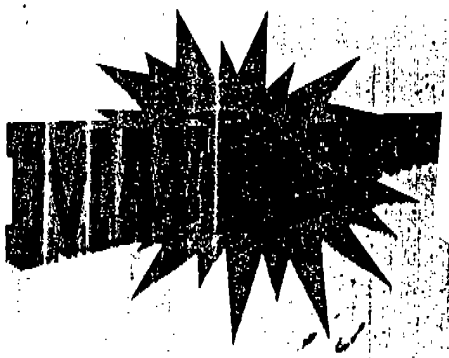

MFG: MAV RECS
NAME: TANK TAG

TANK TAG

OPERATING MANUAL

&

SAFETY SPECIFICATIONS

MAY, 1990

MAV REC'S LTD.

#1 - 585 Gaston Avenue, Kelowna, B.C., Canada V1Y 7E6 — Phone (604) 861-4877

MAV REC'S LTD.

TANK TAG

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MAV REC"S LTD.

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NOTICE TO BUYERS

The following is a manual setting forth the minimum standards for operations of the facilities for the M.A.V. REC'S tanks, boats and guns which have been purchased by you.

Please follow these minimum standards and you may enhance them by procedures to provide additional safety to the patrons utilizing the boats or guns, the spectators or other members of the general public. Please note that no addition or modification is authorized to any tank, boat or gun which has not been approved in writing by M.A.V. REC'S. The modification of any product shall void all warranties; and you are reminded of your agreement to indemnify M.A.V. REC'S, Amusement Services Corporation and all successors, distributors, agents and employees and affiliates of any such entity, harmless of, from and against all liability, causes of liability, actions, defense fees or fees to settle any matter. Components installed in the product being purchased by you have been tested and furnish a reasonable degree of safety, which we are unable to assure for any enhancements or modifications made by you, or in the event that you delete any component or feature now made a part of the Products.

However, the contents of this manual, any subsequent modifications or additions and revisions to this manual and any terms of this letter, the manual or any warranties, shall not, in any manner, be a warranty, guarantee or assurance that the product is free from all liability, and you should warn patrons that they are participating in a "participatory amusement" which may cause injury.

Please also include as part of your warning that all patrons must follow the instructions and the failure to do so may result in serious injury not only to themselves but to other persons.

M.A.V. REC'S

NOTICE TO OPERATORS

Read all instructions given in this manual and follow recommendations. A MAV REC'S Ltd. representative is at your disposal for assistance in training your crew and inspecting your installation. Although safety has been built into our product, safe operation is the responsibility of the crew. Use only mature and well trained crew members, who have been totally familiarized with the equipment and have been made aware of the importance of safety to the public or users of the facility.

Proper instruction to the patrons and a well organized dock crew will make for a very safe operation. Daily checks before opening the facility will eliminate any danger to the public and patrons.

All helmets balls or other equipment must be kept off the dock area used by the crew and public. A clean area adds to a safer operation.

There are many disinfectant sprays available on the market. Helmets should be cleaned after each use to avoid transfer of any germs or other dangers to the public. This is also very much appreciated by your customers.

MAV REC'S Ltd. will appreciate any recommendations from you with regard to product improvements and most certainly ideas that will contribute to added safety for the public.

EMERGENCY PROCEDURES

FIRE

In the event a fire occurs in the vehicles, the following procedure should be followed if local fire procedure is non-existent:

1. Turn perimeter guns emergency shut-off switch to "off" position.
2. Assist patrons in exiting vehicle.
3. Lead patrons to a safe area.
4. Instruct all other vehicle operators to proceed to safe area.
5. Assist on-board fire extinguisher with portable extinguishers to completely suppress fire.
6. Remove vehicle to storage area and call Fire Department.

PATRONS OPENING CANOPY IN BATTLE AREA

1. Shut off perimeter guns.
2. Instruct patron to close canopy.
3. Instruct other gunners to cease firing and return to loading dock.

PATRON EXITING VEHICLE IN BATTLE AREA

1. Shut off perimeter guns.
2. Instruct tank gunners to cease firing.
3. Assist patron to a safe area.
4. Remove vehicle to dock area.

INSTRUCTIONS TO CREW

Give instructions loud and clear.

Ask each patron if they understand instructions.

Tank should not be activated until the following has been done:

1. Both driver and gunner have put on their helmets properly and have seat belts securely fastened.
2. Both driver and gunner have been given instructions.
3. Gun canopy has been closed.
4. Gun barrel is pointing straight ahead.
5. There are no other tanks ahead of tank being activated in the line-up.
6. There are no crew members in front of tank.

Standing from the side of tank, activate the key once to the right. Tank is now activated. Immediately hit the turret target to de-activate the gun. Signal driver to proceed.

Always assist patrons when loading or unloading.

Helmets are to be put on patrons before they are loaded in the tanks.

Helmets are supplied with the tanks complete with face guards. Patrons must be helmeted at all times when using tanks. Crew members should not enter battle area unless wearing a helmet and face guard.

Crew members are not to be in the loading lane at any time when tanks are being loaded or unloaded. Always stay on loading dock unless engines are shut off. This applies to patrons as well.

INSTRUCTIONS TO PATRONS

Tank Driver

Fasten your seat belt.
There is one pedal, push on right side of pedal, tank moves forward, push on left side of pedal, tank moves backward.
Take foot off pedal, tank stops.
Tank is steered like a car.
Do not open canopy in the battle area.
Do not ram other tanks or guard rails.
Return to loading area immediately when right side of dashboard lights up. (return to base)
Tank will stop for ten seconds when body target is hit.
Gun will not fire when the turret target is hit.
Gun will not fire when ride is over.
Do not unbuckle seat belt until stopped in the loading area.

Tank Gunner

Fasten your seat belt.
Do not open canopy in battle area.
Aim for targets, upper target knocks out gunner, lower target stops tank for ten seconds.
Light will flash when gunner is knocked out.
Your gun will not fire when your target is hit. (ten seconds)
Your gun will not fire when the ride is over.
Do not unbuckle seat belt until stopped in loading area.

Gunner and Driver

Helmets must not be removed until safely back in loading area.

These instructions can be on a card that the customer reads when there is a line-up. The card is handed to a dock crew member prior to entering vehicle. Customer must be asked if he understands instructions prior to activating his or her vehicle.

PERIMETER GUNS

Perimeter guns are installed as per the drawing supplied. The netting around gun barrels must be checked daily to ensure that no holes exist that may allow a ball to pass through and strike a patron.

If the guns are installed behind a chain link fence, the section cut out of the fence is replaced with netting. Enough slack should be used to allow the guns to swing the required angles horizontal and vertical. (See drawing BP-03, 2 of 2).

Guns should be mounted no more than the coupling length from fence or net, to prevent the gun from being pulled through the net and used to fire at spectators or other patrons. The net should fit tightly around barrel and secured with a tie-strap or nylon twine. See drawings.

Proper signs, as supplied, shall be displayed on the fence or net, warning people to keep hands and face back from net. These signs should be at six to eight feet above the ground with ten foot spacing.

TECHNICAL DATA

The perimeter guns are powered by a compressor capable of producing 3 CFM per gun. This can be located centrally or at either end of the gun setup. A one and one-quarter inch (1 1/4") feeder line runs under the gun bench, with a reducing tee down to 1/4" at each gun.

See drawing for installation of system.

The perimeter guns are a 12 volt DC system, each gun drawing approximately one amp. Ensure all electrical and air lines are strapped in such a way as to ensure no wear can damage wires or lines.

All electrical and air systems to be installed to meet local ordinances.

Air system operates at 90 to 100 psi. Do not exceed this pressure.

A master switch should be installed in 12v system to enable shutdown of all guns in case of emergency.

BALL RETRIEVAL

The ball retriever is a simple rubber paddle wheel design. A height adjustment allows for pickup on pavement or gravel base. The machine is pulled by a small tractor, such as a garden tractor 5 to 10HP.

A protective cage must be built to protect the operator. Mesh size can vary, but no larger than 1" openings. Balls must be retrieved during operations and care must be taken by the tractor operator to avoid collisions.

The ball retriever has a removable basket. This can be dumped into the ball bin in the loading dock area. Ensure protection for the tractor operator using netting in this area.

If battle area is sloped or graded to conveyor area, a ball retriever is not required. The conveyor system is recommended for safety and economic reasons.

LOADING AMMO INTO TANKS

The tanks hold approximately 50 balls. A lid on the turret gives access to dump ammo into the vehicle. Plastic buckets are usually used that are of such size as to hold approximately 50 balls. The loading dock crew fills these buckets from the ball bin. There is usually one person responsible for this duty. This is done immediately after the last patron exits the tank.

SELLING AMMO - PERIMETER GUNS

Perimeter gun ammo is sold to each patron in two bucket sizes. Family size - 50 rounds, Small buckets - 8 to 10 balls. This is done much the same as a driving range. A booth is set up which has an ample supply of balls.

DAILY SAFETY CHECKS

1. Do not smoke or have open flame within 10 feet of vehicle during fueling or when working in the engine compartment.

2. Check seat belts and shoulder harnesses for wear, breaks, loose bolts, and nuts. Check impact grab-lock and ensure entire assembly is in good working order.

3. Check helmets for damage. Check straps and screws for loss damage and tightness. Check for any sharp edges on faceguard and repair any such defects.

4. Check fire extinguisher. Pressure must be indicated in between the charge area and the overcharge area on the guage. Replace or recharge before operating vehicle.

5. Check windshields for breaks, cracks and ensure fasteners are not loose. Repair or replace any defective parts before vehicle.

6. Check steering system and drive system to ensure vehicle can be adequately manoeuvred and stopped by operator, or driver.

7. Vehicles should not be fueled any where near the loading dock or any area used by the public. Do not over-fill fuel tanks and avoid spillage. Any spilled fuel, oil or grease should be cleaned up immediately.

8. Check for any bared wires and loose connections in engine compartment that may short out and cause a spark.

9. All netting and fencing shall be checked daily to ensure no ball can be shot through any opening and possibly strike the patrons.

10. Ensure loadspeaker system is operative.

11. Check perimeter gun kill-switch for emergency shut-down.

M.A.V. Rec's Ltd.

SAFETY FEATURES
PARK CONSTRUCTION

The entire playing area is surrounded by a 6 foot chain link fence. All spectator areas are surrounded by fencing and netting.

The playing area surface is compacted material. The ground is covered with suitable material, the nature of which to be determined as that which is most economical to install in the area where the park is located.

The playing area is restricted to grades not exceeding 3%. The playing area has hills and berms in place to enhance the game effect. The hills and berms are surrounded by protective barriers to prevent any vehicle access. For night use the park is well lit.

VEHICLE ACCESS

The vehicles are loaded and unloaded in a loading dock area. The loading dock height is such that patrons are able to step from the dock to the vehicle and to their seats in the vehicle with one step down to the driver's seat and one step up to the turret seat.

Access to the loading dock is by way of a walkway with stairs leading to the dock.

Access to the loading area is restricted to those holding valid tickets.

The loading dock is not a spectator area.

The boarding area is separated from the game area by chain link fence and nylon netting (1 1/2" openings) constructed to provide full protection to those entering and leaving vehicles.

When the ride period is over (timed in computer) the gun is automatically disengaged.

Dock area shall be equipped with two fire extinguishers, one at each end of dock. These shall exceed "on board" vehicle extinguishers capacity and be acceptable to local fire authority. Proper training shall be given to dock crew in operation and maintenance of same.

M.A.V. Rec's Ltd.

SAFETY FEATURES
VEHICLES

CONSTRUCTION:

- Steel frame
- Fiberglass body components
- Aircraft grade Lexan windows surrounding the driver and turret occupant.

IMPACT RESISTANCE:

- Vehicle body contains an integral laminated spruce wood beam which completely surrounds the body enclosure.
- The beam is reinforced with bulkheads at the front, mid-section and rear of the vehicle.
- At the front and rear of the vehicle is a 4 inch rubber bumper which extends the full width of the vehicle.
- A polyethylene rub strip is mounted on each side of the vehicle and extends the full length of the unit.
- All bumpers and rub strips are of uniform height on all vehicles.

OCCUPANT PROTECTION:

- Occupants are restrained with three point lap and shoulder safety harnesses and wear a CSA approved hockey helmet complete with faceguard.
- Vehicle construction ensures that with turret and driver canopy closed no object can enter the user compartment.
- Speed of vehicle does not exceed 3.5 M.P.H.
- Vehicles have been tested with impact between two vehicles head on with occupants unrestrained resulting in no effect upon occupants.

FIRE PROTECTION:

- All motor components are located at rear of vehicle.
- The engine compartment is separated from the passenger compartment by the rear bulkhead/firewall.
- The engine compartment contains a U.L. approved automatic fire extinguisher system.
- Gasoline and hydraulic fluid storage tanks are located in the engine compartment. The tanks are sealed at the fill point and vented to outside through a rear mounted external outlets.

KNOCK OUT SYSTEM

The gun knock-out and engine knock-out work through the computer. Failure of the knock-out system can be caused by the following:

Dirt on commutator (turret gun only).
Blockage in sensor lines or leak in lines.
Faulty pressure switch.
Sensor lines not attached to target or pressure switch.
Computer malfunction or blown fuse.

Spare pressure switches are supplied.

ELECTRICAL SYSTEM

The electrical system is 12 volts. An in-line fuse is located between the positive battery post and the terminal strip. It is most important that the diodes are connected with the positive wire connected to the "ring" side of the diode. Do not run the computer with diodes disconnected. This can cause damage to the computer. Short circuits can cause the diodes to burn out. Do not work on the electrical system when the main switch is in on or forward position.

A schematic is included in the parts manual. Extra diodes are included in the package.

SITE SPECIFICATIONS

1) Minimum area for 6 vehicles is 80 x 100 feet, preferably rectangular with minimum width 120 feet, however, shape can be somewhat irregular. Circular area is 50' radius or 100' diameter.

2) Chain-link fencing shall enclose the entire perimeter for vandalism protection - minimum height - 6 feet. Max. mesh size 1 1/2".

3) Loading dock area shall be protected by netting and fencing. See drawing #BP-02-1 of 2.

4) All spectator areas shall be protected by fencing and netting.

5) Any inclines over 3% shall be restricted to vehicle access by use of guardrails.

6) Height of guard rails - 35" to the centre of the rail.

7) Height of loading dock - 40".

8) Loading dock shall have a wooden or polyethylene wear strip full length - height of strip - 35" to centre from ground elevation.

9) Length of loading dock should be 60 feet minimum. (This accommodates 5 vehicles.)

10) Building requirements are minimal or as per local building codes.

11) Storage for vehicles can be open air, this is however dependent on local weather conditions.

12) Fuel storage to meet local ordinances.

13) Service area should be covered but is dependent on local weather conditions.

14) Park rules must be posted in loading dock area readily visible to patrons. (See enclosed sheet -- Park Rules)

15) All traveled areas must be constructed using a structural gravel material, which will compact to 95% density, free of large stones and any non-structural material.

16) Entire traveled area shall be graded to facilitate adequate drainage.

17) All fences, netting, hills or structures must be protected by guardrails at 35" in height to centre of rail from ground level and 24" inside fence.

18) Guardrails - min. 2" x 10"
Posts - min. 8" x 8" - 2' in ground at 4' centre.
(See drawing #T1).

19) Ball or ammo-bin is of plywood construction 4x4x4 cut out 27" from floor for access. (See drawing #BP-04)

20) See attached drawings for netting and fencing construction.

21) A loudspeaker system shall be installed for use in case of emergency.

TROUBLE SHOOTING GUN

The gun is operated by air pressure, and fired electrically by a magnetic solenoid valve. Mis-fires, jamming or total failure of the gun can be caused by dirt, low air pressure, or poor electrical connections. New balls can jam if a fuzzy texture is observed. These balls should be wetted down just before use for three or four days which removes this texture.

A test gauge is supplied with the package.

Jamming or low trajectory.

Check for leaks in air system. Dirt in the line can cause the dump valve to leak.

Ensure slide-gate in gun is sliding freely and is traveling forward fully to seal.

Check all screws on top of gun for tightness.

Check air compressor belt for tightness.

Ensure gun barrel is tight.

Check the exhaust dump valve is operating properly. (engine compartment)

Contamination in dump solenoid valves can cause them to leak or not open fully when activated. A definite "click" can be heard when the valves are operating properly. Low voltage will also cause the solenoid to malfunction.

Check air relief valve for leakage.

Check snubber on Penn pressure switch for dirt.

The system operates at 90 psi. This can be checked by removing the quick-coupler located under the turret base, and attaching the test gauge. The pressure is set with the Furnas switch. Do not operate above this pressure.

If the system is contaminated, the dump valve in the gun may have to be removed and cleaned. The check valve and the exhaust solenoid valve should be cleaned at the same time.

TANK/BOAT TROUBLE SHOOTING

B.W. 15/5/90

NOTES:

Most problems have been traced to accidental shorting of light sockets during bulb replacement. When this happens, the switching sockets may be subjected to unlimited current. They usually blow with no external sign of damage.

You can short the metal flange of the chassis mounted, metal flange transistors and find out which transistor operates which function by watching the lights. If, when sequentially shorting each transistor, the light or function does not operate, then look for trouble outside the controller.

The parts used in this controller are all U.S.A. manufactured and should be obtainable at any electronic parts supplier. Most solid state devices are from Motorola, Texas Instruments or Exar.

MIS-FIRES

Mis-fires are usually caused by low voltage, poor electrical connections, broken balls sticking in orifice or contamination in dump-valves. Mis-fires can be caused by low air pressure or a faulty pressure switch.

Check for dirt on commutator and brushes. These can be cleaned by using a cleaning solution such as Electrosolve. This cleaner is very good for cleaning the slide-gate if dirt is causing it to stick.

Check for loose connections in wiring. A loose battery terminal can cause low voltage which prevents the dump valves from opening fully.

Diodes are incorporated throughout the electrical system, and are crucial components. A burned-out diode will prevent power from reaching the gun. There is a diode located in line on the wires (under turret).

NOTE;

Do not operate the system without the diodes in place. This will cause the computer to mal-function or burn out!

Disconnect the power source when working on the electrical system at main switch, to eliminate shorting out.

General Maintenance:

Tighten all screws, nuts and bolts on the gun.
Ensure all air fittings are tight.
Tighten all electrical connections.
Follow Speed-Aire manual for regular maintenance procedures.
Clean commutator and brushes regularly.
Follow Honda Manual for regular engine maintenance.

ENGINE

An owner's manual is included in the package. Follow instructions contained therein. Do not operate above 2700 rpm. use recommended lubricants and service regularly.

Check motor mounts occasionally and all other attachments on the motor.

Shut off gas line valve when unit is not operating. This is located between the carburetor and the fuel tank.

An automatic fire extinguisher is mounted in the engine compartment. This unit is over-specified for the area or volume of the compartment.

Do not work on this unit while engine is running.

DAILY SYSTEMS CHECK

After checking oil levels, air, hydraulic, drive belts, and general mechanical functions the knock-out system should now be checked.

1. Start engines.
2. Activate controller key (one turn to right).
3. Hit each target firmly with closed fist. Strobe light should flash and dash lights should indicate your gun damage/engine damage, howler will sound (gun only).

NOTE: The strobe light does not flash on engine damage.

4. Load gun with gun barrel pointing in safe direction; fire gun.

Vehicles are now ready for operation.

NOTE: If any of the above functions do not operate properly, see "trouble shooting" - air, gun, and electrical.

HYDRAULIC SYSTEM

The hydraulic system comprises a reservoir, pump and 2 (two) hydraulic motors. The pressure setting is 1500 to 1800 psi. The pressure is adjusted on the relief valve. The forward and reverse speed is adjusted on the foot feed or pedal. This is by means of two adjustable stop nuts, right for forward and left for reverse.

The Parker valve activates the knock-out function by simply by-passing oil directly back to the reservoir.

The filter is located on the reservoir and should be changed after first 100 hours, then every 300 hours.

Check periodically that all nuts and connections are tight and no leakage is visible. Ensure that the oil level is 7/8 full in reservoir. Make any repairs in a clean dirt-free area and avoid any contamination of system.

Use any manufacturer approved type "F" hydraulic fluid. Do not exceed pressure or temperature specifications.

If the machine fails to stop when computer indicates "ENGINE DAMAGE", this would probably mean a burned-out coil in the Parker valve. Check for power at the valve or on the terminal strip. If 12 volts are indicated, replace coil.

AIR SYSTEM

The air system is for the operation of the cannon, and operates at 90 psi. on demand. Follow manufacturers specs on operation and maintenance. Operation at excessive rpm will seriously shorten life of compressor. 600 rpm is adequate for loading the cannon. Ensure overflow oil line is attached to compressor base to prevent oil splash. Do not exceed temperature as per specs. use only non-detergent compressor oil and check oil level regularly.

. Clean filter regularly. Dusty conditions demand a daily inspection of filter.

See "GUN" for testing air system.

See drawing for compresssor and alternator belt replacement.

CONTROLLER

To activate the controller, turn key once to right. To deactivate controller, turn off main switch in engine compartment.

This controller has three timers. The main timer controls the running time of the tank or boat. The other two timers are to cut off the cannon or the driving motor.

To set the main timer, first, choose the appropriate switches. Select the number of seconds you wish the timer to elapse.

The 8 position dip switch will take all the "on" selected contacts and add them.

1 - 10 seconds
2 - 20 seconds
3 - 40 seconds
4 - 80 seconds
5 - 160 seconds
6 - 320 seconds
7 - 640 seconds
8 - 1280 seconds

All timers are within 5 percent, so care should be taken to ensure that you are getting enough operational time.

The other two timers are adjustable from 5 seconds to 20 seconds.

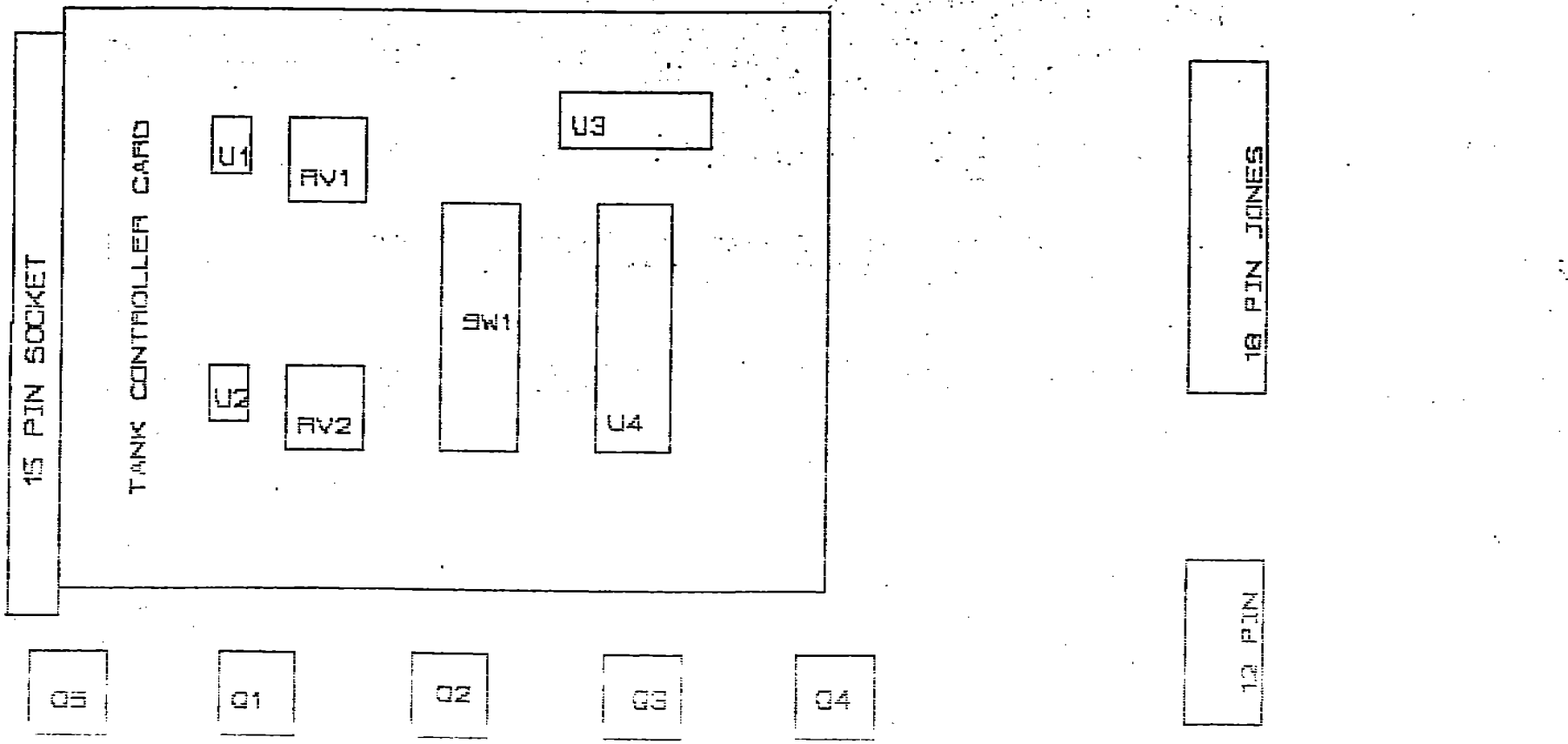
Each control is 20 seconds at full counter clockwise and 5 seconds at full clockwise.

PARTS LIST FOR CONTROLLER

Q1, Q2, Q3, Q4, Q5 - 2N3904
Q6, Q7, Q8, Q9 - T1P121
D1 - 1N914 OP 1N4143
D2 - 1N4007
1C1 - 2240
1C2 - MC14093
1C3, 1C4 - LM555
1C5 - UA7808
C1 - 2, 2UFD/25V. ELECT
C2, C7, C12 - 10UFD/25V. TANTULUM
C3, C4, C6, C8, C10, C13 - .01/50v. CERAMIC
C9, C14 - .1UFD/50V. CERAMIC
C5, C11 - 1UFD/25V. ELECT
C15 - 100UFD/25V. ELECT
R1, R2, R4, R10, R11, R12, R13, R22 - 15K 1/4
R3, R7, R19 - 1M 1/4
R5 - 3.3K 1/4
R6, R14, R15, R16, R17, R18 - 1K 1/4

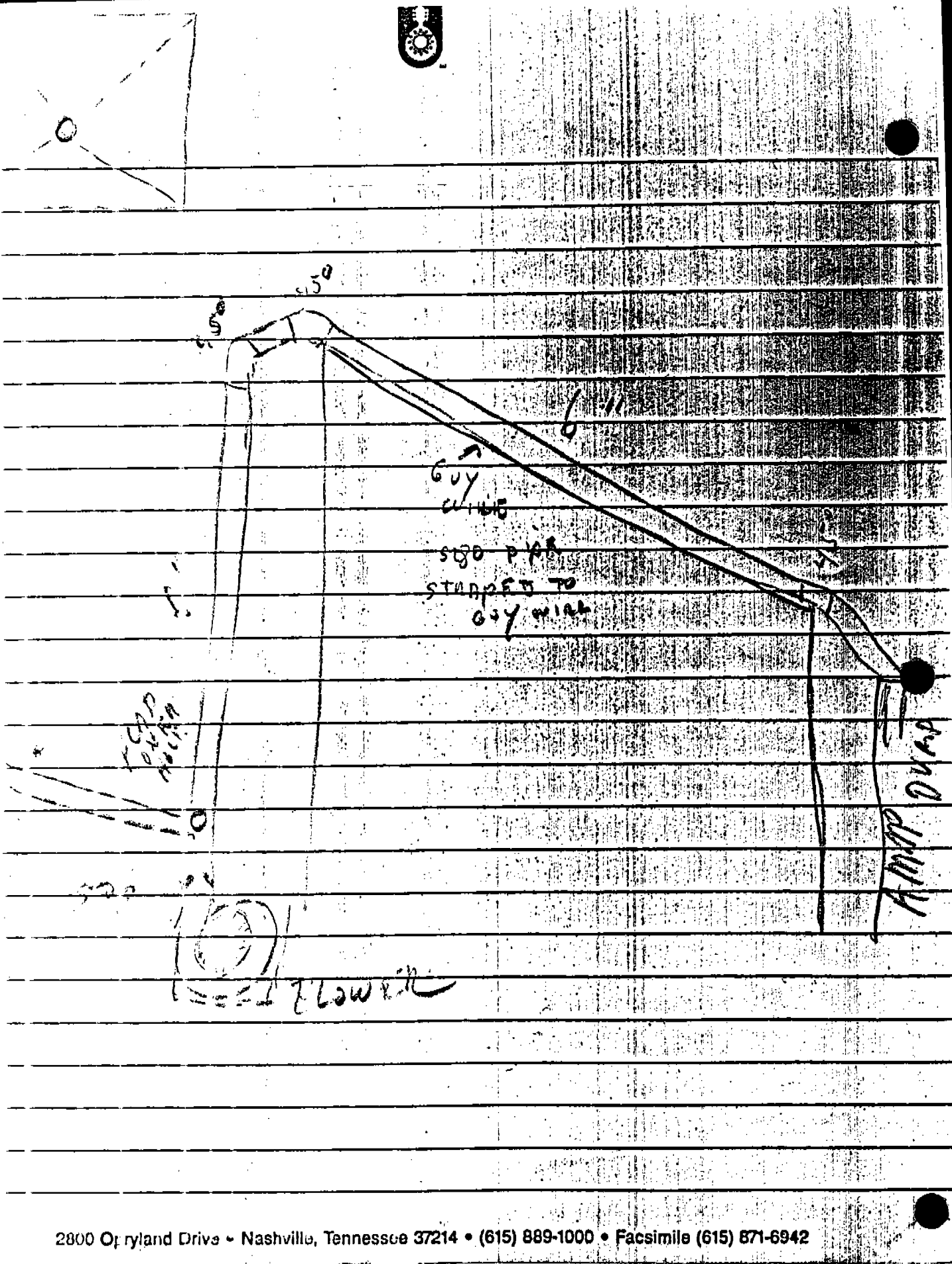
ITEM	USEAGE
Q1	GUN DAMAGE LIGHT SWITCH
Q2	BODY DAMAGE/PARKER VALVE SWITCH
Q3	RETURN TO BASE LIGHT SWITCH
Q4	GUN VALVE SWITCH
Q5	USED ONLY ON BOAT CONTROLLER
RV1	BODY DAMAGE TIMER
RV2	GUN DAMAGE TIMER

ITEM	USEAGE
SW1	GAME RUNNING TIME SWITCH
U1	5-20 SECOND TIMER FOR BODY DAMAGE
U2	5-20 SECOND TIMER FOR GUN DAMAGE
U3	GATING CONTROL
U4	TANK OPERATING TIME SWITCH.

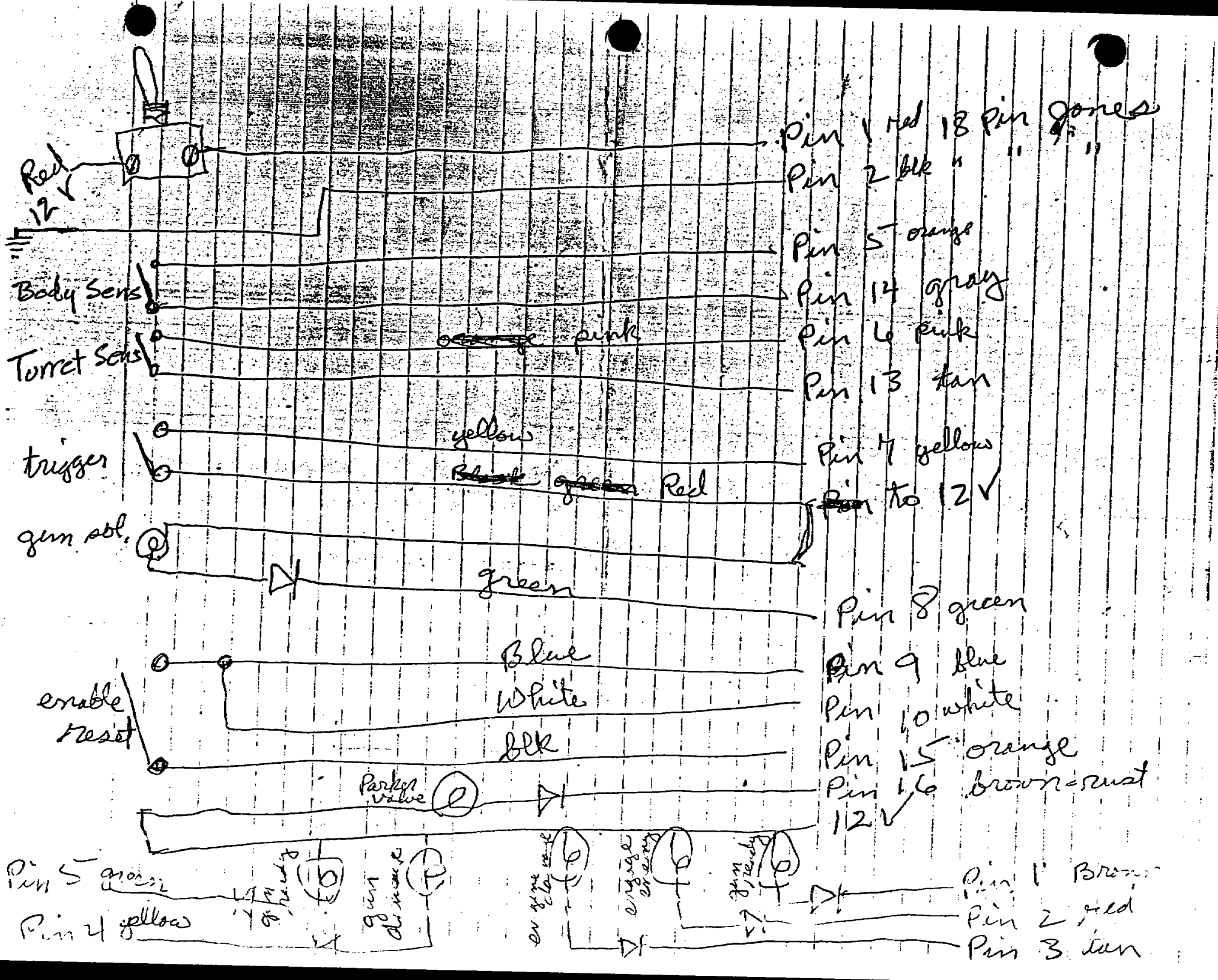


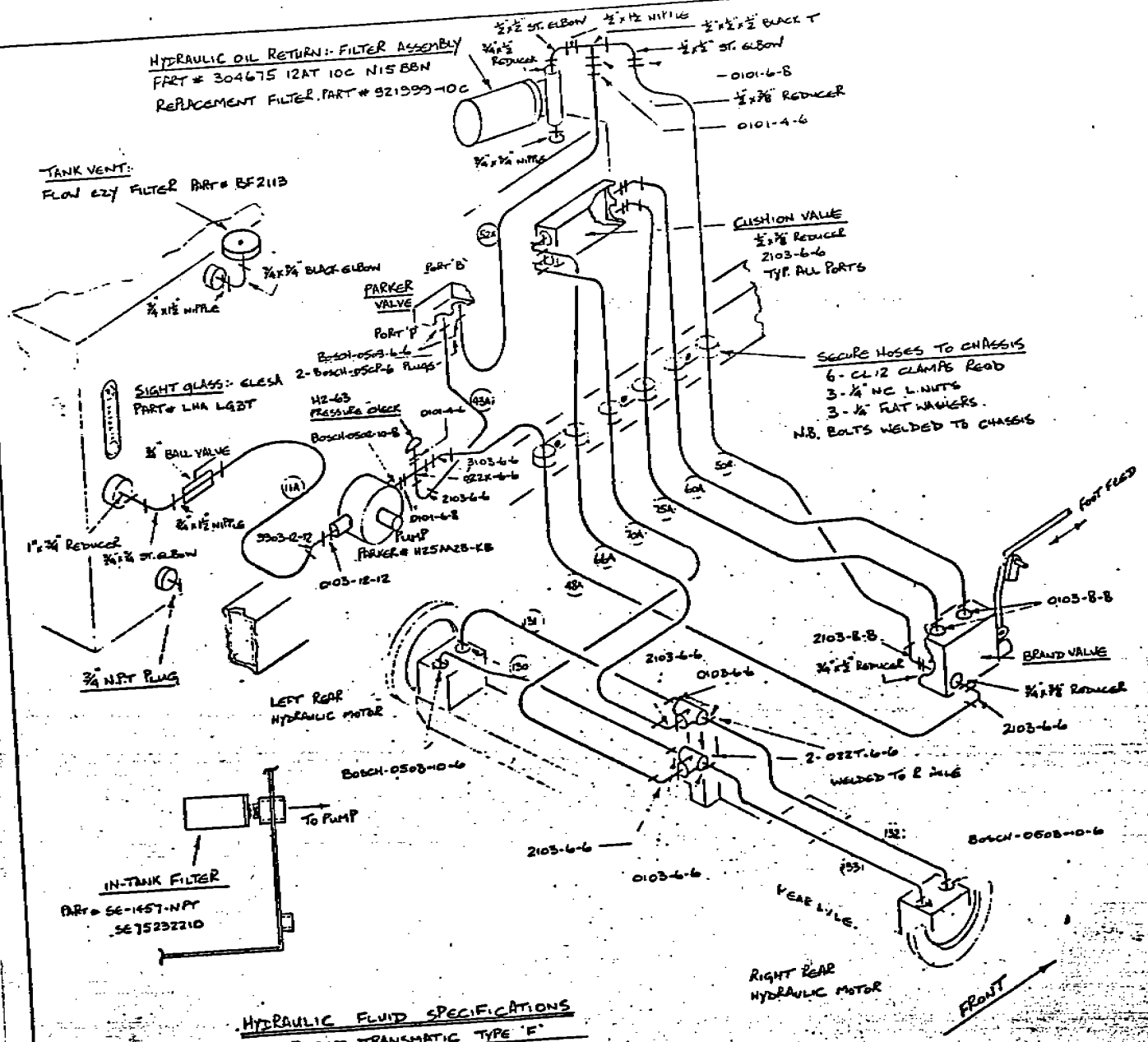
CONTROLLER TECHNICAL 19/5/92. B.W.

R8, R20 - 470K 1/4
R9, R21 - 10MEG. 1/4
R23 - 470HM 1 WATT
VR1, VR2 - 1MEG. POTENTIOMETERS
S1 - 8 POSITION DIP SWITCH



2800 Opryland Drive • Nashville, Tennessee 37214 • (615) 889-1000 • Facsimile (615) 871-6942


Red 12 V
Body Sens
Turret Sens
trigger
gun sol.
enable reset
Pin 1 red 18 pin Jones
Pin 2 blk "
Pin 5 orange
Pin 14 gray
Pin 6 pink
Pin 13 tan
Pin 7 yellow
Pin to 12 V
Pin 8 green
Pin 9 blue
Pin 10 white
Pin 15 orange
Pin 16 brown-rust
12 V
pink
yellow
Red
green
Blue
White
blk
Parker valve
Pin 5 green
Pin 4 yellow
Pin 1 Brown
Pin 2 red
Pin 3 tan



HYDRAULIC FLUID SPECIFICATIONS

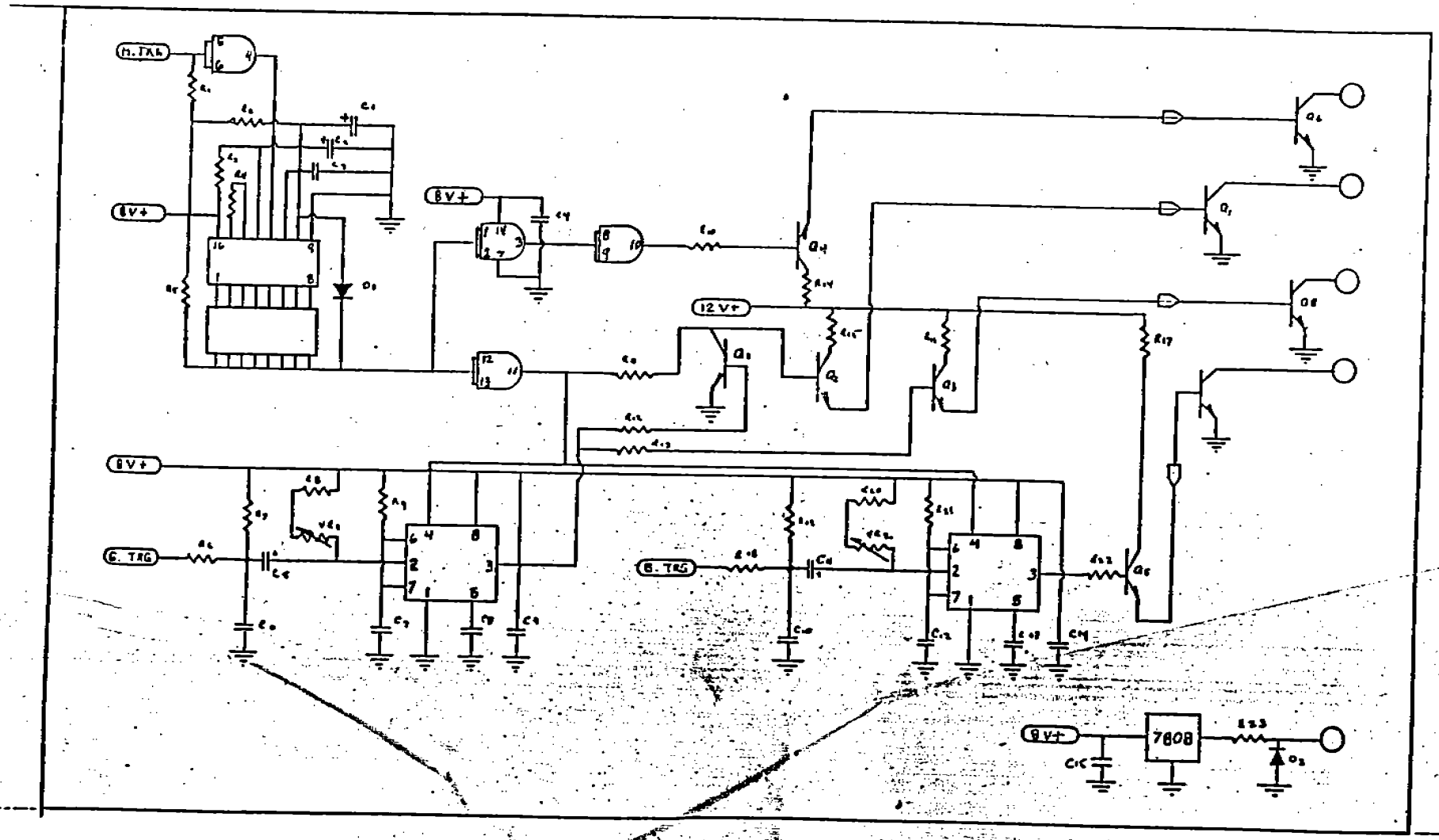
TYPE:- SUNFLEET TRANSMATIC TYPE 'F'

SYSTEM CAPACITY:- 13 IMP. GALLONS

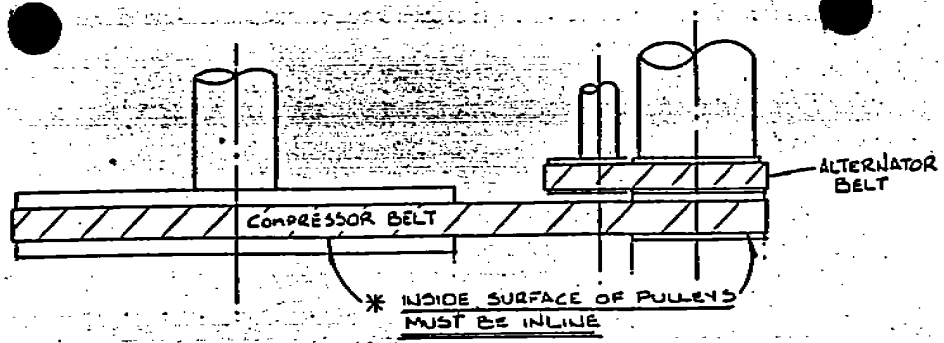
HOSE DETAIL

11A –	TANK TO PUMP		
	24"	# 821-12	
	1	30182-12-12 B	
	1	30682-12-12 B	
43A –	PUMP TO SOLENOID VALVE		
	10"	# 421-6	
	2	10643-6-6	
48A –	PUMP TO MANUAL VALVE INLET		
	37½"	# 421-6	
	2	10643-6-6	
60A –	WORK PORT TO CUSHION VALVE		
	35"	# 421-6	
	2	10643-6-6	
66A –	CUSHION VALVE TO WHEEL MOTOR TEE		
	27"	# 421-6	
	2	10643-6-6	
70A –	SAME AS 66A		
75A –	WORK PORT TO CUSHION VALVE		
	35"	# 421-6	
	2	10643-6-6	
130 –	WHEEL MOTOR TO LOWER TEE		
	13½"	# 421-6	
	1	10643-6-6 & 1	13943-6-6
152 –	SAME AS 130		
131 –	WHEEL MOTOR TO UPPER TEE		
	14½"	# 421-6	
	1	10643-6-6 & 1	13943-6-6
133 –	SAME AS 131		
50R –	MANUAL VALVE TO TANK. 2 30682-8-8-1		
	46"	½" x 1F 200 PSI WP PUSH-LOK HOSE	
52R –	SOLENOID VALVE TO TANK. 2 30682-6-6-		
	24"	⅜" x 1F 200 PSI WP PUSH-LOK HOSE.	

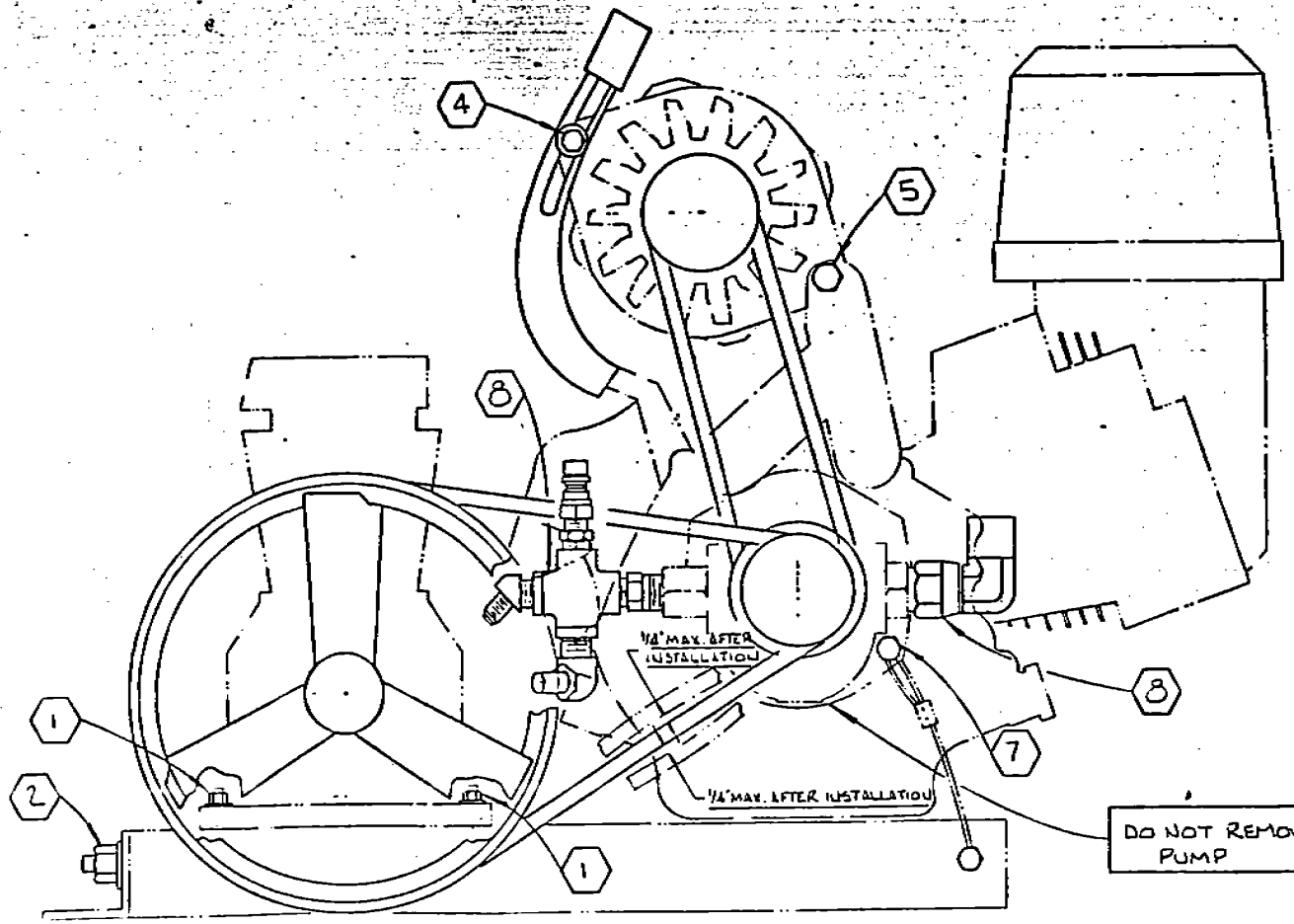
MAVRECS
HYDRAULIC SYSTEM
SCALE:- N.T.S.
APPROVED:-
REVISED:-
DRAWING No.:- MT-06
DRAWN:- GKERSULL FEB 23 1989


H. TRG
8V+
8V+
12V+
8V+
B. TRG
B. TRG
8V+
7808

COMPRESSOR AND ALTERNATOR BELTS INSTALLATION



1. LOOSEN COMPRESSOR HOLD DOWN BOLTS (5/16" BOLT)
2. LOOSEN TIGHTEN ROD (3/8" ROD)
3. REMOVE COMPRESSOR BELT FROM PULLEYS
4. LOOSEN ALTERNATOR BELT (5/16" x 1" BOLT)
5. LOOSEN ALTERNATOR HOLD DOWN BOLT (3/8" x 3 1/2")
6. REMOVE ALTERNATOR BELT FROM PULLEYS
7. REMOVE TORQUE STRAP BOLT 3/8" x 1 1/2")
8. REMOVE DISCHARGE AND SUCKTION FITTINGS
9. REMOVE OLD BELTS COMPRESSOR + ALTERNATOR
10. INSTALL ALTERNATOR BELT FIRST OVER PULLEYS
11. INSTALL COMPRESSOR BELT OVER PULLEYS
12. REPLACE HOSE FITTINGS
13. REPLACE TORQUE STRAP BOLT (3/8" x 1 1/2")
14. TIGHTEN ALTERNATOR BELT AND BOLTS
15. TIGHTEN COMPRESSOR BELT (SEE NOTE *)
16. TIGHTEN COMPRESSOR



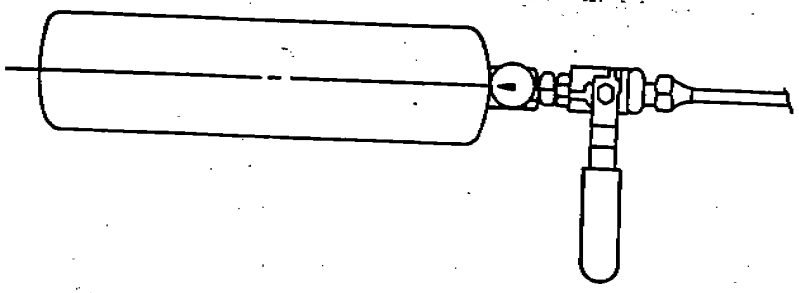
NOTE: USE PAN WHEN REMOVING HYDRAULIC FITTINGS TO CATCH OIL

MAVRECS
COMPRESSOR - ALTERNATOR
BELTS INSTALLATION
SCALE: NTS
APPROVED:
REVISED:
DRAWING NO.
DRAWN

Mounting Instructions for the Shurout Extension Model

1. Fasten vehicle bracket securely to a solid structure.
2. Install Shurout unit in the vehicle bracket with the head down.
3. Connect extension tubing to discharge valve.
4. Uncoil tubing and secure in at least two places.
5. Mount thermal release head in desired location using bracket supplied, and connect tubing. Note: Thermal release head must be securely fastened in place to avoid damage when unit discharges.
6. Connect lever to discharge valve and move counterclockwise to open position. Lever will be in line with unit and valve.
7. Check for leaks in piping connections using a soap and water solution.
8. Remove lever to avoid accidental closing of discharge valve.

CLOSED



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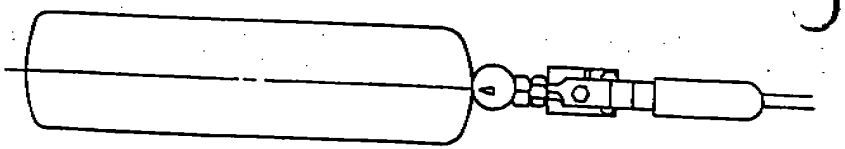


Inspection and Maintenance

It is recommended that inspection and maintenance be conducted in accordance with the following instructions and applicable sections of the National Fire Protection Association pamphlet for Halogenated Extinguishing Agent Systems Halon 1211, NFPA No. 12B.

Monthly inspections should be carried out as follows to ensure that:

1. Pressure is in the operating range.
2. Mounting bolts or screws are securely fastened.
3. Guard is in place over discharge head.
4. Unit is undamaged.

Annual maintenance examinations should be carried out as follows:

1. Examine unit carefully for signs of damage, particularly the discharge head, and replace parts if necessary.
2. Check that the pressure is in operable range of the pressure gauge.
3. Check that the weight of the unit is not below the minimum weight shown on the label.
4. Tighten all mounting bolts or screws.
5. Hydrostatically retest the shell to 3620 KPA (525 PSI) every 12 years.

Recharging Instructions

Recharging of these units should be carried out by an authorized distributor of Flag Fire Equipment Limited extinguishers, using the Halon Recharging Apparatus supplied for this purpose.

1. Remove the wire guard from the sprinkler head.
2. Install a new sprinkler head of the same temperature rating (should a change be desired, Flag Fire Equipment Ltd. or their authorized distributor should be consulted).
3. Place the unit on a scale and connect the recharging adaptor to the Schrader valve.
4. Refill the unit with the amount of Halon 1211 indicated on the label.
5. Pressurize the unit to 690 KPA (100 PSI) with nitrogen.
6. Shake the unit and repressurize until the pressure remains at 690 KPA (100 PSI).
7. Remove the recharging adaptor and replace the cap on the Schrader valve.
8. Replace the wire guard on the sprinkler head.
9. Check the unit for leakage.
10. Reinstall the unit on the mounting flange (Spaceman models) or vehicle bracket (Shurout models).

Hazards and Coverage

The Flag fire extinguisher units are effective in extinguishing fires in specific hazards, equipment, or occupancies where an electrically non-conductive medium is essential or desirable, or where cleanup of other media presents a problem. Some of the typical types of hazards or equipment the units may protect include:

1. Gaseous and liquid flammable material.
2. Electrical hazards such as transformers, oil switches and circuit breakers, and rotating equipment.
3. Engines using gasoline or other flammable fuels.
4. Ordinary combustibles such as paper, wood and textiles.

The following table indicates the maximum enclosure volume and maximum enclosure length which the Model specified will cover with a minimum 5 per cent concentration at 0°C (32°F) and 20°C (70°F). These concentrations are suitable for the extinguishment of fires in most flammable and combustible liquids, gases and small amounts of solid materials. Higher concentrations may be required for certain hazards. These values have been calculated using the data given in the National Fire Protection Association pamphlet for Halon 1211 Systems, NFPA No. 12B, and verified by Underwriters Laboratories of Canada. If higher or lower concentrations are considered Flag Fire Equipment Ltd. should be consulted.

Model	Halon 1211 Capacity Kg (lb)	Max. Volume Protected Cum (Cu Ft)	Max. Enclosure Length M (Ft)	Storage Temperature °C (°F)
HAL-1KG	1 (2.2)	2.4 (86)	2.4 (8)	0 (32)
HAL-1KG	1 (2.2)	2.7 (94)	2.4 (8)	20 (70)
HAL-2KG	2 (4.4)	4.8 (172)	2.4 (8)	0 (32)
HAL-2KG	2 (4.4)	5.3 (187)	2.4 (8)	20 (70)
HAL-3KG	3 (6.6)	7.3 (258)	2.4 (8)	0 (32)
HAL-3KG	3 (6.6)	8.0 (282)	2.4 (8)	20 (70)
HAL-4KG	4 (8.8)	9.7 (344)	2.4 (8)	0 (32)
HAL-4KG	4 (8.8)	10.6 (375)	2.4 (8)	20 (70)
HAL-7KG	7 (15.4)	17.0 (602)	3.7 (12)	0 (32)
HAL-7KG	7 (15.4)	18.6 (656)	3.7 (12)	20 (70)
HAL-9KG	9 (19.8)	22.0 (774)	3.7 (12)	0 (32)
HAL-9KG	9 (19.8)	23.9 (844)	3.7 (12)	20 (70)
HAL-11KG	11 (24.3)	27.0 (946)	3.7 (12)	0 (32)
HAL-11KG	11 (24.3)	29.2 (1031)	3.7 (12)	20 (70)
HAL-13KG	13 (28.7)	32.0 (1110)	3.7 (12)	0 (32)
HAL-13KG	13 (28.7)	34.5 (1219)	3.7 (12)	20 (70)

Installation

Installation and maintenance should be in accordance with the applicable requirements of the National Fire Protection Association Pamphlet for Halogenated Extinguishing Agent Systems Halon 1211, NFPA No. 12B.

Note: The discharge of Halon 1211 may create hazards to personnel such as dizziness, impaired coordination, reduced visibility and exposure to toxic decomposition products. Where there is a possibility that personnel may be trapped in or entered into atmospheres made hazardous by Halon 1211, suitable safeguards must be provided to ensure proper evacuation and prompt rescue of any trapped personnel, and to prevent entry into such atmosphere.

Where possible, the location of the extinguishing unit should be in the centre of the enclosure to be protected. If a specific hazard is to be protected such as an engine, an electrical panel or other device or machinery, the unit should be placed either above or as close as possible to the hazard. However, care should be taken not to install the unit above a high temperature source, such as an exhaust manifold, to avoid false discharge of the unit.

Mounting Instructions for Spaceman Models

1. Locate a solid structural member in the ceiling of the enclosure, such as a beam, or joist, and secure the pipe flange to the member with four bolts or screws.
2. Screw the close nipple into the pipe flange.
3. Screw the unit on to the close nipple tightly with the head down.
4. Check the pressure gauge to ensure the pressure is in the operating range.
5. Ensure that the wire guard is securely in place over the discharge head.

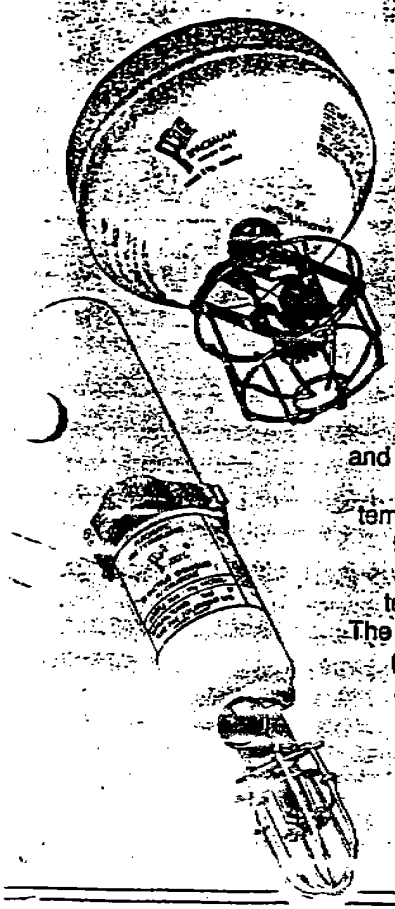
Mounting Instructions for the Shurout Models

1. The Shurout unit, unless specially ordered with a pick up tube, must be mounted with the head down, within 45° of the vertical position.
2. Fasten the vehicle bracket, forks down, to a solid structure, using the screws provided, or suitable nuts and bolts.
3. Install the unit in the bracket and check that the pressure is in the operable range, and that the wire guard is securely in place over the discharge head.

FLAG

Operating and Maintenance Instructions

For Spaceman and Shurout Fire Extinguishers



The Flag automatic fire extinguisher units (Spaceman and Shurout Models) are designed for fixed installation in an enclosed area. The units consist of an extinguishing agent storage cylinder, a charge of Halon 1211 pressurized to approximately 690 KPA (100 PSI), a pressure gauge, a Schrader valve for filling and pressurizing, a valve body, a sprinkler head for automatic discharge at a specific temperature, and a wire guard to protect the sprinkler head. The sprinkler heads are available in temperatures of 57°C (135°F), 68°C (155°F), 93°C (200°F), 141°C (286°F), and 182°C (360°F), depending on ambient room temperature and anticipated fire condition. The duration of discharge of the units at 20°C (70°F) ranges from 3 sec (HAL-1KG) to 10 sec (HAL-13KG) depending on the weight of the agent.

The storage temperature limitations are from 0°C (32°F) to 55°C (130°F).

ULC LISTED

CAUTION

This area is protected with a Flag Halon 1211 Automatic Fire Extinguisher Unit. In the event of fire or accidental discharge, exercise the following precautionary measures:

1. Where possible, call fire department.
2. Avoid exposure to smoke, vapours, or products of decomposition.
3. Ventilate protected area before entry.
4. Adrenalin is contra-indicated in the treatment of over-exposure to Halon 1211 vapour or decomposition products.

WARNING

DO NOT ENTER ROOM WHILE HALON 1211 IS BEING RELEASED.

ATTENTION

Ces lieux sont protégés par un extincteur chimique automatique Halon 1211 de Flag. Dans l'éventualité d'une incendie, prenez les précautions suivantes:

1. Là où il est possible, appelez le poste d'incendie.
2. Évitez l'exposition à la fumée, aux vapeurs ou aux produits de décomposition.
3. Aérez les lieux protégés avant d'entrer.
4. L'adrénaline est contre-indiquée dans le traitement d'une exposition excessive aux vapeurs du Halon 1211 ou aux produits de décomposition.

AVERTISSEMENT

INTERDICTION D'ENTRER DANS UNE PIÈCE PENDANT LA DÉCHARGE DU HALON 1211.

SN 5000

SH5000

Marine Products

Manufactured by
Teleflex Inc. U.S.A.
640 North Lewis Road
Limerick, PA 19468 (USA)
215/495-7011

BIG-T HELM INSTRUCTIONS

INSTALLER: THESE INSTRUCTIONS CONTAIN IMPORTANT SAFETY INFORMATION AND MUST BE FORWARDED TO THE BOAT OWNER.

FOLLOWING ARE INSTRUCTIONS FOR INSTALLING A STEERING CABLE ASSEMBLY (MFD. BY TELEFLEX, INCORPORATED, U.S.A.) INTO A BIG-T HELM. INSTRUCTIONS FOR MOUNTING THE HELM ARE GIVEN IN THE APPROPRIATE BEZEL KIT (SEE CATALOG).

CAUTION

READ THESE INSTRUCTIONS THOROUGHLY BEFORE PROCEEDING WITH INSTALLATION. CHECK CONTENTS OF KIT AGAINST PARTS LIST ON THIS INSTRUCTION SHEET. PARTS SUPPLIED MUST BE USED PER INSTRUCTION. THE COMPANY CANNOT ACCEPT RESPONSIBILITY FOR THE INTEGRITY OF INSTALLATIONS IN WHICH SUBSTITUTE PARTS ARE USED.

NOTE: BOTH HELM AND CABLE ASSEMBLIES AS SUPPLIED ARE PROPERLY LUBRICATED AND READY FOR INSTALLATION. UNDER NO CIRCUMSTANCES SHOULD ADDITIONAL LUBRICANT BE APPLIED TO EITHER HELM OR CABLE ASSEMBLY. USE OF OTHER LUBRICANTS CAN DAMAGE CABLE CONDUIT LINER, RESULTING IN PREMATURE WEAR OF THE STEERING SYSTEM. MAXIMUM CLEANLINESS MUST BE MAINTAINED DURING INSTALLATION OF CABLE ASSEMBLY TO HELM. THE ENTRY OF FOREIGN MATTER MAY DAMAGE THE STEERING SYSTEM OR CAUSE PREMATURE WEAR. DO NOT REMOVE THE PLASTIC PROTECTIVE SLEEVE FROM THE CABLE END UNTIL READY TO INSTALL INTO HELM.

CABLE DRESS

When routing the steering cable aft, select a path with minimum bends and as gradual as possible. Sharp or frequent bends will result in hard steering and premature cable wear. A MINIMUM BEND RADIUS OF 8" (203 mm) MUST BE MAINTAINED. When it is necessary to pass the cable through a bulkhead, a 1-1/2" (38 mm) diameter hole is required. *Cable conduit must not rest on sharp edges which can cause chafing.* Cable should be clamped or tied for support at regular intervals. WARNING: CABLE MUST NOT BE BUNDLED TOGETHER WITH ELECTRICAL WIRING.

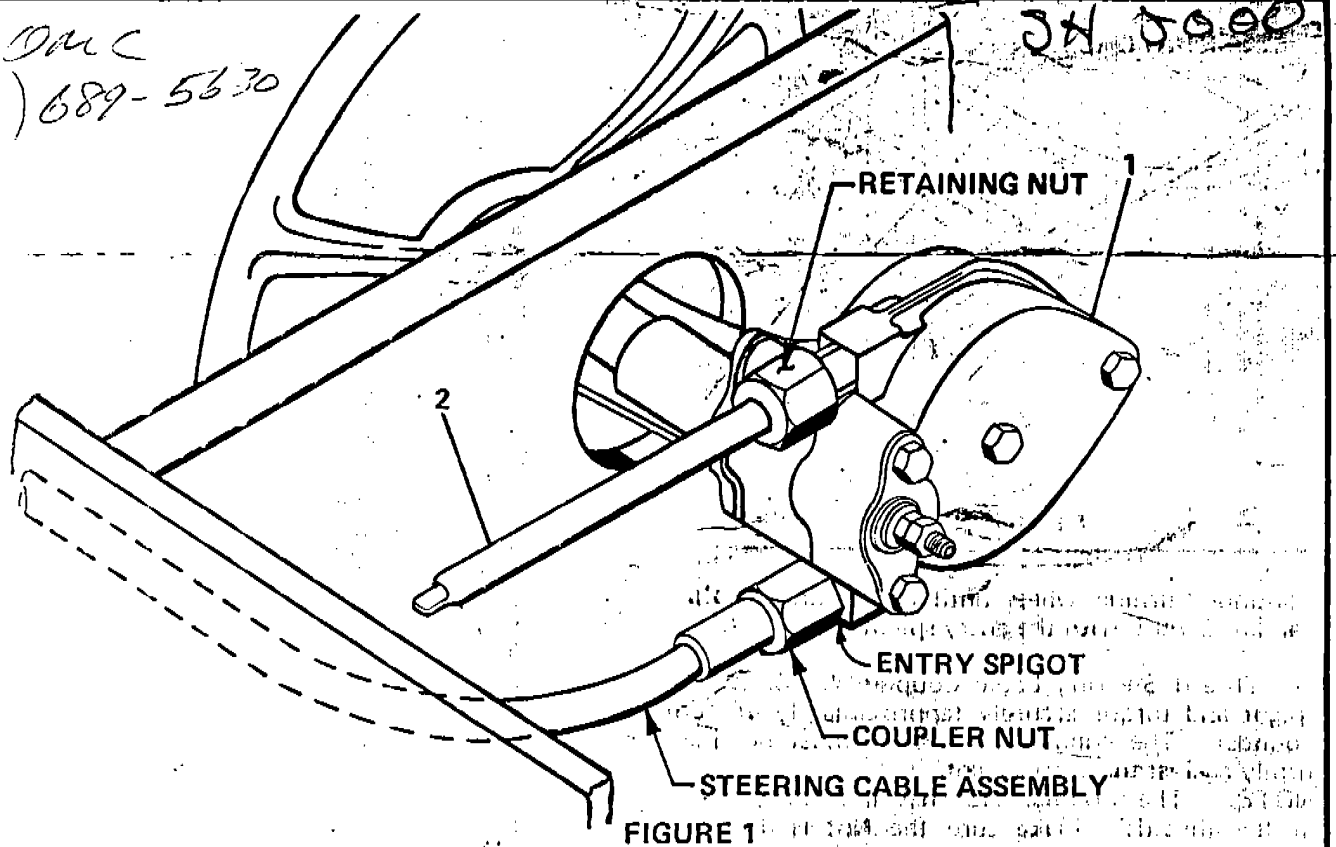


FIGURE 1

TEERING CABLE INSTALLATION

Re ove protective sleeve from Steering Cable, sposi lubricated cable end. Do not allow the id t come in contact with surfaces which may ontan nate it.

. Fe l end into Helm entry spigot while rotating teeri wheel (See Figure 1). For Starboard noun l Helms, rotate wheel to Port (counter-lock se).
For Po t mounted Helms, rotate wheel to Starboard clock se).

NOTE: If boat is equipped with 1979 or 1980 Model ONLY OMC sterndrive engine with power assist steering the cable must be fed into the opposite entry spigot of the helm (See Figure 2). 1981 Models will be tagged by the manufacturer stating that this reverse procedure is no longer required. Rotate wheel starboard for starboard mount, port for port mount to draw cable end into entry spigot. Continue turning wheel until end fitting of Cable conduit is flush with the entry spigot.

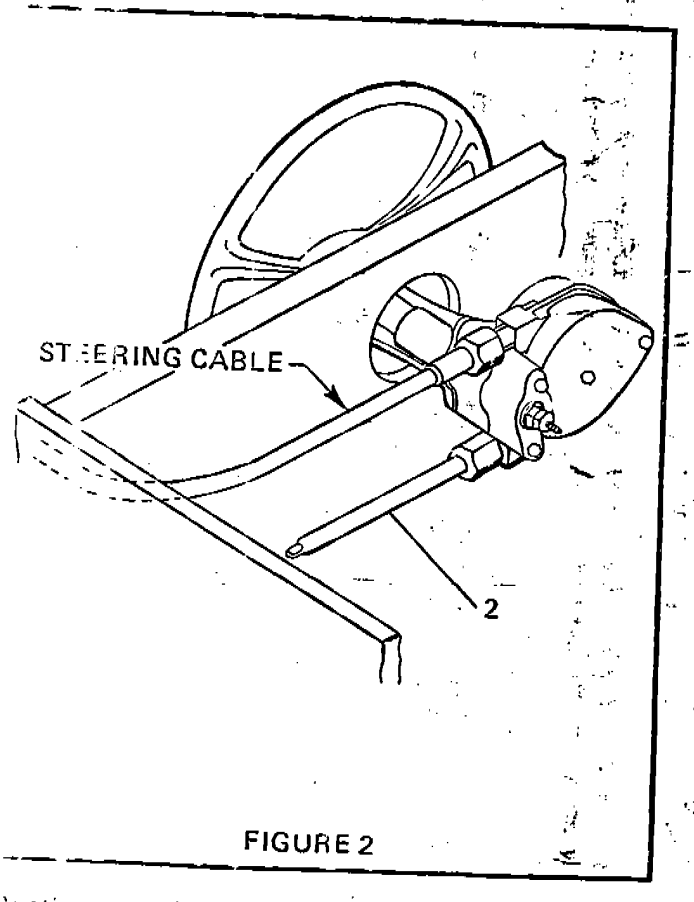


FIGURE 2

Continue turning wheel until end fitting of Cable conduit is flush with the entry spigot.

. Thread Steering Cable Coupler Nut onto entry spigot and torque securely (approximately 15 foot/pounds). The conduit end fitting must be drawn firmly against the entry spigot.
NOTE: The Coupler Nut has a locking feature in the threads. Make sure the Nut is drawn up fully and the locking feature is engaged.

4. Feed Spent Travel Tube (Item 2) over exposed cable and thread Retaining Nut onto spigot. Tighten nut hand tight.

5. Rotate steering wheel several times from stop to stop, observing movement of the Steering Cable output ram.
On Starboard mounted helms turning the wheel clockwise should cause the ram to extend.
On Port mounted helms turning the wheel clockwise should cause the ram to retract.

NOTE: On 1979 and 1980 Model OMC sterndrive engines with power assist steering the opposite will be true, because the cable entry was reversed.

For boat-mounted steering systems, attach cable to boat and engine in accordance with instructions furnished with connection kits.

For engine-mounted steering systems, slide telescopic through engine support tube. Thread cable coupler nut fully onto support tube. **MAKE SURE THAT LOCKING FEATURE IN COUPLER NUT THREADS IS FULLY ENGAGED.** Connect cable telescopic to engine tiller arm in accordance with instructions furnished with connection kit.

PARTS LIST		
Item	Description	Quan.
1	Helm Assembly	1
2	Spent Travel Tube	1

MAINTENANCE NOTES

1. AFTER A FEW HOURS OF OPERATION FOLLOWING INSTALLATION OF THIS KIT AND PERIODICALLY THEREAFTER, RETORQUE ALL FASTENERS AND CHECK THE STEERING SYSTEM FOR SECURITY AND INTEGRITY. LOOSENING OR SEPARATION OF ONE OR MORE FASTENERS MAY CAUSE FAILURE OF THE STEERING SYSTEM, RESULTING IN PROPERTY DAMAGE AND PERSONAL INJURY.

2. KEEP ALL MOVING PARTS FREE OF SALT BUILD-UP OR OTHER FOREIGN MATTER WHICH MIGHT AFFECT THEIR OPERATION.

3. INSPECT PERIODICALLY FOR CORROSION. ALL METAL PARTS MEET OR EXCEED APPLICABLE SPECIFICATIONS FOR CORROSION RESISTANCE; HOWEVER, WITH EXTENDED OPERATION UNDER EXTREME CONDITIONS CORROSION MAY OCCUR AND AFFECTED PARTS SHOULD BE REPLACED.

B.I.A. WHEEL RATING FOR THIS HELM:
MAXIMUM DIAMETER WHEEL - 20" (508mm)
MAXIMUM DISH WHEEL - 6" (152mm)

OPERATING INSTRUCTIONS & PARTS MANUAL

SPEEDAIRE SINGLE STAGE COMPRESSOR PUMPS

MODELS 2Z498A, 2Z499B & 2Z630B

04041

0589/189 VP

READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, OPERATE OR SERVICE SPEEDAIRE AIR COMPRESSOR PUMPS. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE!
RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

Description

Speedaire compressor pumps are an integral part of the air compressor system. They are equipped with cast-iron block and crankcase, aluminum head, Swedish steel reed valves, needle roller bearing, splash lubrication and fan-type flywheel.

Unpacking

When unpacking the unit, inspect carefully for any damage that may have occurred during transit. Make sure that any loose fittings, bolts, etc., are tightened before initial start-up.

DANGER!

This compressor/pump is not equipped and should not be used "as is" to supply breathing quality air. For any application of air for human consumption, the air compressor/pump will need to be fitted with suitable in-line safety and alarm equipment. This additional equipment is necessary to properly filter and purify the air to meet minimal specifications for Grade D breathing as described in Compressed Gas Association Commodity Specification G 7.1 – 1966, OSHA 29 CFR 1910.134, and/or Canadian Standards Association (CSA).

DISCLAIMER OF WARRANTIES

In the event the compressor is used for the purpose of breathing air application and proper in-line safety and alarm equipment is not simultaneously used, existing warranties shall be voided, and Dayton Electric Mfg. Co. disclaims any liability whatsoever for any loss, personal injury or damage.

Specifications

MODEL	BORE & STROKE	DISCHARGE PIPE SIZE	CYL.	WEIGHT	MAX. PSI*	H	W	D	MTG. HOLES CENTER TO CENTER
2Z498A	2¾" 1½"	3/8"	1	23	150	9½"	8¼"	5¾"	5⅛ x 3⅜"
2Z499B	2¾ 2	3/8	2	38	150	11	11	6⅝	6⁹⁄₁₆ x 5⅞
2Z630B	3 2	3/8	2	40	125	11	11	6⅝	6⁹⁄₁₆ x 5⅞

(*) Intermittent duty.

Performance

SI	SYSTEM SPECIFICATIONS	2Z498A			2Z499B			2Z630B
		1/3 HP	1/2 HP	3/4 HP	1 HP	1½ HP	2 HP	3 HP
100	Pump RPM	575	690	740	400	560	735	850
	Motor pulley size*	3⅛"	3½"	3¾"	2⅝"	3¼"	4¼"	4¾"
	Displacement (cfm)	2.95	3.55	3.80	5.50	7.70	10.8	13.9
	Delivery (free air cfm)	1.50	1.80	2.00	3.10	4.40	5.70	8.10
25‡	Pump RPM	530	640	715	385	535	715	850
	Motor pulley size*	2⅞"	3¼"	3⅝"	2½"	3⅛"	4⅛"	4¾"
	Displacement (cfm)	2.75	3.30	3.70	5.25	7.35	9.80	13.9
	Delivery (free air cfm)	1.25	1.50	1.70	2.80	3.90	5.20	7.30
150‡	Pump RPM	490	590	690	370	520	690	—
	Motor pulley size*	2¾"	3"	3½"	2⅜"	3"	4"	—
	Displacement (cfm)	2.50	3.05	3.55	5.10	7.15	9.50	—
	Delivery (free air cfm)	1.60	1.20	1.50	2.50	3.40	4.50	—

(‡) Intermittent duty at 125 and 150 PSI.
(*) Based on 1725 electric motor. Pulley sizes in outside diameters.

HAYDEN INC.

INSTALLATION INSTRUCTIONS
10", 12", 14" ELECTRIC FANS

READ THE ENTIRE INSTRUCTION SHEET BEFORE YOU START.

I. REMOVE BELT DRIVEN FAN (only if fans are used for primary cooling)

1. Remove belt driven fan (and fan clutch) assembly and fan shroud, if possible.
2. Replace the pulley. Take care to use washers. It may be necessary to use shorter bolts to clear the water pump housing.

II. ASSEMBLY OF MOTOR AND BRACKET

1. **Rear Mounting - Puller Fan** (Engine Side of Radiator)
   A. Place motor inside fan bracket. (Fig. 1)
   B. Place flat washers on bolts and insert through bracket and motor. (Fig. 2)
   C. Tighten nuts to 4 ft-lbs torque.

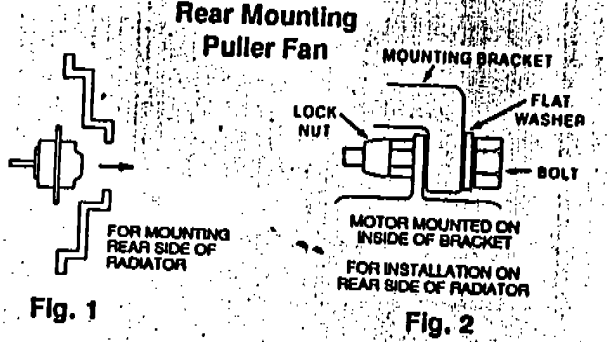


Fig. 1 Fig. 2

2. **Front Mounting - Pusher Fan**
   (Radiator or Air Conditioner Condenser)
   A. Place motor on outside of bracket. (Fig. 3)
   B. Insert bolts through motor and fan bracket.
   C. Install flat washers and nuts on bolts. Tighten to 4 ft-lbs. (Fig. 4)

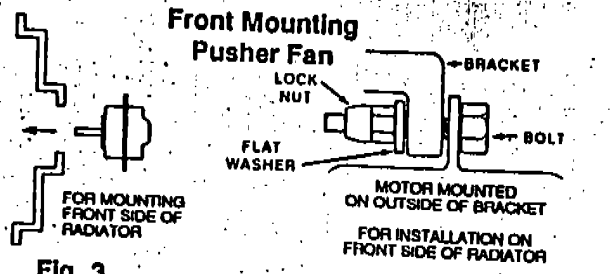


Fig. 3 Fig. 4

III. INSTALLATION OF FAN BLADE AND FASTENER

NOTE: Flat side of fan blade with Hayden logo will always face the front of vehicle.

1. **Rear Mounting - Puller Fan** - With flat side facing away from fan motor, align groove in fan blade center with the roll pin in the motor shaft. (Fig. 5)

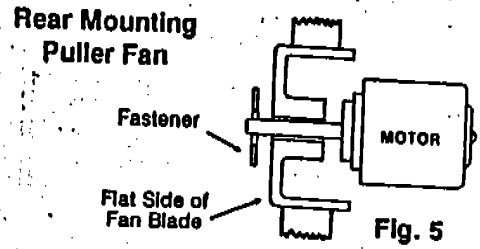


Fig. 5

2. **Front Mounting - Pusher Fan** - With flat side facing toward fan motor, align groove in fan blade center with roll pin in the motor shaft. (Fig. 6)

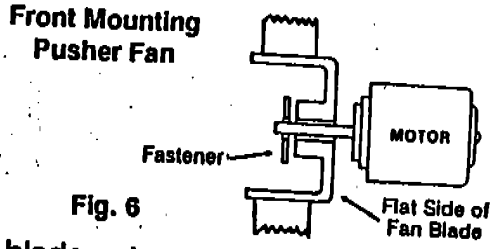


Fig. 6

3. Carefully press fan blade onto motor. **CAUTION:** Do not force blade onto motor. Motor damage may result. If blade does not slide on easily, apply light coating of oil to motor shaft. **NOTE:** Two types of fasteners are used to hold the fan blade to the motor. Your kit is equipped with one or the other.