil along the crankshaft. The frame cover on the opposite end houses a starting unloader and pilot valve.

1-13. CRANKSHAFT AND CONNECTING RODS. The crankshaft has an overhung crank-throw which permits the use of solid end-type connecting rods (Figure 1-3). The crankshaft is counterweighted to give proper running balance. The drive end is keyed to receive the fan-type flywheel. The other end of the crankshaft is fitted with a crankpin cap on which is mounted the centrifugal starting unloader. Each of the connecting rods is cast in one piece, and both are readily replaceable. A single crankpin bushing serves as a bearing for the crankshaft end of both connecting rods. A pressed-in solid bronze bushing is located in the piston end of both connecting rods. Oil dippers are cast as integral parts of both connecting rods and provide splash lubrication to all running parts. The one-piece construction of the connecting rods assures proper alignment.

1-14. BREATHER TUBE. A breather tube (Figure 1-3) connects the interior of the crankcase to the inboard side of the air inlet filter silencer. This connection permits pulsations created by the reciprocating action of the pistons to be vented to atmosphere, thus preventing any pressure build-up within the crankcase.

1-15. FAN-TYPE FLYWHEEL. The fan-type flywheel (Figure 1-3) is keyed to the compressor crankshaft and is enclosed by the belt guard assembly. It moves ambient air through the belt guard, drawing it over the aftercoole r and intercooler tubing and discharging it around the cylinders, providing the required cooling for the compressor.

1-16. CYLINDERS AND PISTON ASSEMBLIES. The compressor has two cast iron cylinders (Figure 1-3), one for each stage. Each cylinder is a one-piece casting with integral cooling fins and is bolted to the crankcase with a gasket between the two. Each cylinder bore is honed to provide a proper wearing and sealing surface for the piston rings. Each piston is equipped with two single piece, taper-faced style compression rings; one four-piece, ventilated, chrome plated steel rail style oil control wiper ring; and one single-piece, non-ventilated beveled-scraper style oil control wiper ring. Piston pins are hardened steel with a ground finish. They are full floating, with snap rings to prevent them from striking the cylinder walls. Both pistons are the trunk type, and made of aluminum.

1-17. AIR HEADS AND VALVES. Air enters and leaves each cylinder through an air head and valve (Figure 1-3) at the top of the cylinder. The valves are stainless steel finger type (Figure 5-4), consisting of valve spacer plates and inlet and discharge valves secured to the plates with fillister head screws and nuts. The valve and spacer assemblies are secured to the cylinders by bolts through the air heads, with appropriate gaskets. They are readily accessible and may be removed without disturbing piping.

1-18. AIR INLET FILTER SILENCER. An air inlet filter silencer (Figure 1-2) located at the first stage cylinder inlet filters all air entering the compressor and reduces the noise level of the intake pulsations to a level which is not objectionable. The filter uses cleanable pads to remove harmful grit and dirt from the intake air. If the air in the vicinity of the compressor is unduly dirty or contains corrosive fumes, pipe the filter silencer to a source of cleaner air.

1-19. STARTING UNLOADER. The compressor is equipped with a starting unloader (Figure 1-3) which relieves cylinder pressure when the compressor stops, permitting it to start

against a light load. This increases the life of the drive motor and belts and also reduces the possibility of tripping the motor overload relay. The unloader incorporates a pilot valve which is actuated centrifugally by unloader weights attached to the end of the crankshaft.

1-20. INTERCOOLER AND AFTERCOOLER. The compressor is equipped with an intercooler (Figure 1-2) between the first and second stages which removes most of the heat of compression from the air before it enters the second stage, thus improving efficiency and decreasing the final discharge air temperature. The intercooler consists of finned tubing connecting the discharge of the first stage to the inlet of the second. The compressed air flows through these tubes and its heat is transferred to the cooling fins. The ambient air from the fan-type flywheel passes over the fins, dissipating the heat to atmosphere. The aftercooler (Figure 1-2) consists of finned tubing connecting the second stage discharge to the receiver, and functions in the same manner as the intercooler.

1-21. SAFETY VALVES. Safety valves are provided for both the first and second stages to protect against damage from over pressure. The first stage safety valve (Figure 1-2) is mounted on the intercooler outlet manifold, and the second stage safety valve (Figure l-l) is located in the service line of the receiver. The first stage safety valve is set to blow at 60 PSIG, and the second stage is set at 200 PSIG.

1-22. STARTING SWITCH. The compressor starting switch is incorporated as a part of the magnetic controller (Figure 1-1) furnished with the driving motor. The controller incorporates an ON-OFF snapswitch for starting and stopping the compressor. Complete details will be found in Section VI..

1-23. CHECK VALVE. A check valve (Figure 5-13) is located in the discharge line and acts to check the flow of air from the air receiver to the cylinder when the compressor is stopped.

1-24. COMPRESSOR REGULATION. The compressor is regulated by Automatic Start and Stop Control, which makes or breaks electrical contact to the motor at predetermined pressures. This type of regulation is used when the demand for air is small or intermittent, but where pressure must be continuously maintained.

1-25. AUTOMATIC START AND STOP CONTROL .

1-25.1. Automatic Start and Stop Control is obtained by means of a pressure switch (Figure l-l) which makes and breaks an electrical circuit, starting and stopping the driving motor, thereby maintaining the air receiver pressure within prescribed limits. The pressure switch **is** piped to the receiver and is actuated by changes in receiver pressure.

1-25.2. The pressure switch has a cut-out adjustment and a differential adjustment. The cut-out is the pressure at which the switch contacts open, and the differential is the span between the cut-in and cut-out settings. A fairly wide differential setting of the pressure switch should be maintained to prevent frequent starting and stopping of the compressor.

SECTION II

INSTALLATION

2-1. POWER REQUIREMENTS. The driving motor requires a 220 volt, 3 phase, 60 hertz electrical source. Connections to be made between the electrical supply system and the compressor are shown in Figure 2-3.

2-2. LOCATION AND VENTILATION. In cold climates, it is desirable to install the compressor in a heated building. Choose a clean, relatively cool location. and provide ample space around the unit for cooling and general accessibility. Adequate ventilation must be provided the compressor to assure proper intercooling and aftercooling as well as heat dissipation from the cylinders. This is especially important under conditions of high humidity, which are conducive to formation of water in the crankcase. If adequate ventilation is not provided. rusting, oil sludging and rapid wear of running parts may result. This is particularly true for compressors operating on very intermittent duty. At least 15 inches of space should be provided between the aftercooler end of the unit and the nearest wall.

2-3. FOUNDATION.

2-3.1. The unit may be bolted to any substantial, relatively level floor or base. If such a surface is not available, an adequate base must be constructed. Should a concrete base be necessary, make certain the foundation bolts are positioned correctly to accept the receiver feet, and that these bolts project at least 1-3/4 inches above the surface of the foundation. Refer to Figure 2-1 for correct spacing of bolts.

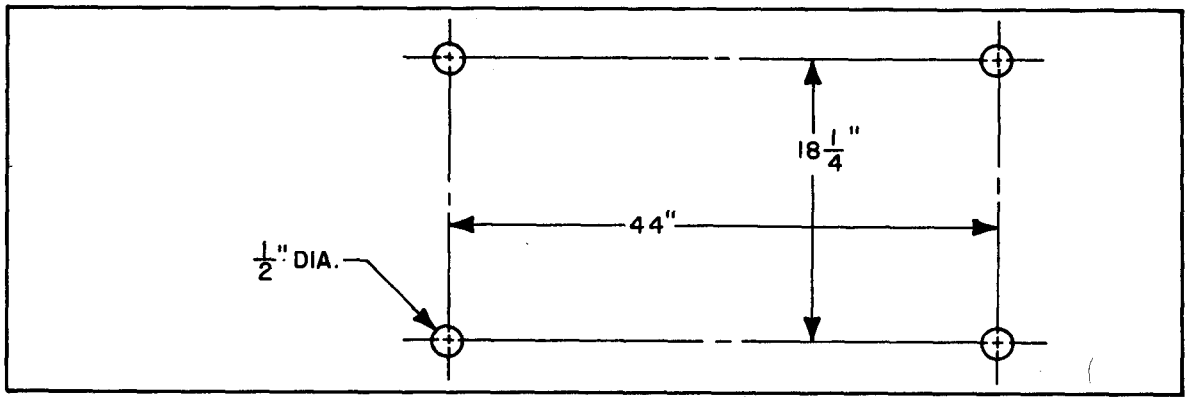


Figure 2-1. Bolting Diagram

2-3.2. To prevent vibration and insure proper operation, it is important that the unit be level and the receiver feet pulled down on shims in such a manner as to avoid pre-stressing the feet and receiver. The following technique is recommended for anchoring the compressor to its base:

2-3.2.1. Tighten evenly, and to a moderate torque, the nuts of any three of the four receiver feet. Check the unit for level. If the unit is not level, insert metal shims, as shown in Figure 2-2 under one or two of the feet to obtain level, and retighten the nuts.

2-3.2.2. Note the distance the unanchored foot is elevated above the base and insert a metal shim of the necessary thickness under this foot to provide firm support.

2-3.2.3. After all shims are inserted and the unit is level, pull up the nuts on all receiver feet to a moderate (not excessively tight) torque.

2-4. BELT GUARD. The enclosed belt guard provides protection front and back as well as at the top and sides. A screened front allows ample air circulation across the aftercooler and intercooler while protecting personnel from contact with rotating parts and moving belts.

2-5. CLEARANCES FOR ACCESS. With, the exception of the air compressor cylinders, room for access to all parts of the compressor for service or removal is available within the overall dimensions of the compressor, providing the 15 inch space for ventilation is maintained between the aftercooler and the nearest wall. A clearance of at least 12 inches should be provided over the unit to allow removal of the cylinders.

2-6. MECHANICAL ASSEMBLY PROCEDURES. The air compressor is shipped with the air hose and inflator gauge assemblies packed separately. Installation of these components will complete the required mechanical assembly procedures. In the event a remote location for the air inlet filter silencer is chosen, make the inlet line as short and direct as possible and as large as, or larger than, the inlet connection at the compressor.. Increase the diameter of the inlet pipe for every 50 feet in length. Attach the air inlet filter silencer to the end of the inlet air line.

2-7. TESTING FOR SATISFACTORY INSTALLATION. After all wiring is completed, "jog" or "inch" the motor to make certain the compressor rotates in the same direction as that indicated by the arrow on the compressor flywheel. Soon after receiver pressure has built up for the first time, go over all piping joints made during installation to be certain there are no leaks. Soapy water applied to the joints will disclose any leaks.

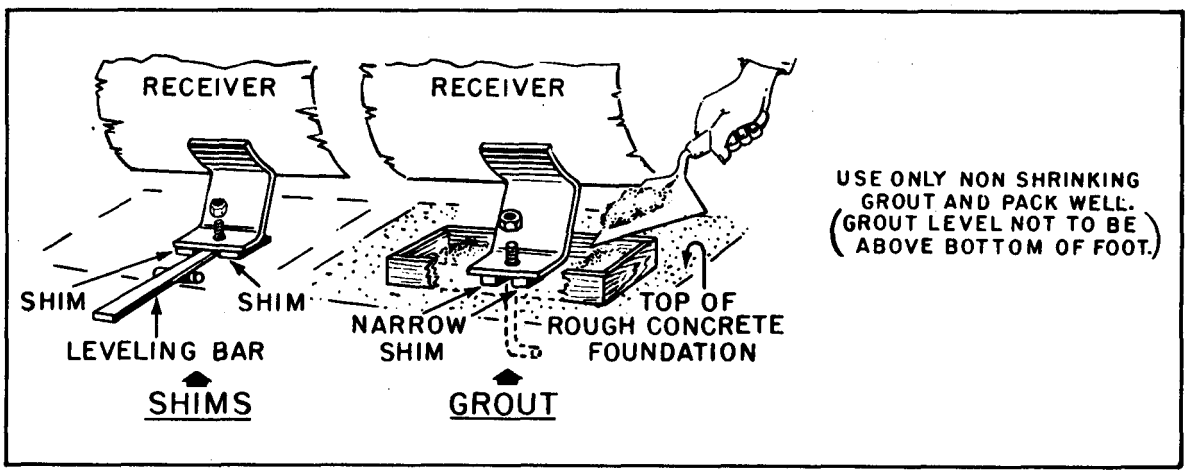


Figure 2-2. Methods of Leveling Unit

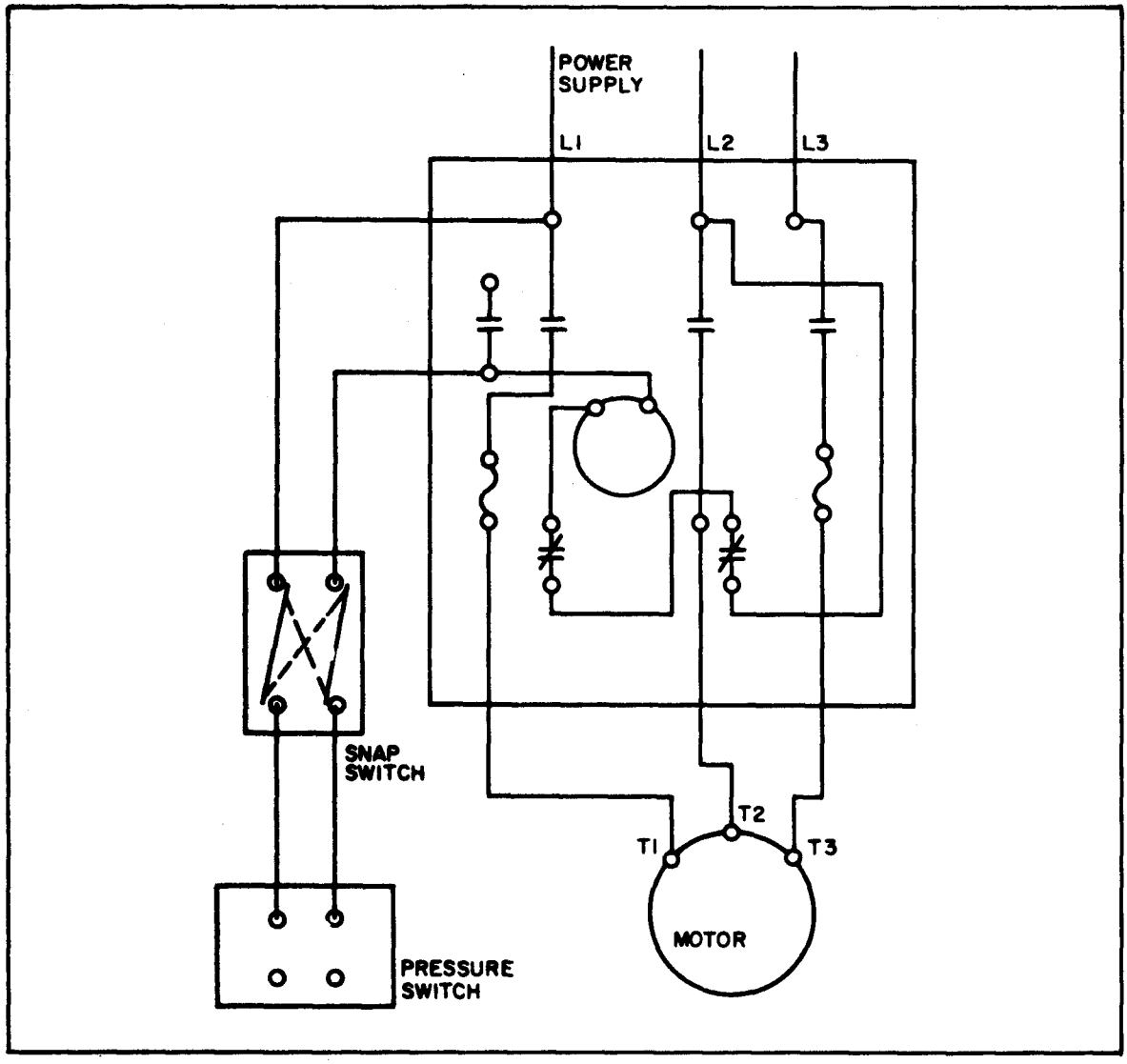


Figure 2-3. Electrical Wiring Diagram

SECTION III

OPERATION

3-1. PRE -STARTING CHECKS - NEW UNITS.

3-1.1. Before starting a new unit fill the compressor crankcase to the overflow point with oil as specified in Table 5-2.

3-1.2. Turn the compressor flywheel through several revolutions by hand to see that everything is free and in working order.

3-1.3. Check the tension of the belts as described in Paragraph 5-5.

3-1.4. Remove tools, rags and any other objects from the vicinity of the compressor before starting it.

3-2. OPERATING CHECKS. Satisfactory operation depends to a large degree upon adherence to a preventative maintenance schedule. To obtain optimum performance, observe the Routine Inspection and Maintenance Guide in Table 3-4. As a further initial precaution, tighten all capscrews and nuts after 25-to 50-hours to maintain efficiency and prevent loss of oil. Tighten to the torque values recommended in Table 5-1.

3-3. SAFETY PRECAUTIONS. The following precautions should be observed to assure the safety of operating personnel.

3-3.1. BEFORE OPERATION.

Be sure all guards are in place.

Remove all tools and other objects from the compress or.

3-3.2. DURING OPERATION.

Always stop the compressor before making adjustments.

Never disconnect any air lines without first relieving pressure from the entire unit.

Never direct air at personnel; serious injury may result.

3-3.3. AFTER OPERATION.

Drain the receiver and relieve all air pressure from the entire unit before performing any maintenance on the compressor.

TABLE 3-1. OPERATING CONTROLS (REF FIG. 1-1.)

Control	Action
Motor Controller	
On-Off Snapswitch	Position as required
Reset Pushbutton	Push to reset
Receiver Drain Valve	Open to drain receiver

TABLE 3-2. INDICATING DEVICES (REF FIG. 1-1.)

Device	Normal Operating Indication
Pressure Gauge	
Receiver	175-to 200-PSIG

3-4. STARTING. Start the compressor by placing the motor controller snapswitch in the ON position. The compressor will start and stop automatically in accordance with air demand.

3-5. STOPPING. The unit is stopped by moving the motor controller snapswitch to the OFF position.

TABLE 3-3. OPERATING LIMITS

PRESSURE LIMITS , PSIG	
First Stage Safety Valve Setting	60
Second Stage Safety Valve Setting	200

3-6. OPERATOR'S MAINTENANCE. The maintenance procedures as recommended in Table 3-4 are limited to inspection, cleaning, servicing, lubrication, adjustment and minor parts replacement functions that may be readily performed by the operator. More detailed maintenance procedures are described in Section V - Maintenance and Repair. Where a choice between a number of operational hours and a time exists, the choice shall be the one that occurs first.

TABLE 3-4. ROUTINE INSPECTION AND MAINTENANCE GUIDE

COMPONENT	ACTION	INTERVAL
Air Receiver	Drain condensate	Weekly
Crankcase Oil	Check level and refill to overflow with oil recommended in Table 5-2.	Weekly
Air Inlet Filter Silencer	Clean pads	Monthly
Crankcase Oil	Drain and replace	90 days or 500 hours

3-7. CRANKCASE OIL. Check the oil level weekly and refill to overflow with oil recoinmended in Table 5-2. Drain and replace the crankcase oil at 500 hour intervals.

WARNING

When changing oil, never use kerosene or gasoline to flush out the crankcase. The use of flammable cleaning agents is dangerous and is absolutely prohibited. Use a regular flushing oil for this purpose.

3-8. AIR INLET FILTER SILENCER. It is very important that the air inlet filter silencer be kept clean at all times. A dirty inlet filter silencer reduces the capacity of the compressor and may allow induction of dirt particles which will rapidly accelerate wear of internal parts. Remove and clean the filter pads once a month (more often in dusty conditions). The pads should be replaced at 1000 hour intervals. As dirt collects on the outside of the filter silencer the outside surfaces should be brushed.

WARNING

We recommend the use of safety solvent for cleaning. Never use kerosene, gasoline or similar flammable fluids to clean the air inlet filter silencer.

3-9. INTERCOOLER AND AFTERCOOLER. Never permit air flow to the intercooler or aftercooler tubes to become obstructed, and clean the surface of the tubes whenever deposits of oil, dirt and grease are observed. Use a non-flammable safety solvent for cleaning purposes.

3-10. SAFETY VALVES. The safety valves are provided to protect against damage from overpressure. If either valve blows, and continues to blow for more than a minute, the compressor should be stopped at once. Refer to Table 4-1, Compressor Troubleshooting Chart, to determine the cause of the blowing safety valve.

SECTION IV

TROUBLESHOOTING

4-1. GENERAL. This section contains a troubleshooting chart, Table 4-1, which will aid and guide the operating personnel by indicating the possible troubles that may occur in the operation of the compressor. The chart also lists the probable causes of troubles that may occur and the necessary remedies for correcting them. The necessary remedies include servicing, adjusting, or replacing the components causing the trouble.

TABLE 4-1. COMPRESSOR TROUBLESHOOTING CHART

TROUBLE	CHECK POINT NOS.
Oil Pumping	1-7 -10-15 -20-21
Knocks or rattles	2-16-17 -18-19-21
Air delivery has dropped off.	1-5-15 -17-20
Intercooler safety valve pops..	6-17
Trips motor overload or draws excessive current	8-12-13-14-15-17-18-19-21
Water in frame or rusting in cylinders.	10-11
Excessive starting and stopping	3-5-6
Compressor doesn't unload when stopped	15
Compressor runs excessively hot	4-6-17
Compressor won't come up to speed	12-15
Lights flicker when compressor runs	12-13

CHECK POINT NOS.	PROBABLE TROUBLE CAUSES
1	Clogged air inlet filter silencer.
2	Loose belt wheel or motor pulley or motor with excessive end play in shaft.
3	Receiver needs draining.
4	Air to fan-type flywheel blocked off.
5	Air leaks in piping (on machine or in outside system).
6	High pressure discharge valve leaking.
7	Oil viscosity too low.
8	Oil viscosity too high.
9	Oil level too low.
10	Detergent type oil being used.
11	Extremely light duty or located in a damp humid spot.
12	Low line voltage, poor motor terminal contact, loose connections, improper starter heaters.
13	Poor power regulation (unbalanced line).
14	V-Belts pulled excessively tight.
15	Leaking or maladjusted centrifugal pilot valve, or defective O-Ring on pilot valve.
16	Carbon on top of piston.
17	Leaking, broken, carbonized or loose valves.
18	Worn or scored connecting rod, piston pin or crank pin bearings.
19	Defective ball bearing on crankshaft or on motor shaft.
20	Piston rings broken or not seated in, end gape not staggered, stuck in grooves, rough, scratched or excessive end gap (over . 020”), or excessive side clearance (over .006”).
21	Cylinders or pistons scratched, worn or scored.

CHECK POINT NOS.	POSSIBLE TROUBLE REMEDY
1	Clean or replace pads.
2	Tighten loose belt wheel or motor pulley. Refer to Section VI for remedy for excessive end play in motor shaft.
3	Drain receiver.
4	Remove obstruction which is blocking flow of air to fan-type flywheel.
5	Tighten piping joints; replace broken pipes or fittings.
6	Remove valve and thoroughly clean it. Replace any broken or worn parts before reassembly.
7	Change to an oil as recommended in Table 5-2.
8	Change to an oil as recommended in Table 5-2.
9	Add oil to the overflow point.
10	Change to non-detergent type oil recommended in Table 5-2.
11	Run the unit for at least 15 minutes each time it is started.
12	Tighten loose connections; replace improper heaters.
13	Correct unbalanced power regulation condition.
14	Tighten belts to correct tension. Refer to Paragraph 5-5.
15	Clean and adjust or repair pilot valve; replace leaking O-Ring.
16	Clean carbon deposits from piston.
17	Clean and repair valves.
18	Replace worn parts.
19	Replace defective bearings. Refer to Paragraph 5-9 for compressor bearing replacement. Refer to Section VI for instructions on replacement of motor bearings.
20	Replace worn piston rings.
21	Replace scratched, worn or scored parts.

SECTION V

MAINTENANCE AND REPAIR

WARNING

Before attempting any repair work on the unit. be certain the snapswitch is in the OFF position or the wiring is disconnected from the line. Blow down the pressure from the receiver and isolate the unit from any outside source of air pressure. These simple precautions will prevent accidents.

5-1. GENERAL. This section provides information useful. to maintenance personnel in inspecting, servicing, repairing and otherwise maintaining the air compressor. Any special disassembly or reassembly procedures are described under the appropriate heading.

5-2. TORQUE VALUES. We recommend the use of a torque wrench. The following table gives the torque for tightening the different size cap screws and nuts.

TABLE 5-1. TORQUE VALUES

UNIFIED COARSE			UNIFIED FINE		
Dia. Pitch	Ft. Lbs .		Dia. Pitch	Ft. Lbs .	
	Min.	Max.		Min.	Max.
1/4''-20	6	7	1/4''-28	5	6
5/16''-18	12	14	5/16''-24	9	10
3/8''-16	21	24	3/8'' -24	14	16
1/2''-13	52	59	1/2''-20	40	42
5/8''-11	105	120	5/8''-l8	60	70
3/4''-10	170	190	3/4''-16	100	120

5-3. COMPRESSOR LUBRICATION. A non-detergent, napthenic base oil containing a rust and oxidation inhibitor is recommended. The viscosity should be selected for the temperature immediately surrounding the unit when it is in operation. The viscosities given in Table 5-2 are intended as a general guide only. Heavy-duty operating conditions require heavier viscosities, and where borderline temperature conditions are encountered, the viscosity index of the oil should be considered.

TABLE 5-2. OIL VISCOSITY

Temp. Range	Viscosity at 100°F (37.8°C)	
	SSU	Centistokes
40°F & Below (4.4°C & Below)	150	32
40°F to 80°F (4.4°C to 26.7°C)	500	110
80°F to 125°F (26.7°C to 51.7 C)	750	165

5-4. PERIODIC INSPECTION AND MAINTENANCE. Table 5-3 lists the components which require periodic inspection and maintenance.

TABLE 5-3. PERIODIC INSPECTION AND MAINTENANCE

COMPONENT	ACTION	INTERVAL
Entire Unit	Inspect for loose or missing bolts, screws, nuts and washers.	500 Hours
Drive Belts	Check tension and adjust as necessary.	500 Hours
Compressor Valves	Inspect and clean; repair as necessary.	500 Hours
Air Inlet Filter Silencer	Replace pads.	1000 Hours
Tubing and Piping	Inspect for breaks, loose connections.	1000 Hours
Intercooler and Aftercooler	Clean and inspect for damaged fins and tubing. Replace damaged finned tubing.	1000 Hours
Cylinder Cooling Fins	Clean and inspect for damaged fins. Replace cylinders having damaged fins.	1000 Hours

5-5. DRIVE BELTS. Drive belts must be properly adjusted. A belt that is too loose will slip and cause heating and wear and a belt that is too tight may overload the bearings. To inspect the belt tension, it is necessary to remove the belt guard assembly. A quick check to determine if belt adjustment is proper may then be made by observing the slack side of the belt for a slight bow when the unit is in operation, as shown in Figure 5-1. Be careful to keep hands and clothing away from moving belts when checking belt tens ion. NEVER RUN THE UNIT WITH THE GUARD REMOVED EXCEPT TO CHECK BELT TENSION.

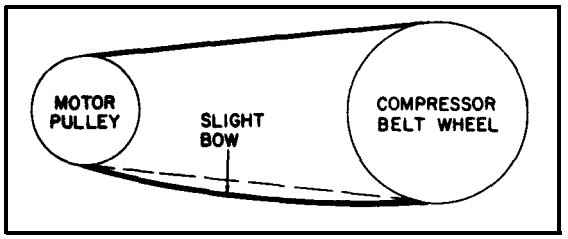


Figure 5-1. Visual Method of Checking Belt Tension

5-5.1. If a slight bow in the belts is evident as shown in Figure 5-1, the belts are usually adjusted satisfactorily. However, a more accurate method of checking belt tension is by the spring scale measurement that follows. Measure the belt span (t) as shown in Figure 5-2. At the center of the span (t) apply a force perpendicular to the span by attaching a spring scale to the two outside belts. The force applied to the spring scale should be sufficient to deflect the belts 1/64" for every inch of span length (t). For example: The deflection of a 100" span would be 100/64" or 1-9/16", thus, the force applied to the spring scale should deflect the belts to 1-9/16". When the belts are deflected the necessary distance, compare the spring scale reading (in lbs. force) with the values given in Table 5-4. If the reading is between the value for normal tension and 150% normal tension, the belt tension should be satisfactory. A reading below the value for normal tension indicates the belt slack should be reduced, and, conversely, a reading exceeding the value for 150% normal tension indicates the belt slack should be increased. Experience has shown that a new drive belt can be tightened initially to two times normal tension to allow for any drop in tension during run in.

TABLE 5-4. BELT TENSION

Belt Type	Normal Tension	150% Normal Tension
A	1-1/4 lbs.	1-7/8 lbs.

5-5.2. When installing new belts, do not pry the belts over the pulley grooves. Loosen the anchor nuts and the belt tightener shown in Figure 5-3 and push the motor toward the compressor. After the belts are over the pulleys, use the belt tightener to adjust the belt tension.

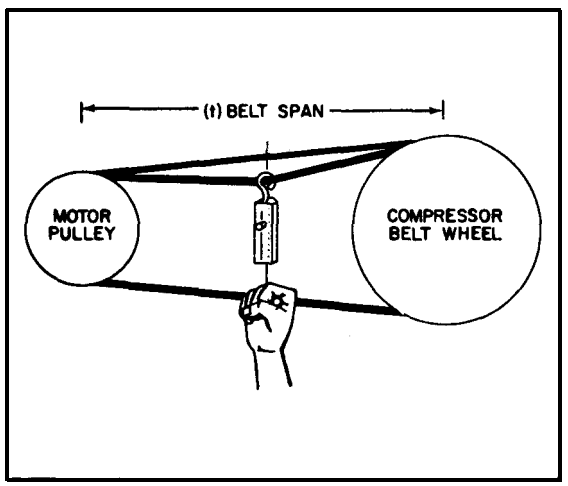


Figure 5-2. Spring Scale Method of Checking Belt Tension

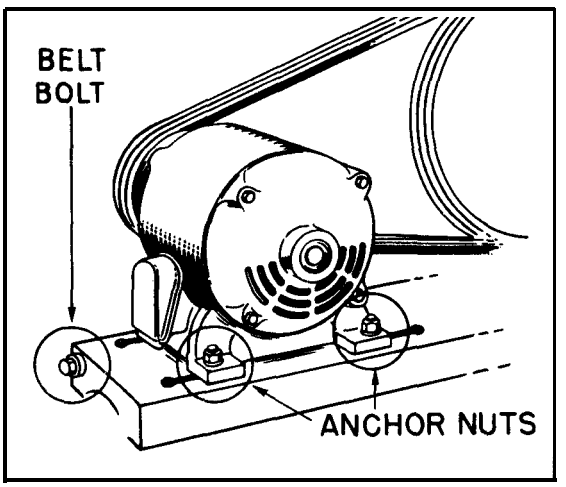


Figure 5-3. Belt Adjustment Device

5-6. AIR VALVE CLEANING.

5-6.1. To clean the valves, take out the air head cap screws and remove the head and valve plate from the cylinder. Remove the valves from the valve plate and clean both the valve and seat by brushing with a stiff bristle brush (not wire). If necessary, use a non-flammable safety solvent to loosen dirt, oil or carbon deposits. Should it be necessary to scrape, do so lightly to prevent marring the valve or seating surface.

5-6.2. Handle the valves with care and be careful not to nick or scratch them. When replacing a valve, make certain it will lie flat against the seating surface surrounding the port hole; otherwise, the valves will leak air, resulting in carbonization and reduced compressor output .

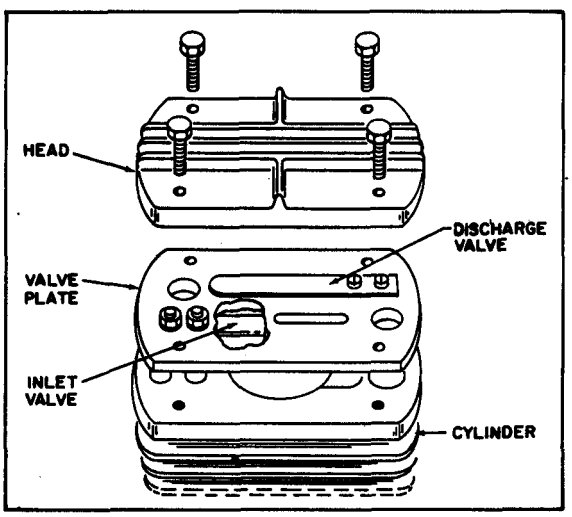


Figure 5-4. Finger Valves

5-7. PISTON RING REPLACEMENT.

5-7.1. Piston ring replacement is usually considered necessary when a compressor does not meet its normal air delivery or when its oil consumption is considered to be too great.. If the compressor's normal air delivery has dropped off or if the oil consumption of the compressor is considered to be excessive, it may be an indication of several possible causes of trouble, one of which may be that the piston rings could either be broken or worn., Worn piston rings can often be a contributing factor in a decline in performance of a compressor that has been in service for a long period of time.

5-7.2. A general rule in determining if a compressor's oil consumption is excessive is to consider a good rate of oil consumption to be approximately fifty horse-power-hours per ounce. This compressor should use no more than one pint of oil in 150 hours of operation. If it uses more than that, it would be classed as not meeting commercial standards and would require corrective action, such as replacement of the piston rings. If it has been determined that replacement of the piston rings is necessary, it is recommended that
a complete new set of rings be installed and that these instruction: be used as a guide for piston ring replacement.

5-7.3. New replacement piston rings are of the quick-seating-type in that they are distinguished by their narrow seating edge where they contact the cylinder wall. Compression rings are classed as “B” type rings and are single-piece, taper-faced style; they have a slight taper machined on their outer surface to provide line contact with the cylinder wall for quicker seating and better oil control. See Figure 5-5.

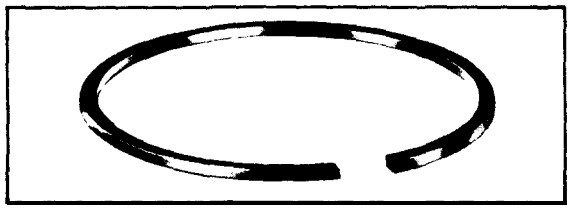


Figure 5-5. "B" Type or Single-Piece, Taper-Faced Style Compression Ring

5-7.4. Oil rings are classed as "H" type, is a single-piece, non-ventilated, beveled-scraper style ring. This style ring has both beveled and undercut edges which allow it to act as a combination oil-scraper and compression sealing ring. See Figure 5-6. The "M" type ring is a four-piece, ventilated, chrome plated, steel rail style ring. This style ring utilizes an expander which exerts a uniform pressure all the way around two independent, thin, cylinder contacting rails, the rails being held apart by an open separator. This style of ring provides maximum oil drainage with the most uniform and positive conformability. See Figure 5-7.

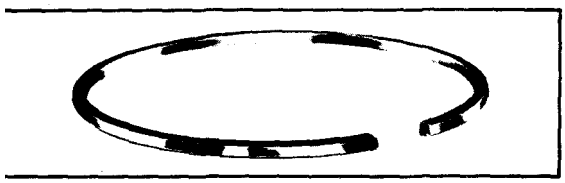


Figure 5-6. "H" Type or Single-Piece, Non-Ventilated Beveled-Scraper Style Oil Control Wiper Ring

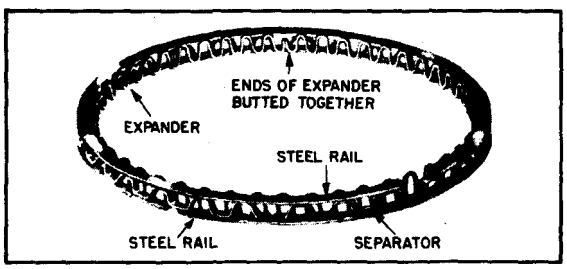


Figure 5-7. "M" Type or Four-Piece, Ventilated, Chrome Plated Steel Rail Style Oil Control Wiper Ring

5-7.5. The following paragraphs contain complete instructions, in step-by-step procedure, for the disassembly, cleaning, inspection and replacement of cylinders, pis - ton rings and pistons; therefore, before installing new replacement piston rings, we recommend that the entire procedure be very carefully read. Refer to Figure 6-2.

5-7.5.1. Disconnect any tube lines to the air head. Remove the air head attaching screws and washers and then remove the entire air head assembly from the cylinder. Remove the air head gasket. If the gasket sticks, a thin blade may be used to pry the gasket loose from the air head or the cylinder.

5-7.5.2. Remove the cylinder attaching screws and washers and then carefully remove the cylinder from over the piston and piston rings. Remove the cylinder-to-crankcase gaskets.

5-7.5.3. Remove the piston from its connecting rod and then remove all of the old piston rings from the piston.

5-7.5.4. Thoroughly clean the air head by brushing or scraping lightly to remove any accumulated carbon deposits. Make sure the gasket surface is thoroughly cleaned of any gasket particles.

5-7.5.5. Thoroughly clean the cylinder of any accumulated oil, using a non-flammable safety solvent. Pay particular attention to the cleaning of the cylinder bore. Make sure the cylinder-to-frame gasket surf aces are thoroughly cleaned of any gasket particles.

5-7.5.6. Thoroughly clean the piston of any accumulated oil, using a non-flammable safety solvent. Pay particular attention to the cleaning of the piston ring grooves and the oil return holes in the oil control wiper ring grooves.

5-7.5.7. Inspect the cylinder bore for any signs of scoring and scuffing. If the cylinder bore shows any signs of being scored or worn, as indicated by visible ridging at the end of the ring travel, it must be replaced; otherwise, effective oil control will not be established even with the new piston rings.

5-7.5.8. Inspect the piston for any signs of scoring or for any indication of cracked or broken lands which would require replacement of the pistons. If the piston shows no signs of being scored or of having any cracked or broken lands, check the general condition of the ring grooves for any signs of excessive wear. Wearing of the ring grooves may cause “tapering” of the grooves, which would result in excessive clearance between the piston rings and their corresponding grooves.

5-7.5.9. Assemble the new piston rings on the piston by first applying compressor lubricating oil to the piston ring grooves. To eliminate the possibility of breaking or distorting a piston ring, always use a piston ring expander and never pass one ring over another. If a piston ring expander is not available, spread the piston rings only far enough to allow them to be placed over the piston. The bottom oil control wiper ring is always installed first and then the adjacent one, then each compression ring on up to the top. Refer to Paragraphs 5-7.6, 5-7.7 and 5-7.8 for details on installation of rings.

5-7,5.10. After all of the piston rings have been installed on the piston, it may then be replaced on its corresponding connecting rod.

5-7.5.11. When a new replacement piston ring set has been installed and the original cylinder is to be reused, the cylinder wall must be “deglazed” or slightly roughened to provide a proper, “seating-in" surface for the piston rings. Use a No. 80 grit abrasive cloth and go over the cylinder wall using a rotating and reciprocating motion. The abrasive cloth should be wetted with some type of oleum spirits or safety solvent during deglazing to reduce the harshness of its surface and to keep feathered edges to a minimum. Do not overdo the deglazing; dulling the glaze is usually sufficient and can be accomplished with a very light pres - sure. After deglazing, the cylinder wall should be thoroughly cleaned by scrubbing the bore with a good stiff bristle (not wire) brush, using ordinary soap or detergent and hot water. Rinse thoroughly with hot water and then check the cleanliness of the cylinder bore by wiping with a soft white paper cloth. If the paper shows more than slight discoloring, the cylinder bore has not been completely cleaned.

NOTE

After the piston and the cylinder have been properly reconditioned, including proper "deglazing" and cleaning of the cylinder bore, the use of an abrasive or lapping compound to seat the piston rings is not necessary and is not recommended.

After the cylinder has been thoroughly cleaned, apply compressor lubricating oil to the cylinder bore and replace it on the compressor frame, making sure a new gasket is used between the cylinder and frame. Extreme care must be used when replacing the cylinder over the piston rings to avoid distorting or breaking the rings. The use of a piston ring compressor is highly recommended. Replace the cylinder attaching screws, tightening each screw to the recommended torque value.

5-7.5.12. Apply a liberal amount of compressor oil to the cylinder bore and then replace the air head on the cylinder, making sure a new gasket is used between the air head and the cylinder. Replace the air head attaching screws, tightening each screw to its recommended torque value.

5-7.5.13. After new replacement piston rings have been installed, the compressor should be operated for at least 10 hours at full load before checking for proper air delivery and oil consumption.

5-7.6. “H” Type Rings - To install the “H” type or single-piece, non-ventilated, beveled-scraper style ring, slip the ring into the ring groove, making sure that the bevel is toward the head of the piston and the undercut groove is toward the bottom of the piston. The “H” type ring is always installed in the bottom ring groove.

5-7.7. “M” Type Rings - Install the “M” type or four-piece, ventilated, chrome plated steel rail style ring by first placing the expander in the ring groove with the free ends toward you. Push the ends of the expander to the inside of the ring groove, butting the ends together. Make sure the ends of the expander do not overlap. Caution: do not clip or cut the ends of the expander or the tension will be destroyed. Thread one of the two steel rails over the expander and into the bottom side of the ring groove. This rail will hold the expander in position. Again check to be certain that the ends of the expander are not overlapping. Place the open separator over the expander and adjacent to the steel rail, with the free ends of the separator away from you. Thread the second steel rail around the expander and into the remaining clearance at the top of the ring groove. Again be certain that the free ends of the expander are butted together and are not overlapping.

5-7.8. “B” Type Rings - Install the “B” type or single-piece, taper-faced style compression rings by placing each ring into its groove, starting with the bottom compression ring and working towards the top. Each taper-faced style compression ring is identified in some manner, usually with the word “top”, the letter T, a dash, a dot or a paint mark to aid in making sure that the ring will be positioned properly in the ring groove. That is, each compression ring must be installed so that the top of the ring is towards the head or top of the piston.

5-8. SEPARATING THE PISTON FROM THE ROD. To separate the piston from the connetting rod, proceed as follows:

5-8.1. Remove the air head cap screws (Figure 5-4) and pull the air head off the cylinder. If the gasket sticks, remove it with a thin blade.

5-8.2. Disconnect any assemblies or piping that may prevent removing the cylinder. Now, take out the cap screws securing the cylinder to the frame and pull the cylinder over the piston.

5-8.3. To avoid bending the connecting rod when driving out the piston pin, we recommend removing the piston and rod assembly from the crankshaft. To do this, drain the oil from the frame and remove the frame end cover. Then, take the centrifugal unloader assembly off the end of the crankshaft and pull the connecting rod off its throw.

5-8.4. Remove the piston pin lock rings from their grooves and with a dowel of appropriate size and a soft hammer, drive out the piston pin. Important: To prevent piston distortion during this operation, play between the piston pin bosses and connecting rod must be eliminated by inserting fork-type shims of the necessary thickness between the rod and boss. See Figure 5-8.

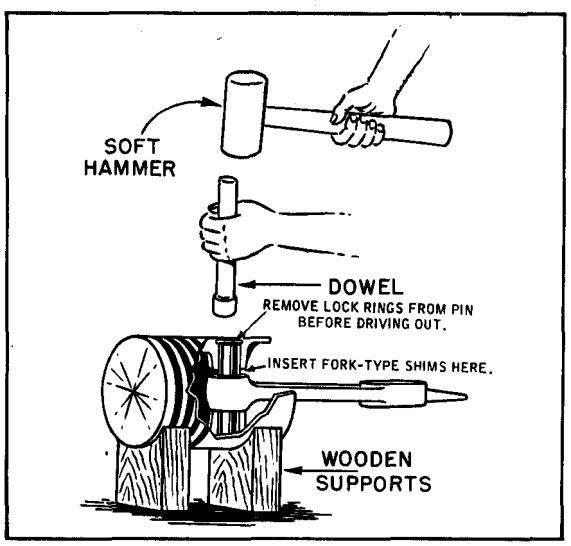


Figure 5-8. Recommended Method of Removing or Replacing Piston Pin

5-9. CRANKSHAFT ASSEMBLY REPLACEMENT. A new crankshaft assembly includes bearings, spacer etc. , all of which are installed as a unit. To remove the old crankshaft and install a new one, refer to Figure 6-2 and proceed as follows:

5-9.1. First remove the fan-type flywheel, flywheel key and shaft end cover. Next, drain the crankcase oil, then remove the crankcase end cover and centrifugal unloader assembly.

5-9.2. Remove the cylinder to crankcase cap screws and pull the cylinders over the pistons. Remove the centrifugal unloader and connecting rods from the end of the crankshaft, and take the snap ring from the outer bearing. It may be necessary to drive the crankshaft endwise before removing snap ring.

5-9.3. The crankshaft assembly is a moderate press fit in the crankcase and may be forced out by tapping the flywheel end of the shaft with a lead hammer.

5-9.4. Prepare the new crankshaft assembly for installation by removing the snap ring from the outer bearing, grasping it near the end and springing it from the groove.

5-9.5. The new crankshaft may be inserted into the crankcase from the crankcase end cover side. Since the assembly is a moderate press fit, it may be forced into position by tapping it with a lead hammer. (Be careful to strike the center of the shaft, since an off center blow may spring it.)

5-9.6. The assembly must be driven in until the snap ring groove in the outer bearing clears the end of the crankcase by about 1/16". Replace the snap ring by putting one end in the groove and springing the ring into place.

5-9.7. Tap the crankshaft back until the snap ring is tight against the crankcase.

5-9.8. Before replacing the shaft end cover (includes oil seal) make certain that there are no burrs on the flywheel end of the crankshaft and that the edges of the keyway are smooth and slightly rounded to prevent damage to the oil seal. When satisfied that the crankshaft is smooth, replace the shaft end cover. As an added precaution against cutting the oil seal, an assembly tool can easily be made in the form of a truncated cone of a .003" brass shim stock. See Figure 5-9.

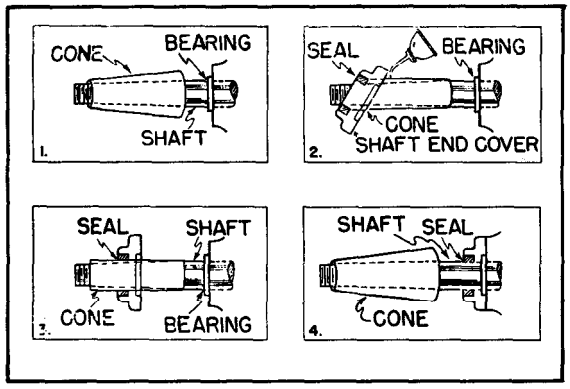


Figure 5-9. Oil Seal Replacement

5-9.9. Re-assemble the rest of the compress or, using caution when replacing the cylinders over the pistons. We recommend the use of a piston ring compressor in this operation.

5-9.10. Fill the crankcase with oil.

5-10. OIL SEAL REPLACEMENT. Remove the flywheel, key and shaft end cover. The oil seal may be removed from the cover by prying under the inside lip with a pinch bar, or driving it out with a metal rod.

5-10.1. Insert the new seal with the sealing lip facing in the same direction as the one removed and coat the outside diameter of the seal with shellac or pipe compound. Press the seal into the shaft end cover with a vise or in a press. Note: Protect the parts from damage by serrated vise jaws by padding the vise jaws.

5-10.2. After the seal has been installed in the shaft end cover, it is returned to its original location by sliding it over the end of the crankshaft as described in Paragraph 5-9.8 of Crankshaft Assembly Replacement.

5-11. PRESSURE SWITCH ADJUSTMENT. The pressure switch has a cut-out adjustment and a differential adjustment. The cut-out is the pressure at which the switch contacts open, and the differential is the span between the cut-in and cut-out settings. Note: There is interaction between these two adjustments; i. e., if the cut-out is increased, the differential will also increase, or if the differential is narrowed, the cut-out will be reduced, etc. These factors must be considered when adjusting the switch and compensated for accordingly. The cut-out point may be increased by screwing the range nut clockwise. See Figure 5-10.

Screwing the range nut counter-clockwise decreases the cut-out point. Note the pressure gauge readings at which the compressor cuts-in and out and re-establish the differential pressure setting if necessary. The differential pressure maybe increased by screwing the differential nut clockwise. Backing off the nut will narrow the span. It is advisable to have as wide a differential as possible to avoid frequent starting and stopping of the compressor. Note the pressure gauge reading at which the compressor cuts out and re-establish this point if necessary.

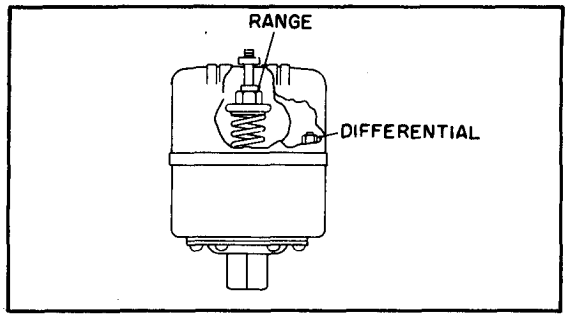


Figure 5-10. Pressure Switch Cut-In and Cut-Out Adjustment

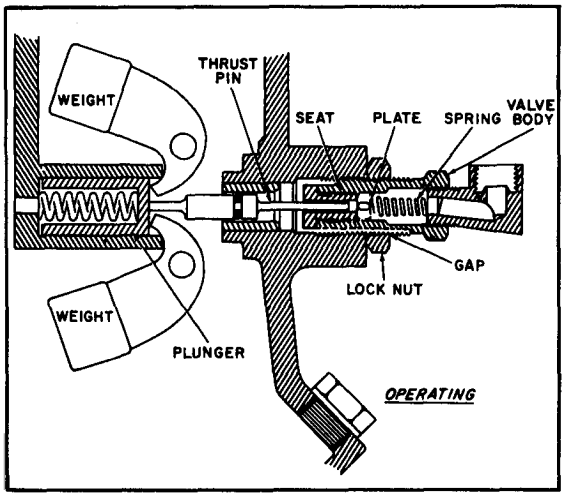


Figure 5-11. Operation of Centrifugal Unloader and Pilot Valve

5-12. PILOT VALVE ADJUSTMENT. If the pilot valve tube line is excessively hot, it is a good indication that the pilot valve is leaking and adjustment is required. To adjust the pilot valve, refer to Figures 5-11 and 5-12 and proceed as follows:

5-12.1. Stop the compressor. Remove the pilot valve tube fitting and withdraw the spring .'

5-12.2. With a small rod, push the plate in against the resistance of the thrust pin until the plate is firmly seated. Mark this position on the rod in line with the outer edge of the pilot valve body. Now, permit the thrust pin to push the plate away from the seat as far as it will and also mark this position on the rod.

5-12.3. The correct stroke, or measurement between the two marks, is between 1/16" and 1/8". Should the measurement be under 1/1 6", adjust for the proper stroke by screwing the pilot valve body in a clockwise direction; should the measurement exceed 1/8", screw the body in a counter-clockwise direction.

5-13. CHECK VALVE REPAIR. The check valve (Figure 5-13) can be disassembled by forcing the point of a screw driver between the cap and body. To reassemble the valve, put the spring and disc into the valve cap and snap the cap and body together. Be certain the disc is installed with its lapped side "up".

5-14. PRECAUTIONS FOR EXTENDED SHUTDOWN. Whenever the unit is taken out of service for long periods of time, certain precautions must be taken to prevent general deterioration.

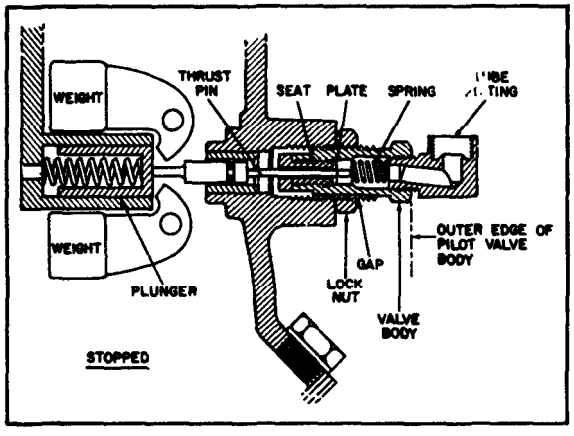


Figure 5-12. Pilot Valve Adjustment

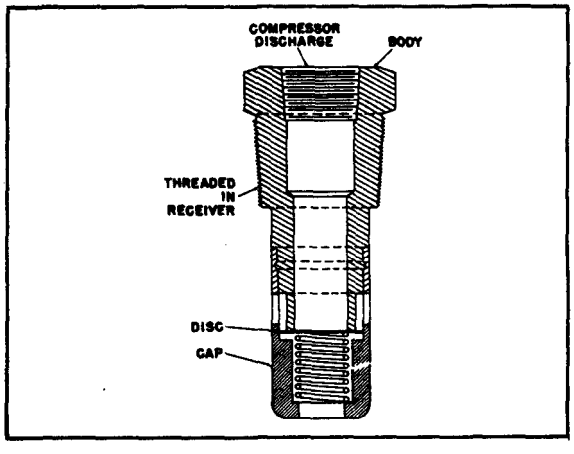


Figure 5-13. Check Valve

5-14.1. All interior surfaces of the unit should be protected against rust by draining the crankcase and refilling it with a rust inhibiting oil. The unit should now be operated for fifteen minutes and the oil should be fogged into the compressor intake, thus coating all internal surf aces. Leave the rust inhibiting oil in the crankcase. Note: When putting the unit back into service, replace the rust inhibiting oil with compressor lubricating oil.

5-14.2. After this operation, all openings are to be taped shut to prevent moisture from entering the unit.

5-14.3. Drain the air receiver of all moisture and store the unit in a dry sheltered location.

5-14.4. Follow the instructions for storing the electric motor as described in Section VI.

SECTION VI

MISCELLANEOUS DATA

INSTRUCTIONS: INSTALLATION AND MAINTENANCE

SINGLE AND POLYPHASE BALL BEARING MOTORS
FRAMES 143 THROUGH 215
FRAMES 143T THROUGH 215T
ALL ENCLOSURES–ALL TYPES

READ CAREFULLY BEFORE INSTALLING AND STARTING MOTOR

INSTALLATION

1. LOCATION

a. ***Dripproof Motors*** are designed for installation in a well ventilated place where the atmosphere is reasonably free of dirt and moisture.

b. ***Standard Enclosed Motors*** are designed for installation where motor may be exposed to dirt, moisture and most outdoor conditions.

c. ***Severe-duty Enclosed Motors*** are designed for installation in highly corrosive or excessively moist atmospheres.

2. MOUNTING

a. ***Mount motor*** securely on a firm, flat base. All ball-bearing motors, except vertical high-thrust, may be mounted in any position.

b. ***Align motor*** accurately, using a flexible coupling if possible. For drive recommendations consult drive or equipment manufacturer, or General Electric Company.

c. ***V-belt Sheave Pitch Diameters*** should not be less than the following values:

Horsepower Synchronous Speed, Rpm				V-belt Sheave, Min Dia.	
3600	1800	1200	900	Conventional* A and B Pitch Dia.	Super† 3V Outside Dia.
1½	1	¾	½	2.2	2.2
2–3	1½–2	1	¾	2.4	2.4
—	3	1½	1	2.4	2.4
—	—	2	1½	2.4	2.4
5	—	—	—	2.6	2.4
7½	5	—	—	3.0	3.0
10	7½	3	2	3.0	3.0
—	—	5	3	3.0	3.0
15	10	—	—	3.8	3.8

* Max sheave width = 2 (N-W) – ¼".
† Max sheave width = N-W.

Sheave ratios greater than 5:1 and center-to-center distances less than the diameter of the large sheave should be referred to the Company.

d. ***Tighten belts*** only enough to prevent slippage. Belt speed should not exceed 5000 ft. per min.

3. POWER SUPPLY & CONNECTIONS

a. ***Nameplate*** voltage and frequency should agree with power supply. Motor will operate satisfactorily on line voltage within 10% of nameplate value; or frequency within 5%; combined variation not to exceed 10%.

b. ***Dual voltage*** motors can be connected for the desired voltage by following instructions on nameplate or connection diagram.

c. ***Wiring*** of motor and control, overload protection and grounding should be in accordance with National Electrical Code and local building codes.

If wire size is selected from the following table, single-phase motor performance will not be adversely affected by voltage drop in the branch circuit.

Individual Branch Circuit for Single-Phase Motor					
Motor HP	Volts	Max* Fuse Amps	Minimum wire gage no. for branch circuit lengths indicated 0-50 ft.	50-100 ft.	100-200 ft.	200-500 ft.
1	230	25				
	115	50				
1½	230	30				
	115	60				
2	115	80				
3	230	60				
	115	110				
5	230	90				

* Values based on National Electrical Code.

4. THERMAL PROTECTORS

a. The words "***Thermally Protected***" on the nameplate identify motors having built-in protection against dangerous overheating.

1. ***Manual reset*** protectors are reset after motor cools by pressing external reset button.

2. ***Automatic reset*** protectors (no external button) reset automatically after motor cools.

CAUTION: Where unexpected starting would be dangerous, do not use automatic reset protection.

OPERATION

1. ***Dry*** the motor windings if stored in a damp location. In drying, do not exceed 85°C (185°F).
2. ***Check*** rotation under no-load conditions. To reverse rotation: 3 Phase—interchange any two line leads; 2 Phase—interchange line leads 1 & 3; 1 Phase—follow connection nameplate or label on motor.
3. ***Operate*** under load for at least one hour. Then observe whether any unusual noise or heating has developed.
4. ***Check operating current*** against nameplate.

MAINTENANCE

1. INSPECTION

a. ***Inspect*** motor at regular intervals. Keep motor clean and ventilating openings clear.

2. LUBRICATION

a. ***Ball-bearing motors*** are adequately lubricated at the factory. Relubrication at intervals consistent with the type of service (see table at right) will provide maximum bearing life. Excessive or too frequent lubrication may damage the motor.

b. ***Relubricate*** with General Electric D6A2C5 grease unless special grease is specified on nameplate.

c. ***Motors having pipe plugs or grease fittings in bearing housings*** should be relubricated while warm and at stand-still. Replace one pipe plug on each end shield with ⅛" pipe thread lubrication fitting. Remove the other plug for grease relief. Be sure fittings are clean and free from dirt. Using a low-pressure grease gun, pump in the recommended grease until new grease appears at grease relief hole. After relubricating, allow motor to run for 10 minutes before replacing relief plugs.

d. ***Motors not having pipe plugs or grease fittings in bearing housings*** can be relubricated by removing end shields from motor, cleaning grease cavity and refilling the cavity with recommended grease.

CAUTION: Bearings and grease must be kept free of dirt.

3. MOTOR WINDINGS

a. To clean, use a soft brush and, if necessary, a slow-acting solvent in a well-ventilated room.

Type of Service	Typical Examples	Hp Range	Relubrication Interval
Easy	Valves; door openers; portable floor sanders; motors operating in frequently (1 hour per day).	½–7½ 10–40 50–150 200–250	10 years 7 years 4 years 3 years
Standard	Machine tools; air-conditioning apparatus; conveyors, 1 or 2 shifts; garage compressors; refrigeration machinery; laundry machinery; textile machinery; oil-well pumps; water pumps; woodworking machinery.	1½–7½ 10–40 50–150 200–250	7 years 4 years 1½ years 1 year
Severe	Motors for fans, M-G sets, etc., that run 24 hours per day, 365 days per year; coal and mining machinery; motors subject to severe vibration; steel-mill service.	1½–7½ 10–40 50–150 200–250	4 years 1½ years 9 months 6 months
Very Severe	Dirty, vibrating applications; where end of shaft is hot (pumps and fans); high ambient.	1½–7½ 10–150 200–250	9 months 4 months 3 months

CR105 MAGNETIC CONTRACTORS
CR106 MAGNETIC STARTERS

RATINGS

Max Voltage	CONTACTOR 8-hr Current RATING	A-c Volts	Max Hp for A-c Motors	
			Single-phase	Poly-phase
600	30 AMP (OPEN) 27 AMP (ENCLOSED)	110	2	3
		220	3	7½
		440/600	5	10

DESCRIPTION

The CR105 is an open or enclosed magnetic contactor.

A CR106 full-voltage magnetic starter consists of one CR106 contactor and one or more CR124 overload relays. The overload relays provide motor protection against running and stalled rotor overloads. However, separate motor branch circuit over-current protection against electrical faults should be supplied in accordance with the National Electrical Code.

FEATURES

- Horizontal straight-line motion makes starter compact, easy to maintain.
- Strongbox coil.
- Newly designed overload relays incorporate dial for &1570 field adjustment of tripping current, so that it is no longer necessary to change heaters to eliminate such problems as nuisance tripping in hot weather.
- Straight through wiring.
- Large combination knock outs.
- Oversized power terminals will accommodate up to #8 wire.
- Standard wire on open starters meets JIC specifications.
- Starter can be disassembled in a matter of seconds.

INSTALLATION

Before connecting starter to power supply:

1. Remove all packing.
2. Clean magnet mating surfaces.
S. Install overload relay heater(a). To prevent overloading the starter, do not select heaters for a motor of a larger rating than given on the starter nameplate. Select heater(s) in accordance with heater tables.

4. Operate movable magnet and operating arm by pressing on the nameplate to assure free movement.

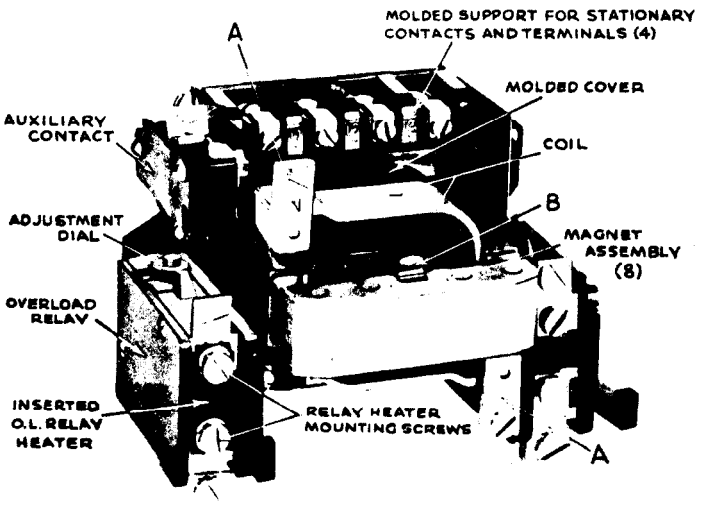


Fig. 1. Typical CR106 starter with auxiliary contact added

5. Mount starter on a sturdy vertical support.

MAINTENANCE

1. Keep magnet mating surfaces free of any accumulated dirt or dust.
2. DO NOT OIL OR GREASE the magnet mating surfaces.
3. The silver-cadmium oxide contacts need only be replaced when nearly all tip material is gone and contact tip support material is exposed.
4. The ultimate tripping current of installed relay heater can be adjusted ±15% by using adjustment dial. Turn dial clockwise to reduce ultimate tripping current and counter-clockwise to increase ultimate tripping current.

Removal of Coil

1. Press against coil while pulling slightly with fingers on side of coil retainer (A) Fig. 1, and move retainers away from coil.
2. Pull one end of spring clip (B) forward and slide out of slot.
3. Draw movable portion of magnet assembly and coil from the starter.
4. Replace coil and re-assemble, reversing the procedure.

Removal of Contacts

1. Press against coil while pulling slightly on coil retainer (A) Fig. 1, and move retainer away from coil.
2. Draw magnet assembly, including coil, molded cover and operating arm, from the starter.
3. Depress and slide movable contacts, spring and spring seat from the support.

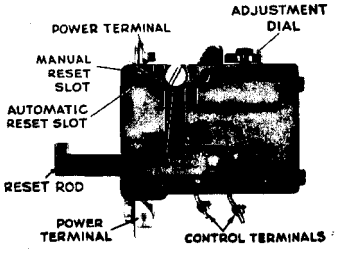


Fig. 2. CR124 overloed relay

4. Remove screws which hold stationary contacts to the molded support and remove the contacts.

Note: For starters with one or more normally closed contacts, proceed with Step 1; then remove spring clip (B), and take the coil, magnet assembly and molded cover from the starter. Then remove the stationary contacts before removing the operating arm for movable contacts.

Normally Closed Contacts

The contacts on this starter may be changed from normally open to normally closed with no additional parts. Disassemble the starter as previously described. Reverse spring and movable contact and re-install in upper position facing opposite direction. Remove the stationary contact as previously described. Install the operating arm for movable contacts. Re-install stationary contacts so silver-cadmium oxide pads face movable contact pads.

Re-assemble the starter.

To change contacts from normally closed to normally open, reverse the above procedure.

PRINCIPAL RENEWAL PARTS

Complete set of stationary & movable contacts with springs & screws:—

For 1 pole ..... Cat. 546A301G1

For 4 poles ..... Cat. 546A301G2

Coil (1 required) ..... Cat. 15D21G (see table)

ACCESSORY KITS

3rd O. L. Relay	CR124C024
Aux. Cont. Single For CR106	CR 105X100P
Double Aux. Cont. (All Forms)	CR 105X100N
Aux. Cont. Single For CR105	CR 105X100M
Push Button	CR105X120N
Sel. Switch	CR105X130N
Ind. Light	CR105X150N
Aux. Pole	CR105X111B

COILS

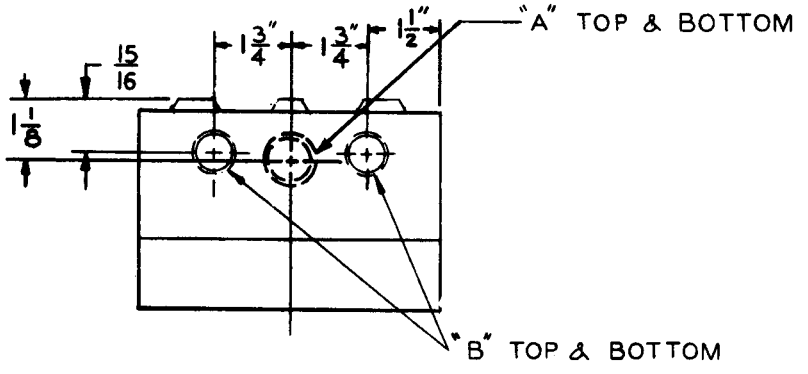
Order coil by Cat. No. plus number in the table.
Example: Cat. 15D2 1 G2 is rated 110 volts 60 cycles

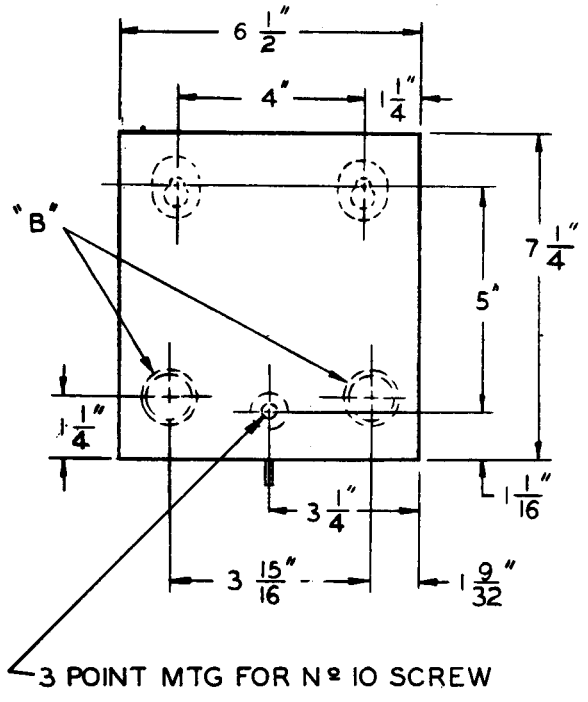
Freq. (cycles)	110V	220V	440V	550V	600V
60	2	3	4	5	6
50	7	8	9	10	11
25	17	18	19	20	21

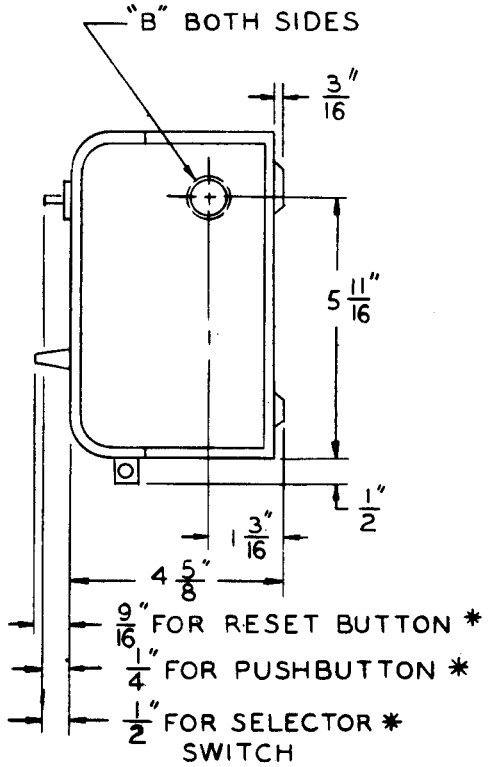
TITLE

OUTLINE

FIRST MADE FOR CR 106 B & C NEMA TYPE 1 ENCLOSURE







A - COMBINATION KNOCK-OUT FOR $\frac{3}{4}$" OR 1" CONDUIT

B - COMBINATION KNOCK-OUT FOR $\frac{1}{2}$" OR $\frac{3}{4}$" CONDUIT

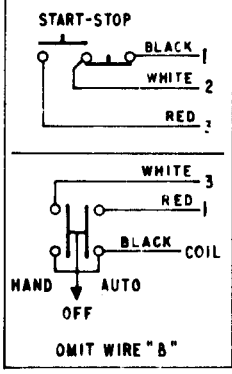
*-IF SPECIFIED

545A576

WIRING INSTRUCTIONS FOR:
CR106 ACROSS THE LINE STARTER.
CR107 ACROSS THE LINE STARTER WITH CIRCUIT BREAKER.
CR108 ACROSS THE LINE STARTER WITH DISCONNECT SWITCH.
NEMA SIZE 0, 1 AND 2.

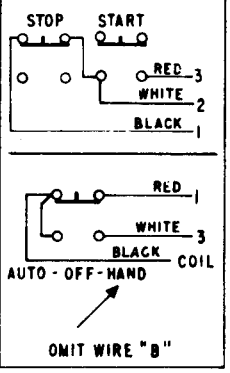
START-STOP P.B. OR 3 POS. SEL. SW. IN COVER

TABLE "A"
STANDARD "START-STOP" PUSH BUTTON STATION OR 3 POSITION SEL. SWITCH

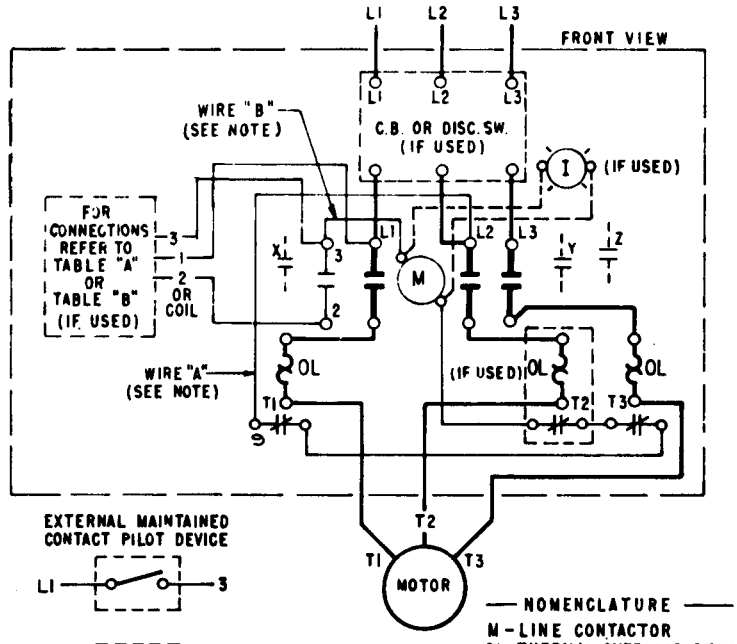


OMIT WIRE "B"

TABLE "B"
OIL-TIGHT "START-STOP" PUSH BUTTON STATION OR 3 POSITION SEL. SWITCH



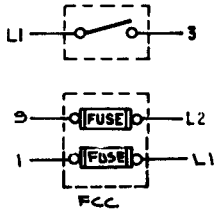
OMIT WIRE "B"



EXTRA AUXILIARY CONTACT TABLE

FINAL SUFFIX LETTER OF "CR" Nº	CONTACT LOCATION SIZE 0 AND 1 X	Y	Z	SIZE 2 X	Y	Z
A (OR NONE)						
B	NO				NO	
C	NC				NC	
D	NO	NC			NO	NC
E	NO	NO			NO	NO
F	NC	NC			NC	NC
G	NO	NO	NC	NO	NO	NC
H	NO	NC	NC	NO	NC	NC

EXTERNAL MAINTAINED CONTACT PILOT DEVICE



— NOMENCLATURE —
M - LINE CONTACTOR
OL - THERMAL OVERLOAD RELAY
FCC - FUSED CONTROL CIRCUIT
I - INDICATING LIGHT

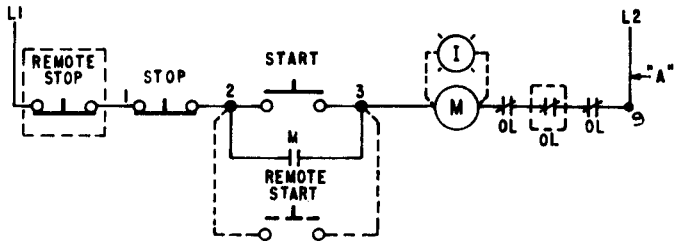
NOTE: FOR STARTER ONLY, OMIT WIRING FROM CIRCUIT BREAKER OR DISCONNECT SWITCH TO STARTER AND WIRE LINE DIRECT TO L1, L2 AND L3 OF STARTER

FOR SEPARATE CONTROL SOURCE - WHEN USING START-STOP PUSH BUTTON, REMOVE WIRE "A". DISCONNECT BLACK WIRE FROM L1 AND CONNECT CONTROL SOURCE TO OVERLOAD RELAY AND TO BLACK WIRE FROM PUSH BUTTON.

FOR SEPARATE CONTROL SOURCE - WHEN USING 3 POSITION SELECTOR SWITCH, REMOVE WIRES "A" AND "B". DISCONNECT RED WIRE FROM L1. CONNECT SEPARATE CONTROL SOURCE TO OVERLOAD RELAY AND TO RED WIRE FROM SELECTOR SWITCH. CONNECT EXTERNAL MAINTAINED CONTACT PILOT DEVICE TO Nº3 AND RED WIRE SIDE OF CONTROL SOURCE.

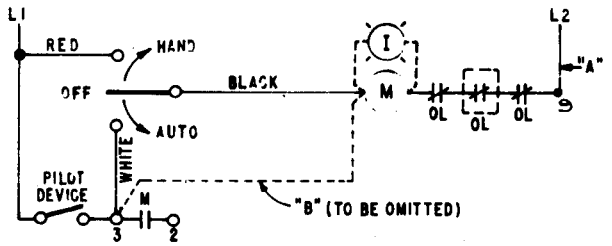
WIRE "A" HAS BEEN OMITTED AT FACTORY ON ALL FORMS HAVING A COIL VOLTAGE OF 120 VOLTS OR LESS.

— CONTROL ELEMENTARY FOR "START-STOP" PUSH BUTTON —



TO ADD ADDITIONAL "START-STOP" PUSH BUTTON STATION, CONNECT PER DOTTED LINES.

— CONTROL ELEMENTARY FOR 3 POSITION SELECTOR SWITCH —



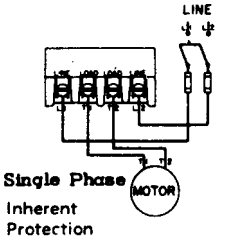
55-152642

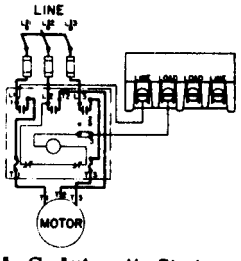
Class 9013 **Types GSG-1,2,3 GHG-1,2,3,4,5,6**

PRESSURE SWITCH

Replaces Class 9213 Types DSG, DHG

TYPICAL WIRING DIAGRAMS — Class 9013





A. C. Automatic Starter with Pressure Switch

ELECTRICAL RATINGS

VOLTAGE	SINGLE PHASE	POLYPHASE	DC
110	2 HP	3 HP	1 HP
220	3 HP	5 HP	1 HP
440-550	5 HP	5 HP	- - - -
32	- - - -	- - - -	1/2 H P

INSTRUCTIONS

WORKING RANGE (Large Spring) — Switches are set at the factory os indicated on the name plate. If it is desired that the switch operate at higher pressures, turn the range spring nut down in order to compress the range spring. The reverse of this operation will lower the operating pressure.

DIFFERENTIAL (Small Spring) — Pounds pressure between "Open" and "Close" is referred to as the differential. To increase the differential turn down differential nut which increases tension on differential spring. By backing off this nut differential will be narrowed. (Differential adjustment affects cut-out paint only).

RELEASE VALVE ADJUSTMENT — With contacts open, turn clockwise on adjusting screw (8) to a point where valve just begins to bleed, then turn screw in an additional 11/2 turns.

MOUNTING — The Class 9013, all types, may be mounted in any position directly cm a pipe. Use o wrench on the hexagon flange nut (Port No. 9) when fastening to pipe.

MOTOR PROTECTION — A pressure switch of this type does not of afford motor protection. However it is quite frequently used as a pilot to operate o starter providing these desirable features. This company manufactures a complete line of motor protective switches, information on which will be sent upon request.

U. L. LISTED — These devices are approved by Underwriters Laboratories with or without Forms D, P, X, Z or combinations thereof.

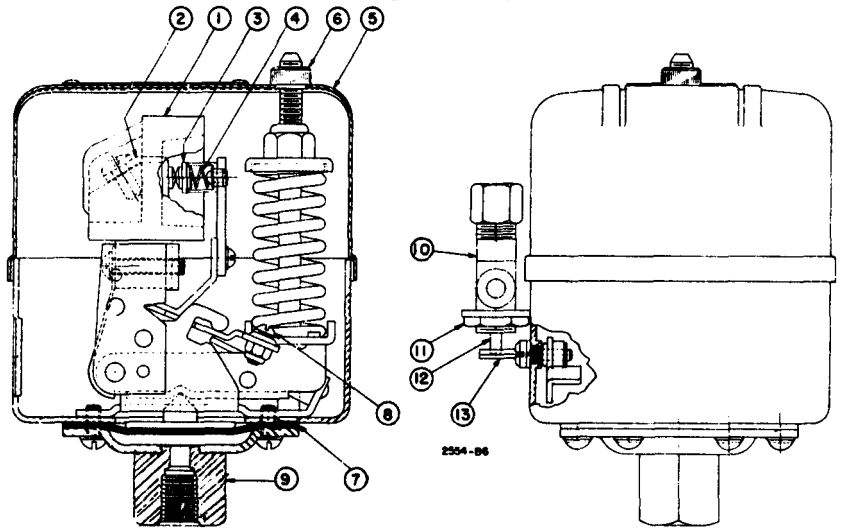
Class 9013 **Types GSG-1,2,3 GHG-1,2,3,4,5,6**

PRESSURE SWITCH

Replaces Class 9213 Types DSG, DHG

JULY, 1966

REPLACEMENT PARIS — When ordering replacement parts for Class 9013 always give serial number of switch and full nameplate reading.



Item Number	Description	Number Req'd.
-	**Set of movable and stationary contacts (Includes Contact Springs)**	1 Set
1	**Contact block assembly (Includes Stationary Contacts)**	1
7	**Diaphragm Assembly (With Pressure Plate)**	1
9	**Connecting flange assembly**	1
10	**Pressure release valve complete for Form X switches**	1
	Movable Contact Yoke Assembly (Less Movable Contacts)	1

If valves are to be popped by hand, pressure should be at least 75% of set pressure to prevent foreign material from becoming caught between seat and disc. The recommended procedure is to pop the valve" by-running pressure up to set pressure of valve.

Valve failure may be caused by seizing of parts, scored or wire drawn seats and over-tightening valve in bushing, heavy discharge piping supported directly by valve, operating pressure too close to set pressure of valve and corroded or eroded springs. The first case may be corrected by careful cleaning followed by light sanding of the seating surfaces. For correction of the second, safety valves are susceptible of re-machining of seating surfaces to angles shown on part drawings, or careful hand lapping if damage is less severe. Springs rarely require replacement, but may be purchased from manufacturer as a unit of spare parts should replacement be necessary.

DISMANTLING

1. Remove lifting gear and/or hood and mark relative positions of pressure screw, locknut and cap.
2. Loosen pressure screw locknut and pressure screw to release pressure on spring.
3. Remove cap.
4. Remove spindle, disc and guide.
5. Mark location of regulator ring(s) if used and remove it.

To reassemble, reverse the above procedure, being careful to return parts to their marked positions and replace all gaskets. Re-set valves according to instructions below.

ADJUSTMENT, SETTING and TESTING

Popping Pressure or Cracking Pressure. Make sure of gauge accuracy before beginning. Remove lifting gear and hood exposing pressure screw and locknut. Loosen locknut and raise pressure until valve pops. If opening pressure is too low, turn down on pressure screw. If pressure is too high, reverse pressure screw. After proper pressure has been reached securely tighten locknut.

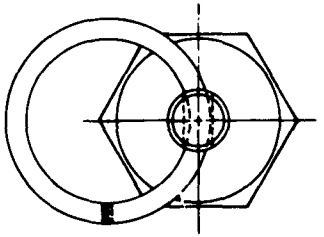
Blowdown Adjustment, Steam, Air, Gas Valves Only. When popping pressure is changed, a slight adjustment in blowdown may be required. Raising the popping pressure lengthens blowdown and lowering the popping pressure shortens blowdown. Raising the regulator ring toward the disc will increase blowdown and lowering the ring will decrease blowdown. Regulator ring adjustments should be made a notch at a time as the adjustment is sensitive. The normal position would be six (6) notches down from touching the disc, but this figure will vary with conditions.

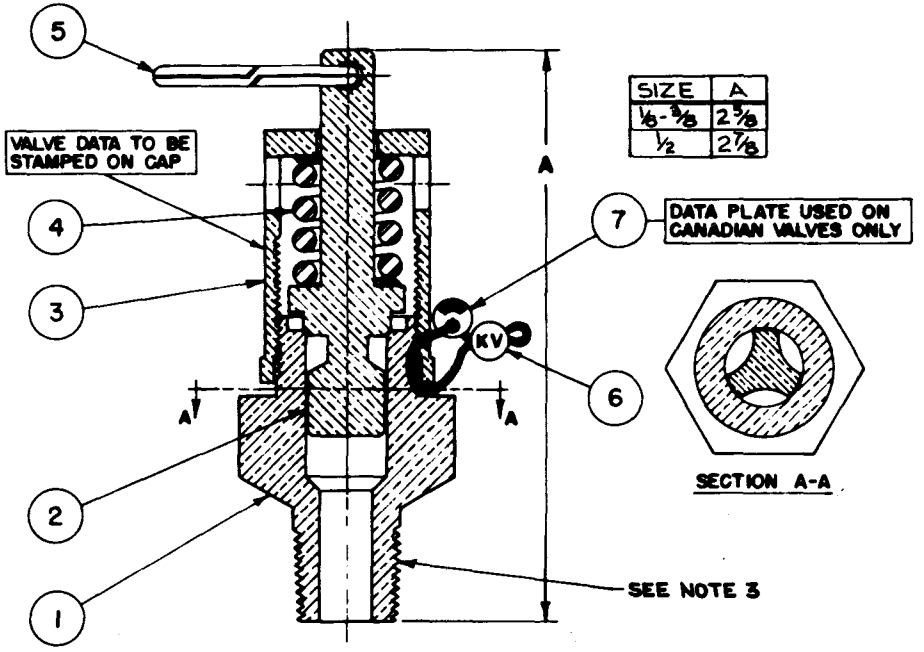
CAUTION: Re-tighten regulator ring set screw being careful that it rests in notches without gouging ring surface. Adjusting regulator ring may cause valve to pop if it is simmering. Keep hands and face clear of outlet.

TOLERANCES
FRACTIONAL DIMENSIONS ± 1/64
DECIMAL DIMENSIONS : .005 UNLESS OTHERWISE SPECIFIED

DRAWING NUMBER
B-2916-2

ITEM NO.	DESCRIPTION	NO. REQ'D	MAT'L	1/4"	3/8"	1/2"
1	BODY	1	BRASS	B-2730.001.124	B-2730.002.124	A-3746.001.124
2	DISC	1	BRASS	A-2729.001.124	A-2729.001.124	A-3747.001.124
3	CAP	1	BRASS	A-5728.001.124	A-5728.001.124	A-5729.001.124
4	SPRING	1	STL. CAD. PLTD.	A-2917.___.___	A-2917.___.___	B-4481.___.___
5	LIFT RING	1	STL. NI. PLTD.	A-1836.001.___	A-1836.001.___	A-1836.001.___
6	SEAL	1	LEAD & WIRE	STD.	STD.	STD.
7	DATA PLATE	1	ALUMINUM	A-3136.001.122	A-3136.001.122	A-3136.001.122





SIZE	A
1/8-3/8	2 5/8
1/2	2 7/8

SECTION A-A

NOTES -
1. FIG. 48 & 48-A ARE IDENTICAL.
2. SEE DWG. A-6220 FOR N.B. APPROVED CAPACITY RATINGS.
3. INLET -
   3/8" VALVE - 1/4 OR 3/8 MALE N.P.T. FURNISHED AS STD. - CAN BE FURNISHED WITH 1/8 MALE N.P.T. OR 1/8 FEMALE N.P.T.
   1/2" VALVE - 1/2 MALE N.P.T. ONLY.

APPENDIX A

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

A-1. General

a. This appendix provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III is not applicable.

d. Section IV is not applicable.

A-2. Explanation of Columns in Section II

a. Group Number, Column 1. The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group, Column 2. This column contains a brief description of the components of each assembly group.

c. Maintenance Functions, Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C - Operator or crew
O - organizational maintenance
F - Direct support maintenance
H - General support maintenance
D - Depot maintenance

The maintenance functions are defined as follows:

A - INSPECT. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - TEST. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

c - SERVICE. 10 clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D - ADJUST. To rectify to the extent necessary to bring into proper operating range.

E -ALIGN. To adjust specified variable elements of an item to bring to optimum performance.

F - CALIBRATE. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments , one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G - INSTALL. To set up for use in an operational environment such as an emplacement, site, or vehicle.

H - REPLACE. To replace unserviceable items with serviceable like i terns.

I - REPAIR. Those maintenance operations necessary to restore an item to serviceable condition through-correction of material damage or a specific failure. Repair may be-accomplished at each category of maintenance.

J - OVERHAUL. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. it oonsists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

K - REBUILD. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuiid reduces to zero the hours of miles the equipment, or component thereof, has been in use.

d. Tools and Equipment, Column 4. This column is not applicable.

e. Remarks. Column 5. This column is not applicable.

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
01	ELECTRIC COMPONENTS													
	Motor			C					C	F				
	Rotor Assembly									F				
	Capacitor		F						F					
	Starter, Magnetic								C	F				
	Switch, Pressure				C				C	C				
02	AIR COMPRESSOR ASSEMBLY													
	Compressor, Air	C						C	O	F	H			
	Crankshaft, Air Compressor								F			D		
	Rod Assembly, Connecting High and Low Pressure								F	F				
	Belt, V	C		C					O					
	Filter Assembly, Air			C					O					

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
02	**AIR COMPRESSOR ASSEMBLY (CONTINUED)**													
	Receiver, Air	C		C					O					
	Valve, Unloader				C				O					

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the Air Compressor or are required for installation, operation, or operator's maintenance.

B-2 . General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items - Section II. A list of items which accompany the Air Compressor and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies - Section III. NOT APPLICABLE

B-3 . Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR):

(1) Source code, indicates the source for the 1 is ted i tam. Source codes are:

Code	Explanation
P	Repair parts which are stocked in or supplied from the GSA/DSA or Army supply system and authorized for use at. indicated maintenance categories.
M	Repair parts which are not procured or stocked, but are to be manufactured in indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.

Code	Explanation
X	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization. Where such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above GS and DS level or returned to depot supply level.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Repair parts (assemblies and components) which are considered economically reparable at direct and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.

Code	Explanation
s	Repair parts and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U	Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

b Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Pleasure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity incorporated in Unit. This column indicates the quantity of the item used in the assembly group.

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. Illustration. This column is not applicable.

SECTION II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) QTY FURN WITH EQUIP	(7) ILLUSTRATION (A) FIG NO.	(7) ILLUSTRATION (B) ITEM NO.
PC		ARMY LUBRICATION ORDER LO 5-4310-339-12	EA	1	1		
PC		ARMY TECHNICAL MANUAL TM 5-4310-339-15	EA	1	1		
PC	7510-889-3494	BINDER, Looseleaf	EA	1	1		
PC	7520-559-9618	CASE, Operator and Maintenance Publications	EA	1	1		
PC	4210-555-8837	EXTINGUISHER, Fire	EA	1			

By Order of the Secretary of the Army:

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Gem-al, United States Amy,
Chief of Staff

Official:

KENNETH G. WICKHAM,
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