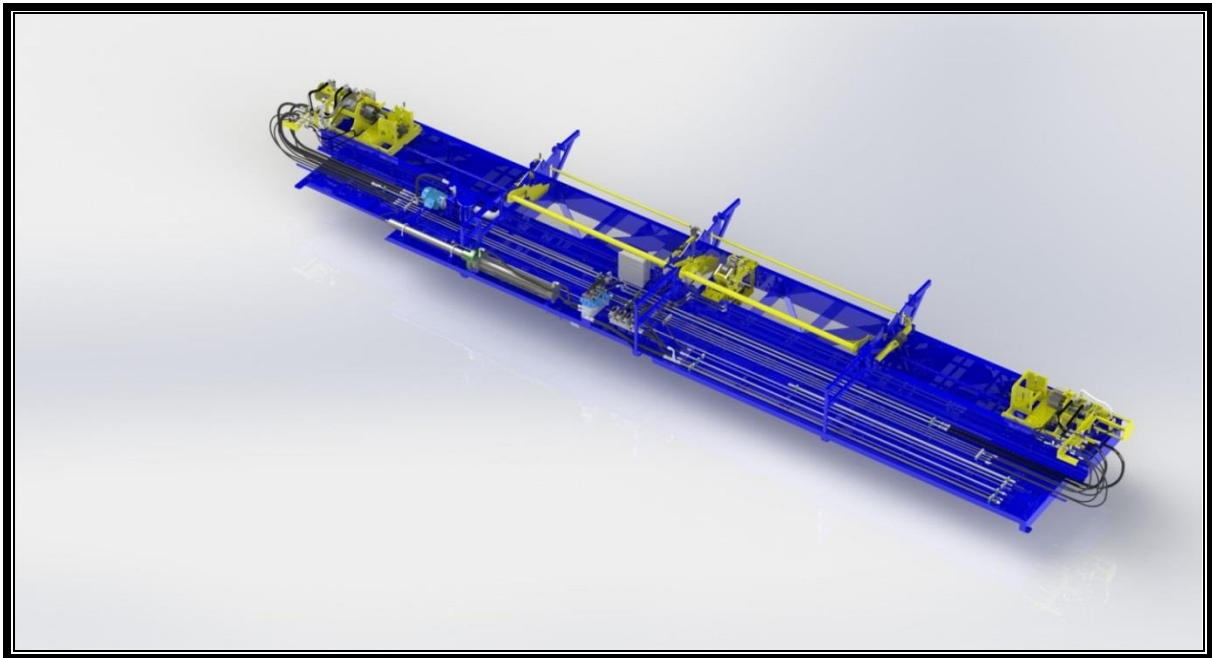


**HUB CITY
IRON WORKS**

HYDROSTATIC TESTING UNIT

Operation and Maintenance Manual

HTM-720



Hub City Iron Works
700 E Texas Ave.
Rayne, LA 70578
Phone: (337) 334-6969
Fax: (337) 365-6565
www.hubcityironworks.com

Customer: _____
Location: _____
Job #: _____
Local Rep: _____
Rep Phone # _____
Document # _____

Table of Contents

Introduction	3
Safety	4
Machine Specifications	5
Standard Features.....	5
Specifications.....	5
Pipe Plant Requirements.....	5
Machine Setup.....	6
Controls	7
Process Setup	8
Changing Test Plug.....	8
V Roller adjustment	9
Pipe Vise adjustment.....	9
Rack adjustment.....	9
Startup.....	10
Process	12
Preventative Maintenance Procedure	13
Trouble shooting guide.....	15
Parts List	16
Recommended Spare Parts	16
Rotary Coupling.....	18
Discharge Check Valve.....	19
Clamp Assembly.....	20
Vise Clamp Assembly.....	22
Mandrel Assembly	23
Intensifier Assembly	24
High Car Drive Shaft	25
Car V-Roller Assembly.....	27
Tray Assembly	28
Low Car Drive Shaft.....	29
Schematics	30
480V Electrical Schematic.....	30
PLC Schematic.....	31
Transducer Layout	33
Power Supply Layout.....	34
Hydraulic Schematic.....	35
HTM-2000 Equipment Layout.....	36

Service

Call: 337.334.6969

Email: servicerequest@hubcityironworks.com

Spare Parts

Call: 337.334.6969

Visit: www.hubcityironworks.com

Sales

Call: 337.334.6969

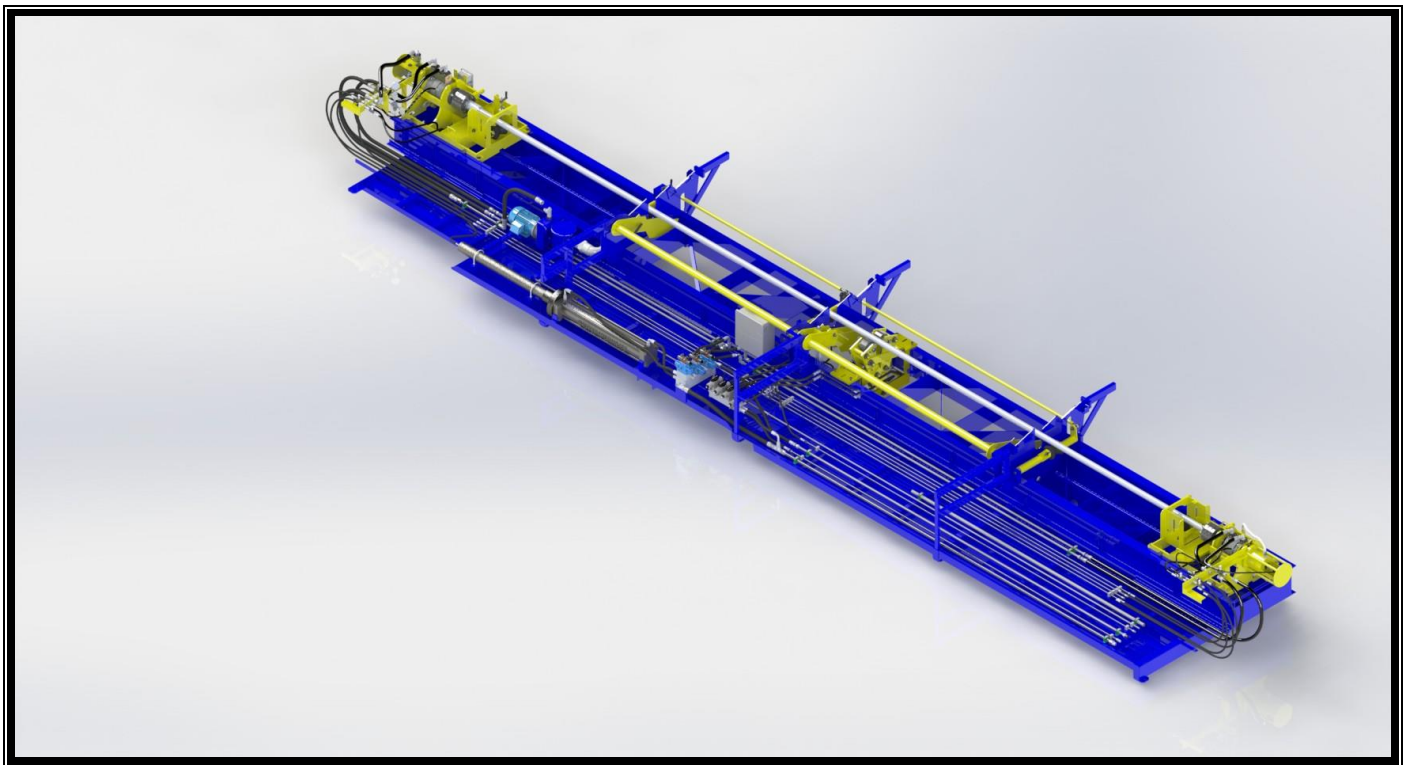
Email: sales@hubcityironworks.com

Introduction

HTM -720 SEMIAUTOMATIC HYDROSTATIC TEST MACHINE

Hub City Iron Works' Hydrostatic Testing Unit is a safety oriented product used to pressure test tubing and premium connections up to 20,000 PSI in order to meet API standards. The unit utilizes test plugs with motorized rotation allowing for appropriate torque application, ultimately enabling high quality and consistent test operations. The HTM-720 is an excellent choice for safely testing tubing and premium connections.

- Pressurizes tubing and premium connections up to 20,000 psi in accordance with API test standards
- Controlled by a single operator within a safety cage featuring a door operated safety switch
- Control station is PLC controlled to minimize human error.
- Test cycle for a joint of tubing can be as quick as two minutes
- Automated loading and off-loading of pipe
- Pipe lock-down mechanism to secure pipe during testing
- Water is recycled after each test
- Robust construction for demanding oilfield use with moving parts painted "safety yellow"



Safety

Hub City has provided operating procedures and safety information to ensure the wellbeing of both the operator and the equipment.

This operating manual contains important safety information - please read it thoroughly.

Safety Features Include:

- Mechanically active components are painted safety yellow.
- Low oil level indicator protects machinery in the case of a hydraulic line rupture.
- Low voltage operator interface (24vdc).
- Equipment safety labels.
- Operator safety cage with door activated switch



Machine Specifications

Standard Features

- Operator controlled loading and unloading of pipe.
- Hydraulic power supply
- Range 2 pipe standard
- Safety cage for operator only

Specifications

- Standard capacity (others available at customer request)
 - 2-3/8" 8RD
 - 2-3/8" MS6
 - 2-7/8" 8RD
 - 2-7/8" MS6
 - 3-1/2" 8RD
 - 3-1/2" MS6
 - 4-1/2" MS6
- Test module
 - Length 50' 6"
 - Width 10' 0"
 - Height 5'-0"
 - Ship Weight 18,000lbs
- Hydraulic Power supply
 - Length 6'7"
 - Width 6'6"
 - Height 3'4"
 - Weight 5000lbs
- Operator Cage
 - Length 7'
 - Width 4' 2.5"
 - Height 6'4"
 - Weight 3000lbs

Pipe Plant Requirements

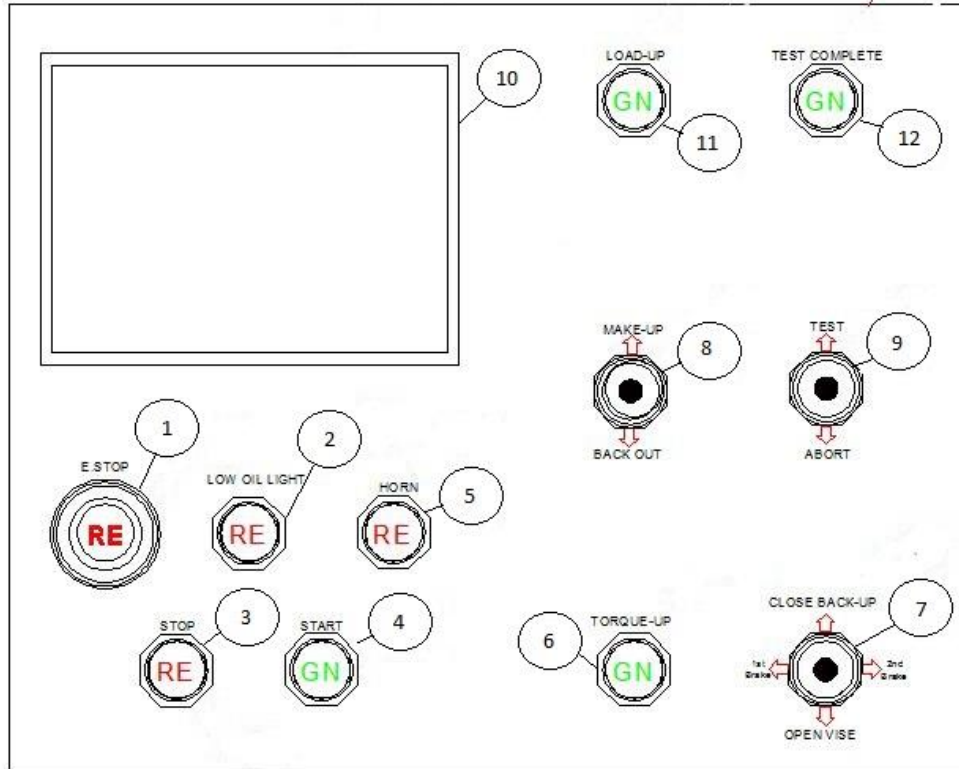
- Electrical 230/480V, 3 Phase, 60 Hz 48 Kilowatts
(Others available upon request)
- Rack height 38"-42"

Machine Setup

1. A sight inspection by KMI personnel is required prior to installation. Failure to do so can lead to prolonged installation times.
2. It is required that a Hub City Iron Works representative be present during the installation and initial operation of the machine.
3. Machine is to be installed on flat and level concrete. A foundation study by a qualified civil engineer is recommended to protect personnel and equipment. It is recommended that a fresh water source is located nearby. It is also recommended that a cover be built over all equipment to protect the machine and operator from the elements.
4. Machine is to be leveled on both axes using shims or epoxy grout and also squared off to pipe rack as required. Maximum test module's out of level to be 1/2 inch per 50-1/2 feet along the length of the machine. Maximum test modules' out of level to be 1/8 inch per 10 feet along width of the machine. Maximum allowable frame twist or soft foot is 1/8 inch.
5. Drill and install concrete anchors into slab according to bolt pattern print.
6. Torque down bolts as required.
7. Install power supply according to general layout drawing. Hydraulic power supply is to be leveled and anchored to foundation.
8. Install Operator safety cage according to general layout drawing. Tester module should be in visible range of Operator cage so that an operator can identify any problems with leakage or other defects. Operator cage to be level and anchored to foundation.
9. Hydraulics to be installed and tested by a qualified technician. See page 24 for hydraulic schematics
10. Electrical to be installed and tested by a qualified technician. See page 19 for electrical schematics.
11. A Factory acceptance test that is performed or witnessed by a Hub City Iron Works representative is required during commissioning.

Controls

Standard HTM-720 Controls



(Standard Control Layout – Specific Control Locations May Change)

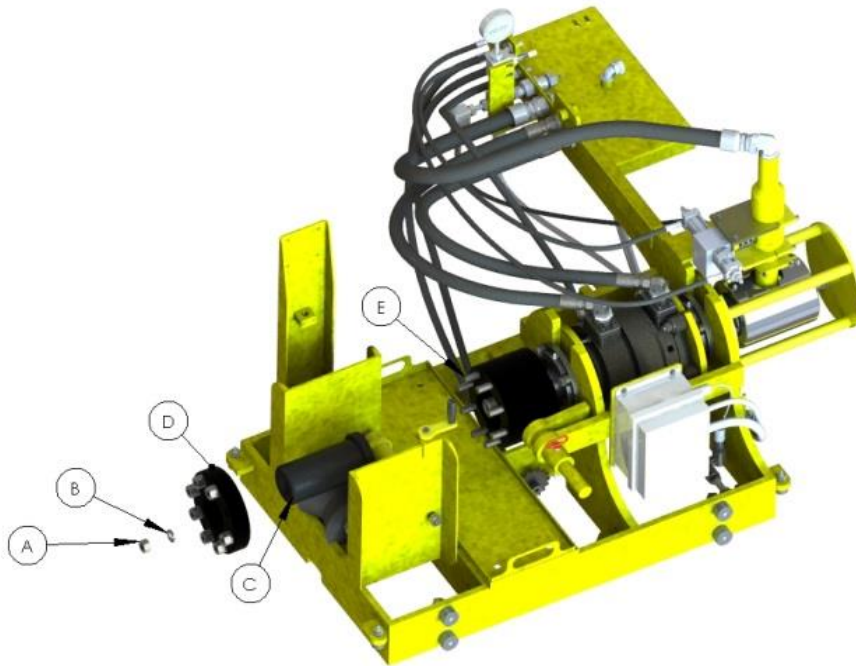
	<u>Function</u>	<u>Description</u>
1	Emergency Stop	Stops machine in case of an emergency
2	Low oil light	Light indicating low oil level. Machine needs servicing
3	Stop Button	Turns off system hydraulics
4	Start Button	Turns on system hydraulics
5	Horn	Alerts surrounding personnel to testing in progress
6	Torque-up	Torques pipe up to preset conditions
7	Close back-up joystick	UP- Closes back-up vise DOWN- Opens back-up vise LEFT- Hi torque initial break out, carts don't move RIGHT- Hi speed low torque to complete breakout operation
8	Make-up/Back Out	UP- Cars move in and make threads up – no torquing performed DOWN- Cars move out and threads are Are unmade
9	Test/Abort	Up- Pressurize the test piece up to preset conditions Down- Abort Pressurization
10	Touch Screen	See below for instructions
11	Load up	Loads and unloads test pieces
12	Test complete light	Indicator light to tell operator when complete

Process Setup

Follow the Process Setup procedure each time a new pipe size or type is to be tested. Failure to do so can damage the test piece, the equipment or cause bodily injury.

Changing Test Plug

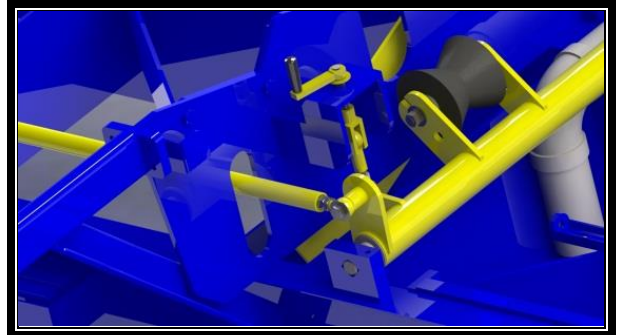
1. When loading the first pipe, or changing pipe sizes or connections, the test plugs(C) need to be changed accordingly.
2. Lock out/Tag out machine to prevent bodily harm.
3. Inspect test plugs to insure that the correct plug is installed or is being installed to test the upcoming connections
4. Inspect test plugs to ensure that there is no unacceptable damage according to API specifications. Damage to the test plugs can damage the pipe connections. It can also cause bodily injury or death
5. Remove the eight hex nuts (A) and washers (B) holding the outer flange (D) of the mandrel.
6. Remove the outer flange.
7. Remove the test plug and store appropriately. Remove O-ring.
8. Replace O-ring.
9. Install new test plug and matching flange.
10. Inspect studs and nuts for damage and wear.
11. Apply anti-seize compound to the studs (E) to prevent thread galling and corrosion.
12. Install selected test plug. Reinstall flange and hex nuts.
13. Torque hex nuts between 320 and 430 foot pounds.



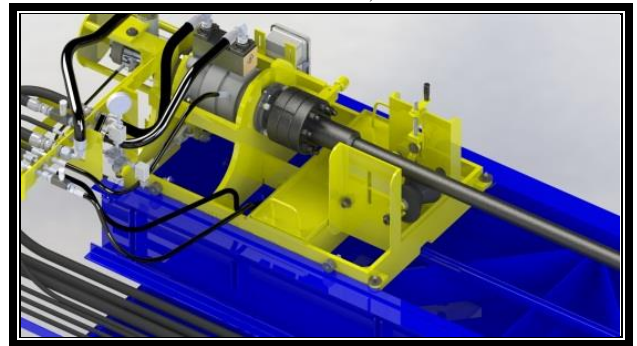
V Roller adjustment

The V roller pipe supports are designed to support the test piece at an elevation that allows the test plugs to mate with the box or pin without damaging the connections.

1. Clear rollers of test pipe. Raise center V rollers so that pipe rests above centerline. Lower both car V rollers until they bottom out.
2. Load first test piece into machine. Bring in cars so that test plugs are in close proximity to each end of pipe. Pipe may need to be bumped over to the center of machine. Pipe upset must be between the roller and the test plug.
3. Adjust the center rollers until the pipe is on or slightly below center line of test plugs.
4. Manually adjust the car V rollers until the test piece is in line with the test plugs.



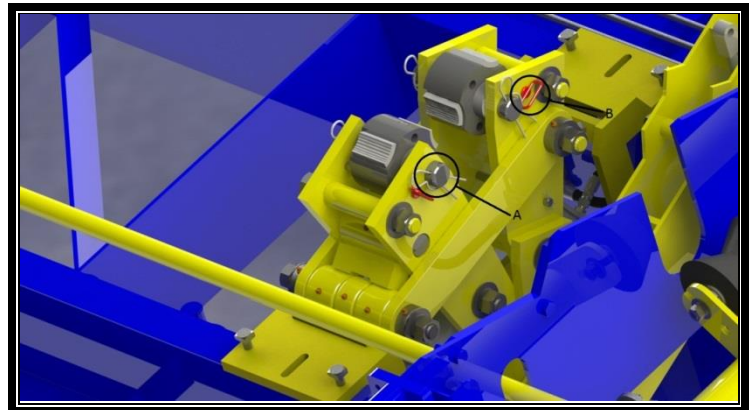
Center V roller adjustment



Car V roller adjustment

Pipe Vise adjustment

1. Clear all pipe from load racks.
2. The HTM-720 comes equipped with a die that handles tubulars from 2-3/8" to 4-1/2".
3. The HTM-720 is equipped with a three sided vise head to allow for different sizes with minimal setup change to the vise. Each side of the vise head is equipped with a different die size.
4. Determine which size die is required. Pull pin A and rotate die until the correct die is facing the centerline of the test piece. If correct die is not on triple sided head, pull pin B and replace triple sided head with the correct one.



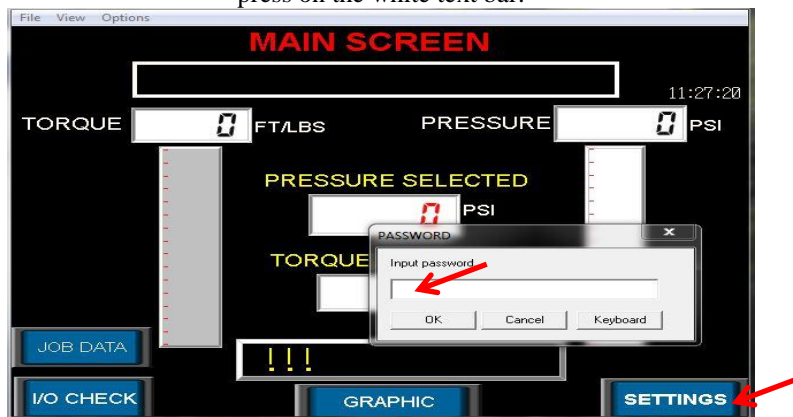
Rack adjustment

1. Pipe diameter tab may need adjustment for pipes of different diameter. Loosen bolts on load plates. Move plates as required so that load arms grab only one pipe at a time. Tighten bolts as required. Test pipe should come into contact with all three load plates

Startup

1. Before starting, ensure that all daily maintenance is completed.
2. Load pipe onto pipe rack.
3. Remove thread protectors. Visually inspect threads for damage.
4. **Blow compressed air through each test piece to remove any debris in test piece. Failure to do so will cause damage to the machine's seals and prevent it from holding pressure.**
5. Apply pipe dope to threads.
6. Enter test cage and close door.
7. Follow the menu options to select pipe size, grade, connection type, torque, pressure and test time. (See below for detailed menu instructions)

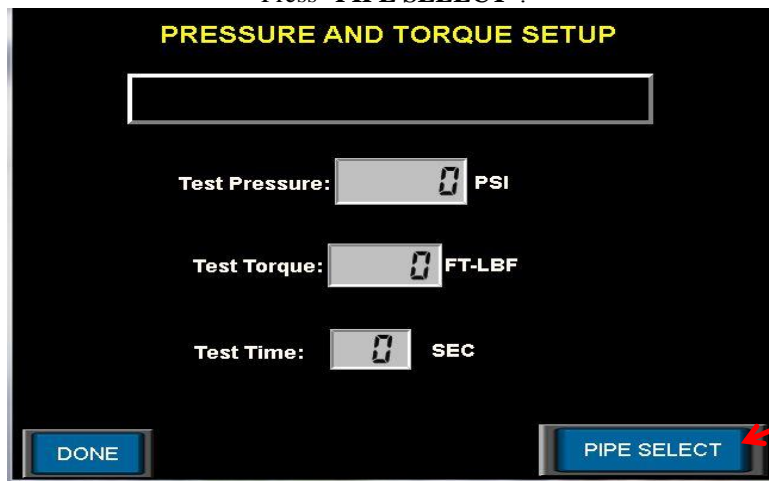
To select pipe, press the “SETTINGS” key, then press on the white text bar.



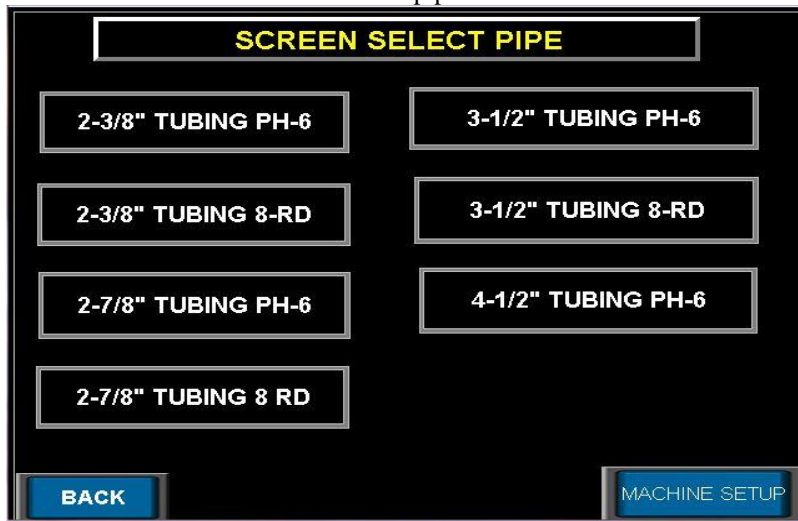
Enter the correct Password using the keypad.
Press “ENTER”, then “OK”



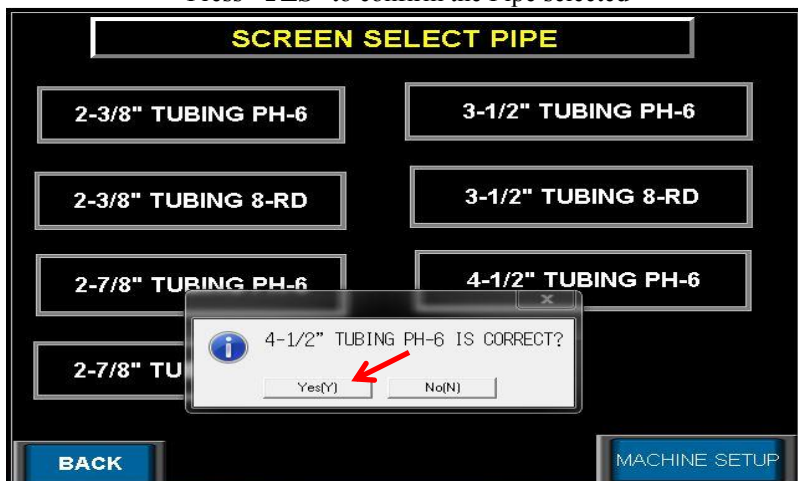
Press "PIPE SELECT".



Press the desired pipe to be tested



Press "YES" to confirm the Pipe selected



Press “DONE”, then press “YES”



Process

1. Sound horn by pressing the horn button, if available, (Control #5) to warn nearby personnel. Be sure all personnel are a safe distance away from machine before proceeding.



2. Hit “Start” (Control #4). This will turn on the hydraulic system. Let the machine run until the hydraulic oil comes up to temperature, normally five minutes. The hydraulic system will typically quieten once warmed up.
3. With the pipe on the rack, actuate the Load / Unload button (Control #11). This will load the pipe onto the machine and simultaneously unload the test piece currently on the machine.
4. Activate the Make-Up joystick (▲ Control #8) until both motors stop. You may be required to hit the Back-Up joystick (▼ Control #8) if threads do not engage properly.
5. Press and hold the Torque-Up button (Control #6). It will tighten the connections according to the size and connection type selected previously on the interface screen.
6. After torque is reached, the machine will automatically begin filling the test piece with water. All air must be allowed to escape. As all of the air exits, the water exiting the tube will become less turbulent and air will stop coming out. The pressure gauge on the control console needs to be at least 70 psi before continuing to the next step. It will also activate the safety clamp.
7. Actuate the Test joystick (▲ Control #9). Keep the actuator engaged until peak pressure is reached. The tester will automatically stop at set pressure. Release the controller. If an issue occurs during the pressurization process, actuate the Abort button (▼ Control #9) to depressurize the test piece. The Test Complete Light (Item #12) will illuminate when test is completed. Tester will automatically depressurize once complete.
8. Close the vise by actuating the Close Vise joystick (▲ Control #7).
9. Push 1st Break joystick (◀ Control #7). High torque will be applied to remove the test plugs. Activate until both test mandrels break loose.
10. Push 2nd Break joystick (▶ Control #7). The carts will move away from the test piece and the test pieces will finish unthreading.
11. Push Open Vise (▼ Control #7) to open vise.
12. Actuate the Load/Unload Button (Control #11) again to repeat the process.

Preventative Maintenance Procedure



Hydrotester Daily Preventative Maintenance

Company: _____
 Location: _____
 Machine No.: _____
 Week of: _____

Instructions:
 Inspect each item at the start of each shift - initial next to block after task is complete
 For more detailed information consult operators manual.

Day	Inspect control console (1) touch screen for loose wires and proper function (2) switches and joysticks for loose and/or broken wires	Inspect j-boxes (1) loose wires	Inspect load/unload arms (1) cracks, bent parts, and excessive wear (2) broken bearings or loose grease fittings (3) hydraulic cylinder and hoses for leaks	Inspect vise (1) cracks, bent parts, and excessive wear (2) pipe jaws for wear and missing parts (3) hydraulic cylinder and hoses for leaks	Inspect low car (1) frame for cracks or bent parts (2) pipe adjustment roller and bearing for wear and grease them (3) hoses and fittings for leaks (4) drive chain and sprockets for wear (5) rotary coupling for leaks (6) all other bearings for wear and grease them (7) Clean excess pipe dope off trays	Inspect high car (1) frame for cracks or bent parts (2) pipe adjustment roller and bearing for wear and grease them (3) hoses and fittings for leaks (4) drive chain and sprockets for wear (6) all other bearings for wear and grease them (7) Clean excess pipe dope off trays	Inspect power supply (1) all fittings and hoses for leaks (2) electrical panel for loose wires (3) low oil switch functions properly (4) Check oil levels in hydraulic reservoir (5) Check return filter pressure gauge while make-up motors & loaders are operating	Inspect Water System (1) all piping for leaks/cracks (2) Trough for debris. Clean at first sign of contamination <i>(Critical to performance)</i>
1								
2								
3								
4								
5								
6								
7								

Comments:



Hydrotester Yearly Preventative Maintenance

Company: _____
 Location: _____
 Machine No.: _____
 Week of: _____

Instructions:
 Inspect each item at the start of each shift - initial next to block after task is complete
 For more detailed information consult operators manual.

Year	Power Supply (1) Drain hydraulic reservoir & clean w/ suitable solvent. (2) Remove suction strainer & clean w/ solvent	Machine Alignment (1) Verify machine is aligned properly. Correct if necessary	Winterizing (1) Remove plug on water pump & strainer & drain water at night to prevent freezing (2) Antifreeze may be added to lower freezing point							

Comments:

Trouble shooting guide

Problem	Corrective Action
Tester fails to hold pressure	Attempt test on different pipe Check test plug for damage Check and replace rotary coupling seals(part # 13993, 13994) Inspect check valve O-ring on high side (part # 14076) Check rotary coupling shaft O-ring (part #13993) Check rotary coupling shaft for wear (part #13914) Inspect check valve O-rings on low side (part # 14076) Inspect intensifier seals(part #37230, 37421) Check and replace test plug/mandrel O-ring(part# 37249) <u><i>(Debris in system water is a major contributing factor to pressure loss and care should be taken to keep system water clean)</i></u>
Mandrels fail to make up	Check thread profile, if necessary recut threads
Machine fails to reach specified torque	Check system pressure Call service representative
Jaws fail to grip pipe	Check dies for wear, replace if necessary If dies are dirty, clean and reattempt
Clamp is denting pipe	Check system pressure Check wall thickness of pipe

Parts List

Recommended Spare Parts

LEVEL A			
Stocked on Location & HCIW			
NAME	QTY	SAP#	Price
Limit Switch Arms, LSZ52D	2	14113	\$23.00
Fuse, MDL-2 2A	10	17480	\$3.00
SEAL, POLY PACK	10	13993	\$4.00
RING, BACKUP	10	13994	\$4.14
ROCKET BODY/SEAT ORING	10	14075	\$1.00
ROCKET SEAL ORING	10	14076	\$1.00
RINEER / ROTARY SHAFT ORING	10	21380	\$35.00
CHECK VALVE SEAT	1	24139	\$551.37
ROCKET CAP	1	21147	\$170.00
ROCKET BODY	1	24137	\$596.79
FILL SIDE SPRING	1	24144	\$32.08
FLANGE/FLANGE ORING	30	29046	\$1.00
FLANGE /PLUG ORING.	30	37249	\$1.00
9.5 OD SML PLUG FLANGE	1	37268	\$954.98
9.5 OD LG OD PLUG FLANGE	1	24205	\$763.99
FLANGE ALL THREAD ROD	4	29133	\$4.68
RINEER MAIN BEARING	2	14598	\$666.00
CART LARGE CAM FOLLOWER	2	27201	\$84.00
CART SMALL CAM FOLLOWER	2	14601	\$38.00
INTENSIFIER BUSHING	2	29275	\$31.27
INTENSIFIER BACKUP RING	12	37230	\$10.26
INTENSIFIER SEAL	12	37241	\$8.88
DUMP SIDE CHECK BODY	1	21306	\$732.83
DUMP SIDE CHECK SEAT	1	24133	\$889.43
DUMP SIDE SWIVEL	1	22342	\$83.70
WISE DIES	*		
PIPE ROLLER RUBBER WHEEL	1	13630	\$242.00
RUBBER ROLLER BEARING	2	14599	\$34.00
TEST MANDRELS	*		
Level B			
0-3 days delivery			
NAME	QTY	SAP#	Price
Pressure Transducer,GT1850 Series 4-20mA	1	24691	\$720.35
Load Cell,RDE900-3MTN'TL-166 Output 4-20mA	1	24692	\$1,245.00
PLC, 40I/O CP1H	1	16823	\$1,358.00
PLC Expansion I/O Unit	1	16375	\$216.00
8 port Ethernet Switch(MOXA)	1	16479	\$256.00
Ethernet Device, CP1W-CIF41	1	15285	\$267.00
Amplifier,DRC1-A06 DinRail	1	24763	\$628.85
Power Supply, 480v/24vdc Power Supply 20A	1	24184	\$581.64
Contactora, 24vdc coil ;25HP,50A	1	14974	\$85.00
Thermal Overload relay (22-26A)	1	17014	\$53.00
Thermal Overload relay(26-32A)	1	17022	\$53.00
Contactora, 24vdc coil ; 15hp,32A	1	16444	\$53.00
Thermal Overload Relay(5-8A)	1	17024	\$34.00

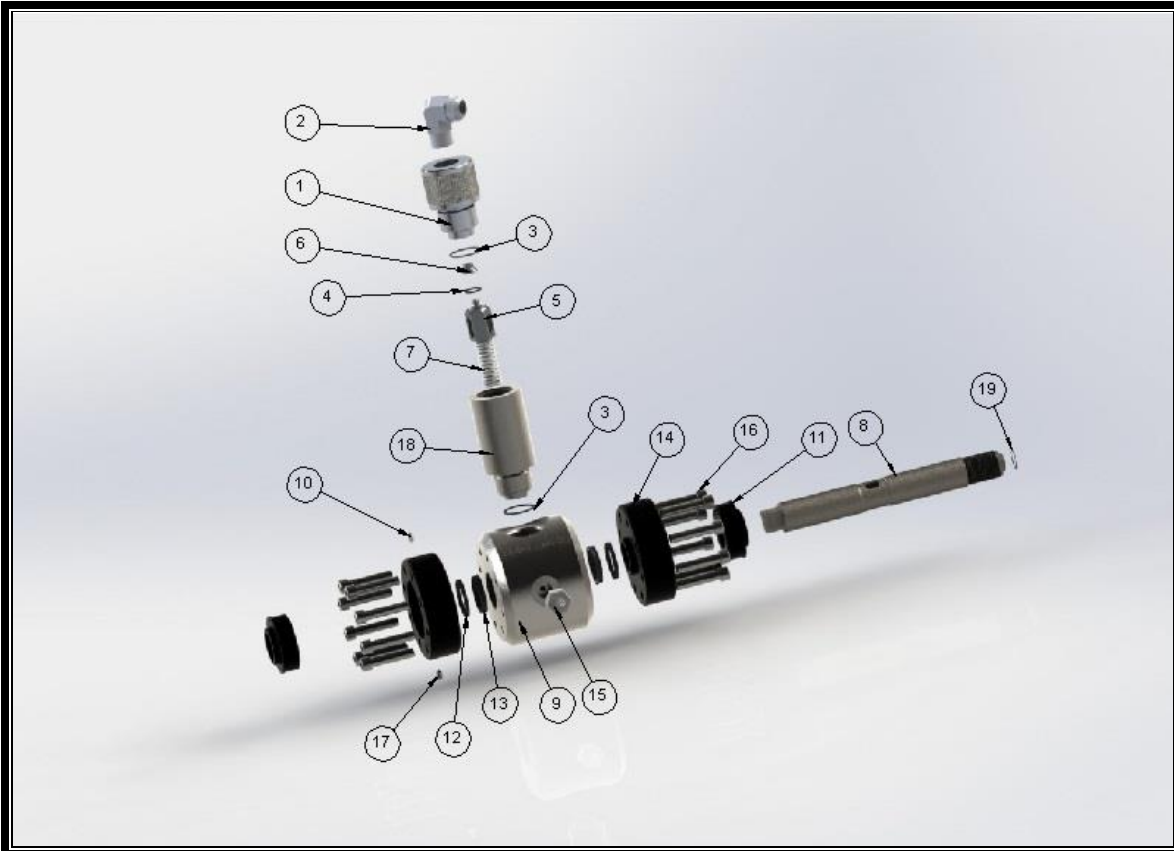
Joystick, Two ways Joystick	1	17309	\$294.00
Joystick, 4 ways Joystick	1	17311	\$405.00
Relay, 8 pins 2 Pole 24vdc Coil	1	17001	\$12.00
Relay, 11 pins 3 Pole 24vdc Coil Relay	1	17002	\$12.00
Limit switch, adjust Lever, 5A 230vAC	1	17397	\$200.00
Limit switch, Plunger Actuated	1	17403	\$165.00
Relay ,24vdc 1PDT Phoenix	2	43849	\$9.54
8" Touchscreen Omron	1	17132	\$2,438.00
Breaker, 5A 1 Pole Breaker	1	14656	\$39.00
ROTARY COUPLING SHAFT	1	13914	\$338.00
ROTARY COUPLING SHAFT BEARING	2	15492	\$69.98
ROTARY COUPLING BODY	1	27508	\$1,872.71
ROTARY COUPLING END CAP	2	24211	\$730.07
RINEER MOTOR SHAFT	1	20862	\$2,652.95
INTENSIFIER FLANGE	1	24213	\$2,325.68
INTENSIFIER TUBE	1	24212	\$1,266.58
DUMP SIDE CHECK CYLINDER	1	15114	\$180.00
CART PIPE ROLLER	2	13630	\$242.00
LOAD CYLINDER	1	24125	\$434.00
LARGE VISE CYLINDER	1	24124	\$708.53
SMALL VISE CYLINDER	1	15113	\$388.80
V ROLLER RUBBER WHEEL SHAFT	2	42404	\$50.07
V ROLLER SHAFT LG	2	42403	\$166.64
GO3 VALVE	1	17604	\$381.00
G06 VALVE OPEN CENTER	1	28595	\$634.28
606 VALVE P-T CENTER	1	28593	\$530.71
MODIFIED TAP BLOCK FOR G06 P-T VALVE	1	28602	\$47.00

Level C

0-120 Day Delivery

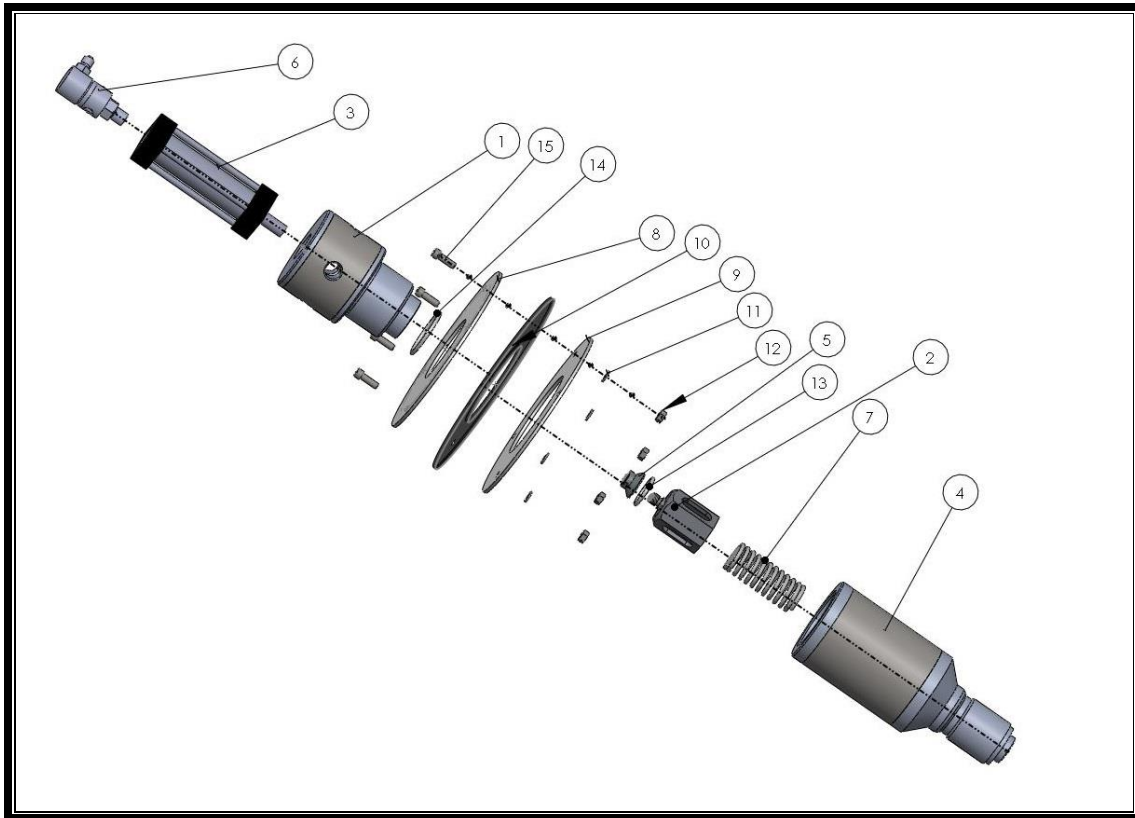
NAME	QTY	SAP#	
RINEER MOTOR	1	16441	\$6,417.00
WATER PUMP ASSEMBLY	1	24734	\$1,850.00
INTENSIFIER CYLINDER	1	24126	\$6,617.78
HIGH VOLUME HYDRAULIC PUMP	1	22532	\$1,963.44
HIGH VOLUME HYDRAULIC MOTOR	1	16412	\$1,177.43
HIGH PRESSURE HYDRAULIC PUMP	1	22534	\$1,729.13
HIGH PRESSURE HYDRAULIC MOTOR	1	16414	\$1,662.00

Rotary Coupling



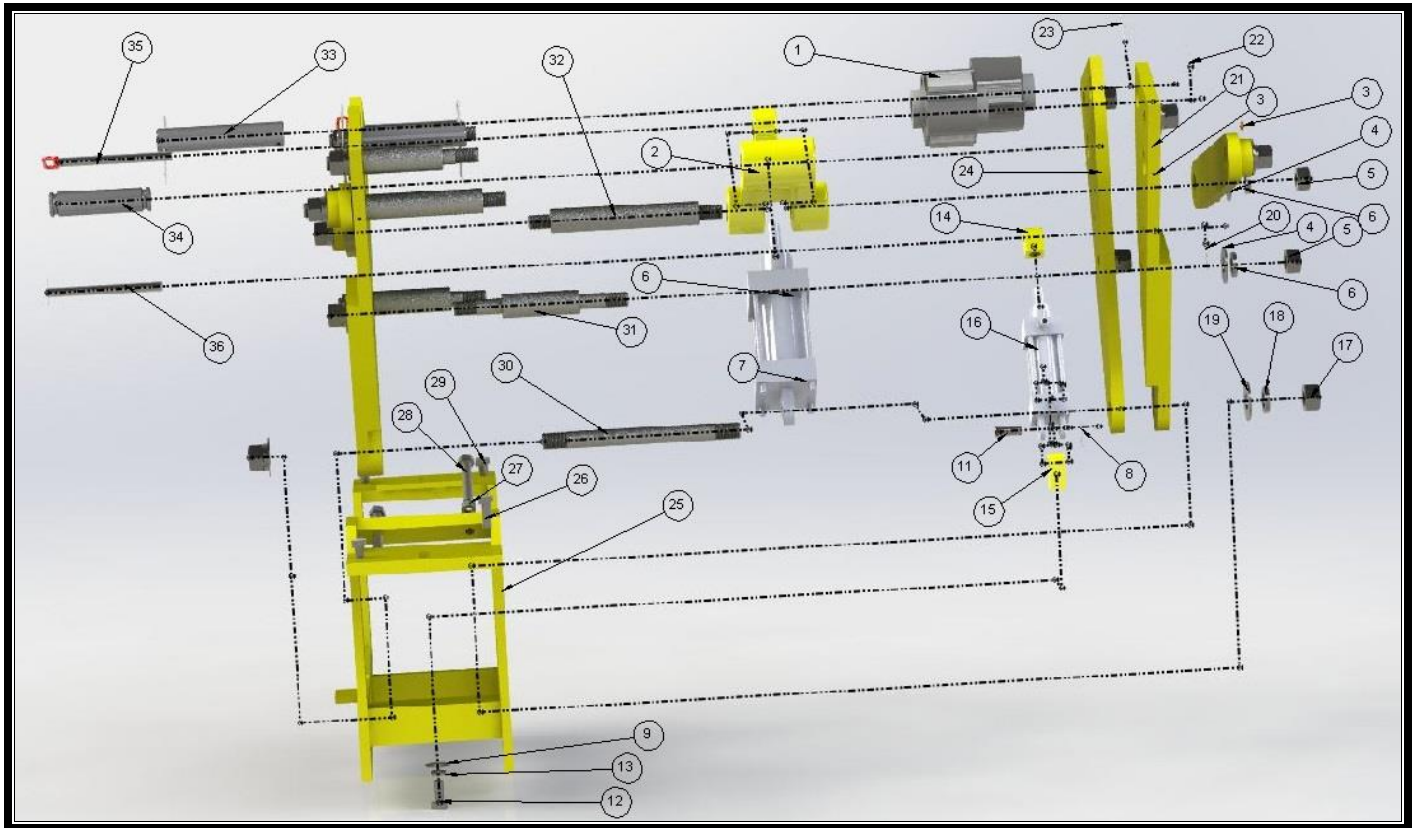
Item #	Part #	Description	Quantity
1	24139	CHECK VALVE SEAT - FILL SIDE	1
2	22192	HYDRAULIC 90 FITTING	1
3	tbd	ROCKET VALVE BODY O-RING	2
4	14076	ROCKET O-RING	1
5	13389	HYDRO T UNIT CHECK VALVE ROCKET BODY	1
6	21147	HYDRO T UNIT CHECK VALVE ROCKET CAP	1
7	24144	SPRING,(FILL)	1
8	13914	ROTARY COUPLING SHAFT	1
9	24210	ROTARY COUPLING BODY W/AUTOCLAVE	1
10	16086	GREASE ZERK	2
11	15492	BEARING	2
12	13994	ROTARY COUPLING BACKING RING	2
13	13993	ROTARY COUPLING SEAL	2
14	24211	ROTARY COUPLING END-CAP	2
15	21978	ADAPTER	1
16	14451	BOLT	16
17	17158	SET SCREW	2
18	24137	HYDRO T UNIT CHECK VALVE BODY	1
19	21380	ROTARY SHAFT ORING	1

Discharge Check Valve



Item #	Part #	Description	Quantity
1	24133	CHECK VALVE SEAT	1
2	13889	HYDRO T UNIT CHECK VALVE BODY	1
3	15114	HYDRAULIC CYLINDER	1
4	21306	CHECK VALVE BODY, DUMP SIDE	1
5	21147	HYDRO T UNIT CHECK VALVE ROCKET CAP	1
6	22342	HYDRAULIC SWIVEL	1
7	24145	SPRING DUMP SIDE	1
8	110-200-043-018	OILER POT INSERT-P3	1
9	110-200-044-018	OILER POT INSERT-P4	1
10	110-200-045-XXX	OILER POT INSERT RUBBER DISK	1
11	28272	LOCK WASHER	4
12	28229	HEX NUT	4
13	14076	O RING	1
14	14075 42227**	ORING **-FOR CHECK VALVE BODY OLDER THAN 10/9/15 THAT HAS NOTE BEEN MODIFIED	1
15	28240	BOLT	4
16	21380	ROTARY SHAFT ORING	1

Clamp Assembly

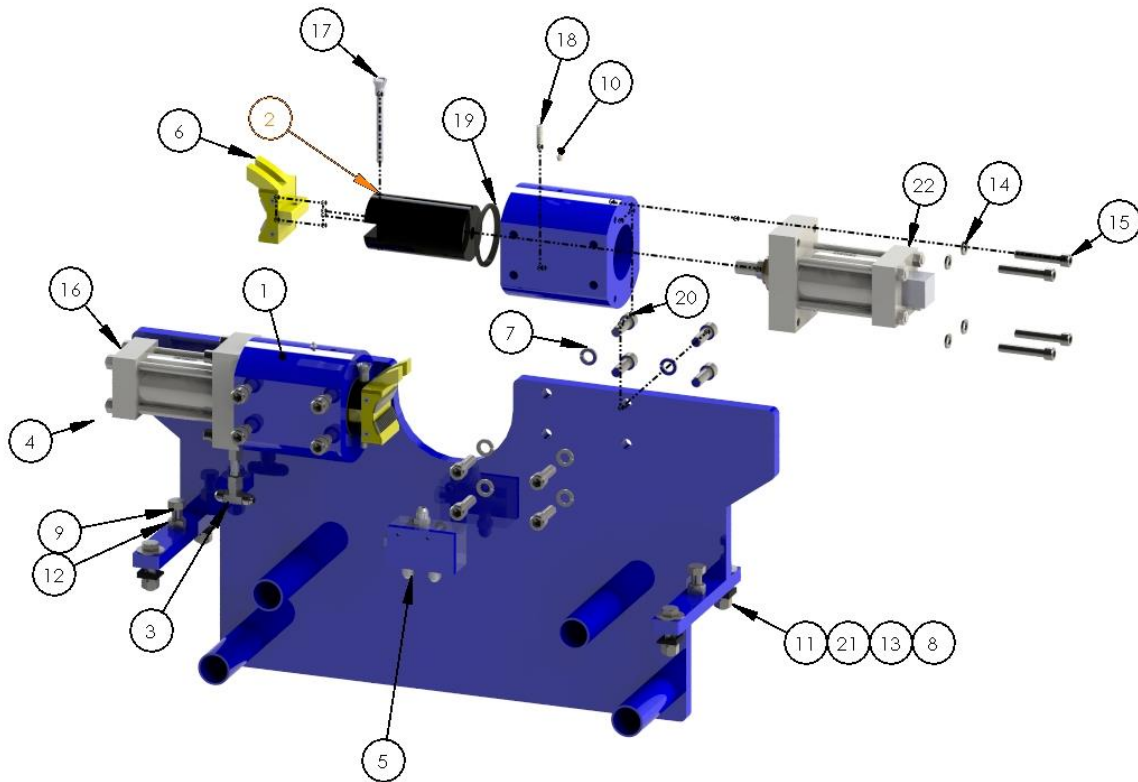


Item #	Part #	Description	Quantity
1	110-700-079-00	WISE OFFSET ARM RT	1
2	110-700-078-00	WISE OFFSET ARM LT	1
3	110-350-021-018	WISE SEPARATOR PIN	3
4	110-350-018-018	WISE STRAIGHT ARM	2
5	110-350-022-018	WISE 6 IN. LINK ARM PIN 2 IN. OD	1
6	110-350-023-018	WISE SEPARATOR PIN MID	1
7	110-350-024-018	WISE BASE CYLINDER PIN 1-3/8 UNC	1
8	110-350-025-018	WISE 24 IN. LINK ARM PIN 1-1/4 UNC x 2 OD.	2
9	110-350-026-018	WISE DIE PIN	2
10	16098	LARGE HAIR PIN	4
11	110-350-027-016	WISE CYLINDER ROD EYE PIN	3
12	15290	ROD EYE	1
13	16279	HYDRO WISE DIE W/O DOVETAIL	2
14	110-700-076-00	LARGE WISE LINK ARM	2
15	110-700-077-00	SMALL WISE LINK ARM	1
16	16101	COTTER PIN	9
17	16082	GREASE FITTING	8
18	22329	LOCK WASHER	12
19	28425	LOCK WASHER	2
20	14133	LOCK WASHER	1
21	25385	HEX NUT	12
22	25386	HEX NUT	2
23	16496	HEX NUT	2
24	17666	WASHER, FLAT, 1.25"	12
25		Regular FW 1.375	2
26	17653	WASHER, FLAT, .75"	1
27	110-700-080-00	WISE 6 IN. LINK CYL ROD EYE.	1
28	24124	LARGE WISE CYLINDER	1
29	110-700-075-00	WISE FRAME FAB ASSEM.	1

30	15113	SMALL VISE CYLINDER	1
31	110-350-030-018	VISE CYL SM CLEVIS MOUNT	1
32	17153	SET SCREW	2
33	25285	CLEVIS PIN	1
34	28426	SQUARE HEAD BOLT	4
35	26864	ALL THREAD ROD	2
36	22488	BOLT, HEAVY HEX	1
37	15624	HYDRAULIC FITTING (SMALL CYLINDER)	2
38	15837	HYDRAULIC FITTING(LARGE CYLINDER)	2
39	22710	DYE, 3-1/2"	2
	22711	DYE, 2-3/8"	2
	22712	DYE, 1-1/4"	2
	22713	DYE, 2-7/8"	2

Vise Clamp Assembly (If Equipped)

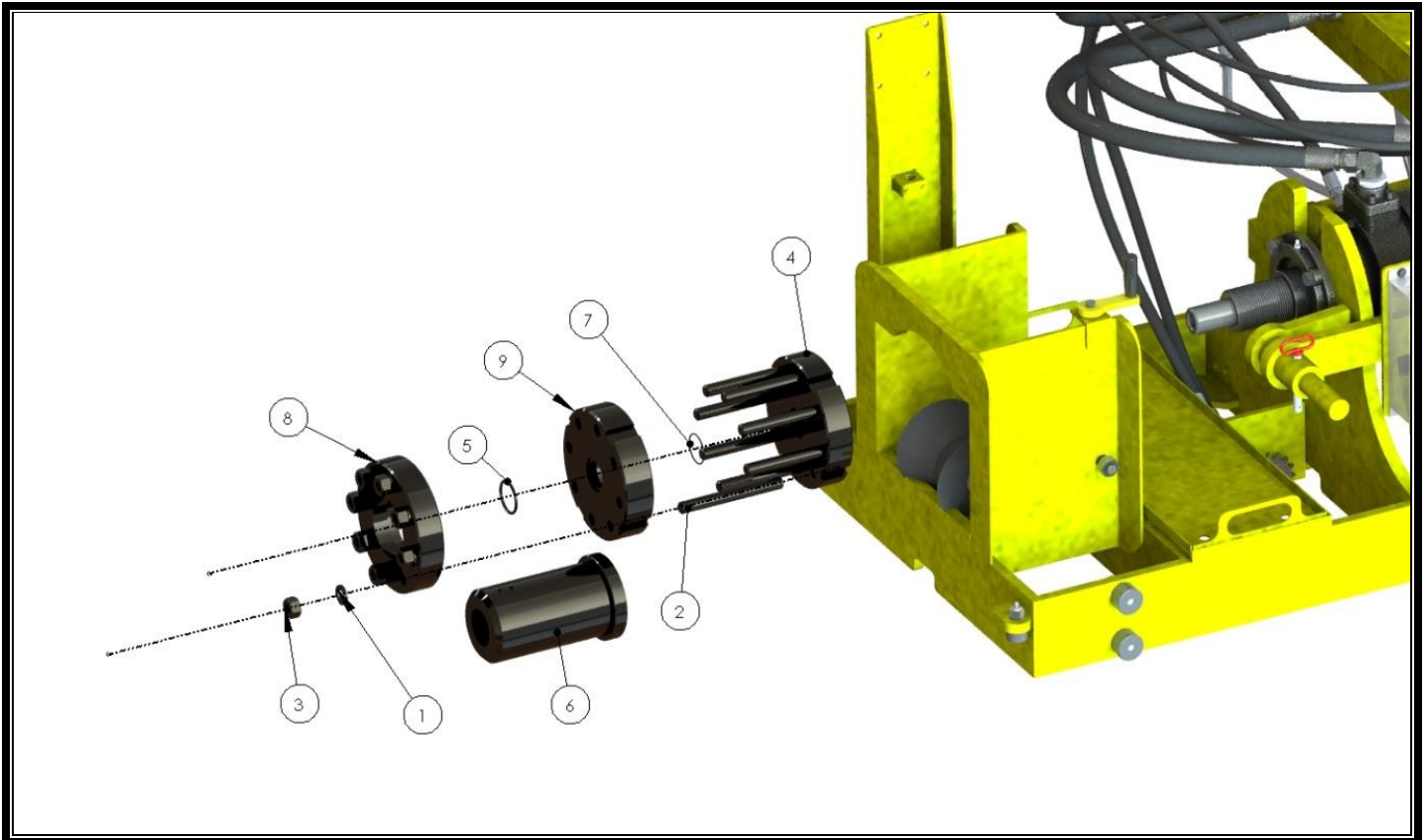
Revision: C



Note: Panel hidden for visibility

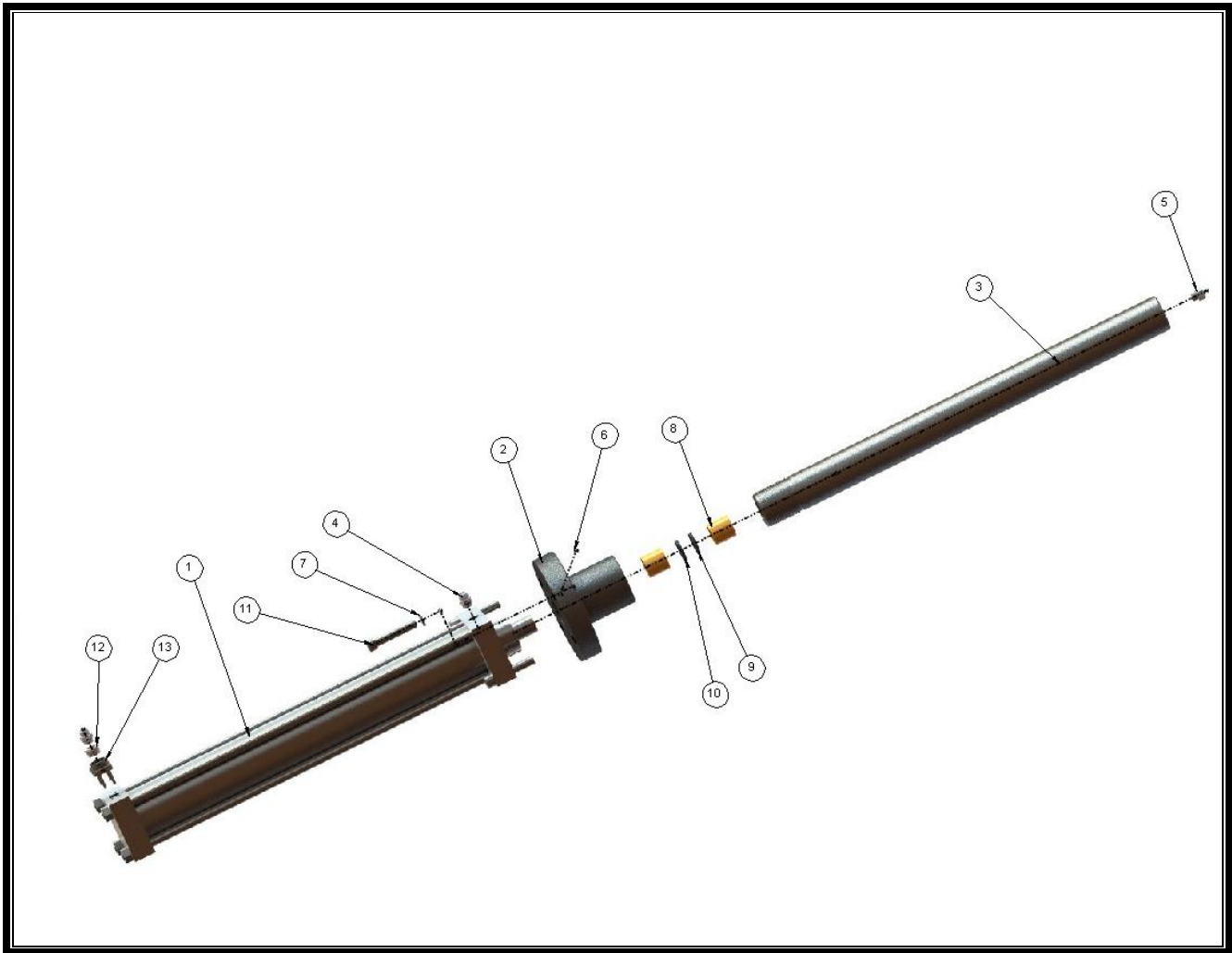
Item #	Part #	Description	Quantity
1	37708	CLAMP BORE HOLDER	2
2	37709	CLAMP INNER PUSH ROD	2
3	110-601-067-00	EXTENDED TEE	1
4	110-700-214-00	CLAMP (VISE) FAB ASSEM	1
5	110-701-021-00	FLOW DIVIDER ASSEMBLY	1
6	110-701-704-00	DIE HOLDER ASSEMBLY 3.65-5.765	2
7	14133	WASHER, LOCK, .75"	20
8	14319	BOLT, HHCS, .75" X 3" NC GR5	4
9	14404	BOLT, HHCS, .75" X 3" NF GR5	2
10	16086	GREASE ZERK, 1/8 NPT	2
11	16485	NUT, HEX, .75" NC	4
12	16496	NUT, HEX, .75" NF	2
13	17653	WASHER, FLAT, .75"	4
14	17674	WASHER, LOCK, .625"	8
15	28382	BOLT, SHCS, .625" X 3.50" NC GR8	8
16	37892	CYLINDER, 3 1/4 HHFHF4A	1
17	38195	92385A144, 1/2" x 4.5" quick release pin marine grd	2
18	38197	95289A646 1/2 x 2" dog set screw	2
19	38344	4IN ID WIPER SEAL 9403k82	2
20	38410	BOLT, SHCS, .75"-10 X 2.250" NC GR8	16
21	42012	SHIM, IRON LEVELING GAL. .75 SCREW	4
22	42357	CYL, 3.25HHFHF4AY, W/SWITCH POS 9	1

Mandrel Assembly



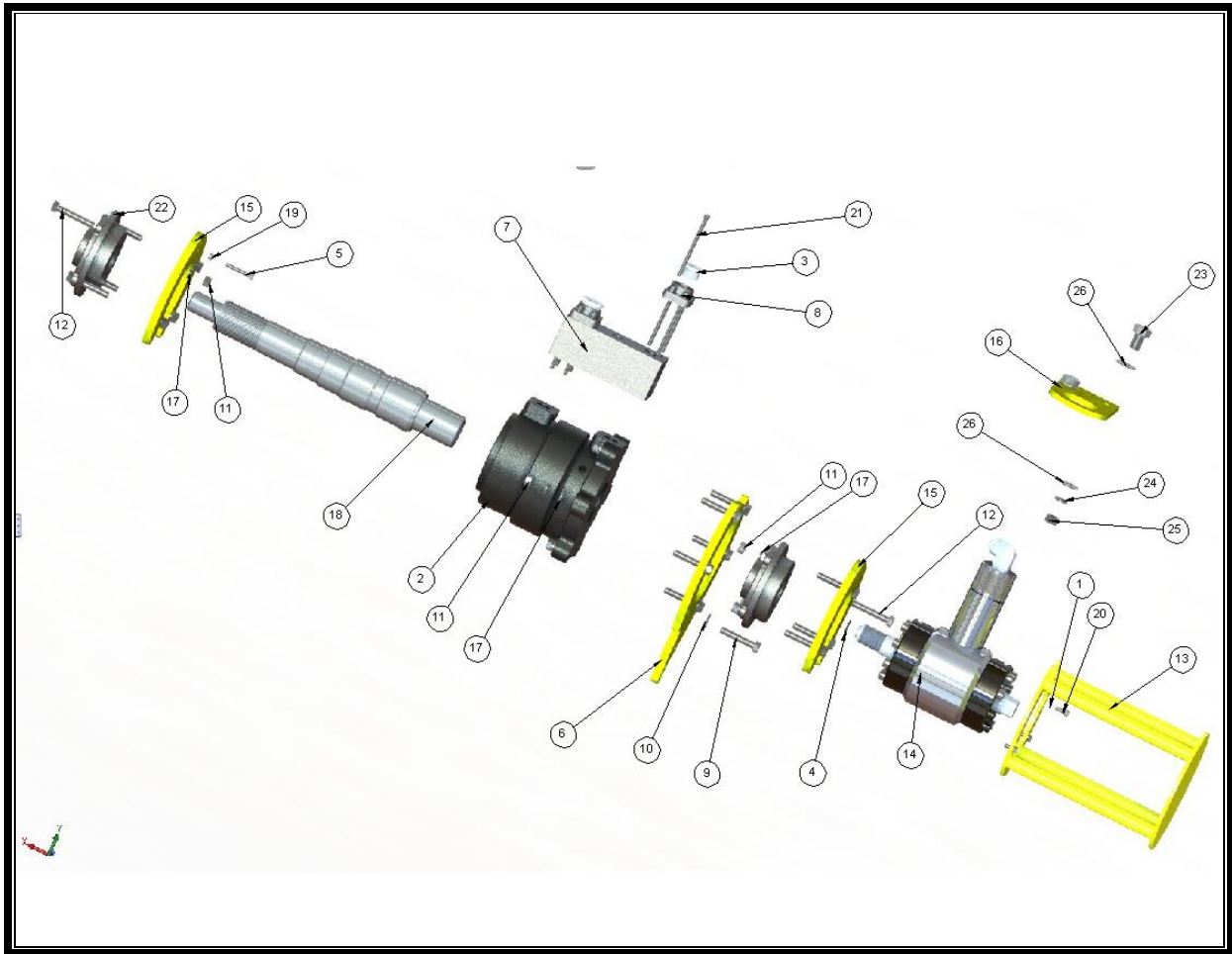
Item #	Part #	Description	Quantity
1	17677	WASHER, LOCK, .875"	8
2	29133	ATR 7/8"-9 x 8 IN LG.	8
3	16518	NUT, HEX, .875" NC	8
4	24954	LOCKING FLANGE	1
5	37249	MANDREL/TEST PLUG O-RING	1
6	24522	HYDRO TEST PLUG, 2-3/8" 8RD PIN 4.70#	
	24523	HYDRO TEST PLUG, 2-3/8" 8RD BOX 4.70#	
	24524	HYDRO TEST PLUG, 2-7/8" 8RD PIN 6.50#	
	24525	HYDRO TEST PLUG, 2-7/8" 8RD BOX 6.50#	
	24526	HYDRO TEST PLUG, 3-1/2" 8RD PIN 9.30#	
	24527	HYDRO TEST PLUG, 3-1/2" 8RD BOX 9.30#	
	24528	HYDRO TEST PLUG, 2-3/8" MS6 PIN 5.95#	
	24530	HYDRO TEST PLUG, 2-3/8" MS6 BOX 5.95#	
	24531	HYDRO TEST PLUG, 2-7/8" MS6 PIN 7.90#	
	24532	HYDRO TEST PLUG, 2-7/8" MS6 BOX 7.90#	
	24533	HYDRO TESTPLUG,3-1/2" MS6 PIN 12.95#	
	24534	HYDRO TESTPLUG,3-1/2" MS6 BOX 12.95#	
	24535	HYDRO TEST PLUG, 4-1/2" MS6 PIN 15.50#	
	24536	HYDRO TEST PLUG, 4-1/2" MS6 BOX 15.50#	
7	29046	MID MANDREL O-RING	1
8	24205	SMALL CLAMP FLANGE	1
	37268	LARGE CLAMP FLANGE	1
9	24204	DRIVE FLANGE	1

Intensifier Assembly



Item #	Part #	Description	Quantity
1	24126	HYDRAULIC CYLINDER	1
2	24213	INTENSIFIER FLANGE	1
3	24121	INTENSIFIER CYLINDER	1
4	15756	HYDRAULIC FITTING	2
5	21978	HP ADAPTER	1
6	16087	GREASE ZERK	2
7	17675	LOCK WASHER	4
8	29275	BUSHING	2
9	37230	HIGH PRESSURE SEAL	1
10	37421	HIGH PRESSURE BACKUP RING	1
11	29309	BOLT	4

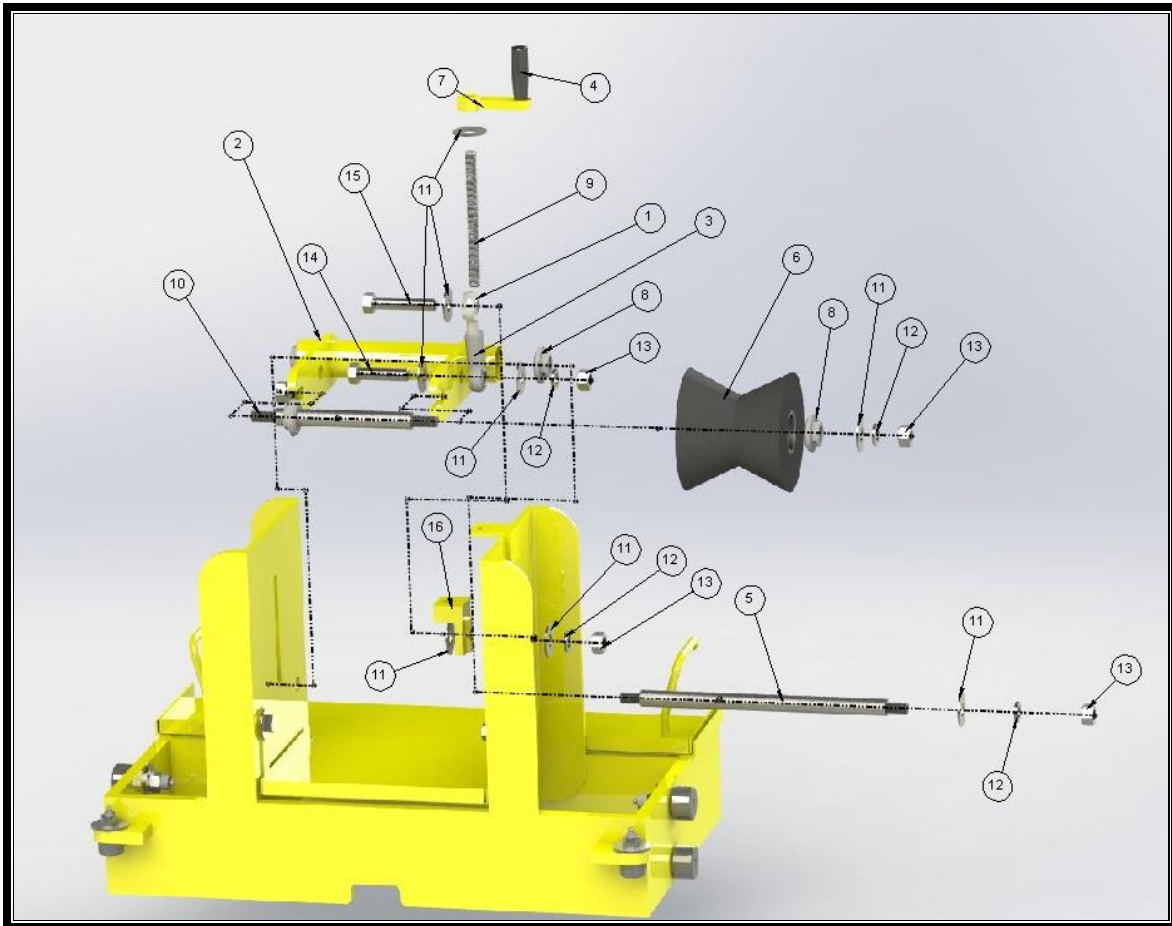
High Car Drive Shaft



Item #	Part #	Description	Quantity
1	14145	WASHER, LOCK	4
2	16441	HYDRAULIC MOTOR	1
3	37066	THREADED BUSHING	2
4	21380	ORING,	1
5	14330	HEX BOLT	1
6	110-200-034-018	CAR MOTOR TORQUE PLATE	1
7	36779	HYDRAULIC MANIFOLD	1
8	21204	FLANGE PAD	2
9	14318	HEX BOLT	6
10	17651	FLAT WASHER	6
11	16484	HEX NUT	12
12	21817	HEX BOLT	8
13	110-200-032-901	ROTARY COUPLING CAGE	4
14	----	ROTARY COUPLING (SEE ASSEMBLY DETAIL)	1
15	110-200-130-018	ROTARY COUPLING & BEARING SUPPORT PLATE	2
16	16484	ROTARY COUPLING SUPPORT	1
17	17674	LOCK WASHER	12
18	20862	DRIVE SHAFT	1
19	16487	HEX NUT	1
20	14132	HEX BOLT	4

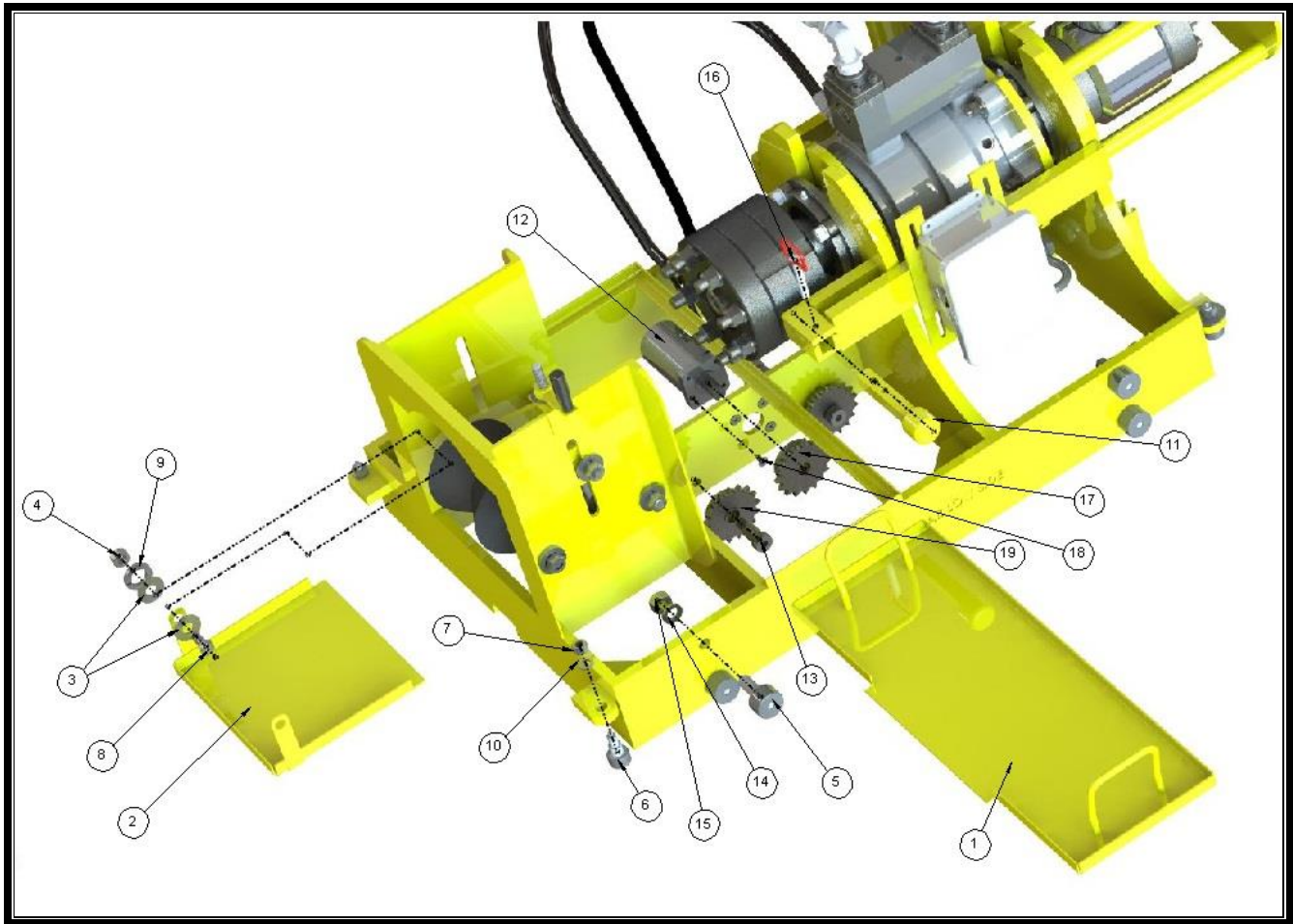
21	14474	SOCKET HEAD CAP SCREW	8
22	14598	FLANGED BEARING	2
23	14325	HEX BOLT	2
24	14133	LOCK WASHER	2
25	16494	HEX NUT	2
26	21940	FLAT WASHER	2
1	14145	WASHER, LOCK	4
2	16441	HYDRAULIC MOTOR	1
3	37066	THREADED BUSHING	2
4	21380	ORING,	1

Car V-Roller Assembly



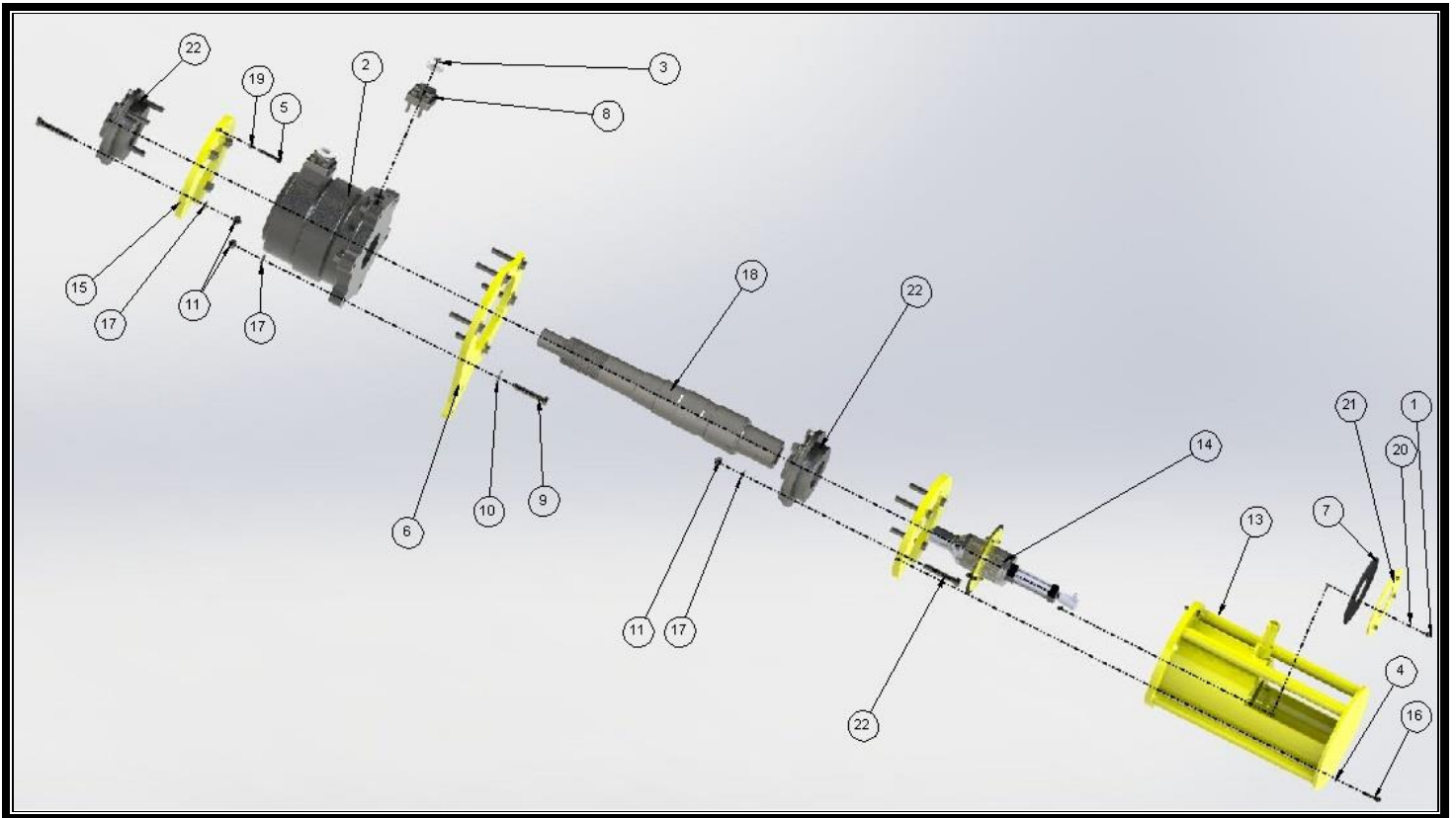
Item #	Part #	Description	Quantity
1	14627	ROD EYE W/MALE THREADS	1
2	110-700-109-00	CAR ROLLER ARM	1
3	110-200-054-029	CAR SUPPORT ROLLER ELEVATOR TUBE	1
4	16113	BRUSH HOUSING LIFT HANDLE	1
5	110-200-055-018	V-ROLLER SHAFT	1
6	110-701-004-00	V ROLLER	1
7	110-700-047-00	CRANK HANDLE CAR V-ROLLERS	1
8	14599	BEARING	4
9	21938	THREADED ROD	1
10	110-300-064-018	V-ROLLER SHAFT	1
11	21940	FLAT WASHER	9
12	14133	LOCK WASHER	6
13	16496	HEX NUT	11
14	14374	HEX BOLT	1
15	14320	HEX BOLT	1

Tray Assembly



Item #	Part #	Description	Quantity
1	110-200-047-018	TRAY BASE PLATE -LARGE	1
2	110-200-048-018	TRAY BASE PLATE -SMALL	1
3	14133	FLAT WASHER	2
4	16496	HEX NUT	2
5	27201	LARGE ROLLER	8
6	14601	SMALL ROLLER	4
7	27368	HEX NUT	1
8	14314	HEX BOLT	2
9	22329	LOCK WASHER	2
10	17674	LOCK WASHER	4
11	110-200-016-018	STOP BAR	1
12	16391	CAR DRIVE MOTOR	1
13	27155	SHOULDER BOLT	1
14	17677	LOCK WASHER	8
15	16505	HEX NUT	2
16	24753	HITCH PIN	1
17	14514	DRIVE SPROCKET	1
18	29340	COUNTERSUNK FLAT HEAD SCREW	4
19	29114	IDLER SPROCKET	2

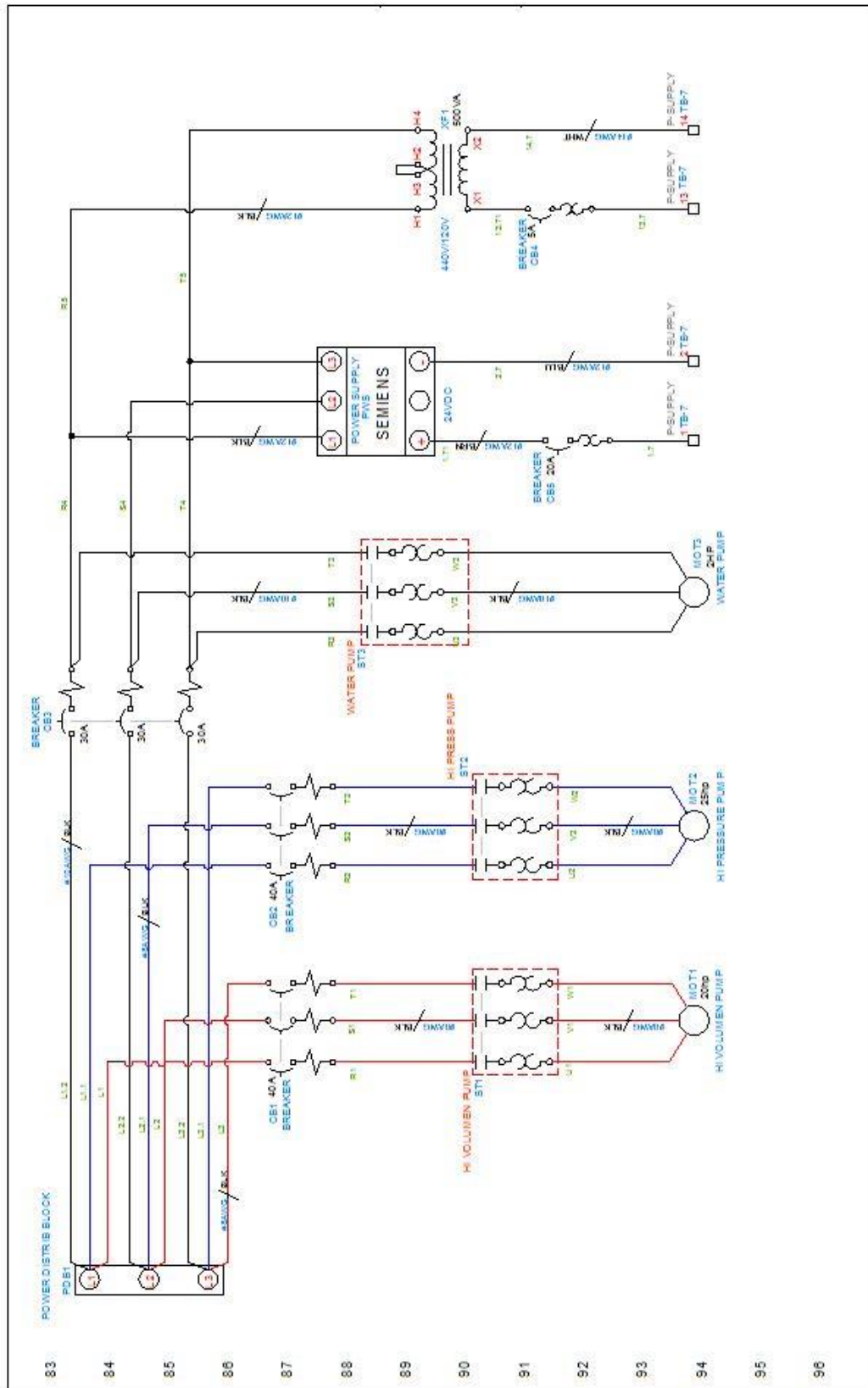
Low Car Drive Shaft



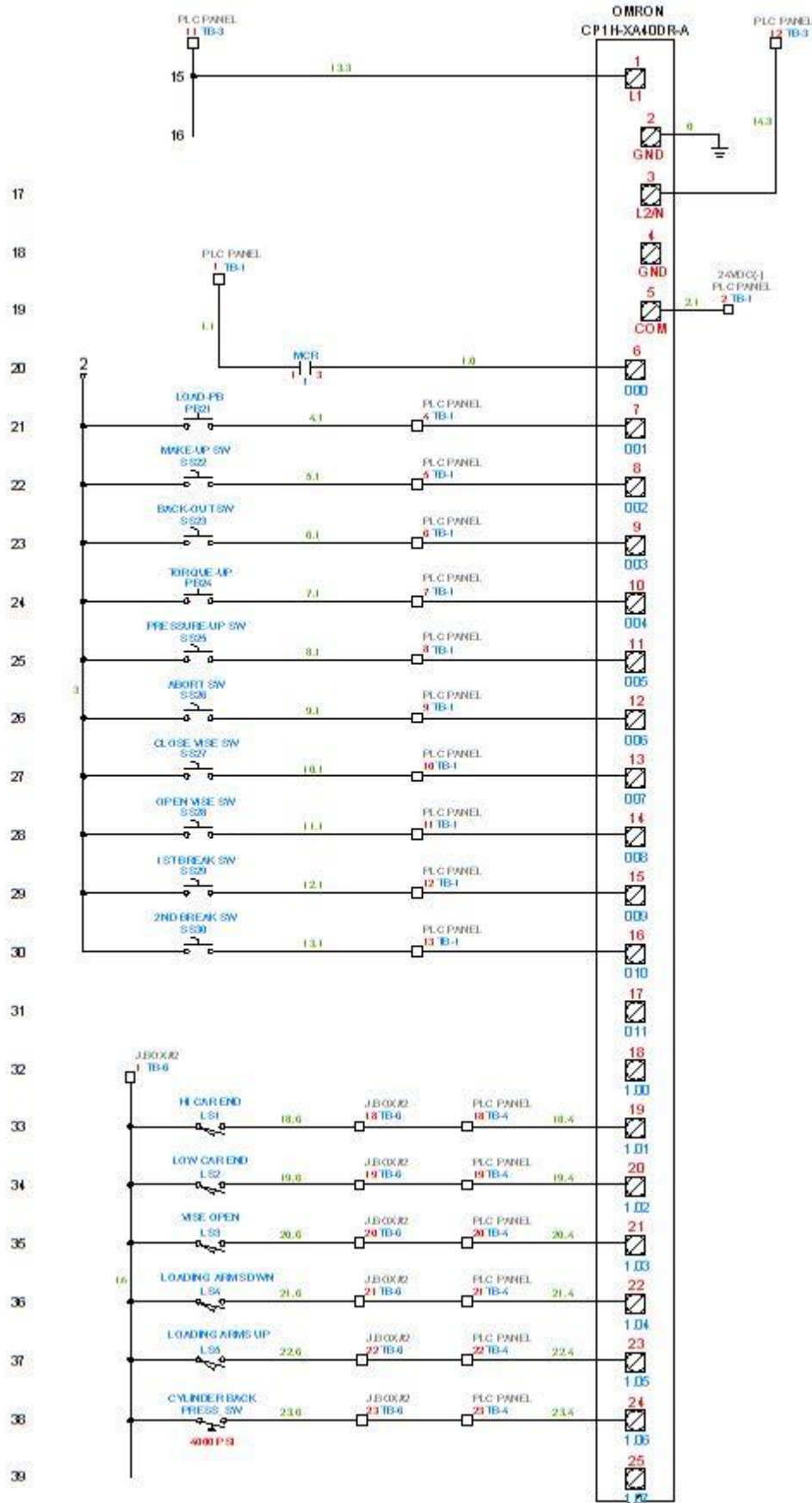
Item #	Part #	Description	Quantity
1	28229	HEX NUT	4
2	16441	HYDRAULIC MOTOR	1
3	37066	THREADED BUSHING	2
4	28272	LOCK WASHER	4
5	14330	HEX BOLT	1
6	110-200-034-018	CAR MOTOR TORQUE PLATE	1
7	110-200-042-XXX	RUBBER DISK	1
8	21204	FLANGE PAD	2
9	14318	HEX BOLT	6
10	17651	FLAT WASHER	6
11	16484	HEX NUT	6
12	21817	HEX BOLT	8
13	110-700-106-00	VALVE CAGE	1
14	110-701-611-00	DISCHARGE VALVE	1
15	110-200-130-018	BEARING SUPPORT PLATE	2
16	14307	HEX BOLT	8
17	17674	LOCK WASHER	8
18	20862	DRIVE SHAFT	1
19	16487	HEX NUT	1
20	28272	LOCK WASHER	4
21	110-200-041-018	STEEL DISK	1
22	14598	FLANGED BEARING	2

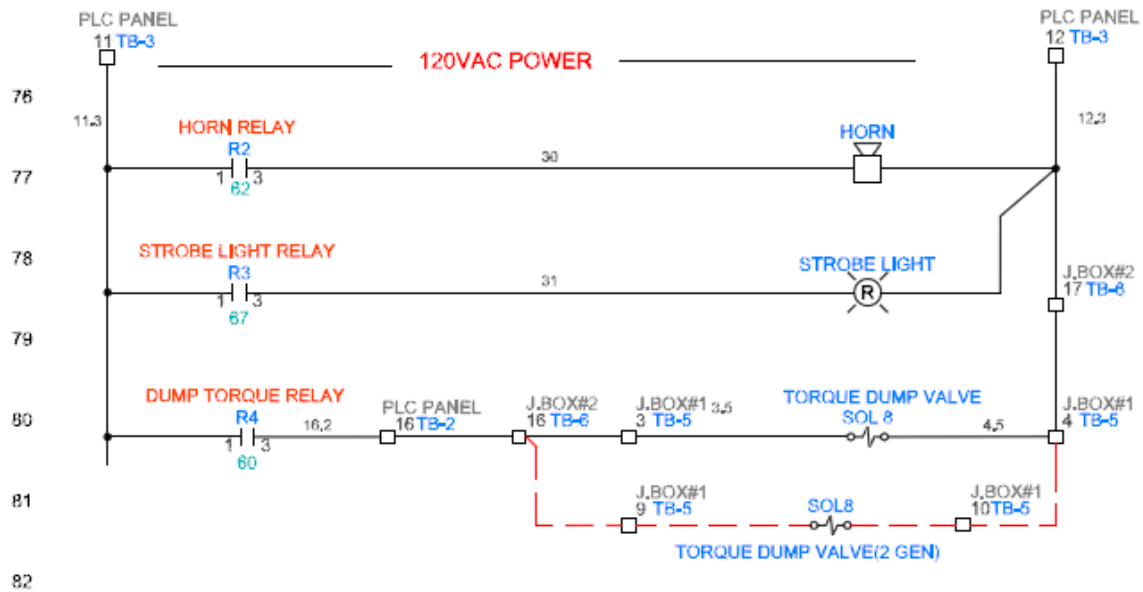
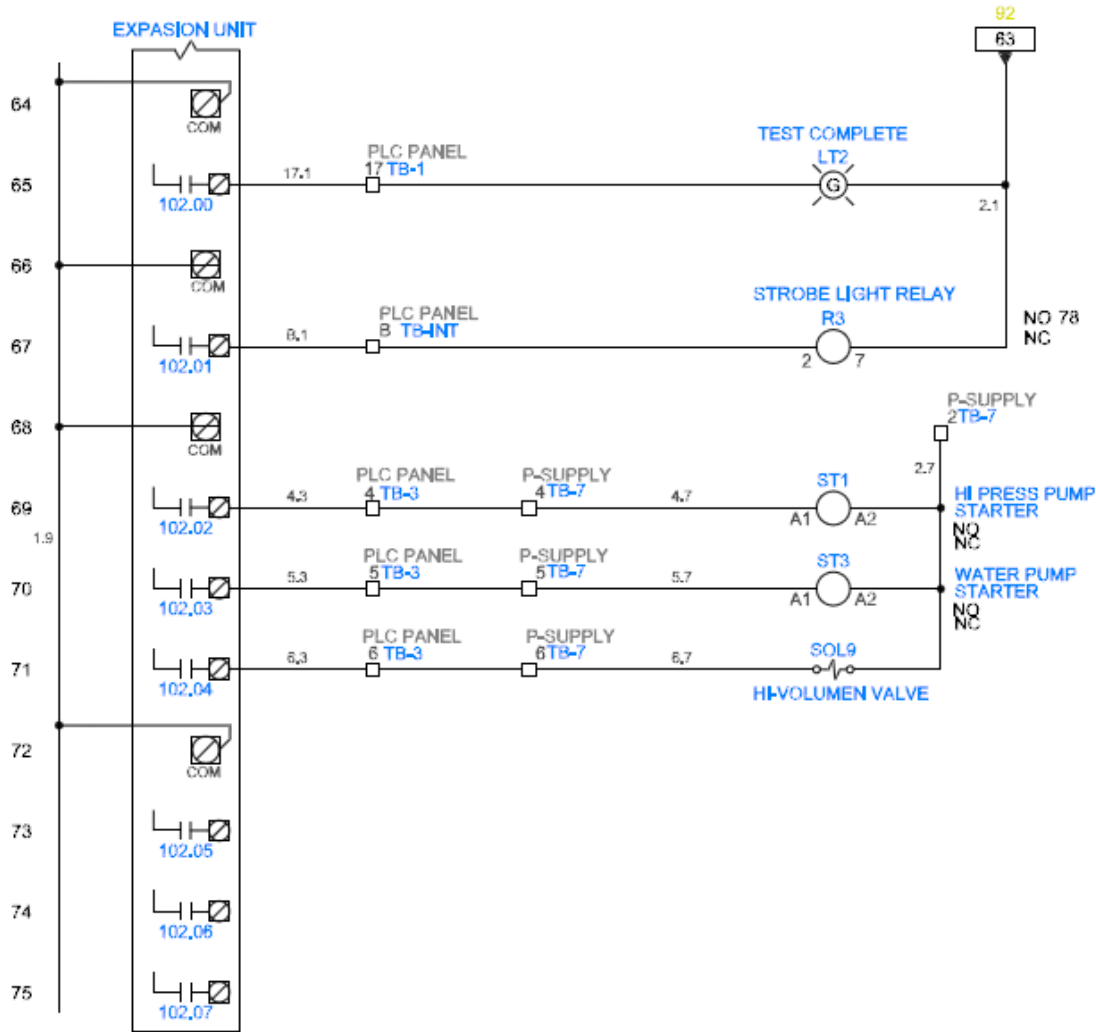
Schematics

480V Electrical Schematic

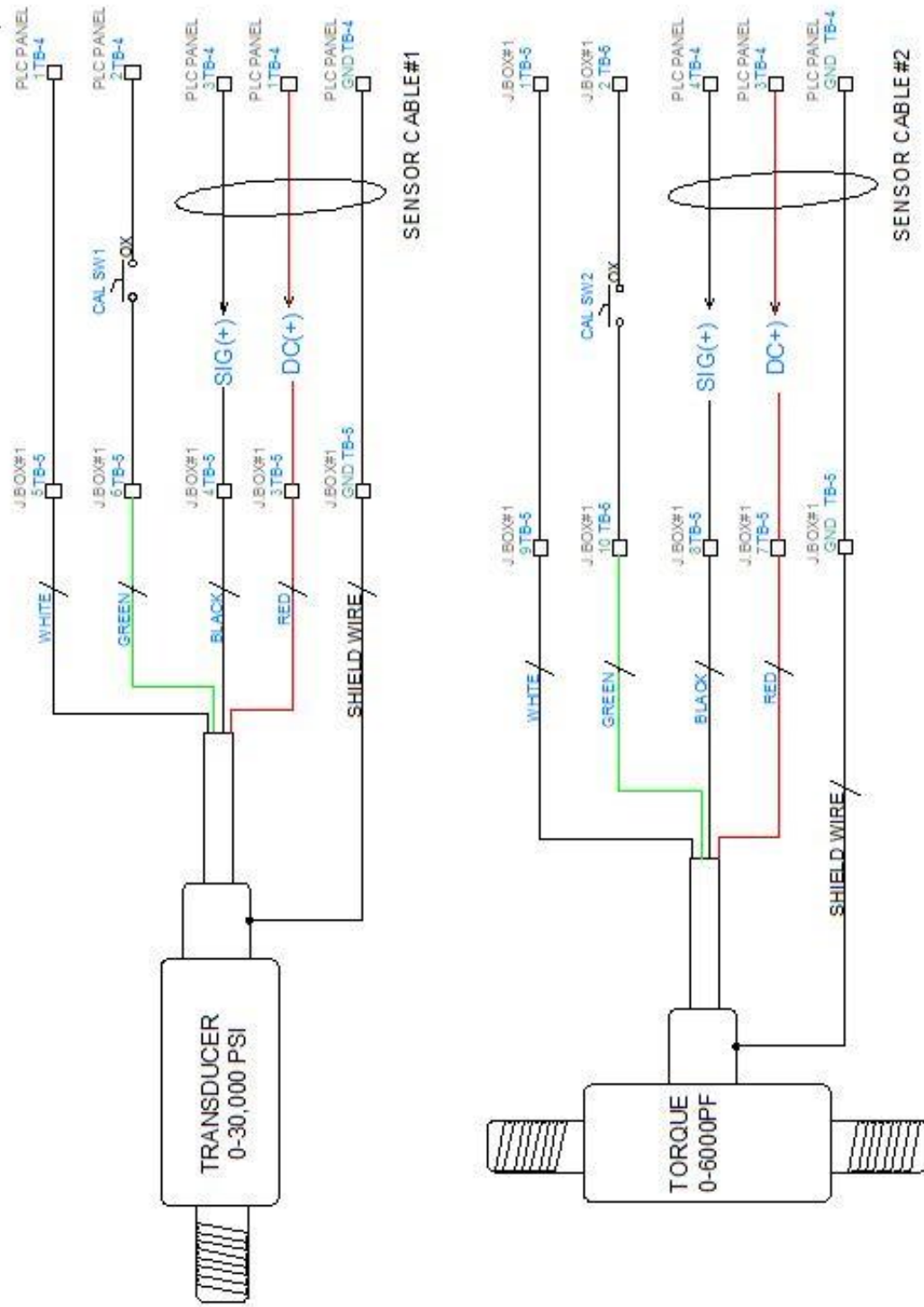


PLC Schematic

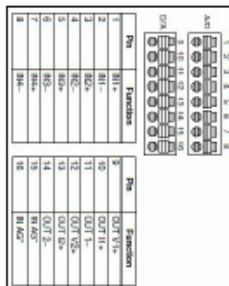
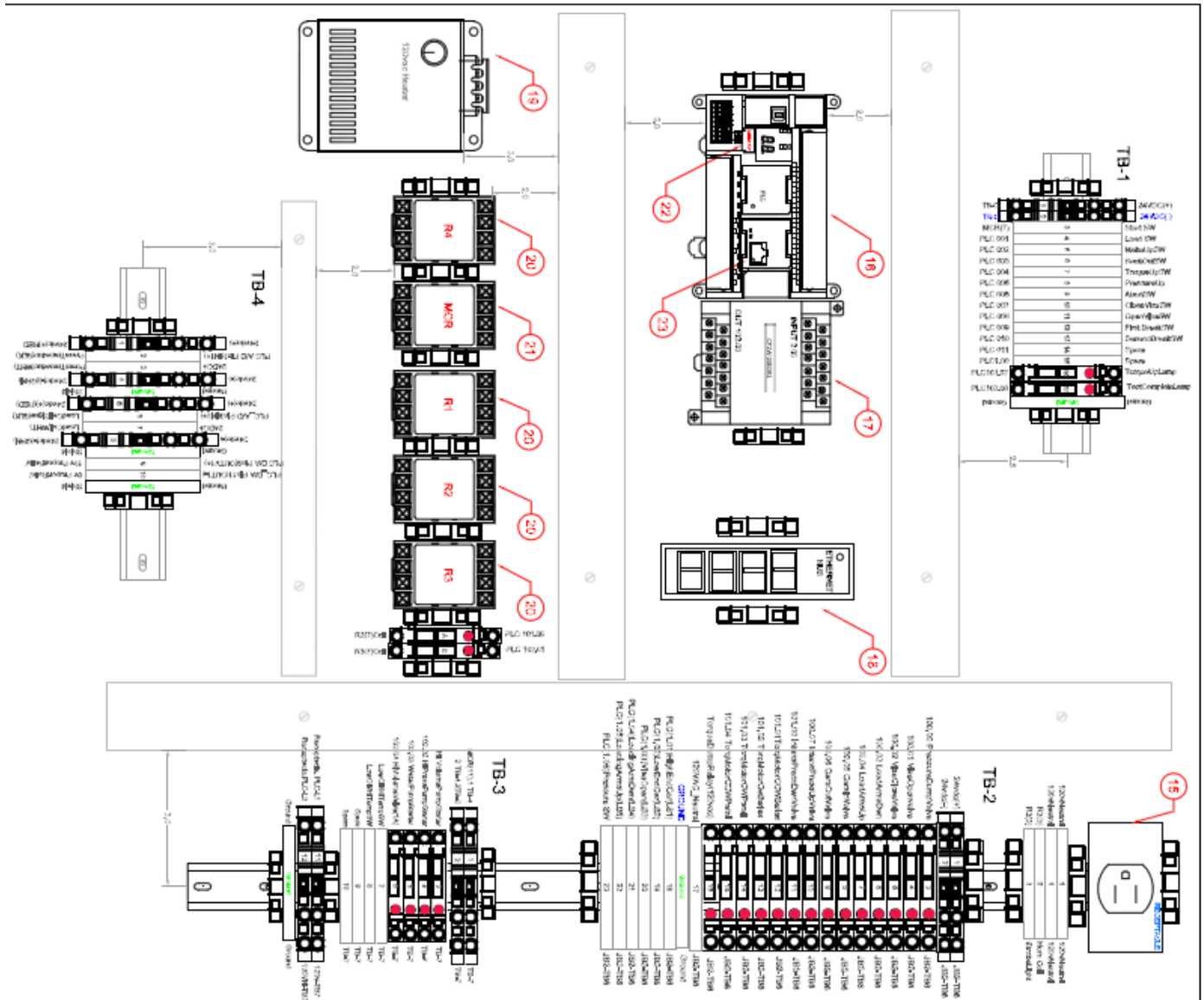




Transducer Layout

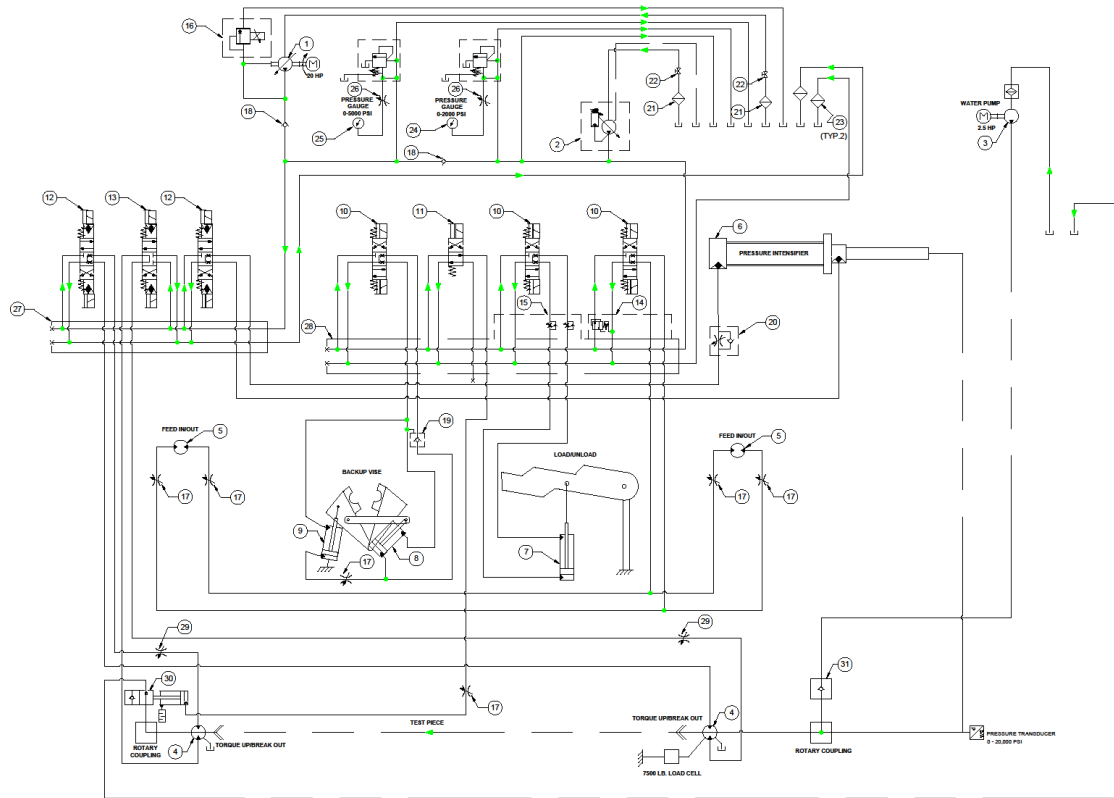


Power Supply Layout



ITEM	NAME	QTY	MT	PAR
15	Receptacle, 120V DinRail Receptacle	1	23173	
16	PLC 40/O/CP1H	1	15883	
17	PLC Expansion I/O Unit	1	15375	
18	8 port Ethernet Switch(MOXA)	1	16479	
19	Heater, 150watt Hoffman	1	21726	
20	Relay, 8 pins 2 Pole 24vdc Coil	4	17001	
21	Relay socket, 8 pins relay Socket	4	17246	
22	Relay, 11 pins 3 Pole 24vdc Coil Relay	1	17002	
23	Memory Cassette	1	17247	
24	Ethernet Device, CP1W-CF-A1	1	14808	
24	Console Panel	1	24232	
24	Writing panel	1	24242	
	Wago Terminal, Single Terminals	35	14155	
	Wago Terminal, Double terminals	14	17452	
	Wago Terminal, Ground Terminals	6	17450	
	Wago Terminal, Hold 24VDC Terminals	20	17455	
	Wago Terminal, Ends Caps Terminals	24	14204	
	Wago Terminal, Jumpers	2	15283	
	Wago covers, Separate Single Terminals	5	13963	
	Wago covers, Separate Doubles Terminals	6	13964	
	Fuse, Fuse MDL-11/2A	16027		
	Din-Rail 35mm	12	15967	
	Panduit, .5" Panduit	6	15240	
	Panduit Cover, 1.5" Panduit Cover	6	15237	
	Screws, ENDING 10-32x1/2" 71611	25	15119	
	Panduit, Panduit trough 1x2	6	15588	
	Panduit Cover, 1.5" x6" long	6	15237	

Hydraulic Schematic



ITEM	QTY.	DESCRIPTION	PART NO.
1	1	PISTON PUMP 19 GPM	22534
1.1	1	20 HP MOTOR C-FACE	16412
2	1	VANE PUMP 39.5 GPM	22532
2.1	1	25 HP MOTOR C-FACE	16414
3	1	WATER PUMP	24734
4	2	HYDRAULIC MOTOR	16441
5	2	HYDRAULIC MOTOR	16391
6	1	7" X 48" HYDRAULIC CYLINDER	24126
7	1	3 1/4" X 12" HYDRAULIC CYLINDER	24125
8	1	4" X 5" HYDRAULIC CYLINDER	24124
9	1	2" X 2" HYDRAULIC CYLINDER	15113
10	3	SOLENOID DIRECTIONAL CONTROL VALVE	17604
11	1	SOLENOID DIRECTIONAL CONTROL VALVE	21654
12	2	SOLENOID DIRECTIONAL CONTROL VALVE	28592
13	1	SOLENOID DIRECTIONAL CONTROL VALVE WITH REVERSED SPOOL	28593
14	1	MODULAR PRESSURE REDUCER	28591
15	2	MODULAR FLOW CONTROL	14790
16	1	PROPORTIONAL RELIEF VALVE	21016
17	6	FLOW CONTROL	15994
18	2	CHECK VALVE	28546
19	1	PILOT OPERATED CHECK VALVE	26104
20	1	COUNTER BALANCE	14797
21	2	STRAINER	29113
22	2	2" BRONZE GATE VALVE	17570
23	2	FILTER	29112
24	1	2 1/2" LM PRESSURE GAUGE 0-2K	16817
25	1	2 1/2" LM PRESSURE GAUGE 0-5K	16818
26	2	NEEDLE VALVE	16038
27	1	MANIFOLD	28610
28	1	MANIFOLD	28611
29	2	FLOW CONTROL	21008
30	1	DUMP VALVE	110-701-611-00
31	1	CHECK VALVE	110-701-054-00

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<p>TITLE: HYDROSTATIC TEST UNIT HYDRAULIC SCHEMATIC</p>	
DWG. No:	110-800-001-00
REV.:	—
WT:	LBS SHEET 1 OF 1

BY:	DATE:
BL	12/31/12
CHECKED:	XXXX
JBB	XXXX
APPROVED:	XXXX

HTM-2000 Equipment Layout

