

*Copy 1*

U.S. DEPARTMENT OF LABOR MSHA



00031844

*Open file - CHFD*

# Automatic Emergency Braking System for Mine Haulage Cars

Lee M. Manna

U. S. Bureau of Mines  
Minneapolis, Minn.  
LIBRARY

OFR  
78-42

U.S. BUREAU OF MINES LIBRARY  
5629 Minnehaha Avenue South  
Minneapolis, MN 55417-3099

DISCLAIMER NOTICE

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or of the U.S. Government.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Final Report	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Final Report - Automatic Emergency Braking System for Mine Haulage Cars		5. TYPE OF REPORT & PERIOD COVERED Final July 76 - Aug 77
		6. PERFORMING ORG. REPORT NUMBER 1663
7. AUTHOR(s) Lee M. Manna		8. CONTRACT OR GRANT NUMBER(s) H0366023
9. PERFORMING ORGANIZATION NAME AND ADDRESS GARD, INC. 7449 N. Natchez Avenue Niles, IL 60648		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Dept. of the Interior Bureau of Mines Pittsburgh, PA 15213		12. REPORT DATE August 1977
		13. NUMBER OF PAGES 39
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) 50 Copies - U. S. Dept. of Interior, Bureau of Mines, Pittsburgh, PA		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES  <p style="text-align: right;">U.S. BUREAU OF MINES LIBRARY 5629 Minnehaha Avenue South Minneapolis, MN 55417-3099</p>		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) BRAKE SYSTEMS BRAKING FORCE MECHANICS VEHICLE BRAKES PNEUMATIC BRAKES		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  This report summarizes the program to design, fabricate, install and preliminary test a pneumatic braking system for 10-ton mine haulage cars. Major arrangement drawings are reproduced, pneumatic schematics, parts list and actual developed costs. Recommendations as to system improvements are made.		

## FOREWORD

This report was prepared by GARD, INC. of Niles, Illinois under U. S. Bureau of Mines Contract Number H0366023. The contract was initiated under the Coal Mine Health and Safety Research Center. It was administered under the technical direction of PM&SRC with Mr. Steven R. Lenney acting as the Technical Project Officer. Mr. Daniel B. Dawkins was the contract administrator for the Bureau of Mines.

This report is a summary of the work recently completed as part of this contract during the period June 1976 to August 1977. This report was submitted by the authors on August 31, 1977.

The engineering and fabrication services of GARD, INC. and General American Transportation Corporation's Sharon Division were utilized in this work. Direct responsibility was held by Dr. L. B. Holmes, Manager of the Mechanical Systems Department; Project Engineering by Mr. Lee Manna, Technical Advisor. Mr. Manna is credited with the major portion of the design and development of the braking system.

The cooperation and assistance of personnel of the Bureau of Mines Industrial Safety Group under the direction of Dr. John Murphy, Ph.D., with project management by Mr. James Ault, and project engineering by Mr. Steven R. Lenney, is acknowledged. Only with their cooperation was the program brought to a fructuous conclusion.

AUTOMATIC BRAKING SYSTEM

FOR 10-TON COAL MINE RAIL HAULAGE CARS

Prepared for:

UNITED STATES DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES

by:

GARD, INC.  
7449 N. NATCHEZ AVENUE  
NILES, ILLINOIS 60648

FINAL REPORT

on

Contract No. H0366023  
GARD PROJECT 1663

AUGUST 1977

## TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	INTRODUCTION	5
2	HISTORY	5
	2.1 Brake System	6
	2.2 Theory of Operation	6
	2.3 Test Program & Results	10
	2.3.1 Conclusions and Suggestions	12
	2.4 Maintenance	13
	2.5 Adjustments	13
	2.6 Assembly & Operation Recommendations & Observations	14
3	DRAWING BILL OF MATERIAL	16
4	FABRICATION COSTS	19
5	DRAWINGS AND PICTURES	20

## AUTOMATIC BRAKING SYSTEM FOR 10-TON COAL MINE CARS

### 1.0 INTRODUCTION

This program, entitled "Automatic Braking System for 10-Ton Coal Mine Cars", was established by the Industrial Hazards and Communication Branch of the U. S. Bureau of Mines, Pittsburgh, PA.

The objective of the program was to provide the Bureau of Mines with five operating 10-ton coal mine cars having a braking system which complies with the intent of the Coal Mine Health and Safety Act of 1969, Public Law 91-173, Section 314, which requires mine rail haulage cars to be equipped with automatic brakes or similar devices.

The program dealt with the design, fabrication, installation and test of a braking system capable of automatic operation in the breakaway mode and as a manually-operated parking brake for five 10-ton coal mine cars.

This program borrowed heavily on data, concepts, and designs originated on Bureau of Mines Contract No. J0357158, entitled, "Preliminary Design Study of Braking System for 10-Ton Coal Mine Rail Haulage Cars". The concepts advanced, based on utilization of standard truck brake control components, have produced a well-performing brake system consistent with reliability and low overall cost.

### 2.0 HISTORY

The aforementioned program, "Preliminary Design Study of Braking System for 10-Ton Coal Mine Haulage Cars", determined that a utilitarian system would employ pneumatics for stored energy and brake actuation on each car.

The communication of state or condition of the couplers, i.e., connected or disconnected, was to occur by the actuation of a cylinder rod acting on a control valve located on the adjacent car. The braking means would be cast iron shoes against one truck wheel set. These shoes would be actuated by a brake cylinder connected by the appropriate brake rigging through levers and linkage designed and sized to deliver maximum allowable braking force to the brake shoes.

## 2.1 BRAKE SYSTEM

The brake system is shown in Figures 1 and 2. It is shown on the Bureau of Mines cars with the cars shown in the coupled position and at minimum rail radius for purposes of determining component clearances. The piping schematic of Figure 3 describes the circuit and lists the components. The brake system operates as a fail-safe brake system on breakaway; setting the brakes on the first car downstream of the separation and setting the brakes successively in sequence on all cars downstream. The brake system also operates automatically in the same manner if air pressure goes below 30 psi. This would occur in the event of a line breakage or component failure. The brakes can be operated as a parking brake actuated by the removal of the locking pins when cars are uncoupled. The brakes can then be released by replacement of the locking pins. With maintained pressure on the rod, the parking brakes can also be set by manually activating the control valve rod. These functions are covered in more detail in the following sections.

## 2.2 THEORY OF OPERATION

Brakes are applied by pulling on a lever by a spring loaded actuator which, through the brake linkage, forces brake shoes against the wheels. In order to

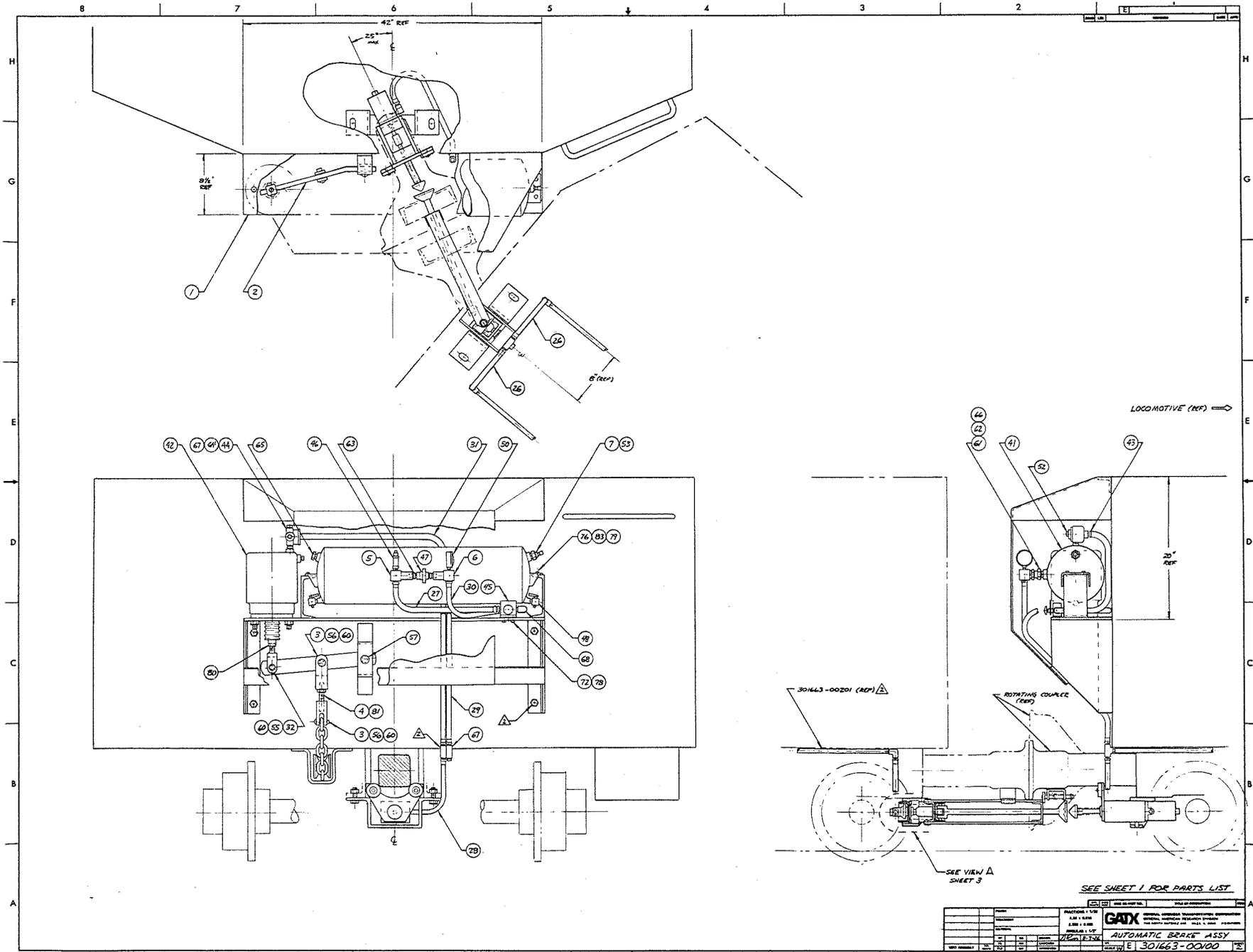


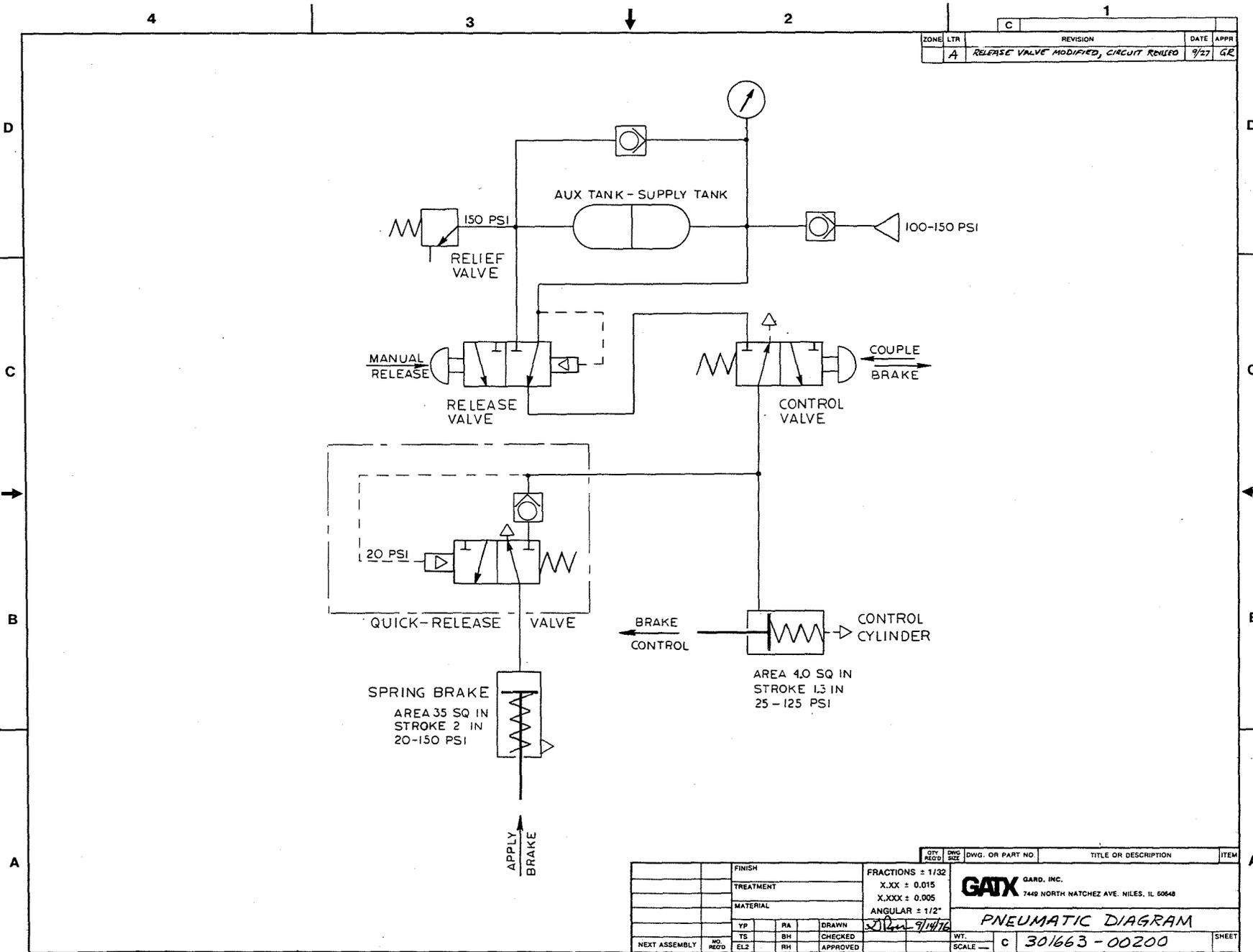
Figure 1

GARD, INC.

7

PARTS LIST 301663-0001 (REP)		SEE SHEET 1 FOR PARTS LIST	
GATX GARD, INC. 1234567890	AUTOMATIC BRAKE ASSY 301663-0000	GATX GARD, INC. 1234567890	AUTOMATIC BRAKE ASSY 301663-0000





C		REVISION	DATE	APPR
ZONE	LTR			
A		RELEASE VALVE MODIFIED, CIRCUIT REVISED	9/27	GR

GTY		DWG		DWG. OR PART NO.		TITLE OR DESCRIPTION		ITEM
REQD		SIZE						
						<b>GATX</b> GARD, INC. 7449 NORTH NATCHEZ AVE. NILES, IL 60048		
						<b>PNEUMATIC DIAGRAM</b>		
NEXT ASSEMBLY		NO	RA	DRAWN	WT.		SCALE	
NO		REGD	TS	TS	C		301663-00200	
EL2			RH	RH	APPROVED		SHEET	

Figure 3

GARD, INC.

release the brakes, this spring brake cylinder must be pressurized to overcome the internal spring. Air pressure is supplied from a precharged air reservoir. The reservoir is divided into a supply tank and an auxiliary compartment which may be used in the event the supply compartment becomes exhausted. Brakes are automatically applied when the brake control valve is released when the car becomes uncoupled and the supply line to the spring brake is exhausted. The brakes are also applied if the air reservoir pressure falls due to leaks or damage to hoses or fittings, (Ref. schematic Figure 3, Air) or if more than 6 or 7 brake cycles have occurred. Each car is equipped with its own air reservoir and is pneumatically independent. A mechanical link is provided between each car and consists of a tube and socket fitting, which can be actuated by a control cylinder and push rod mounted to the leading car. This device allows the communication of "SET BRAKE ON" signal to the following car. In the event a car becomes uncoupled, the control cylinder will cause the application of the brakes of the following car, thus all cars behind the uncoupled car will be braked. The mechanical link is designed to follow the couplers when on a curve and will function with coupler at an angle to the car body centerline. The mechanical link actuates the brake control valve automatically when a car is uncoupled. The line (push tube) may be maintained in the brake-released position by inserting a lockout pin.

### 2.3 TEST PROGRAM & RESULTS

Preliminary testing of the system at Bureau of Mines Facility, Bruceton, Pa. occurred during the month of July, 1977. The BOM facility consists of a double tracked end-looped rail facility approximately one quarter mile long. The grade of the tracks is approximately four percent.

The testing was limited due to the facilities just being checked out. The locomotive did not as yet have the proper coupler with which to couple the cars and keep the push tube in the proper position. To compensate for the lack of this coupler, the piping was changed on the number one car so that the valve assembly could be actuated by hand at the junction of the first and second car. This allowed static simulation of the braking system of the five cars.

For the test, the five cars coupled with filled reservoirs had pressures of approximately 100 psi. Coupling was accomplished by backing the locomotive into the one car and causing progressive release of each car brake as the coupler flange came into contact. As the cars were coupled, the first rod assembly was positioned in the flange sensing position causing air pressure to remove the actuation spring force on the brake linkage and also causing the control cylinder to retract, thus causing the control rod of the next adjoining car to shift the valve, putting pressure on, to release the actuator.

This action was tried several times with satisfactory results. The next series of tests consisted of causing various combinations of cars to roll down the incline. The brakes were actuated by removing the stop pin from the push rod thus setting the first car brakes and communicating the signal to the adjacent coupled car. This action was tried in various combinations of cars with satisfactory results. The conditions of the test were empty cars and it appeared to take approximately 40 seconds to communicate the signal on a four-car train.

Attempts were made to pull the cars and simulate uncoupling. While trying this mode it was determined that the play in the couplers due to wear was beyond the system capability to accommodate. Thus when the train was stretched out, the push rod which sensed flange to flange coupling, was actuated.

Upon observing and measuring the displacements, it was determined that the change from a hard stop to a spring loaded bracket with more play would allow the operation of the system. Accordingly, a set of spring loaded brackets were fabricated that allowed play in the couplers up  $1\frac{1}{4}$ ". Results of additional testing with these brackets as of this time have not been reported.

### 2.3.1 Conclusions and Suggestions

It is felt to be presumptuous to formulate conclusions on such a small data base. Also, it is BOM's intention to do extensive testing on the system using the hardware as a starting point to develop the criteria of operation. In analyzing the short time exposure to the completed system, these conclusions are evidenced:

- a) The concept of pneumatic release and spring loading of the brake is viable.
- b) The application of braking load thru brake shoes by rigging afford a flexible system readily adjusted to conform to car variations.
- c) The communication of signal from car to car by spring operated plunger is a valid concept.
- d) Effort should be made to simplify the mechanism, i.e., improve its reliability by increasing spring forces, susceptibility to binding from misalignment and weathering.
- e) Effort should be made to improve the structural strength of the sensing hardware.

- f) Pneumatic circuit changes should be made to dump air at the control cylinder in order to cut actuation time so as to set the brakes faster on adjacent cars.

## 2.4 MAINTENANCE

Air pressure checked daily - maintain approximately 125 psi. System is to be charged with dry, clean compressed air. Charging valve is a standard military style AN 6287. See design standard AND 10071 for instructions.

Periodically check for mechanical damage, corrosion, loosening of threaded parts.

Push rod and push tubes may be occasionally lubricated with a water-proof white grease such as "Lubriplate".

When reservoirs are to be recharged, it is advisable to purge tank and lines of accumulated moisture by opening all drains. (2 drains on tank and 2 drains on pipes beneath car.) Replace cap on valve after filling.

## 2.5 ADJUSTMENTS

1. Uncouple cars and pressurize tank to approximately 125 psi. Check pressure gage -- if pressure gage indicates a pressure drop in one hour, check all fittings at tank for leaks, check all hose connections and pipe joints from air tank to release valve, and hose connection to make sure all drains are closed -- tighten as required.

Make sure the brake actuating mechanism is free of dirt and debris - no mechanical damage.

2. Forward Car - insert lockout pin in push tube, to actuate control valve, spring brake cylinder should be fully extended releasing emergency brakes. Control cylinder should be fully retracted. Push rod position of lockout pin hole may be adjusted by threaded connection at clevis fitting item 21 (Ref. drawing -00100). After determining best position, drill and insert cotter pin.

NOTE: Locomotive must provide stop bracket on coupler to actuate brake control valve of forward mine car. Lockout pin is provided to allow movement of uncoupled car only. With lockout pin in place, automatic brake function is prevented.

3. Couple cars. Emergency brake of forward car should be released (See NOTE). Check to make sure lockout pin of car to be coupled has been removed. After coupling, check to see if following car brakes are released. Stop bar assembly may be adjusted for proper valve actuation by re-positioning (shifting) mounting bracket, item 16.

Exercise forward car brake system by manually depressing push tube of forward car or exhausting supply tank of forward car.

4. Check engagement of push rod and coiler socket of push tube. Slight adjustments may be made by rotating threaded socket fitting in push tube. Drill and insert cotter pin to permanently position push tube linkage. With brakes off, clearance must exist between socket fitting and head of push rod.

## 2.6 ASSEMBLY & OPERATION RECOMMENDATIONS & OBSERVATIONS

### Design and Assembly Impressions

The connection between the dual tank ports was originally designed and built with rigid threaded pipe fittings. It was found that after assembling

the units that the ports were not exactly parallel to each other or perpendicular to the tank. This caused some difficulties in assembling the check valve and adapter to the tank fittings and possibly some bending of the parts and difficulties in sealing. It is suggested that a flexible connection or fitting that could accommodate misalignment be a design improvement.

#### Operation

#### Testing

Remote actuation of brake system for testing.....

The spring brake can be remotely actuated if a 3-Way Normally Open solenoid valve is added in line item 31. The  $\frac{1}{4}$ " valve may be directly connected to the extra  $\frac{1}{4}$ " pipe port in the quick release valve; item 44. Actuation of the valve will cause the exhaust of the spring brake only, retaining pressure in the control cylinder and supply lines. Alternately a low pressure switch can also be installed in the same port to provide an electrical indication of pressure.

(WM-761) (Williams Controls or equal)

These devices are not supplied with brake systems.

Section 3.0

DRAWING BILL OF MATERIAL

PART NUMBER	DESCRIPTION	MAT'L	FINISH
100	AUTOMATIC BRAKE ASSEMBLY		
101	SUPPORT ASSY		PAINT
102	GUSSET PLATE ASSY		
103	GUSSET PLATE		
104	SUPPORT ANGLE		
105	CHANNEL, TANK SUPPORT		
106	SHELF, SUPPORT		
107	LEVER		PAINT
108	CLEVIS (LEVER)		ZINC PL.
109	ROD, THREADED	PURCHASED	
110	FITTING, AUX. TANK		ZINC PL.
111	FITTING, SUPPLY TANK		ZINC PL.
112	FITTING, CHARGING VALUE	1/2" PLUG	
113	SUPPORT BRACKET, CYLINDER		PAINT
114	MTG. BRACKET, CYLINDER		PAINT
115	GUIDE PLATE		
116	PUSH ROD		MANG. PHOSP.
117	HEAD, ROD		MANG. PHOSP.
118	PLUG	BRASS	
119	SPRING, PUSH ROD		PAINT
120	STOP TUBE		ZINC PL.
121	PIVOT PIN		MANG. PHOSP.
122	SUPPORT BRACKET, VALUE		PAINT
123	SUPPORT BRACKET		
124	MTG BRACKET, VALUE		PAINT

PART NUMBER	DESCRIPTION	MAT'L	FINISH
125	STOP BAR ASSY		PAINT
126	STOP BAR		
127	PUSH TUBE		MANG. PHOSP.
128	FITTING, SOCKET		MANG. PHOSP.
129	FITTING, CLEVIS		ZINC PL.
130	ACTUATOR ASSY		PAINT
131	ACTUATOR		
132	GUIDE PIN		MANG. PHOSP.
133	SPACER		MANG. PHOSP.
134	HOSE ASSY	PURCHASED	
135	STOP BRACKET ASSY		
136	GUIDE BRACKET		
137	CLEVIS, BRAKE		ZINC PL.
138	PIPE BRACKET		ZINC PL.
139	LOCKOST PIN	PURCHASED	
140	BUSHING		ZINC PL.
141	WASHER	DELIN	
142	HOOD, ENCLOSURE		PAINT
143	PAD	DELIN	
144	SPRING, ACTUATOR	PURCHASED	PAINT
145	PIN, CLEVIS		MANG. PHOSP.
146	GUIDE		
147	PANEL, ENCLOSURE		

Section 4.0

FABRICATION COSTS

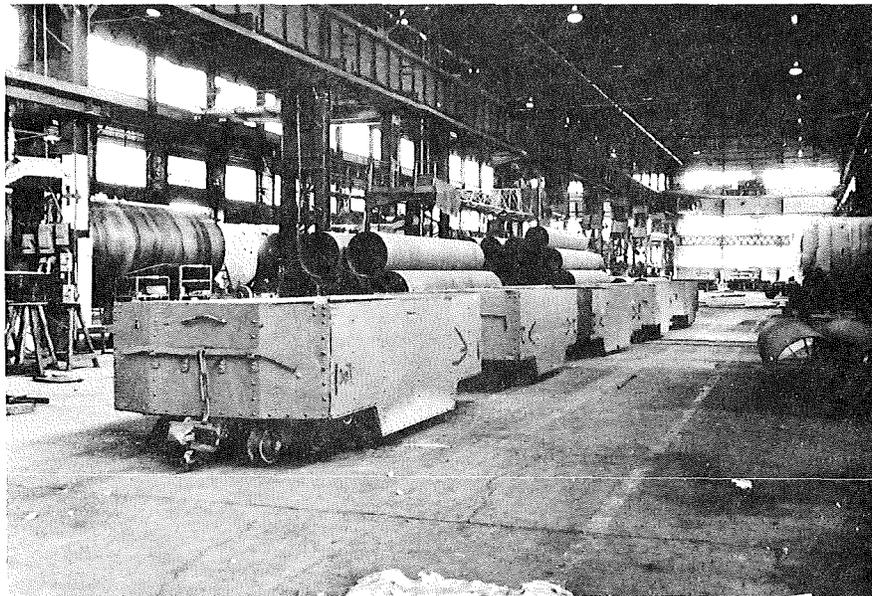
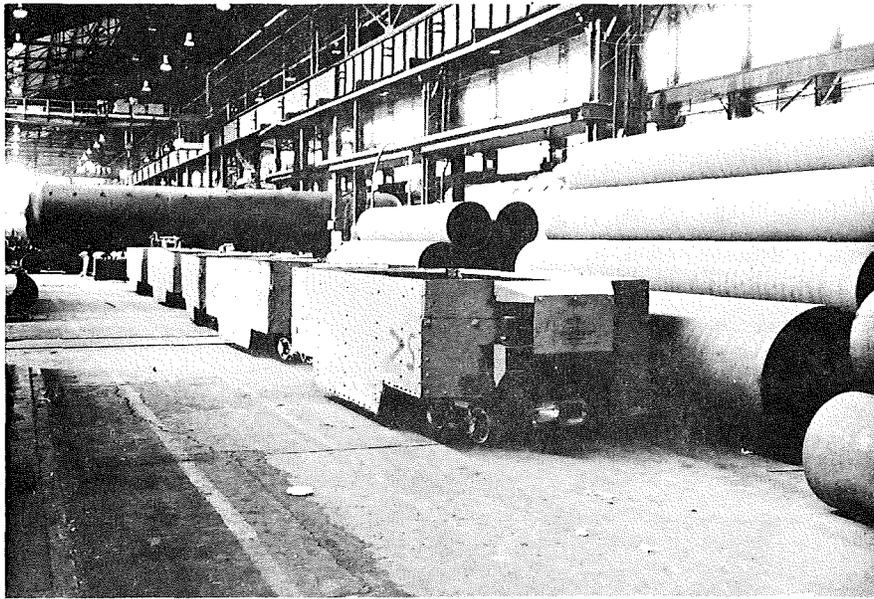
Steel	1/5 x \$788. (324.73+164.43+298.87)	\$ 157.60
Finishes & Coatings	1/5 x \$71.20 (11.5+15+27.30+17.40)	14.24
Panel & Protective Hood	1/5 x \$460.	92.00
Springs & Mech. Hardware	1/5 x \$188.25 (104.83+19.20+9.20+55.00)	37.65
Pipe & Fillings	1/5 x \$507.11 (118.16+310.75+28.94+49.26)	101.42
Spring Actuator	1/4 (500.60+125.50)	125.22
Air Tank		
Valves & Gages	$(\frac{\$716.55 + 186.35}{5})$	180.58
Charging Valve	$(\frac{24 + 6}{5})$	6.00
Air Filter, Drain Valve, Vents	$(\frac{21.75+23.20+93.80+1.62}{5})$	28.07
Cylinder	$\frac{169.08 + 33.23}{5}$	40.46
Lockout Pin	$\frac{25.00}{5}$	5.00
<hr/>		
TOTAL MATERIALS	\$3,941.25	COST - CAR \$ 788.24
Add Purchased Services - Welding Fitting - Sharon		480.00
GARD Shop Fabrication and Assembly (Actual Direct Labor)		<u>561.00</u>
	TOTAL COST/ASSEMBLY	<u><u>\$1,829.24</u></u>

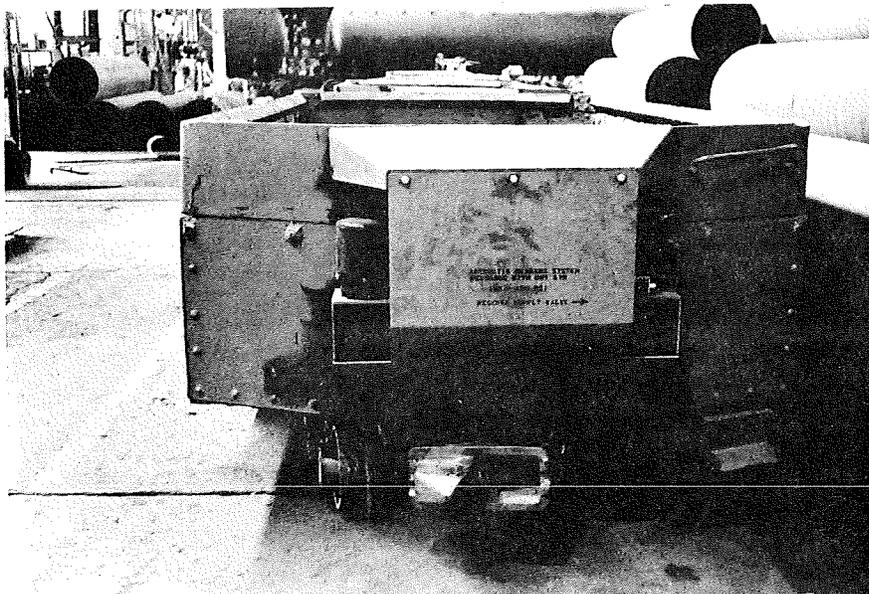
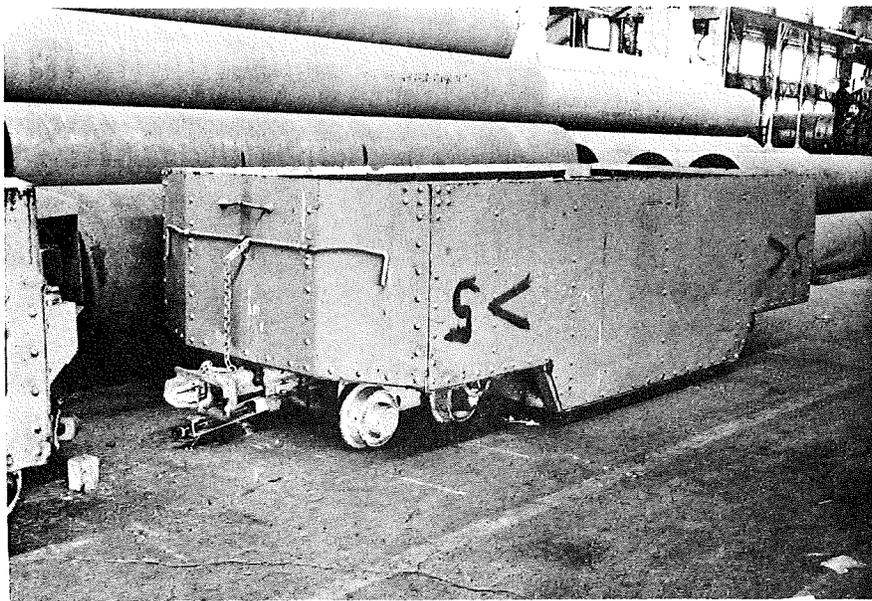
Section 5.0  
DRAWINGS AND PICTURES



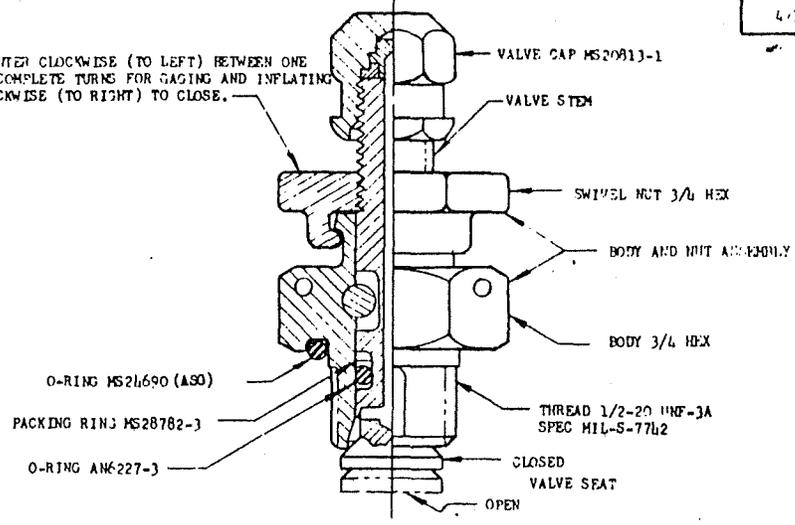








TURN COUNTERCLOCKWISE (TO LEFT) BETWEEN ONE AND TWO COMPLETE TURNS FOR GAGING AND INFLATING. TURN CLOCKWISE (TO RIGHT) TO CLOSE.



MS2989-1 HIGH PRESSURE AIR VALVE ASSEMBLY

LUBRICATE O-RING MS24690 (ASO) WITH GREASE, SPECIFICATION MIL-1-4343 PRIOR TO INSTALLATION IF POSS. THIS AIR VALVE SHOULD NOT BE USED IN ANY BOSS HAVING A DIAMETER OF LESS THAN 13/16 INCH. BOSS MUST BE CLEAN, AND SMOOTH.

**CAUTION:** CLEAN TOP SURFACE OF BOSS AND INSURE THAT IT IS FREE FROM NICKS AND SCRATCHES BEFORE INSTALLING AIR VALVE. WITH O-RING IN PLACE, TIGHTEN 3/4 HEX AGAINST TOP SURFACE OF BOSS TO 100-110 IN. LB TORQUE. NEVER LOOSEN BODY ASSEMBLY TO DISCHARGE AIR.

THIS AIR VALVE REPLACES AN287-1 ON SHOCK STRUTS, AIR BOTTLES AND ACCUMULATORS AND IS SUITABLE FOR ALL OPERATING PRESSURES UP TO 5000 PSI. USE O-RING MS24690 (ASO) TO SEAL VALVE AT THE BOSS. USE CAP MS20813-1 AS A DUST SEAL DURING OPERATION. LOCK WIRE VALVE TO UNIT AFTER INSTALLATION IN BOSS, USING HOLES PROVIDED IN 3/4 HEX OF BODY. USE VALVE AS A COMPLETE ASSEMBLY. DO NOT INTERCHANGE PARTS.

OPERATING INSTRUCTIONS

A. USING GAGE ASSEMBLY MIL-G-8348

1. TO CHARGE WITH OR DISCHARGE AIR:
  - a. REMOVE DUST CAP MS20813-1
  - b. ATTACH AIR FILLING CHUCK TO VALVE BY MEANS OF GAGE ASSEMBLY.
  - c. LOOSEN 3/4 HEX SWIVEL NUT TO BETWEEN ONE AND TWO TURNS. TURN COUNTERCLOCKWISE TO LOOSEN.
  - d. CHARGE OR DISCHARGE TO PROPER AIR PRESSURE.
  - e. TIGHTEN 3/4 HEX SWIVEL NUT TO 50-70 INCH-POUNDS TORQUE. TURN CLOCKWISE TO TIGHTEN.
  - f. REMOVE GAGE ASSEMBLY FROM VALVE AND REPLACE AND TIGHTEN DUST CAP MS20813-1 TO EXTREME FINGER TIGHTNESS.

B. WITHOUT USING GAGE ASSEMBLY:

1. TO CHARGE UNIT WITH AIR:
  - a. REMOVE DUST CAP MS20813-1.
  - b. ATTACH AIR FILLING CHUCK FROM BOOSTER PUMP, AIR BOTTLE, ETC., TO VALVE STEM THREADS.
  - c. LOOSEN 3/4 HEX SWIVEL NUT TO BETWEEN ONE AND TWO TURNS. TURN COUNTERCLOCKWISE TO LOOSEN.
  - d. CHARGE TO PROPER AIR PRESSURE.
  - e. TIGHTEN 3/4 HEX SWIVEL NUT TO 50-70 INCH-POUNDS TORQUE. TURN CLOCKWISE TO TIGHTEN.
  - f. REMOVE AIR FILLING CHUCK FROM VALVE AND REPLACE AND TIGHTEN DUST CAP MS20813-1 TO EXTREME FINGER TIGHTNESS.
2. TO DISCHARGE AIR FROM UNIT:
  - a. REMOVE DUST CAP MS20813-1
  - b. LOOSEN 3/4 SWIVEL NUT TO GIVE REQUIRED DISCHARGE. IF ONLY A SMALL AMOUNT OF AIR IS TO BE DISCHARGED, LOOSEN 3/4 HEX SWIVEL NUT SLIGHTLY. RETIGHTEN SWIVEL NUT AS IN "1. - e." AND REPLACE AND TIGHTEN DUST CAP MS20813-1 TO EXTREME FINGER TIGHTNESS.

APPROVED 21 JUN 57 REVISED (A) FOR CHANGES SEE SPEC. 1.

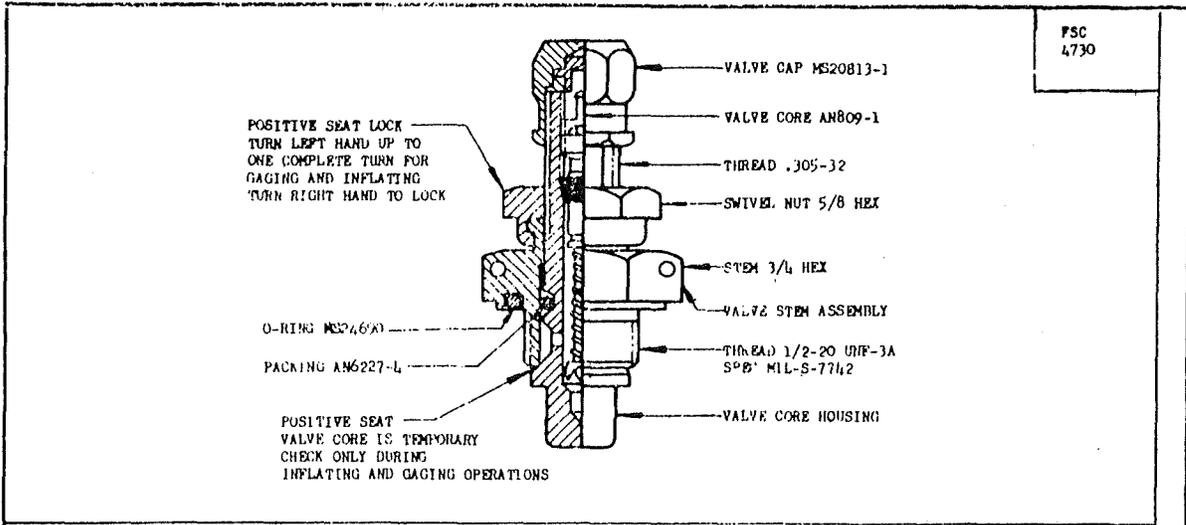
This military standard is approved by the Department of Defense and is mandatory on all activities. Selection for all new engineering and design applications and for repetitive use shall be made from this document.

P.A. USAF - 11 Other Cust USAF - 11 Army - ME Navy - AS	TITLE  BOSS AND INSTALLATIONS - AIR CONNECTION	MILITARY STANDARD
		MS33651
PROCUREMENT SPECIFICATION NONE	SUPERSEDES:	SHEET 2 OF

User activities:  
Army - MS

Review activities:  
Navy - AS  
USAF - 11

NOTE: This drawing was approved by joint action of the Air Force and Navy Departments as the Air Force-Navy standard for this product. This drawing supersedes all antecedent standard drawings for the same product and shall become effective for the procurement of armament supplies, or for use in new designs, not later than 6 months after the latest date of approval shown.



FSC  
4730

**AN6287-1 HIGH PRESSURE AIR VALVE ASSEMBLY**

5 LUBRICATE O-RING MS24690 WITH GREASE, SPECIFICATION MIL-L-4343 PRIOR TO INSTALLATION IN BOSS. THIS AIR VALVE SHOULD NOT BE USED IN ANY BOSS HAVING A DIAMETER OF LESS THAN 1/16 INCH. BOSS, MUST BE CLEAN, SMOOTH, AND SQUARE WITH 1/2-20 THREAD CENTERLINE.

**CAUTION:** CLEAN TOP SURFACE OF BOSS AND INSURE THAT IT IS FREE OF NICKS AND SCRATCHES BEFORE INSTALLING AIR VALVE. BOTTOM 3/4 HEX STEM AGAINST TOP SURFACE OF BOSS AND TIGHTEN TO 100-110 IN. LB TORQUE. NEVER LOOSEN 3/4 HEX STEM TO DISCHARGE AIR PRESSURE. THIS HEX SHOULD REMAIN TIGHT AGAINST THE BOSS AT ALL TIMES.

THIS AIR VALVE REPLACES AN812-1 ON SHOCK STRUTS, AIR BOTTLE, AND ACCUMULATORS AND IS SUITABLE FOR ALL OPERATING PRESSURES UP TO 3000 PSI. USE O-RING MS24690 TO SEAL VALVE AT THE BOSS. USE VALVE CORE AN809-1 INSIDE THE VALVE. THIS CORE FUNCTIONS AS A CHECK VALVE FOR FILLING AND GAGING PROCEDURE ONLY, AND DOES NOT SEAL DURING OPERATION. USE VALVE CAP MS20813-1 AS A DUST SEAL ASSEMBLY. DO NOT INTERCHANGE PARTS.

**OPERATING INSTRUCTIONS**

**A. USING GAGE ASSEMBLY MIL-G-8348**

1. TO CHARGE WITH OR DISCHARGE AIR:

- a. REMOVE VALVE CAP MS20813-1.
- b. ATTACH AIR FILLING CHUCK TO VALVE BY MEANS OF GAGE ASSEMBLY.
- c. LOOSEN 5/8 HEX SWIVEL NUT TO A MAXIMUM OF 3/4 OF A COMPLETE TURN. TURN LEFT HAND, COUNTERCLOCKWISE TO LOOSEN.

**CAUTION:** EXCESSIVE LOOSENING WILL RESULT IN THE STEM ASSEMBLY DROPPING INTO THE UNIT TO WHICH THIS VALVE IS ATTACHED. FURTHERMORE, THE 5/8 HEX WILL INTERFERE WITH THE CHUCK ON GAGE ASSEMBLY AND CAUSE DAMAGE TO THE VALVE CORE HOUSING.

- d. CHARGE OR DISCHARGE TO PROPER AIR PRESSURE.
- e. TIGHTEN 5/8 HEX SWIVEL NUT TO 50-70 INCH-POUNDS TORQUE. TURN RIGHT HAND, CLOCKWISE TO TIGHTEN.
- f. REMOVE GAGE ASSEMBLY FROM VALVE AND REPLACE AND TIGHTEN VALVE CAP MS20813-1 TO EXTREME FINGER TIGHTNESS.

**B. WITHOUT USING GAGE ASSEMBLY:**

1. TO CHARGE UNIT WITH AIR:

- a. REMOVE VALVE CAP MS20813-1.
- b. ATTACH AIR FILLING CHUCK FROM BOOSTER PUMP, AIR BOTTLE, ETC., TO VALVE STEM THREADS.
- c. LOOSEN 5/8 HEX SWIVEL NUT TO A MAXIMUM OF 3/4 OF A COMPLETE TURN. TURN LEFT HAND, COUNTERCLOCKWISE TO LOOSEN.

**CAUTION:** EXCESSIVE LOOSENING WILL RESULT IN THE STEM ASSEMBLY DROPPING INTO THE UNIT TO WHICH THIS VALVE IS ATTACHED. FURTHERMORE, THE 5/8 HEX WILL INTERFERE WITH THE CHUCK ON GAGE ASSEMBLY AND CAUSE DAMAGE TO THE VALVE CORE HOUSING.

- d. CHARGE TO PROPER AIR PRESSURE.
- e. TIGHTEN 5/8 HEX SWIVEL NUT TO 50-70 INCH-POUNDS TORQUE, TURN RIGHT HAND, CLOCKWISE TO TIGHTEN.
- f. REMOVE AIR FILLING CHUCK FROM VALVE AND REPLACE AND TIGHTEN VALVE CAP MS20813-1 TO EXTREME FINGER TIGHTNESS.

2. TO DISCHARGE AIR FROM UNIT:

- a. REMOVE VALVE CAP MS20813-1.
- b. LOOSEN 5/8 SWIVEL NUT. THE AMOUNT THE NUT IS LOOSENED UP TO ONE (1) COMPLETE TURN ONLY WILL GOVERN THE RATE OF DISCHARGE OF AIR.
- c. DEPRESS VALVE CORE WITH SUITABLE TOOL COMPARABLE IN SIZE TO A MATCHSTICK OR USE BLEEDER ATTACHMENT OF THE GAGE ASSEMBLY. IF SMALL AMOUNT OF AIR ONLY IS TO BE DISCHARGED, LOOSEN 5/8 HEX SWIVEL NUT ABOUT ONE TENTH (1/10) OF A COMPLETE TURN, DEPRESS VALVE CORE, THEN RETIGHTEN SWIVEL NUT AS IN "L - a." AND REPLACE AND TIGHTEN VALVE CAP MS20813-1 TO EXTREME FINGER TIGHTNESS.

5 NOTE: AN6287 VALVES COVERED BY AND10071 ARE INACTIVE FOR DESIGN. FOR INSTALLATION INSTRUCTIONS FOR THE SUPERSEDING MS2889 VALVES, SEE MS33651.

APPROVED 3 Sep 48 REVISED 5 FOR CHANGES SEE SHEETS 1 AND 2.

AIR FORCE-NAVY AERONAUTICAL DESIGN STANDARD		AND10071
BOSS AND INSTALLATIONS, AIR CONNECTION (AN6287)		
		SHEET 2 OF