

Flexible Hydraulic Hose

This system conveys the hydraulic oil from the HPU to the Barrier through flexible hose(s) which in turn are run through a larger conduit, generally a 3 inch [75 mm] PVC tube per hose pair. The PVC conduit should be run to the Barriers in as direct a line as possible, all bends being a radius of at least 6 diameters of the conduit. The burial depth of the conduit should be deeper than the maximum permafrost level in areas subject to freeze. This will prevent excessive pressure drops in the hoses due to high viscosity from the cold. As the hose length changes under pressure, always provide some slack in the hose to allow for shrinkage or expansion.

All joints in the conduit system should be smooth and free from sharp edges and burrs to prevent scoring the hose outer sheathing during pulling and Barrier operation. A hose under pressure is very rigid and tends to bounce when the directional valves are shifted. Sharp edges will quickly cause a hose failure. Where the hose can not be clamped or fixed away from abrasive surfaces, a steel or plastic protective coil or sleeve should be placed over the hose.

Insulate the hose with a heat resistant boot, fire-sleeve or a metal baffle if the hose run passes near an exhaust manifold or other heat source.

Hoses received from the factory have caps on each end and are free from dirt and other contamination. Do not remove caps until hoses are pulled through the conduit and are ready for termination. If caps are not present, reclean the hoses by blowing out with clean compressed air. As an alternate, hose assemblies may be rinsed out with clean mineral spirits, being sure to flow the mineral spirits through from top to bottom without forming any low points which will tend to collect debris.

Before attempting to pull hoses through the conduit first inspect them. Lay the hose out straight and check that the layline of the assembly is not twisted. (Hoses pulled with a twist in them will tend to straighten, causing fitting nuts to loosen.) Check for scoring, cracks, bulging, kinks and dirt in the outer sheath. Check for proper gap between nut and socket or hex and socket; nuts should swivel freely. Be sure hose is capped securely.

If the hose must be stored for a prolonged period prior to installation it should be kept in a dark, dry atmosphere away from electrical equipment. The temperature should not exceed 90°F [32°C]. Storage in straight lengths is preferred. While stored, the hose should be wrapped as necessary with burlap or other suitable material to prevent damage. Hoses should be inspected regularly when in operation, especially where the hose exits the conduit at the power unit and the Barrier. Worn or damaged hose assemblies should be replaced immediately.

Note: Hoses supplied by Delta Scientific are generally supplied in lengths of 50 feet [15 M]. This is adequate for the majority of installations, however, there is generally some left over length. Coil the hose neatly in a circle approximately 20 inches [0.5 M] in diameter at the HPU. Secure the coil with loosely fitting cable ties or similar tying system. Do not allow the hose to rest on the ground or across sharp corners of equipment. If the hose is too short, extension pieces of the correct length can be ordered. As an alternate, hoses can be held back from your shipment and made to exact requirements when the length is determined if desired.

Special field assembly type fittings may be supplied to allow the factory length hoses to be cut and re-terminated to the exact length in the field without the use of special tools.

Steel Pipe Interconnect System

As an alternate to the flexible hose system, steel pipe may be used for the run from the HPU to the Barrier. The same comments above about short, direct runs to the Barrier(s) apply. Typically the pipe run is made up above grade and dropped into a trench for direct burial (below frost level if applicable). If local conditions dictate, the outer portion of the pipe and fittings can be corrosion protected by coating or tape wrapping if desired. Short lengths of hose, typically 3 feet [1 M] long, can be supplied to attach the HPU and Barrier to the pipe system. Or the piping can be plumbed directly to the fittings on HPU or Barrier (for this a union will be required).

The pipe used should be ASTM A-106B seamless (carbon steel) as a minimum. Care should be taken when selecting wall thickness Vs pipe diameter for the system design pressure (Delta can be consulted for proper line sizing, strength calculations and material selection).

Fittings for the pipe run should be forged steel, ASTM A-105 or equal. Malleable iron is not acceptable. All pipe and fittings are to be furnished black, i.e., no galvanizing is permitted; the galvanize can flake off and block or damage hydraulic components.

If desired, stainless steel pipe and fittings can be used, however, do not mix stainless steel pipe with carbon steel fittings or vis-a-vis severe corrosion of the carbon steel components could result. Copper and copper bearing alloys are generally unsuitable for hydraulic oil systems and should be avoided when possible.

Fittings

A variety of fittings are used on a Delta Barrier system; an understanding of how each style seals is important so that leak free operation can be maintained.

Pipe threads are of American National Taper Pipe Thread pattern. As the name implies they seal when the threads pull the tapers together to form a tight joint. These threaded fittings are the only style used by Delta on which Teflon tape or pipe dope may be used. Great care should be taken that pieces of tape or liquid sealant do not end up in the part being sealed as they will eventually find their way into valve seats or other critical parts. Start wrapping the tape one or two threads back from the front of the male fitting and only one or two times around is sufficient. More than twice around is detrimental to a tight joint. Fittings should be brought up snug but not too tight or the female part can be distorted. If orientation of the part is critical, stop on your mark as the part is getting snug instead of trying to force the fitting another complete turn.

SAE (Society of Automotive Engineers) straight threads are used on several fittings where the connection orientation is critical. The male fitting is oriented and a locking nut with washer and O-ring is tightened against the female part. Again, do not over tighten or distortion can occur.

The remaining fittings are SAE 37 degree flare fittings. These have a male nipple to which a compatible female hose or tube/nut can be attached. Most plumbing on the HPU is done with steel hydraulic tubing held to the SAE 37 degree male flare nipple with a ferrule and nut. The tube is not
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flared but cut square and deburred. The sealing pressure comes from the nut forcing the ferrule down onto the tube. These fittings can be broken and remade if necessary. Again snug is preferred to overtightened.

Most hoses supplied by Delta are terminated with SAE 37 degree female swivel ends. As the nut swivels on the hose, unions are not necessary. These screw directly onto a companion SAE 37 degree male nipple. To avoid confusion as to a fitting size, use the following table should ordering be necessary:

<u>JIC Size</u>	<u>Hose I.D.</u>	<u>Steel Tube OD</u>	<u>Thread</u>
JIC02	1/8"	1/8"	5/16-24
JIC04	1/4"	1/4"	7/16-20
JIC06	3/8"	3/8"	9/16-18
JIC08	1/2"	1/2"	3/4-16
JIC12	3/4"	3/4"	1-1/16-12
JIC16	1"	1"	1-5/16-12

Note: To repeat, do not use Teflon tape or pipe dope on any straight thread fitting. Only taper pipe threads are to be so sealed.

Cylinders

The Barriers are moved by double acting hydraulic cylinders. These are specified by the bore diameter and length of stroke, such as 2.5" by 8". When the Barrier is commanded to rise, oil is forced into the bottom or 'cap' end of the cylinder, extending the cylinder rod out of the body. The rod end of the cylinder terminates in a clevis and the clevis pin pushes against the Barrier to move it in the up position. When lowering, the cylinder rod retracts into the cylinder body as the oil flows out of the cap end. These heavy Barriers operate single acting. That is, the rod end of the cylinder is allowed to breath air, gravity alone forcing the oil out of the cap end (single acting). The rod end breather plumbed back to a dry location (usually the reservoir tank top) to prevent water from being sucked into the breather fitting.

The cylinders are pre-plumbed to 'headers' at the Delta factory. The headers terminate in the Barrier access area where the customer ties the Barrier to whatever interconnect system is selected. The connection fittings are color coded as noted above in the Interconnection Convention paragraph.

Interconnect Convention

So that the Barrier rises when the 'Raise' button is pressed it is necessary to coordinate the interconnect lines with the proper HPU and Barrier connections. The following convention has been established by Delta:

<u>Color Tab</u>	<u>HPU Port</u>	<u>Barrier Cylinder</u>	<u>Function</u>
Red	'B'	Cap (Bottom) End	UP
Yellow	TANK TOP VENT	Rod (Top) End	VENT

Hydraulic Oil

The hydraulic oil selected for the Barrier system is one of the most critical decisions to be made on your installation. The properties of the oil will affect the as new performance of the Barriers as well as the performance in years to come. Delta recommends the use of high grade, inhibited petroleum hydraulic oils for use in its' systems. These oils inhibit or prevent rust, oxidation, foaming and wear. They are readily available just about everywhere in the world.

A viscosity compatible to the expected ambient temperature of the job site should be used. A heavy oil used in snow conditions will tend to slow the Barrier response time down, while light grade oils in desert conditions may not provide lubricity necessary to prevent component wear. Most brands of oils are manufactured in different grades for this purpose.

If required, the new fire-resistant or environmentally friendly fluids can be selected, please consult your fluid dealer for correct selection.

Delta does not recommend the general use of automatic transmission fluid in our systems. While compatible with the seal materials used in all the system components, ATF does not have sufficient viscosity at moderate temperatures and it is generally more expensive than the specially formulated general purpose hydraulic oils. **Under no circumstances** should brake fluid be used. It is not compatible with the seals and will swell and degrade them.

Note: The unit as received from the factory has been tested with Shell Oil Company 'Tellus' 46. Although the unit has been drained after test approximately 1 inch [25 mm] of fluid remains in the reservoir bottom. The hydraulic oils in the following tables should be compatible with this fluid.

Biodegradable Oils

Environmentally friendly oils are also acceptable for use in these systems. These fluids are generally based on naturally occurring vegetable oils and are biodegradable by naturally occurring organisms when spilled or leaked in relatively small quantities. Larger spills will still need to be handled similarly to currently accepted methods for conventional mineral oil spills.

Contamination of these oils by other fluids may change the biodegradability, toxicity, or other performance characteristics. Systems should be cleaned as thoroughly as possible before introducing a biodegradable fluid.

Delta has reviewed the data on biodegradable oils manufactured by both Mobil and Texaco. These are summarized below. Other manufacturers' products are acceptable if equal to the performance of these oils or the standard mineral oils listed in the following pages. Consult your local fluid dealer for his recommendation.

Mobil Oil Corporation

Light	EAL 224H
Medium	EAL 224H

Texaco Lubricants Company

Code 1607 Biostar Hydraulic 32
Code 1616 Biostar Hydraulic 46

Commercial Hydraulic Oil Interchangeability Chart

	<u>AMOCO Oil Co.</u> <u>(Std. Oil Co)</u>	<u>AMSOIL</u>	<u>Ashland Oil Co.</u> <u>Valvoline Oil Co.</u>
*			
Light	Rycon Oil #15	AWH ISO 32	AW Oil #15
Medium	Rycon Oil #21	AWI ISO 46	AW Oil #20
Heavy	Rycon Oil #31	AWJ ISO 68	AW Oil #30
	<u>Atlantic Richfield</u> <u>(ARCO)</u>	<u>Chevron USA Inc.</u>	<u>Continental Oil Co</u>
*			
Light	Duro AW S-150	EP Hyd Oil 32	Super Hyd 15
Medium	Duro AW S-215	EP Hyd Oil 46	Super Hyd 21
Heavy	Duro AW S-315	EP Hyd Oil 68	Super Hyd 31
	<u>Exxon USA Inc.</u>	<u>Getty Refining</u>	<u>Gulf Oil Co.</u>
Light	Nuto H 32	Veedol Aturbrio AW 150	Harmony 43 AW
Medium	Nuto H 46	Veedol Aturbrio AW 58	Harmony 48 AW
Heavy	Nuto H 68	Veedol Aturbrio AW 61	Harmony 54 AW
	<u>Mobil Oil Corp.</u>	<u>Phillips Petroleum</u>	<u>Pennzoil Co.</u>
Light	DTE 24	Magnus A 150	Hyd & GP Oil #1
Medium	DTE 25	Magnus A 215	Hyd & GP Oil #2
Heavy	DTE 26	Magnus A 315	Hyd & GP Oil #3
	<u>Shell Oil Company</u>	<u>Std Oil Co of Ohio</u>	<u>Texaco, Inc.</u>
Light	Tellus 32	Industron 44	Rando Oil HD 32
Medium	Tellus 46	Industron 48	Rando Oil HD 46
Heavy	Tellus 68	Industron 53	Rando Oil HD 68
	<u>Union Carbide Corp</u>		
Light	**		
Medium	UCON Hyd Fluid WS34		
Heavy	**		

* Light oils are for cooler climates; medium for temperate zones; heavy for tropical or desert areas.

** No recommendation



**START UP PROCEDURE
VEHICLE ARREST SYSTEM**

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MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

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START UP
PROCEDURE

START UP INSTRUCTIONS PHALANX MODEL BARRIERS WITH DELTA PUMPS

Safety Precautions

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barrier when the power is on. Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise. After work is complete, do not allow traffic over the Barrier until all control and safety functions have been verified to be properly working.

YOUR SPECIAL ATTENTION IS CALLED TO THE FOLLOWING:

Special Safety Considerations

Delta Barrier Systems are designed to deter, and as necessary stop unauthorized vehicle traffic by inserting a nearly immovable obstacle in a roadway. During normal servicing, maintenance and testing work, every effort must be made to protect pedestrian and vehicle traffic from entering traffic lanes where work is underway.

During work on either the Barrier(s), the control circuit, control logic, power unit, power feed or the control panel(s); traffic across or near the Barrier(s) should either be stopped or directed into a safe passage.

Prior to starting, restarting or restoring power to a Barrier system all remote input devices such as radio links, card readers, remote control panels, etc. should be checked to insure that they are properly set or are inactive. This is important to insure that a signal directing the Barrier to change status is not unexpectedly received at the time when the power is restored.

Note that any device (supplied by Delta or others) that produces a contact closure to change the Barrier direction must be checked to verify that stray signals or voltages cannot cause that device to produce a false signal.

When a Barrier is powered up, whether at start-up, following a power outage or following the completion of service or maintenance work, these same precautions should be taken.

Consult the other sections of this manual for additional safety and security instructions and warnings.

System Configuration

Depending on the threat analysis and the specific layout of an installation site, Barrier systems can be configured to react differently to a variety of input signals or events. The selection of components and the configuration to meet these requirements are usually incorporated in the system at the time of manufacture. However some changes can be made in the field or by changing the nature of supplied input.

Default Status Quo

In most locations, security considerations are such that a Barrier system can be configured to 'default status quo', that is the Barrier will not change status following a power outage or interruption. If a Barrier system so configured is in the open position when power is applied at initial start-up, following service or in the event of a local power outage, the Barrier will remain in the open position as when the power was removed or interrupted. Or if the Barrier is in the guard position it will return to the guard position upon resumption of power. An exception to this is the special situation as defined below in the 'power off' section.

Default Secure

In certain high security areas Barrier systems may be configured so as to default to the Secure Status when power is applied to a system, whether following the system having been turned off or after unexpected power interruption. Thus a system on stand-by automatically goes to the guard position when the power is applied. That is, should the power be interrupted and then restored, while the Barrier is in the open position, it will return to the guard position.

If a Barrier is in the guard position when the power is interrupted it is normally designed to hold the guard position.

Power Off Operation

A Barrier system with a battery back-up for the control circuit and the power off feature, can be operated a limited number of times during a power off condition. Once the power off reserve is exhausted, the last command the system receives will dictate the Barrier position when power is restored. Hence, if the Barrier is in the open position when the 'power off' reserve is spent, and the system then receives a close signal, the Barrier will remember that last signal and close when power once power is restored.

Additional Precautions

Delta Barrier system controls are configured to meet site specific security conditions and the operating logic is most often defined at the time of procurement.

If the security or safety consideration of the site where the Barrier is installed or to be installed, dictates that the operation be altered from the original specification, contact the Engineering Department of Delta Scientific Corporation for assistance in making the desired revisions.

During routine maintenance and service work, or during thunder storms or other weather related disturbances, power interruptions can occur.

For detailed service, maintenance and safety information refer to the specific sections of this manual provided with each system.

Before operating the system for the first time, make sure that all on the interconnections have been made between the Barrier, control panels and the hydraulic power system. After you are sure that everything is in order, make a visual inspection of the site to check that tools and construction debris are removed and clear of the equipment.

Power

The electrical power that drives the system is typically supplied through a circuit breaker disconnect (customer furnished) that must be turned on before the system will operate. When the main power is turned on the pump motor will, in most cases, start and run until the system cut off pressure is reached. It is important on start up to **verify that the pump motor is turning in the proper direction** indicated by an arrow on the motor fan housing. Turning on the power without this check will destroy the pump in short order.

Control Devices and Their Function

Master Remote Control Panel On/Off Switch

The master control panel has a main power indication light to show that the control circuit power is 'on'. Turning the master control panel main power On/Off key switch to the ON position will in turn illuminate the panel 'on' light.

Barrier Up/Down Controls

There are two basic controls for each of the Barriers, one to **CLOSE** (raise) and one to **OPEN** (lower). The Barriers can be commanded to either **OPEN** or **CLOSE** at any time whether they are moving or stationary. The Barriers will instantly reverse direction if so commanded at any point in their operation.

Barrier Position Indication (optional)

The Barriers have position indication lights on the control panel. A green light indicates that the Barriers are **OPEN** (fully down) on the limit switches, any other position results in a red light indication.

Emergency Operate (optional)

This feature allows the Barriers to be raised at the maximum possible speed when the Emergency Operate button is pressed. Once the button is pressed, the panel is locked up so that all lower commands are overridden. Power is continuously applied to the UP solenoid valves as well as the EO valves until the Reset button is pressed, which will restore the system to normal operation.

Reset should be pressed within 15 minutes of EO use to prevent possible heat damage to the solenoid valves.

Annunciator (optional)

An annunciator feature is provided to alert the guards that the Barriers have been left in the down position for too long. The master remote control panel has an 'Annunciator Off/On' switch. With the switch in the 'Off' position, no alarm will sound. When placed in the 'On' position, the alarm will sound if the Barriers are left down longer than the preset value of the annunciator timer located in the control circuit. The alarm can be silenced by raising the Barriers or by turning the switch back to the 'Off' position. The timer is customer adjustable by accessing the inside of the master control panel.

Secondary, or Slave Panels (optional)

A secondary or slave panel may be incorporated in the system which allows for full operation of the Barriers from a location remote from the master control panel. The slave control panel is armed from the master control panel location. The slave panel has a main power indication light to show that the panel is armed from the master control panel. Turning the slave control panel main power On/Off key switch to the ON position will in turn illuminate the panel 'on' lights and allow full operation of the Barriers from the slave. The annunciator on/off and EO reset control is absent from the slave control panel although the slave panel does include the annunciator output siren.

Other Control Devices

Other control devices may be provided by Delta or by others. The Barrier can be raised or lowered by any normally opened, momentary closure type button or remote control device, such as radio, key pads, card readers, loops, etc.

Start Up Procedure

Safety Precautions

On initial start up, it is important to close off the roadway and clear the Barrier area of nonessential personnel. **Barrier movement may be very erratic at first.** In addition, each time the system is restarted or maintenance is performed the roadway should again be cleared to guard against unexpected Barrier movement.

Start Up Sequence

1. Block all traffic during tests. Stay clear of Barriers.
2. Check that all electrical and hydraulic inter-connections are tight.
3. Fill system with **clean, filtered** oil to within 1" [25 mm] of the top of the sight glass.
4. Confirm that the pressure bleed down valve is turned fully clockwise to close. Do not over tighten.
5. Turn all flow control valves fully clockwise to close, then open each 2 full turns. This will be the starting point for the Barrier up/down speed adjustments.
6. Briefly apply power to the motor to confirm that the motor direction is per the direction arrow on the motor fan housing. Correct if necessary.
7. Apply power to the motor and allow the pump to bring the system up to the shutoff point as shown on the motor starter drawing, 1900 psig [131 bar].
8. Check for any leaking fittings.
9. Operate each Barrier manually by pushing the override pins on the ends of the solenoid valves.
10. Check that when the left side solenoid pin is depressed, the Barrier **raises**. When the right side pin is depressed the Barrier should **lower**.
11. Cycle the system manually several times to remove air from the system. When the air is removed from the lines (no bleeding should be necessary) the Barrier motion should be smooth.
12. As the Barrier is manually moved, confirm that the pressure switch is turning the pump motor off and on at the correct values as shown on the motor starter drawing; off at 1900 psig [131 bar], on again at 1400 psig [97 bar].
13. Turn power to the pump 'Off'.

14. Bleed the system pressure down to zero by opening the bypass valve. This will help prime the hand pump.
15. **With the system at zero pressure**, top off the reservoir oil tank with **clean, filtered** oil to within 1" [25 mm] of the sight glass top.
16. Test hand pump operation by lifting the Barrier. Approximately 65 to 75 strokes will be required for these Phalanx® Barriers.
17. Turn the motor/pump power back to 'On' to bring the system back to full pressure.
18. Apply power to the control circuit and turn the Master control panel key switch to 'ON'.
19. Run the Barrier Open and Closed several times allowing time for the HPU to recover pressure between each cycle. Check function of the indicator lights on the remote control panel.
20. With the Barrier(s) in the down position and after unit has again come to full pressure, depress the Emergency Operate button. Note that Barrier(s) come to the guard position at the maximum speed. Note that the 'EO Active' light is on. Check that the **OPEN** control buttons are inactive. Press reset button to clear EO condition and lower Barriers.
21. Arm the Slave control panel (if present) from the Master control panel and repeat steps 19) and 20).
22. Arm the annunciator siren from the Master control panel and lower one of the Barriers. Check that the siren sounds at the desired time interval. (The time interval may be adjusted by opening the Master control panel and turning the time knob on the timer.)
23. Adjust the Barrier operating speed to the desired value. Delta suggests that both the up and down speeds be approximately 3 to 5 seconds. The type and adjustments of the valves are in the Drawings section of this manual. Normal operating speeds of 2 seconds or less are possible, but the increased wear and tear on the equipment should negate any considerations to so operate the Barriers. Excess noise also accompanies the faster speeds. After final adjustment is made, lock valves in position.

OPERATIONAL SUMMARY

BARRIERS OPERATED FROM A NORMALLY UP POSITION

1. Barriers are to stay in the up and locked position and are to be lowered for the passage of one vehicle at a time.
2. During the normal hours of operation, the main power key switches shall be in the 'ON' position. The panels shall be turned 'OFF' and the keys removed when no guards are present at the control stations.
3. The control panel controls Barriers in each appropriate location. **CLOSE** and **OPEN** control is provided for each Barrier. Before operating any Barrier:
 - A) Check that vehicles and pedestrians are clear.
 - B) Check that the controls for the correct Barrier will be pressed.
 - C) Press **OPEN** to lower Barrier to permit access.
 - D) After vehicle is clear of Barrier, press **CLOSE**.
4. The **EMERGENCY OPERATE** button is to be used for **emergencies** only.
 - A) Pressing the **EO** button will raise **all** Barriers in approximately 1 to 2 seconds.
 - B) The controls are locked until the **RESET** button is pressed. A red light indication shows that the system is in the **EO Mode**.
 - C) The controls are locked even if all Barriers are **UP** when the **EO** button is pressed.
 - D) The **RESET** button should be pressed within 15 to 30 minutes of the **EO** Actuation.
5. **Do Not Place Items On The Control Panel.** The buttons are sensitive and the Barriers may move while not intended.
6. **Use The Barriers To Control Vehicles.** If a forced entry attempt occurs, use the **EMERGENCY OPERATE** button. The Barriers are powerful and can block or lift most all vehicles.