1.1 Specifications

Pioneer Wheelpuller Specifications	
ENGINE:	• Ford V-8 gasoline, 351 CID (5.8L) • Maximum power: 158 HP (118 KW) @ 3000 RPM • Peak torque: 298 FTLB (404 NM) @ 2400 RPM
TRACTION DRIVE:	• Hydrostatic, 4-wheel • 0-10 MPH (0-16 KMH) speed range • Automatic, hydraulically controlled limited slip
DIMENSIONS:	• Height: 125 IN (3.18 M) • Width: (transport) 102 IN (2.59 M) • Length: 233 IN (5.92 M) • Wheelbase: 96 IN (2.44 M) • Tread: (min) 77 IN (1.95 M) (max) 93 IN (2.36 M)
TIRES:	• 11.2 X 28 RI, 4 PLY
STEERING:	• Hydrostatic
WEIGHT:	• Gross (full fuel tanks): 7300 LBS (3318 KG) • Front axle (approx): 3950 LBS (1795 KG) • Rear axle (approx): 3350 LBS (1523 KG)
CAPACITIES:	• Fuel 60 GAL (226 L) • Hydraulic fluid 46 GAL (174 L) • Engine coolant 5 GAL (19 L) • Engine oil 5 QT (4.8 L)
LIGHTING:	• 2 headlights • 3 forward looking floodlights (one for each 2 rows) • 2 rearward looking floodlights • 1 taillight • 2 flashing warning lights
INSTRUMENTS:	• Engine tachometer • Hourmeter

	• Engine coolant temperature • Engine oil pressure • Ammeter • Fuel level sight gauge (on fuel tank)
FRAME:	• Welded and bolted tubular steel with oscillating • front axle.

HYDRAULICS:	• Two-pump system with: (1) a variable-displacement, piston pump and fixed-displacement, piston motors in a closed circuit system for the traction drive, and (2) a fixed-displacement gear pump, electrohydraulic valve, electronic keypad controls in an open center circuit for:
	  • power steering
	  • puller wheel drive
	  • puller lift/lower
	  • puller unit position
	  • toolbar fold
	  • tread adjustment

DETASSEL SYSTEM:	• Four go-cart style tires (4.10/3.5-4) per row, with each row driven by a hydraulic motor with an adjustable speed range from 0 to 320 RPM. Each two-row gang individually adjustable in height and lateral position on the toolbar. • An electronic height sensing and control system is an integral part of the hydraulic detasseling lift system for automatic height adjustment of the detasseling gangs.

ROW WIDTHS / PATTERNS:	• Narrow row spacing: 30 IN (76 CM)
	  • 4-1-4 planting pattern — Tread at wide spacing (93 IN, 2.36 M) to straddle 3 rows.
	  6-2-6 " " "
	• Wide row spacing: 36-38 IN (91-96 CM)
	  • 4-1-4 planting pattern — Tread at narrow spacing (77 IN, 1.95 M) to straddle 2 rows.

Section 2

Chassis

Moving from front to rear of machine by sections, locate points of maintenance, tell quantity/machine, explain maintenance procedures, and recommended intervals.

Note When contacting the shop concerning trouble shooting or possible parts requisitioning, the serial number located on the left side of the steering column upright will be required.

2.1 Go-Cart Frame

Bearings, Set collars, Set screws

Check following items 3-4 times/day.

- (24) bearings w/collars. Twist collar tight in opposite direction of rotation, and tighten set screws.

Puller Tires and Rims

Check following items 3-4 times/day.

- (24) Tires, Rims Look for cracks in tires and valve stems. Check above items, 1 time/day. Look for loose hub bolts, and set screws. Maintain tire pressure between 8-12 psi.

Auto Height Equipment (Non-electronic.)

Check following items 1 time/day.

- (3) Linear Actuators Look for loose bolts, and screws. Clean upright with emery cloth or steel wool, and reapply spray graphite lubricant. (For pre 1989 models only.) Clean plastic upright with warm water and mild detergent. Do not apply any lubricant. (For 1989 models only.) Perform above procedures as needed to free sticky or dragging sensor brackets.

Note Blown fuses in auto height control box could be indicating the need to perform this procedure.

- (3) Reflector Brackets. Look for loose bolts. Clean upright with emery cloth or steel wool, and reapply spray graphite lubricant. (For all models.) Perform above procedure as needed to free sticky reflector bracket, or to protect from rusting.
- (24) Puller shaft bearings. Look for worn out bearings. Grease cast iron type of pillow block flange. Replace worn bearings in cast iron, and stamped sheet metal flanges.
- (12) Puller Shafts. Look for loose and slipping shafts. Look for worn or cracked shafts at the edge of the bearing. Replace bad shafts, or tighten set collars, and set screws for slipping shafts.

Note

Do not drill detents in shafts!

2.2 Puller Lift and Positioning Assembly

Small Toolbar

Check following items 1 time/year.

- (3) Small Toolbars Clean with emery cloth, or steel wool and reapply spray graphite lubricant. Perform above procedure as needed to free sticky go-cart frame slider tubes. Look for cracks around welds.

Lift Frames

Check following items 1 time/year.

- (6) Lift frames. Lubricate pivot points (12), 1 time/year, prior to winter storage is recommended. Look for loose roll pins. (For pre 1989 models only.) Replace roll pins with 3/16" cotter pins. Look for broken or missing cotter pins. (For 1989 models only.) Look for cracks around welds.

Roller Frames

Check following items 1 time/day.

- (3) Roller frames. Look for loose bolts. Look for rust on roller and roller shaft. Remove rust and reapply WD40 spray lubricant. Perform above procedure as needed. Look for cracks around welds.

Check following items 1 time/year.

- (6) Plastic slider pads. Look for worn out slider pads. Remove slider pad, invert and use remaining good portion of pad.

Main Toolbar

Check following items 1 time/year.

- Main Toolbar Look for cracks around welds. Look for signs of fatigue around pivot pin. (More so on pre 1989 models.) Look for bending around anchor point, and loosening of mounting bolts.

2.3 Main Frame

Front Axle Pivot Pin

Check following items 1 time/day.

- (1) Pivot Pin. Located in the front leg support, under steering column. Lubricate pivot point 1 time/year, before winter storage is recommended, to maintain free movement. Look for cracks around welds.

Welds

Check following items 1 time/year during normal use, more frequently during periods of extended use in rough terrain such as irrigated fields.

- Look at all welds on main frame members, on the deck framework, and ladders and handrails. Check for cracking patterns in the paint around welds on high stress areas such as the area under the engine, on the cantilever beams supporting the deck, and on the steering arms. Contact the shop for recommended repair procedures.

Leg Attachment Crossmember

Check following items 1 time/year during normal use, more frequently during periods of extended use in rough terrain such as irrigated fields.

- (2) Leg Attachment Crossmember. (4 points of maintenance) Look for deep gouges on surface area where leg sleeve travels on crossmember. It will be necessary to inspect this area with the legs in wide and narrow row positions since you cannot see it all without moving the leg sleeves. Once a gouge is discovered you should repair it immediately before moving the legs again, as this problem will get worse with further operation. If possible clean and smooth the gouge with a grinder taking care to remove all metal chips that will eventually break loose and cause the problem to reoccur. These chips will have to be removed from the inside surface of the leg sleeve as well as the crossmember. Use an air gun to blow out all loosened metal chips, then reapply a liberal coat of spray graphite lubricant.

Note

Always tighten (8) bottom leg clamp nuts before operating machine. Failure to do so puts undue stress on front axle pivot pin!

2.4 Operator Station

Seat

(2) Seats. Lubricate mechanisms on main seat as needed to maintain free movement of all seat adjustments. Clean vinyl material, and since the seats are exposed to so much direct sunlight it's recommended that you protect them with Armorall protectant.

Fire Extinguisher

(1) Fire Extinguisher. Look at the gauge to make sure pressure is not being lost. Repressurize if not fully charged. The extinguisher will need to be repressurized after every use no matter how small the amount of pressure that was lost.

Tool Box

(1) Toolbox. Following is a list of recommended tools to be maintained on each Wheel Pulley in the toolbox provided.

- 12" adjustable wrench
- 1/2" drive ratchet
- 1/2" drive x 5" extension
- 1/2" drive x 1 1/4" socket
- 1/2" drive x 1 1/8 socket
- 1/2" drive x 3/4" socket
- 1/2" drive x 22mm socket (Provided with machine.)
- 3/4" combination wrench
- 9/16" combination wrench
- 1/2" combination wrench
- 7/16" combination wrench
- 6 1/2" combination pliers
- 8" needle nose pliers
- Medium Phillips screw driver
- Medium standard screw driver
- 12 oz. ball peen hammer
- 5 1/2" drive pin punch
- 1/8" allen wrench, tee handle
- 8" medium flat file
- 8" medium rat tail file

Steering Column

Check following items 1 time/year.

- Look for loose bolts. Look for cracks around welds.

2.5 Legs

Sleeves

(4) Leg Sleeves. Follow same maintenance instructions given above pertaining to leg attachment crossmembers.

Welds

Check above item 1 time/year.

- Look for cracks around welds.

Drive Tires and Rims

(4) Drive Tires and Rims. Look for weather cracks, foreign objects, and normal wear on tread and side walls of tires.

Section 3

Engine

3.1 Description And Operation

Engine Description

Refer to page 1-5 of the Engine Service Manual, which is located in wheelpuller engine 3-ring binder. Additional information and operating instructions can be found starting on page 5 of the Engine Operator's Manual, which is located in the inside pocket of the front cover of the engine binder.

Engine specifications are given on pages 8-1 to 8-18 of the Engine Service Manual.

Starting Procedure

Refer to instructions starting on page 5 on the Engine Operator's Manual, in the engine binder.

The engine should always be started at the lowest RPM possible and NOT OPERATED AT SPEEDS OVER 1800 RPM until the hydraulic oil has been allowed to circulate through the system and become warm. This is to protect the hydrostatic charging system and its filter. High engine speeds at cold oil temperatures can cause the filter element to burst and allow contaminants to enter the system and damage the pump and wheel motors.

3.2 Engine Maintenance And Service

Ignition System

Refer to pages 2-1 to 2-23 in the Engine Service Manual.

Fuel System

Refer to pages 3-1 to 3-31 in the Engine Service Manual.

Charging System

Refer to pages 4-1 to 4-16 in the Engine Service Manual.

Starting System

Refer to pages 5-1 to 5-8 in the Engine Service Manual.

Governor

Refer to pages 6-1 to 6-4 in the Engine Service Manual.

Cooling System

Refer to pages 7-1 to 7-3 in the Engine Service Manual. The initial fill is a 50-50 mixture of permanent anti-freeze and water.

3.3 Service Intervals

Refer to page 10 of the Engine Operator's Manual for the routine maintenance schedule.

- Use Motorcraft FL-lA oil filter or equivalent.
- Use Motorcraft FA7-18 air filter element, or equivalent, on all units equipped with the automotive type air cleaner. Use *Donaldson* SMP-18-1063 element on the units using the remote mounted air cleaner.
- Use Motogcraft CAV-296 fuel filter, or equivalent.

3.4 Lubrication Specifications

Refer to page 13 of the Engine Operator's Manual for recommended engine oil viscosities and grades. Our engine distributor generally prefers the single viscosity engine oils for use in our application. *Do* not use oils with a "CD" rating because they are intended for turbocharged gas and diesel engines.

3.5 Fuel Recommendations

Refer to page 3.2 of the Engine Service Manual for a detailed discussion of fuel recommendations. Gasoline with a minimum anti-knock rating of 87 is required. Unleaded fuel is preferred because of reduced deposit buildup experienced with its use.

Fuels *containing ethanol* are accepable so long as they contain *no* more the 10 percent ethanol by volume. Apparently some fuels contain more than 10 percent at times, so a trusted source of supply is necessary. *Only* unleaded fuels should be used if they *contain ethanol.*

3.6 Parts And Service Assistance

Refer to the Parts and Service Distributor Directory, which is located in the pocket inside the front cover of the engine binder, for locations of sources of parts and service. A parts catalog is in the engine binder.

Section 4

Hydrostatic Traction Drive

Section 5

Electrical

HYDRAULIC FITTINGS

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	DESCRIPTION & PARKER NUMBER
1F	8	1	6-		STRAIGHT THREAD CONNECTOR, 10-12F4OXS
2F	4	1	6-		STRAIGHT THREAD CONNECTOR, 6-6F4OXS
3F	14	1,3	6-		STRAIGHT THREAD CONNECTOR, 10F5OXS
4F	5	1,3	6-		STRAIGHT THREAD ELBOW, 16C5OXS
5F	1	1	6-		STRAIGHT THREAD ELBOW, 20-16C5OXS
6F	1	3	6-		MALE ELBOW, 2OCTXS
7F	1	3	9-		STRAIGHT THREAD 45 ELBOW, 6V5OXS
8F	2	1	6-		MALE ELBOW, 2O-16CTXS
9F	1	1	6-		STRAIGHT THREAD CONNECTOR, 10-12F5OXS
10F	1	3	6-		STRAIGHT THREAD CONNECTOR, 20-24F5OXS
11F	2	3	6-		HEX PLUG, 1HPS
12F	20	1,3	6-		STRAIGHT THREAD ELBOW, 6C5OXS
13F	12	3	6-8	NOTE (3)	STRAIGHT THREAD CONNECTOR, 8-1OF5OXS
14F	6	3	6-8	NOTE (3)	SWIVEL NUT ELBOW, 8C6XS
15F	1	1	6-		MALE BRANCH TEE, 1O-12STXS
16F	2	3	6-		UNION CROSS, 6KTXS
17F	2	3	6-		SAE FLANGE, 51H-16
18F					PIPE REDUCER, 3/8 X 1/4 PTRS (FOR PRESSURE GAUGE)
19F	2	3	6-		SAE FLANGE, 51F-20
20F	1	3	6-		O RING, 711510-4
21F	2	3	6-		STRAIGHT THREAD CONNECTOR, 6-8F5OXS
22F	1	3	6-		O RING, 711510-3
23F	2	1	6-		STRAIGHT THREAD ELBOW, 12-1OC5OXS
24F	2	1	6-		STRAIGHT THREAD ELBOW, 12-16C5OXS
25F	6	1,3	6-		UNION TEE, 6JTXS
26F	1	3	6-		STRAIGHT THREAD BRANCH TEE, 6S5OXS
27F	1	3	6-		MALE ELBOW, 16CTXS
28F	2	1	6-		STRAIGHT THREAD CONNECTOR, 6F4OXS
29F	24	3	6-		STRAIGHT THREAD CONNECTOR, 6F5OXS
30F	1	3	6-		SWIVEL NUT RUN TEE, 6R6XS
31F	1	1	6-8	12F	MALE ELBOW, 6-2CTXS
32F	1	3	NOTE (5)		STRAIGHT THREAD CONNECTOR, 6-8F5OXS
33F	2	3	6-		STRAIGHT THREAD CONNECTOR, 12-1OF5OXS
34F	1	3	NOTE (5)		SWIVEL NUT RUN TEE, 6R6XS
35F	1	3			STRAIGHT THREAD CONNECTOR, 16F5OXS
36F	1	1	NOTE (6)		STRAIGHT THREAD ELBOW, 6C5OXS
37F	1	1	NOTE (6)		MALE ELBOW, 6CTXS
38F	1	1			PLUG, 3/4HPS
39F	2	3			SWIVEL NUT ELBOW, 6C6XS
40F	7	1,3			STRAIGHT THREAD ELBOW, 1OC5OXS
41F	1	1	6-8	15F	MALE BRANCH TEE, 1OSTXS

HOSE ASSEMBLIES

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	HOSE SPEC. NOTE (2)	END FITTING	END FITTING	LENGTH
1H	8	1	6-		.5OID, SAE 1OOR2	#1O JIC MALE RIGID	#1O JIC MALE RIGID	43
2H	6	1	6-		.25ID, SAE 1OOR6	#6 JIC MALE RIGID	#6 JIC MALE RIGID	43
3H	2	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	58
4H	2	3	6-		.25ID, SAE 1OOR1	#6 JIC MALE RIGID	#6 JIC FEMALE SWIVEL	34
5H	4	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 FIC FEMALE SWIVEL	27
6H	1	3	6-		1.OID, SAE 1OOR2	#16 JIC MALE RIGID	#16 JIC FEMALE SWIVEL	26
7H	2	3	9-		.62ID, SAE 1OOR2	#1O JIC FEMALE SWIVEL	#12 JIC MALE RIGID	176
8H	1	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	3/8 MALE RIGID PIPE	18
9H	1	3	9-		.62ID, SAE 1OOR2	#1O JIC FEMALE SWIVEL	#1O JIC FEMALE SWIVEL	242
1OH	1	3	9-		.62ID, SAE 1OOR2	#1O JIC FEMALE SWIVEL	#1O JIC FEMALE SWIVEL	22O
11H	2	3	6-8	7H	.5OID, SAE 1OOR1	#8 JIC FEMALE SWIVEL	#8 JIC MALE RIGID	176
12H	2	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	42
13H	2	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	36
14H	2	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	134
15H	1	3	6-8	9H	.5OID, SAE 1OOR1	#8 JIC FEMALE SWIVEL	#8 JIC MALE RIGID	242
16H	1	3	6-8	1OH	.5OID, SAE 1OOR1	#8 JIC FEMALE SWIVEL	#8 JIC MALE RIGID	22O
17H	3	3	6-8	38H	.5OID, SAE 1OOR1	#8 JIC FEMALE SWIVEL	#8 JIC FEMALE SWIVEL	34
18H	5	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	54
19H	1	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	4O
37H	1	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	65
38H	3	3	9-		.62ID, SAE 1OOR2	#1O JIC FEMALE SWIVEL	#1O JIC FEMALE SWIVEL	34
39H	1	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	19O
4OH	1	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	18O
41H	1	3	6-		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	24
42H	1	3	NOTE (5)		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	66
43H	1	1	NOTE (6)		.25ID, SAE 1OOR1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	24

REPAIR PARTS AND KITS

FOR P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	DESCRIPTION & VENDOR NUMBER
1C	1	1	6-		GASKET, PUMP, SUNDSTRAND 46941
1C	1	1	6-		O RING, PUMP/MOUNTING PLATE,
5C	1	1	6-		O RING, MOTOR, POCLAIN U1830496
9C	1	2	6-		SEAL KIT, CYLINDER, CROSS 1C4433
13C	1	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 20192031
18C	1	2	6-		O RING, PUMP, DASH #044
21C	1	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 6259SK
22C	2	2	6-8	35C	SEAL KIT, CYLINDER, ROSENBOOM 20112008
23C	2	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 10021005
24C	2	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 10021005
25C	12	1	6-		CAPSCREW, BRAKE, M10X45, POCLAIN M1332953
25C	1	1	6-		O RING, BRAKE, PARKER 2-258
25C	1	1	6-		SNAP RING, BRAKE, POCLAIN V0036276
35C	2	2	9-		SEAL KIT, CYLINDER, ROSENBOOM 631103034
42C	4	1	6-		SEAL KIT, CARTRIDGE, FAUVER 8SK3-0001-N
43C	1	1	2-		SEAL KIT, CARTRIDGE, FAUVER 8SK3-0005-N
44C	1	1	2-		SEAL KIT, CARTRIDGE, FAUVER 8SK3-0020-N

NOTES:

(1) PARTS ARE USED ON MACHINES WITH SERIAL NUMBERS ENDING IN THE INCLUSIVE DIGITS SHOWN. FOR EXAMPLE, 6- MEANS ALL MACHINES, 6-8 MEANS SERIAL NUMBERS ENDING IN 6, 7, AND 8.

(2) HOSE SPECIFICATIONS:
SAE 1OOR1 SHALL BE PARFLEX 56O OR EQUAL. FOR FIELD SERVICE STANDARD SAE 1OOR1 MAY BE USED.
SAE 1OOR2 SHALL BE PARFLEX 59O OR EQUAL. FOR FIELD SERVICE STANDARD SAE 1OOR2 MAY BE USED.

(3) FITTINGS USED AT MOTOR (26C) ON 9- PRODUCTION ARE 3F IN ONE PORT, AND 4OF IN THE OTHER PORT.

(4) PIONEER STANDARDS FOR HYDRAULIC SYSTEMS PROCUREMENT, STORAGE, HANDLING, ASSEMBLY, AND TESTING APPLY.

(5) ADDED IN 1992, PART USED FOR CONNECTING ROD SIDE OF CENTER LIFT CYLINDER TO TANK.

(6) ADDED IN 1992, PART USED IN SHUTTLE VALVE DRAIN SYSTEM.

REVISED 08-01-92, JE, GENERAL UPDATES

PIONEER HI-BRED INTERNATIONAL, INC.

SHOP NO:

TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC

PROJ: SCALE: NONE BY: DK DATE: 3-2-89 SHT: 5 OF: 5

PLANT: DESIGN STD.

ENG NO: 9091

HYDRAULIC COMPONENTS

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	VENDOR NUMBER
1C	1	1	6-		PUMP, SUNDSTRAND PV046C-ABAB-AB-CJJ-AAC-B
2C	1	1	6-		STRAINER, ZINGA TF-1030-0
3C	1	1	6-		RESERVOIR, PIONEER 4235, SHT 1
4C	1	1	6-8	38C	FILTER, FAIREY-ARLON, GA60-SAE16-TXW2-CC10-BLOCKED
5C	4	1	6-		MOTOR, POCLAIN S5 (28.6 CID)
6C	1	2	6-		FILTER, FAIREY-ARLON, TTF-170-SAE24-TXW4-CC10-B-T-22
7C	1	1	6-1	41C	VALVE, FAUVER FV-0-2062-JJJJ
8C	1	2	6-		COOLER, BLISSFIELD 65027
9C	1	2	6-		CYLINDER, CROSS DB250-800-106-CCAO
10C	1	1	6-		BREATHER, OILRITE A3432-4
11C	1	1	6-7	34C	SIGHT LEVEL, HYDROCRAFT HC-SP-8
12C	1	2	6-		VALVE, LOCK, MODULAR SV3-10-C-6T-120T
13C	1	2	6-		CYLINDER, STEER, ROSENBOOM 6931
14C	1	2	8-		VALVE, STEER, ROSS HGA-10-121
15C	1	2	6-7	14C	VALVE, STEER, ROSS HGA-10-127 (NOTE 2)
16C					BLANK
17C	1	2	2-		CYLINDER, LIFT, CTR, ROSENBOOM 6288 (NOTE 4)
18C	1	2	6-		PUMP, SUNDSTRAND TAP 22/90 33.5DSC07
19C	1	2	6-		STRAINER, ZINGA 1230-5
20C	1	2	6-		VALVE, HYDRA-POWR HMA-139
21C	1	2	6-1	17C	CYLINDER, LIFT, CTR, ROSENBOOM 6259
22C	2	2	6-8	35C	CYLINDER, FOLD, ROSENBOOM 6947
23C	1	2	6-		CYLINDER, BOOM, LH, ROSENBOOM 6732
24C	2	2	6-		CYLINDER, BOOM, CTR, RH, ROSENBOOM 6731
25C	2	1	6-		BRAKE, POCLAIN S5
26C	6	2	6-1	45C	MOTOR, WHITE MS-100401
27C	2	2	6-		CYLINDER, LIFT, RH, LH, ROSENBOOM 6288
28C	55		6-		SPLIT BUSHING, PARKER C-SB-10-6
29C	40		6-		SPLIT BUSHING, PARKER C-SB-10-10
30C	2		6-		SPLIT BUSHING, PARKER C-SB-16-16
31C	1		6-		SPLIT BUSHING, PARKER C-SB-32-16
32C	1		6-		CLAMP, PARKER C-PH-10-2
33C	1		6-		CLAMP, PARKER C-PH-16-2
34C	1	1	8-		LEVEL GAUGE, UC-FL-31112
35C	2	2	9-		CYLINDER, FOLD, ROSENBOOM 63110
36C	1	1	6-		MANIFOLD, FAUVER FV-2599
37C	1	1	9-		STRAINER, FILL, ZINGA TF-1220-0
38C	1	1	9-		FILTER, DONALDSON HMK04, P16-4378, BLOCKED
39C	1	2	6-		COUPLER, MALE TIP, PIONEER 4010-3
40C	1	2	6-		DUST CAP, PIONEER 5209-3
41C	1	1	2-		VALVE, 4WD, FAUVER FV-2062-AJJJJK W/SHUTTLE
42C	4	1	6-		CARTRIDGE, FLOW, 4WD VALVE, FAUVER J2A60 W/TC-1124 CAP
43C	1	1	2-		CARTRIDGE, CHARGE RELIEF, 4WD VALVE, FAUVER A8B60
44C	1	1	2-		CARTRIDGE, SHUTTLE, 4WD VALVE, FAUVER K3A60-10.0
45C	6	2	2-		MOTOR, PARKER 040088AS

NOTES:

(1) PARTS ARE USED ON MACHINES WITH SERIAL NUMBERS ENDING IN THE INCLUSIVE DIGITS SHOWN. FOR EXAMPLE, 6- MEANS ALL MACHINES, 6-8 MEANS SERIAL NUMBERS ENDING IN 6, 7, AND 8.

(2) WHEN FURNISHING HGA-10-121 FOR SERVICE, INCLUDE ONE O RING PLUG, 6P5ONS

(3) PIONEER STANDARDS FOR HYDRAULIC SYSTEMS PROCUREMENT, STORAGE, HANDLING, ASSEMBLY, AND TESTING APPLY.

(4) MADE CENTER LIFT CYLINDER SAME AS RIGHT AND LEFT LIFT CYLINDERS IN 1992, TO CONNECT ROD SIDE OF CENTER LIFT CYLINDER TO TANK.

TUBE ASSEMBLIES

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	TUBE SIZE	FITTING	FITTING
1T					BLANK		
2T	2	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
3T	2	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
4T					BLANK		
5T	1	1	6-		1.000 X .095W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
6T	1	1	6-		1.000 X .095W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
7T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
8T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
9T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
10T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
11T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
12T	1	2	6-		1.2500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
13T					BLANK		
14T	1	2	6-		1.000 X .065W	JIC NUT & SLEEVE	1.0 SAE FLANGE
15T					BLANK		
16T					BLANK		
17T					BLANK		
18T					BLANK		
19T					BLANK		
20T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
21T	1	2	6-		1.000 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
22T	1	2	6-		1.000 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
23T					BLANK		
24T					BLANK		
25T					BLANK		
26T					BLANK		
27T					BLANK		
28T					BLANK		
29T					BLANK		
30T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
31T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
32T	2	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
33T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
34T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
35T					BLANK		
36T					BLANK		
37T	1	2	6-8	90T	.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
38T	1	2	6-8	91T	.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
39T					BLANK		
40T					BLANK		
41T					BLANK		
42T					BLANK		
43T					BLANK		
44T	1	2	6-7	NONE	.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
45T	1	2	6-		1.2500 X .065W	JIC NUT & SLEEVE	1.25 SAE FLANGE
46T	1	1	6-		1.2500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
47T	1	1	6-8	93T	.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
48T	1	1	6-8	94T	.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
49T					BLANK		
50T					BLANK		
51T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
52T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
53T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
54T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
55T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
56T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
57T	2	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
58T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
59T	2	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
60T	1	1	6-		.62500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
61T	2	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
62T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
63T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
64T	1	1	6-		.62500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
65T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
66T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE

TUBE ASSEMBLIES

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	TUBE SIZE	FITTING	FITTING
67T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
68T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
69T	1	1	6-8	89T	.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
70T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
71T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
72T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
73T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
74T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
75T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
76T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
77T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
78T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
79T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
80T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
81T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
82T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
83T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
84T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
85T	1	2	6-8	92T	.62500 X .065W	JIC NUT & SLEEVE	#10 JIC MALE WELD
86T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	#6 JIC MALE WELD
87T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	#6 JIC MALE WELD
88T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	#6 JIC MALE WELD
89T	1	1	9-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
90T	1	2	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
91T	1	2	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
92T	1	2	9-		.7500 X .065W	JIC NUT & SLEEVE	#12 JIC MALE WELD
93T	1	1	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
94T	1	1	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE

REVISED 08-04-92, JC, GENERAL UPDATES

PIONEER HI-BRED INTERNATIONAL, INC.

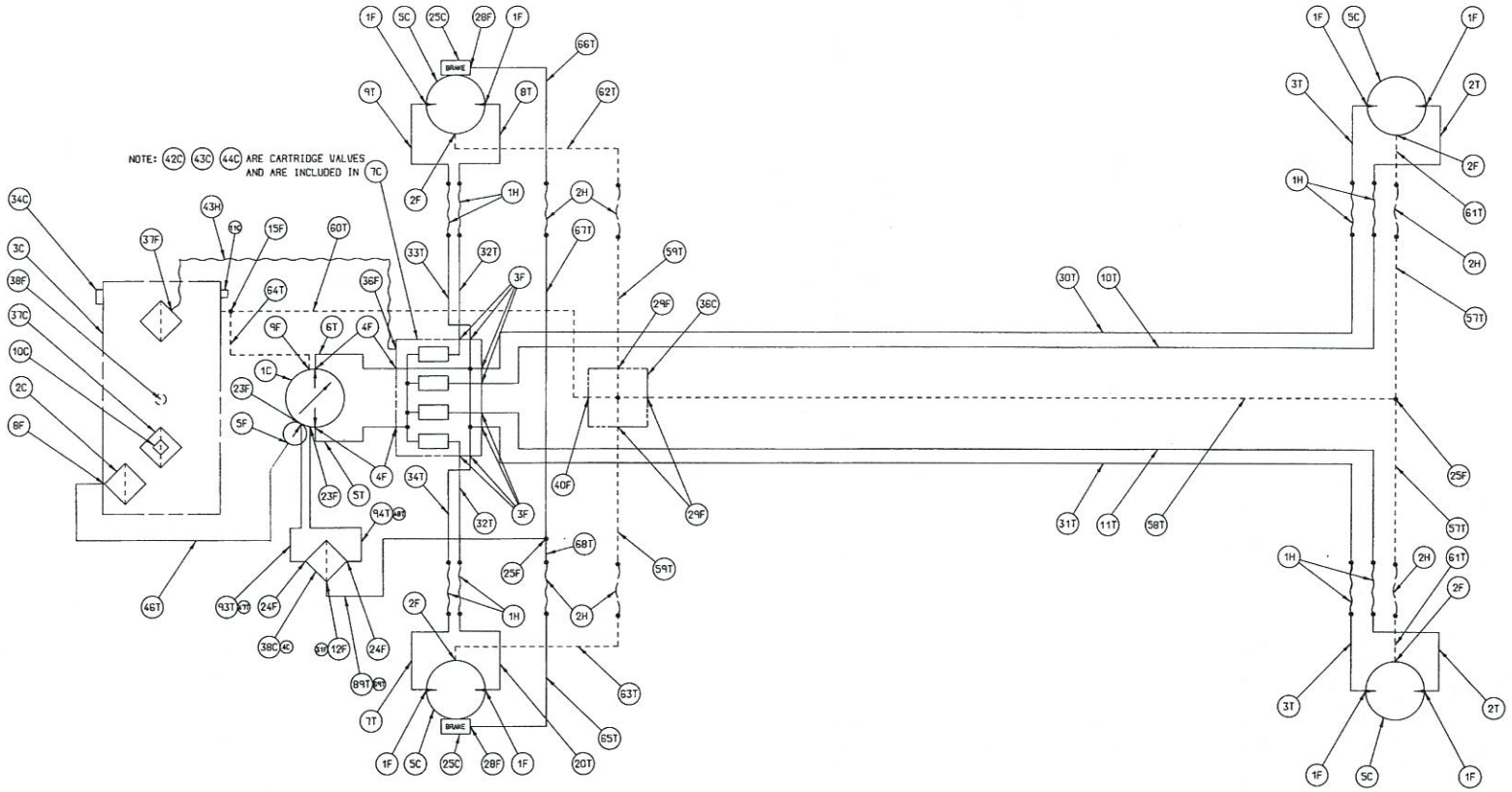
SHOP NO:

TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC

PROJ: SCALE: NONE BY: DK DATE: 3-2-89 SHT: 4 OF: 5

PLANT: DESIGN ST

DWG NO: 9091



XXC → COMPONENTS
XXT → TUBES
— SEE SHEET 4 FOR SPECIFICATIONS

XXH → HOSES
XXF → FITTINGS
— SEE SHEET 5 FOR SPECIFICATIONS

OTE: PART NUMBERS IN SMALL CIRCLE DENOTES PARTS
SED ON WHEELPULLERS BUILT PRIOR TO 1989.

HOSE
TUBE

REVISED 08-04-92, JC, GENERAL UPDATES

PIONEER HI-BRED INTERNATIONAL, INC.

TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC, GROUND DRIVE
PROJ: SCALE: NONE BY: JCC DATE: 3-2-89 SHT: 1 OF: 5

SHOP NO:
PLANT: DESIGN STD.
DWG NO: 9091

- Fauver Service Center
  730 Racquet Club Drive
  Addison, IL 60101 (Chicago area)
  312-543-2828
  Mike Paulick
- Fauver Service Center
  501 W 79th Street
  Bloomington, MN 55420 (Minneapolis area)
  612-884-4462
  Tim Opdahl
- Fauver Service Center (Opens August 1, 1989)
  995 33rd Avenue SW
  Cedar Rapids, IA 52404
  319-366-6437
  Bob Votrobeck
- Rucker Fluid Power (not for Poclain wheel motors)
  1529 North A Street
  Tampa, FL 33606
  813-252-2837

	• Hot oil (+200F) • Failing charge pump • Faulty servo system • Defective wheel motor(s)	• Clean oil cooler • Replace pump • Replace pump • Replace motor(s)
• One wheel slips excessively in mud	• Defective flow control in control valve (7C)	• Replace flow control
• Leaking wheel motor (end plate)	• Bowed end plate	• Remove, flatten, and replace
• Leaking wheel motor (shaft seal)	• Failed seal	• Replace motor
• Leaking wheel motor (brake housing)	• Either failed brake piston seal, or housing joint seal	• Replace motor
• Leaking or burst charge filter	• Excessive charge pressure, caused by high engine startup speed with cold oil	• Operate engine at/below 1800 rpm until oil warms

4.5 Parts And Service Assistance

Most parts will be available at your plant, or in Tipton or Johnston. Hydraulic pumps and wheel motors that need repair can be sent directly to the nearest repair facility listed on the following page. After the unit has been inspected and repaired, it will be returned to your plant. Please attach a tag to the component and explain why the unit is being sent in for repair.

Repair Facilities

The following repair facilities are authorized repair facilities for the Sunstrand hydrostatic pump, Sunstrand gear pump, and Poclain wheel motors.

- Fauver Service Center
  6152 N. Corrington Avenue
  Kansas City, MO 64120
  816-231-1111
  John Johnson
- Fauver Service Center
  4550 40th Street
  Kentwood, MI 49508 (Grand Rapids area)
  616-957-5177
  Steve Hook
- Fauver Service Center
  1500 E Avis Drive
  Madison Heights, MI 48071 (Detroit area)
  313-585-5252
  Greg Short

and reassemble. Machines built in 1989 have the Donaldson filter. Unscrew the bottom element can and replace with a new one.

Inspect elements from both filters for evidence of high pressures. This would be indicated by bulging or parting of the outer perforated metal liner of the Fairey-Arlon element, and by collapsing of the inner perforated metal liner of the Donaldson element.

Oil Change

Change the hydraulic oil after every 1000 hours of operation, or at the end of the season during which the 1000 hours was reached. If the oil contains water (appears milky) or has been severely overheated, it should probably be changed, depending on the results of an oil analysis. Contact Engineering for assistance.

Remove and clean the inlet strainer for the charge pump each time the oil is changed. Use only thread sealants approved for use in hydraulic systems on the pipe threads. Loctite #56931 is an approved sealant.

4.3 Hydraulic Fluid Specification

SUNVIS 868WR hydraulic fluid is used for the initial fill. Any high quality fluid with an ISO viscosity index of 68 that has anti-wear and anti-foaming additives is acceptable. Most hydraulic transmission fluids recommended for modern tractors fall into this category. Deere HYGARD is one example.

4.4 Troubleshooting the System

When trying to determine the causes and solutions of performance problems with the system, the following service tips may help.

Condition	Possible Cause	Corrective Action
• Tractor will not move when control lever is moved	• No oil in reservoir	• Check and fill reservoir
	• Control cable failed or disconnected	• Repair or replace cable
	• Failed charge pump	• Pressure at test port should be about 250 psi, if no pressure replace pump
	• Failed pump	• Replace pump
• Tractor moves, but erratically	• Major leak at hose, tube, or fitting	• Repair leak
	• Plugged charge filter	• Change element
	• Low oil in reservoir	• Fill to sight gauge

Brakes

The rear wheel motors are equipped with wet disk brakes (25C). These brakes are spring-loaded and will automatically apply when hydraulic pressure from the charge pump of the main hydrostatic pump is not available. The brakes are hydraulically connected to a port on the charge filter, which is at charge pump pressure. When the engine stops, charge pressure drops to zero and the brakes apply. When the engine is operating, and the pumps are operating normally, the brakes will remain disengaged. If the vehicle must be moved when charge pressure is not available (an engine failure, for example) the brakes can be held in the disengaged position by use of the tool found in the toolbox.

4.2 System Maintenance And Service

Note

When servicing or repairing any hydraulic system, use every precaution to prevent dirt and other contaminants from entering the system. The added care will mean longer component service life and reduced downtime.

Warning

Never use your hands to seek out escaping hydraulic oil, use a piece of wood or cardboard. When hydraulic oil is escaping under pressure from a small hole, it can penetrate the skin and cause serious injury.

Warning

Always allow the oil to cool and make sure the circuit is not under pressure before servicing or repairing the circuit. To prevent burns from escaping hot oil.

Routine Service

The hydrostatic traction drive should be relatively maintenance free as long as the oil remains clean, and moisture and other contaminants do not enter the system.

Regular inspections for leaking fittings, worn or pinched hoses, missing or worn tube mounting bushings, tubes in metal-to-metal contact, loose mounting bolts, leaking pumps and motors, and their repair will insure more reliable performance and improved service life of the system.

Filter Change

Change the charge filter element following each detasseling season. To replace the element in the Fairey-Arlon filter (machines built before 1989) unscrew the top cover and remove the element assembly. Remove the bottom-threaded washer and the element will drop off the retainer housing. Wipe the magnet stack clean of any metal particles, install a new element,

4.1 Description And Operation

Pump And Charge Filter

The main pump (1C)** is a variable displacement, piston pump where the output flow is controlled by an internal servo valve and piston that rotates a swash plate to vary the stroke of the pistons, thus displacement and flow. The operator controls the servo by movement of the forward/reverse control lever via a control cable.

The pump case also houses a charge pump, main relief valves, and circuit control valves. The charge pump draws oil from the reservoir through a strainer (2C) located in the reservoir. The oil then goes through the charge filter (38C, 4C) and returns to the pump. This oil is used to maintain a constant source of clean oil for the main high-pressure loop, and to cool and lubricate the pump.

Control Valve

When the operator moves the control lever forward, high-pressure oil flows from the main pump to the control valve (7C) and through four pre-adjusted, pressure-compensated flow control valves. These valves insure that roughly equal flow is directed to each wheel motor. For example, if one wheel starts to slip, the valves will prevent all the pump flow from going to that wheel, thus providing a continued flow to the other wheels. This has the effect of providing a "limited slip differential" mode of operation when operating in mud, or other conditions of poor traction.

The limited slip function is operable only when moving forward.

Wheel Motors

The oil flow, after being divided into four parts at the control valve proceeds in separate tubes and hoses to the wheel motors (5C). These are fixed displacement, radial piston motors, whose output shafts are bolted directly to the wheel assemblies. There are no intermediate gear reducers. After flowing through the motors, the oil. now at low pressure, returns to the control valve where it is combined before returning to the pump to be pumped out to the motors again in a continuous loop.

Drain Circuit

As the high-pressure oil is pumped through the motors, a small amount of internal leakage occurs between the valve plates and other internal parts. This oil is conveyed back to the reservoir by the .25 diameter tubes and hoses connected to each motor and combines at the manifold (36C). Charge pump oil flow that is not required to replace this leakage flows from the pump and is also dumped into the reservoir at the same port that receives the leakage from the motors.

** Refer to sheets 1 and 3 of Hydraulic Schematic D9091 for component

Moving from front to rear of machine by sections, locate points of maintenance, tell quantity/machine, explain maintenance procedures, and recommended intervals.

Note

When contacting the shop concerning trouble shooting or possible parts requisitioning, the serial number located on the left side of the steering column upright will be required.

5.1 Main Toolbar.

Mercury switches (2 switches)

Check the following items 1 time/day or each time the wings are folded and unfolded.

- Located on rear hinge plates of wing assemblies.
- Look for proper positioning of switch.
- Make sure mounting assemblies are secure and intact. (rivets, cable ties)
- Make sure that the wires will be free of anything that will snag or pinch them during folding or unfolding.

Check the following items 1 time/year.

- Wires should be cable` tied securely to a nearby hydraulic line so that wire loops will not be vulnerable.
- The right side wire will split at the deck. One wire to the fuse block the other follows the lightbar wire up to the lock valve.
- The left side wire follows the most convenient path to the lock valve.

5.2 Front Lightbar

Front Lights. (5 lights.)

- (3) Flood lights, field use only, upper tube. ((5) flood lights on pre-1989 models)
- (2) Head lights, road and field use, lower tube.

Check following items 1 time/day.

- Replace broken or burned out lights as needed.
- Look at the light mounting nut to make sure it is tight.

Lock Valve Solenoid

Lock valve, located lower tube center. This activates the hydraulic lock for the lift frames located on the toolbar wings.

- Look at the lock valve solenoid nut to make sure it is tight.

Wiring Harness

Wiring harness should be cable tied securely to the lightbar and routed so that it will not be vulnerable to sharp edges or to being pinched.

Under the deck, to the fuse block, the harness should be fastened with Arden frame mounting clips.

- This harness, wire and connections, should be checked thoroughly 1 time/year.

5.3 Operators Console.

Instrument Cluster

Check following items 1 time/year.

- Remove housing and checked inside for bird nests and, or mouse chewed wires.
- This would also be a good time to make sure all connections on the panel are tight.
- Most important, make sure the ground is fastened and good contact is maintained.
- Reattach housing making sure that no wires get pinched.
- Neutral safety switch should be intact and secure.

Do not bypass the neutral safety connection!

Caution

Main Connector

Located in the console, under the instrument cluster. Check following items 1 time/year.

- Inspect connector for breakage or cracks.
- Make sure connector is threaded tight.

Fuse Block

Located under the console, on the seat support beams. Check fuse size and placement to insure adequate circuit protection. (Refer to decal located near fuse block.) Check above items 1 time/year.

5.4 Main Harness, Engine Harness

Main Harness

This harness, wires and connections, should be checked thoroughly 1 time/year.

- Should be secured to control cables with cable ties.
- Should be routed to avoid snags or pinching.

Engine Harness

This harness, wires and connectors, should be checked thoroughly 1 time/year.

- Look at wires for signs of burning or other damage.
- Make sure wires are routed to avoid binding the throttle or governor linkage, or getting into the fan or belts.

5.5 Rear Lightbar. (On models after 1988.)

Rear Lights

(2) Flood lights, field use only.

(2) Flashing lights.

Check following items 1 time/day.

- Replace broken or burned out lights as needed.
- Look at the light *mounting nut* to make sure it is tight.
- Make sure flasher lights work before driving on the road.

Wiring Harness

Harness to be fastened to the lightbar and rear engine shroud with Arden frame *mounting clips*. This harness, wires and *connectors, should* be checked thoroughly 1 time/year.

5.6 Miscellaneous

Flasher

Visually inspect flasher and flasher bracket for damage. Make sure flasher bracket is securely fastened to engine shroud mount. All wires in the area should be routed clear of exhaust. Check above item 1 time/year.

Murphy Switch

Check following items 1 time/year.

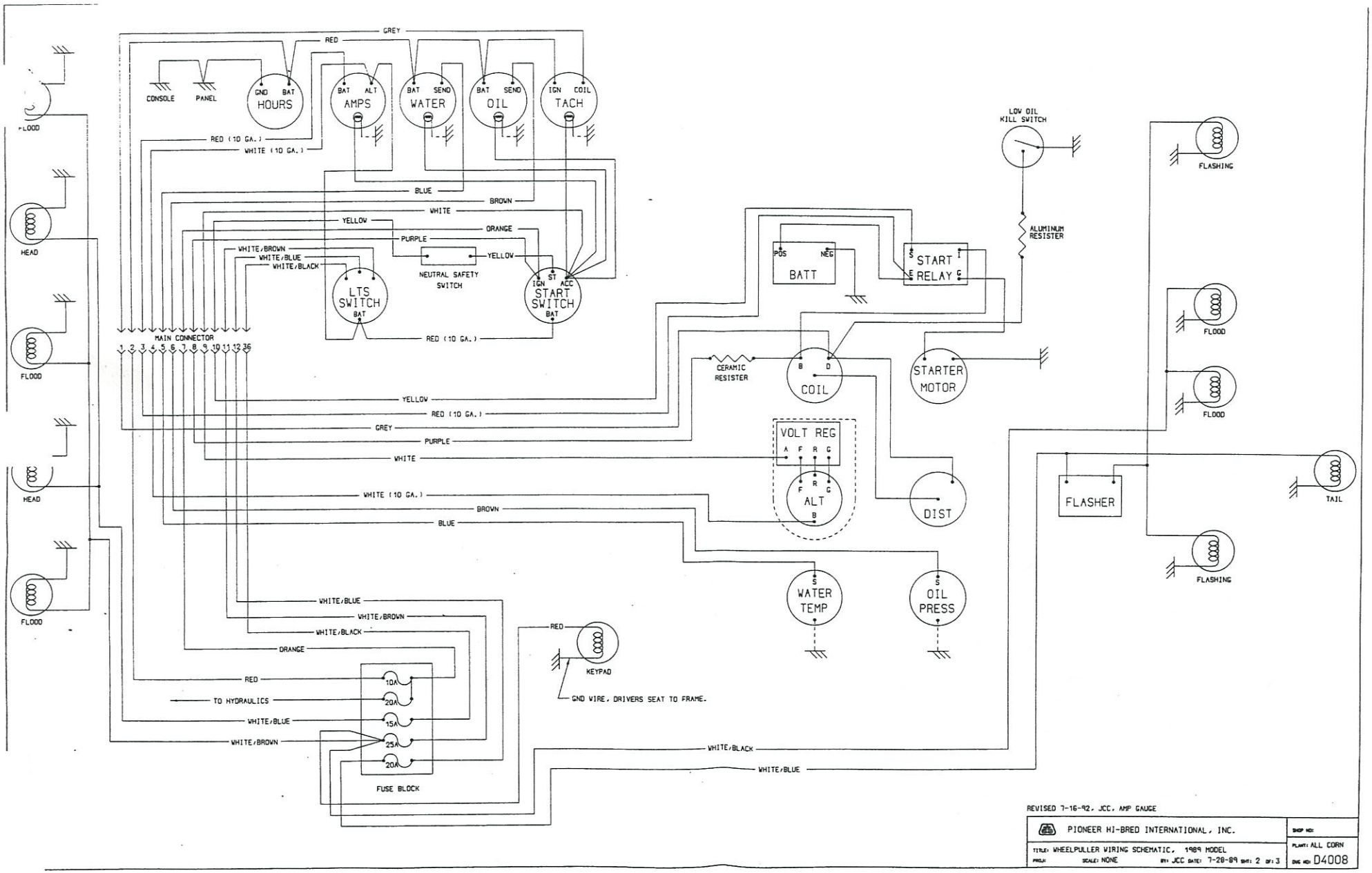
- Look for cracks in housing, and leaks at fittings.
- Look for corroded or loose *connection on* wire.

Tail Light

(1) Tail light.

Check following items 1 time/year.

- Repair if broken or burned out.
- Make sure light mounting nut is tight.



REVISED 7-16-92, JCC, AMP GAUGE

PIONEER HI-BRED INTERNATIONAL, INC.

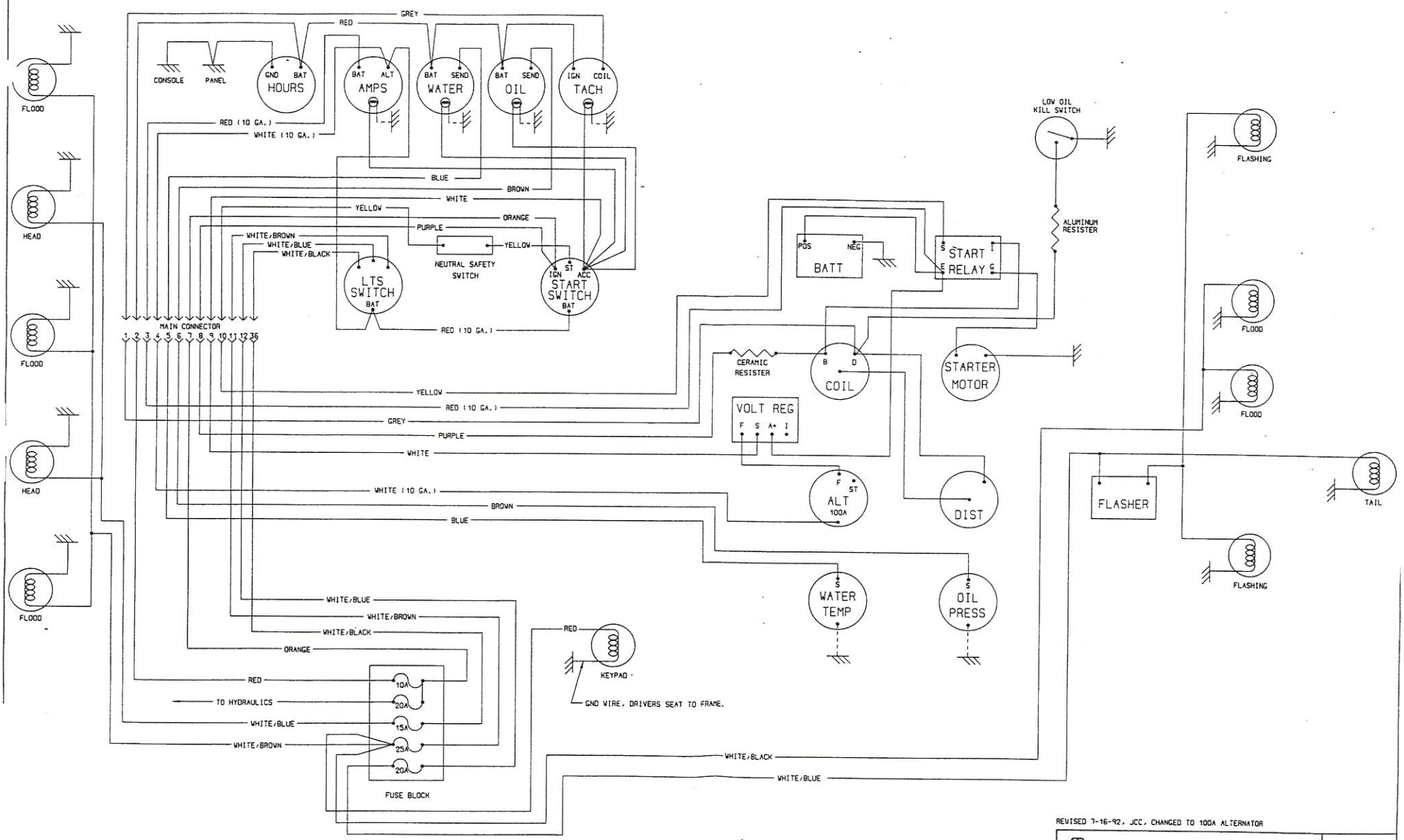
SHOP NO:

TITLE: WHEELPULLER WIRING SCHEMATIC, 1989 MODEL

PROJ: SCALE: NONE BY: JCC DATE: 7-28-89 SHT: 2 OF: 3

PLANT: ALL CORN

DWG NO: D4008



REVISED 7-16-92, JCC, CHANGED TO 100A ALTERNATOR

PIONEER HI-BRED INTERNATIONAL, INC.

TITLE: WHEELPULLER WIRING SCHEMATIC, 1991 OR LATER MODELS

PROJ: SCALE: NONE BY: JCC DATE: 7-16-92 SHT: 3 OF: 3

SHOP NO:

PLANT: ALL CORN

DWG NO: 04008

Section 6

Manual Control Electronics

6.1 System Overview

This section describes the operation of the manual control system for Pioneer built wheelpullers and the components that make up the system.

System Components

Keypad & Cable

The keypad is a snap dome type switch with a custom printed and embossed Lexan legend. When a key is pressed, a metal dome in the switch collapses and makes contact with the circuit board below it. This completes a circuit from the switch common (pin L) to the corresponding output pin. Figure 1.1 indicates the relationship between keys and the keypad output pins.

The keypad cable connects to the keypad output pins via a Panduit 21 pin header. The cable runs to the Solenoid Drive Unit box where it connects to the circuit board via an AMP miniature rectangular connector.

Solenoid Drive Unit (SDU)

On wheelpullers built prior to 1989 the Solenoid Drive Unit (SDU) is enclosed in a gray Hoffman box located under the main tractor console. It is located behind the drivers seat close to the valve on 1989 units. The SDU circuit board contains electronic switches that activate solenoids on the hydraulic valve when a key on the manual control keypad is pressed or when the automatic control is active.

Solenoid Wiring Loom

The solenoid wiring loom carries power to the SDU from the main fuse block on the tractor. It also connects the solenoids on the valve to the SDU circuit board.

The Automatic Control

The automatic control is described in more detail in later sections. For the purpose of studying the manual control, knowing that the automatic control takes over the height adjust function is generally sufficient.

Manual Control Keypad Output Pin Designations	
Function	Pin Designation
Left Row Spacing Right ->	N
Center Row Spacing ->	M
Right Row Spacing ->	K
Left Row Spacing Left <-	P
Center Row Spacing Left <-	Q
Right Row Spacing Left <-	E
Left Height Adjust Down	R
Center Height Adjust Down	S
Right Height Adjust Down	T
Left Height Adjust Up	U
Center Height Adjust Up	V
Right Height Adjust Up	W
Puller Wheels Forward/Off	J
Puller Wheels Reverse	F
Tool Bar Fold Down	H
Tool Bar Fold Up	G
Tread In	D
Tread Out	B
Notes: 1. Pin L is the switch common 2. As viewed from below the keypad assembly, pins begin with A on the left and ascent to W on the right	

Figure 6-1 Keypad Pin Designations

Operation

Keypad Signal to SDU

A low current source of approximately 8 volts is supplied to the keypad common via the SDU and keypad cable. When a switch is pushed, the 8 volt signal appears on one of the switch outputs and is returned to the SDU. In the SDU, the signal from the keypad is amplified to a level suitable for driving the valve solenoids.

Solenoid Connection and Ground Side Switching

Solenoid current is controlled in the SDU by solid state switching circuits. These circuits are constructed of devices called MOSFETs and for purposes of trouble shooting, can be thought of as switches that close when the keypad signal is applied to them.

Switching of the solenoid current takes place on the ground side of the solenoid. 12 volts DC is applied directly to one side of the solenoid. Current flows when the other side of the solenoid is connected to ground via the wiring loom and the MOSFETs in the SDU.

LED Indicators

The SDU contains light emitting diodes (LED's) connected to each of its outputs and the 12 volt input. These devices illuminate red when the circuit they are connected to is active. Use of these indicators in troubleshooting is described in section 6.2.

Output Labeling Convention

Each output on the SDU is labeled to indicate its function. The labels are located between the two rows of output connectors and a dash next to the lettering indicates which output corresponds to the label.

The bottom 12 outputs control the height of the puller units (lifts) and the row spacing. The first letter of the label indicates which unit the output corresponds to (left, center, or right as viewed from the drivers seat). The next four letters represent the function, either lift or RWSP for row spacing. The remaining letters indicate which direction the output action is associated with As examples: L RWSP R is the output that moves the left puller unit right and C LIFT UP moves the center puller unit up.

The next pair of outputs above those just described is the outputs that control the motors that drive the puller wheels. They are labeled P MTR FD for puller motors forward and P MTR RV for puller motors reverse.

Above the puller motor outputs are two outputs for toolbar fold and two for tractor tread width adjustment. Labeling on these outputs is self-explanatory.

The six outputs labeled AUX 1A through AUX 3B are spare outputs and are not used. AUX IA and AUX 1B are driven from the keyboard however and are useful as backup outputs Details on this function are presented in section 6.2.

The CHARGE output must be on when any output function is active. The output labeled TEST is connected to the button labeled test on the SDU board. It normally does not have a wire connected to it and is only for trouble shooting and backup purposes.

The remaining connections to the SDU are for power. There are separate ground connections for the system power and for the solenoids. They are labeled GND and SOLENOID GND. Both wires connected to these points run back to the tractor battery. The connector labeled +12V is the power source-for the SDU. It comes from the main fuse panel of the tractor.

Wire Numbering Convention

The wires in the solenoid loom are numbered and connect to the SDU beginning at the lower right connector (R LIFT UP) with number 1. The lower left connector connects to wire number 2 and so on up the circuit board. In this way all right side connectors are odd numbered in ascending order as one goes vertically up the board. Likewise, left side connectors are even numbered. The TEST connector would correspond to wire number 26 and the empty space between the CHARGE and the +12V connectors would correspond to wire number 27. No wires connect to these points however.

Charge Output

The SDU output labeled CHARGE behaves differently than other outputs. It comes on whenever any other function is on. Pressing any key on the keypad activates this output. The automatic control also activates the CHARGE output when it the calls for a height adjustment.

Puller Motors Forward Output

The puller motors forward (P MTR FD) output also behaves differently that the others. It is activated when the puller wheels forward key is pressed and remains on until the same key is pressed again. Remember that the CHARGE output will be on anytime the puller wheels forward output is on. The puller motor's reverse output (P MTR RV) is only on when the puller wheels reverse key is pressed however.

Effect of Inputs From Automatic Height Control

When the Automatic Height Control is in the automatic mode on one or all of the puller units, the lift up and down outputs are completely under the control of the automatic control. Keypad keys associated with those outputs are inactive when the automatic mode is selected.

6.2 System Maintenance

This section provides information relative to troubleshooting, repairing and maintaining the manual control system on the Pioneer built wheelpuller.

Troubleshooting

Use of LED's In Troubleshooting

The LED's on the SDU board were included in the circuitry primarily for use in troubleshooting. The LED next to the +12V connector is on whenever there is power applied to the SDU circuitry (i.e. whenever the ignition switch is on). There are two fuses that protect the 12V input to the SDU. The first and most obvious is the 1/2 amp fuse on the SDU circuit board itself. Also on the main fuse block for the tractor is a 20 amp fuse. Power for both the SDU (wire # 29) and the solenoids (wire #26) is delivered through this fuse.

The remaining LED's on the SDU illuminate when the corresponding output is active so that one can quickly determine if circuit is attempting to energize a solenoid. While this indication provides a quick check, it is not comprehensive and is sometimes only a starting point from which to trouble shoot further problems.

Use of the "TEST" Push Button

The test button provides a convenient way of energizing a solenoid. The wire from the output in question can be moved to the connector terminal labeled TEST. When the test button is then pushed, the solenoid should energize. Remember that in order for the hydraulic function to operate, the CHARGE output must also be on. This can be accomplished easily by turning on the puller wheels.

Jumpering A Solenoid and Precautions

By using a jumper wire to ground it is possible to energize a solenoid. To do this it is important to first remove the wire that runs back to the SDU. It is easily identified either by wire number or by noting that it is the wire that is not a part of the daisy chain running between all solenoids. Remember that ground side switching is incorporated in this unit and therefore the solenoid is energized by grounding it as described above. DO NOT JUMPER THE SOLENOID TO +12 VOLTS AND DO NOT APPLY +12 VOLTS DIRECTLY TO ANY SDU WIRING.

Troubleshooting the Keypad and Cable

The CHARGE output can be useful in trouble shooting the keypad and cable because it comes on when any key on the keypad is depressed.

In the case where an output does not turn on, one can check the keypad by first making sure the CHARGE LED is off. This will require that no other output be active and that the automatic control is in manual mode. Pushing the key for the function in question should then cause the charge light to come on. If it doesn't, then there may be an open circuit in the keypad or cable.

A short circuit could also occur in the keypad or cable. In this case a hydraulic function would be on all the time and CHARGE LED would also be on. Disconnecting the keypad cable at the SDU will cause the LED to go out (unless the puller wheels forward output is on) if there is a short in the cable or keypad. If the CHARGE LED stays on with the keypad cable disconnected, the automatic control should be checked to make sure it is not forcing that condition.

Once a problem is isolated to the keypad and cable, the faulty component can be identified by referring to figure 1.1, and either checking continuity in the keypad or by jumpering the appropriate pins in the connector on the keypad end of the cable.

Auxiliary Keypad Keys For Test and Backup

Between the height adjust and the tread keys on the keypad is a blank area. There are actually two keys in this area and they are connected such that SDU outputs AUX 1A and AUX 1B turn on when they are pressed. These keys can be useful in troubleshooting and also serve as a backup if one of the other outputs should fail and immediate repairs cannot be made.

Problems Induced By the Automatic Control

There are a number of ways in which the automatic control can produce effects that might lead one to believe there is a problem in the SDU. The quickest way to isolate such problems is to disconnect the cable that runs from the SDU to the automatic control. Some problems that may be observed are:

- 1/2 amp fuse on SDU is blown
- Some output functions are active when no keys are pressed and the automatic control is in the manual mode.

Effect of Lock System Failures

Although it is not a part of the electronic control system, the lock system can create a problem that appears as if a hydraulic function is not working. The lock system consists of mercury switches on each side of the toolbar. When the toolbar folds up, the mercury switches open and a solenoid valve is closed. With the valve closed, the puller units are locked in position. If the lock valve should become closed during wheelpuller operation, because of a failed mercury switch or some other component, the puller units will not move when the operator presses--that function on the keypad. Likewise this type of failure will prevent the automatic control from performing its functions.

Replacing Components

Solenoid Wiring Loom Repair and Replacement.

In most cases the solenoid wiring loom can be repaired with the connectors and crimp tool provided in the service kit. Replacement looms will most likely be of the 1989 style with the T&B liquid tight strain relief. This loom will be suitable for use on older model SDU enclosures although it may be longer in some areas than the originals.

Replacement of Other Cables

The keypad cable connects to the SDU at the upper right corner of the circuit board. There are two retaining clips that hold the connector mated during vibration. The clips can be released by squeezing then together and rocking them out of the way.

The automatic control cable connects to the SDU circuit board directly below the keypad connector. This connector has retainers on the left and right sides. It can be removed by squeezing the sides and pulling at the same time.

The keypad and automatic control cables on 1989 machines have T&B liquid tight strain relief connectors as a part of the assembly. Removal of these cables is accomplished by taking the nut off the strain relief and sliding the cable and connector out through the hole in the SDU enclosure. Cables of this type will most likely be supplied as replacements. They can be used as is in older units as well.

SDU Replacement

The SDU circuit boards in 1989 machines can be removed by disconnecting the cables and solenoid wires and removing the four screws that hold the aluminum panel in place.

The panel can then be removed and replaced with a new panel and circuit board. Alternatively, the circuit board can be removed from the old panel and replaced by new circuit board.

Older machines do not have an inner panel in the SDU enclosure and the board must be removed from the thirteen nylon standoffs that hold it in place. The board is released by squeezing the standoff catch and lifting gently on the board. It is usually best to start in one corner of the board and work down and across until the board is released. The new circuit board can be installed by aligning it with the standoffs and gently pushing on it until all standoffs have snapped into place.

After the SDU board has been installed, the keypad and control cables should be re-connected with the retaining clips secured. The wires of the solenoid loom should be connected as described in section 6.1.

Keypad Replacement

Replacement of the keypad should not be attempted unless it has been positively determined to be bad because once removed, it cannot be re-used.

To remove the keypad, first unplug the connector from its bottom side. Peel the keypad and legend from the steel bracket until both have been removed. The area should then be cleaned with a good solvent to remove any remaining adhesive or dirt.

The adhesive backing form the new keypad assembly should next be removed. This will usually be in two parts, one on the keypad itself and one on the area surrounding the keypad. The keypad assembly can then be put in place making sure the connector pins fit through the opening in the bracket with plenty of clearance all around. It is also a good idea to put a thin bead of silicone sealant around the perimeter of the connector opening in the bracket. The connector can then be re-installed.

Fuse Replacement

The fuse on the SDU circuit board protects the SDU and the automatic control. It should be replaced with a 1/2 amp 3AG type fuse only.

Static Considerations For SDU Boards

When replacing a SDU board measures should be taken to prevent damage from static charge. This is important when handling the failed board as well as the new one because static induced damage may not cause failure of the circuits until several years after the damage first occurred.

Wearing a ground strap connected to the tractor chassis when handling the board is the best approach. If this is not possible, try to maintain skin contact with the chassis. The circuit board should be maintained in the static protective bag when transporting it.

Routine Maintenance

Pre-Season Checkout

In preparing the wheelpuller for the operating season, one should check to make sure that all the manual control functions are operative. If some functions appear to have failed during the period of non-use, disconnect the connectors and re-connect them again to clean any oxidization that may have formed.

Off Season Storage

During seasons when the wheelpuller is not in use, the keypad should be covered to protect it from moisture and sunlight. Appropriate measures should also be taken to prevent rodent damage to the wiring loom.

6.3 General

Returning Failed Components

Importance of Returning Failed Components

The Electronics group maintains a supply of spare parts for support during detasseling season. That supply can only remain at an adequate level if failed components are quickly returned so that they can be repaired and returned to the spare parts inventory.

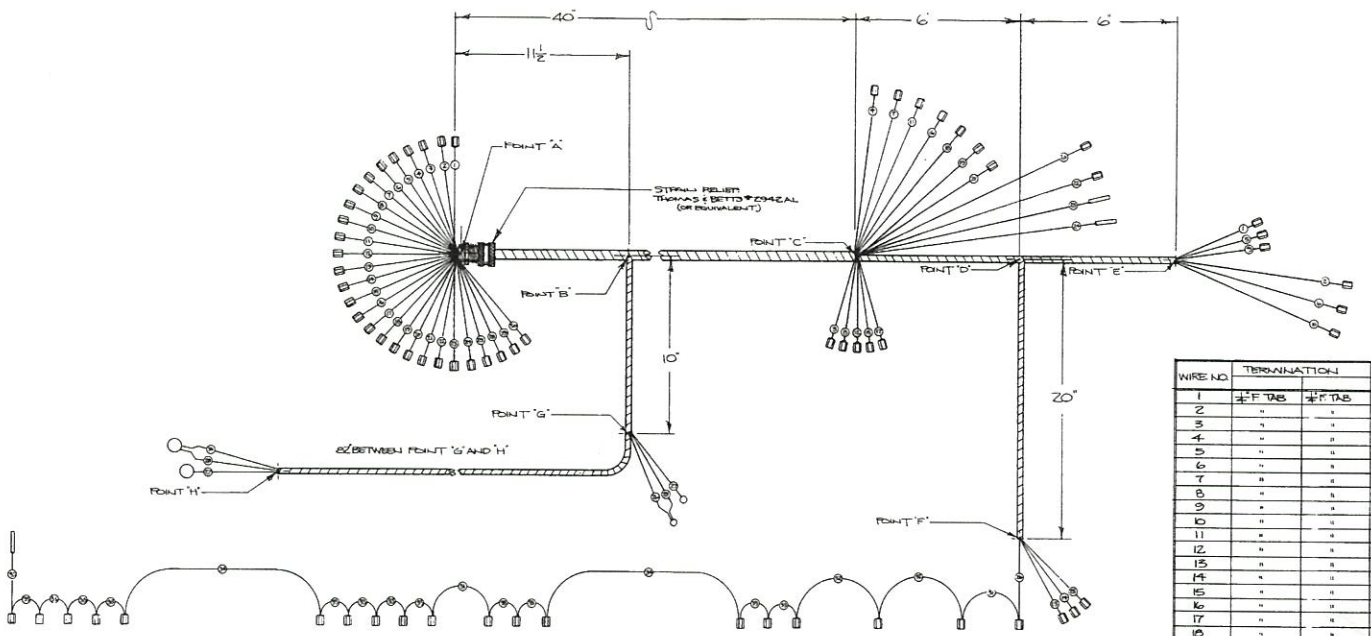
Returning all failed parts also gives us the opportunity to analyze the failures and identify trends that may indicate problems that can be prevented.

Packaging Parts For Return

It is important that failed parts be packaged so that further damage does not occur in shipping. Static sensitive parts should be wrapped in antistatic material and all parts should be packed with an adequate amount of shock absorbing material.

Schematics And Reference Materials

Detassler Keypad Cable			
WIRE COLOR	FUNCTION	SOURCE PIN	DESTINATION PIN
BLK	R LIFT UP	1	24
WHT	R LIFT DN	4	23
RED	R RWSP L	17	22
GRN	R RWSP R	12	21
ORG	C LIFT UP	2	20
BLU	C LIFT DN	5	19
WHT/BLK	C RWSP L	7	18
RED/BLK	C RWSP R	10	17
GRN/BLK	L LIFT UP	3	16
ORG/BLK	L LIFT DN	6	15
BLU/BLK	L RWSP L	8	14
BLK/WHT	L RWSP R	9	13
RED/WHT	MTR FWD	13	12
GRN/WHT	MTR REV	16	11
BLU/WHT	FOLD UP	15	10
BLK/RED	FOLD DN	14	9
WHT/RED	TREAD IN	18	8
ORG/RED	TREAD OUT	20	7
BLU/RED	AUX 1A	19	6
RED/GRN	AUX 1B	21	5
ORG/GRN	AUX 2A	FOLD BACK	4
BLK/WHT/RED	AUX 2B	FOLD BACK	3
WHT/BLK/RED	AUX 3A	FOLD BACK	2
RED/BLK/WHT	AUX 3B	FOLD BACK	1
GRN/BLK/WHT	COMMON	11	36
DRAIN	SHIELD	N.C.	35



NOTES:

1) USE 105°C SAE J1128 WIRE.
2) TIN ALL TERMINALS.
3) DO NOT SCALE DWG.
* 4.) WIRE LENGTHS MEASURED TO CENTER OF TERMINALS.
5) SLEEVE ALL FEMALE TABS.

WIRE NO.	TERMINATION		LENGTH FROM ℄ OF TERMINAL TO POINT "A"	POINT "C"	POINT "E"	POINT "F"	POINT "G"	POINT "H"	* LENGTH	GAUGE
1	¼" F TAB	¼" F TAB	12"	—	6"	—	—	—	—	18
2	"	"	"	—	12"	—	—	—	—	"
3	"	"	"	6"	—	—	—	—	—	"
4	"	"	"	12"	—	—	—	—	—	"
5	"	"	"	—	6"	—	—	—	—	"
6	"	"	"	—	12"	—	—	—	—	"
7	"	"	"	12"	—	—	—	—	—	"
8	"	"	"	6"	—	—	—	—	—	"
9	"	"	"	—	6"	—	—	—	—	"
10	"	"	"	—	12"	—	—	—	—	"
11	"	"	"	12"	—	—	—	—	—	"
12	"	"	"	6"	—	—	—	—	—	"
13	"	"	"	—	—	6"	—	—	—	"
14	"	"	"	—	—	"	—	—	—	"
15	"	"	"	6"	—	—	—	—	—	"
16	"	"	"	12"	—	—	—	—	—	"
17	"	"	"	6"	—	—	—	—	—	"
18	"	"	"	12"	—	—	—	—	—	"
19	"	"	"	"	—	—	—	—	—	"
20	"	"	"	18"	—	—	—	—	—	"
22	"	"	"	"	—	—	—	—	—	"
23	"	BUTT	"	"	—	—	—	—	—	"
24	"	"	"	"	—	—	—	—	—	"
25	"	¼" F TAB	"	—	—	6"	—	—	—	"
26	#6 RING	"	—	—	—	"	6"	—	—	12
29	¼" F TAB	#6 RING	12"	—	—	—	"	—	—	"
27	#6 RING	¼" RING	—	—	—	—	"	8"	—	"
30	¼" F TAB	"	12"	—	—	—	—	"	—	"
28	"	"	12"	—	—	—	—	"	—	"
31	"	¼" F TAB	—	—	—	—	—	—	6"	"
32	"	"	—	—	—	—	—	—	10"	"
33	"	"	—	—	—	—	—	—	42"	"
34	"	"	—	—	—	—	—	—	16"	"
21	"	"	12"	12"	—	—	—	—	—	18

35	¼" F TAB	BUTT	4"	12

REV. 12-14-88 J.C. ADDED STRAIN RELIEF.
REV. 6-1-87 J.C. DESIGN ADJUSTMENTS

SYM.	DATE	BY	REVISIONS	MK. NO.	QTY.	MATERIAL

PIONEER HI-BRED INTERNATIONAL, INC.

SHOP NO.

PLANT

TITLE WHEEL ROLLER-86, SOLENOID WIRING, WH-6

PROJ. SCALE NONE BY J.C. DATE 5-19-87 SHT 12 OF 12

DWG NO. 4234

Section 7

Automatic Control Electronics

7.1 System Overview

This section describes the operation of the Automatic: Height Control (AHC) for Pioneer built wheelpullers and the components that make up the system.

System Components

Control

Although the term Automatic Height Control describes the entire system, the control box mounted above the tractor console is often referred to as the Automatic Height Control (AHC) or simply the automatic control.

The automatic control receives signals from the sensors. The microprocessor internal to the control then filters the signals and decides whether or not the puller unit is in the optimum position. If not, a signal is sent to the Solenoid Drive Unit (SDU) and the appropriate height adjustment is made.

Sensors and Reflectors

As indicated in figure 1.1 two photoelectric sensors are used to detect the height of the plants as they enter the puller units. The light beam emitted by the sensors is visible red and is returned to the sensor by a system of five reflectors on the opposite side of the puller unit.

Linear Actuators

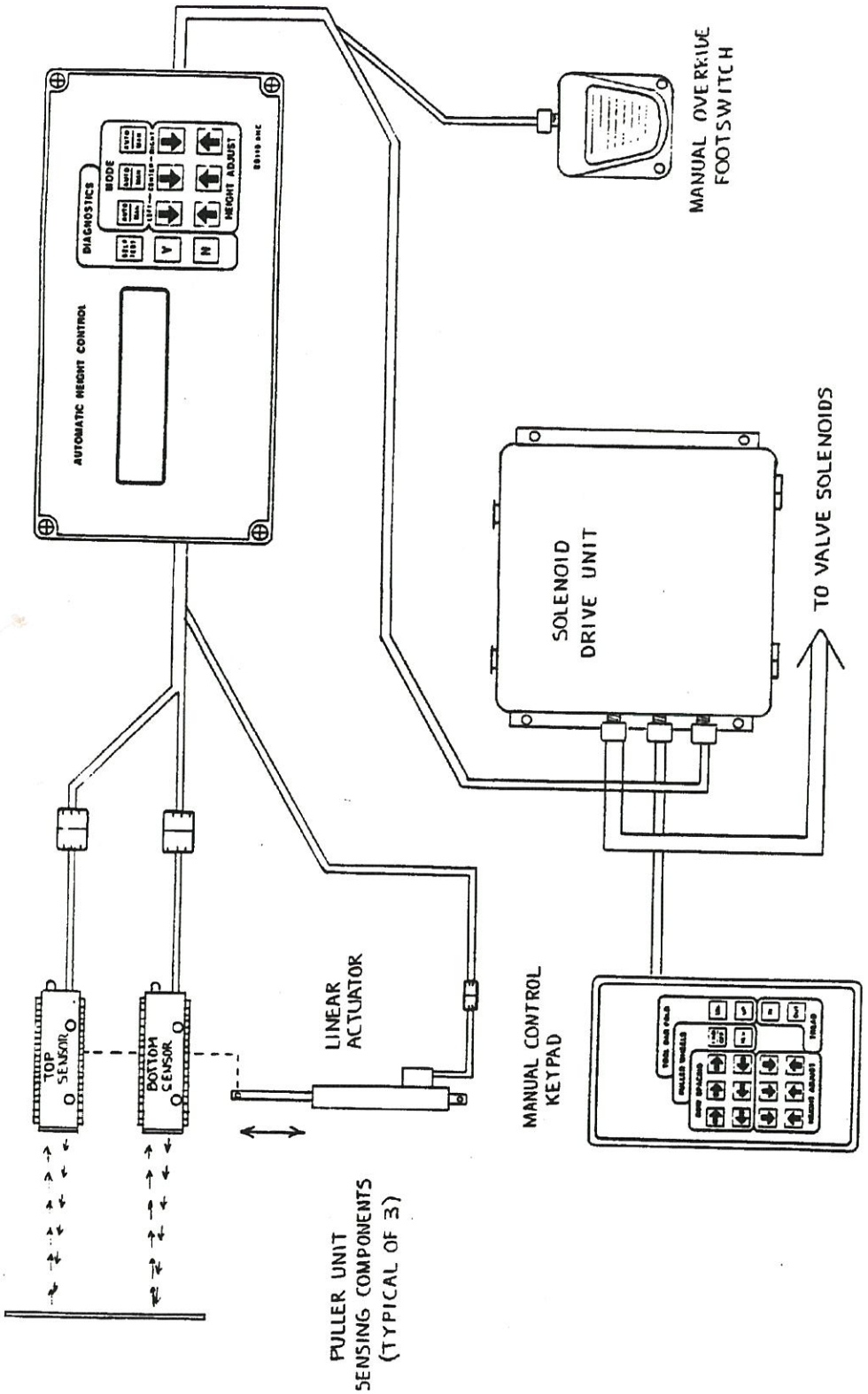
Linear actuators allow the operator to adjust the depth of pull by moving the sensors up and down. Keys on the height adjust section of the Automatic Height Control keypad serve as the operator's adjustment.

Footswitch

A footswitch mounted on the floorboard allows the operator a quick means of putting all automatic *functions* in manual mode at the end of the rows. Likewise when entering a field pushing the switch returns the control to the mode it was in before the switch was pushed.

Sensor Loom

The sensor loom is the largest of the two cables that attach to the back of the automatic control. It carries power to the sensors and returns their signals to the automatic control. It also carries power for the linear actuators from the main fuse block to the control and from there to the linear actuators.



AUTOMATIC HEIGHT CONTROL SYSTEM
FIGURE 1.1

Control Loom to SDU

The Control loom is the smaller of the two cables attached to the back of the automatic control. It carries power to the control from the SDU and supplies automatic height adjust signals to the SDU. The footswitch also connects to the automatic control via this loom.

Operation

General Operation in the Automatic Mode

In the automatic mode, the automatic control take's over the height adjustments from the manual control making those functions on the keypad in-operative.

When the puller wheels on a particular puller unit are in the correct position, the light beam from the bottom sensor is nearly always broken by corn plants. This top light beam is very seldom broken in that condition and the control makes no attempt to adjust the height.

If both light beams are broken, the control recognizes this condition as one in which the puller unit is too low on the corn plant. If this condition persists for more than a few milliseconds, the control will send a signal to the SDU turning on the valve to raise the puller unit. It then shuts off the valve when the top light beam is again restored.

If neither light beam is broken, the control recognizes this condition as one in which the puller unit is too high on the corn plant. If the condition persists for more than a few milliseconds, the control will attempt to lower the puller unit until the bottom beam is broken.

Sensor Operation

The sensors incorporated in automatic height control are of the polarized reflex type and emit visible red light. Polarized reflex sensors only recognize light that has been returned from the reflectors. Therefore polarized reflex sensors will not false trigger off of shiny objects such as wet corn plants.

Sensors by two different manufacturers are used on Pioneer wheelpullers. Photoswitch brand sensors are in a black housing and their cables have a black jacket. Opcon sensors are somewhat smaller than the Photoswitch units and the jacket on their cable is blue. Both types of sensors are fractionally equivalent and there is only one small difference that should be noted. Both sensors have a small red light emitting diode (LED) on the back near where the cable exits the sensor housing. This LED is for alignment purposes and glows brightly when the sensor is receiving light returning from the reflectors. On the Photoswitch unit this LED goes out completely when the sensor is not receiving light. The LED on the Opcon unit however glows dimly when it is not receiving light.

Sensor Position Control

The sensors are mounted on a mechanism that connects to a linear actuator so that the sensor position and hence the depth of pull can be adjusted from the operators position. The height adjust keys on the automatic control are marked with arrows that indicate

which direction the puller unit should move. Note that pushing the up arrow moves the linear actuator down.

The linear actuator is a 12 volt DC unit. Direction is changed by reversing polarity of the power supplied to the unit. It has an internal limit switch that shuts it off at the end of stroke.

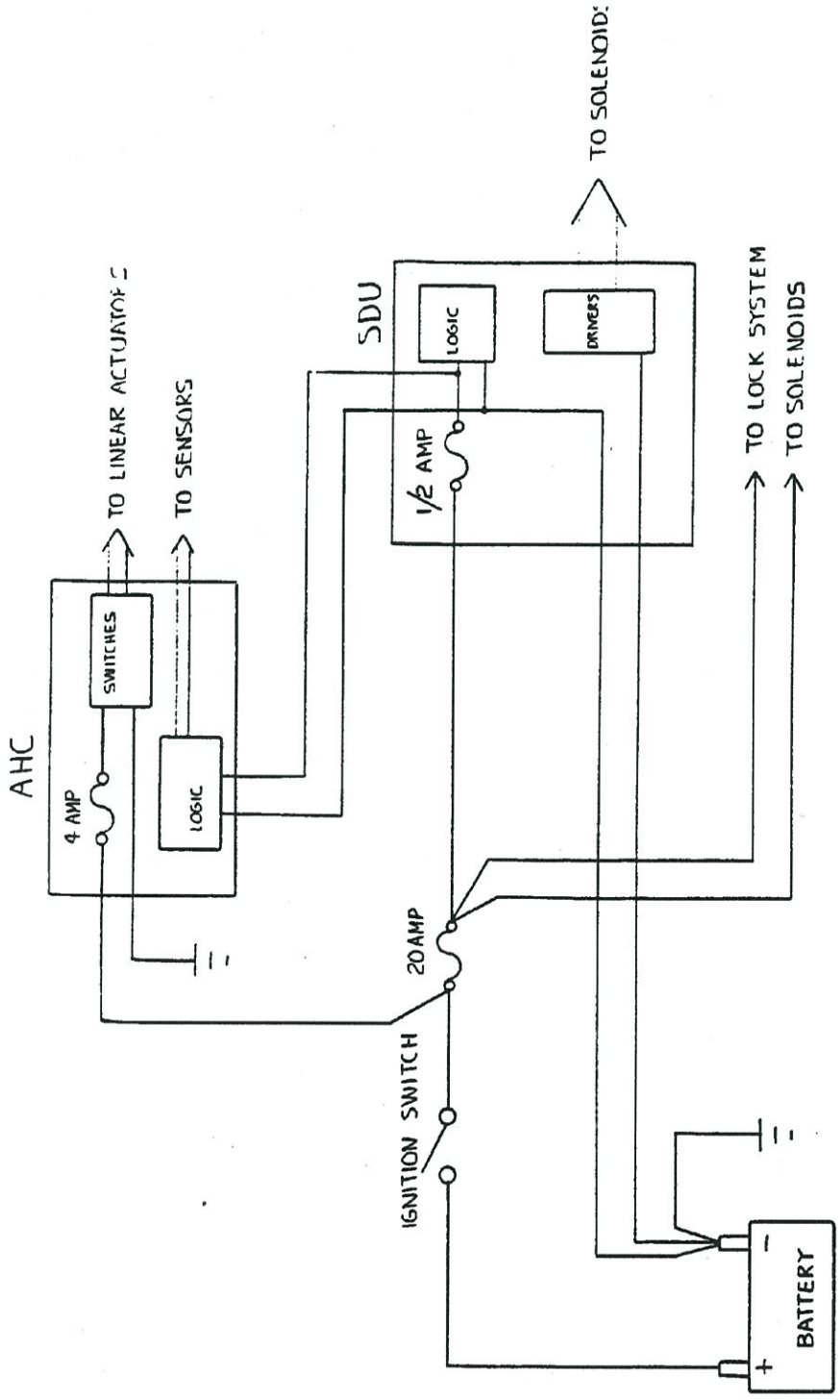
Power Distribution and Fusing

In an effort to supply the automatic control with a source of "clean" power, a number of different sources were established in the system design. This section describes the distribution of power in the system and the location and function of the various fuses.

A simplified schematic diagram is shown in figure: 1.2 to indicate the power distribution. The positive side of the tractor battery is switched by the ignition switch and goes to a 20 amp fuse on the main fuse block. The: fuse supplies power to the solenoids the solenoid drive unit and hydraulic lock system.

Inside the SDU is a 1/2 amp fuse. Power supplied by this fuse is conditioned to remove noise, then routed to the solenoid driver circuits and to the automatic control. In the automatic control, this source powers the logic circuits, display, and sensors. Separate ground wires are provided for the solenoids and for the return from the conditioned power supply. These wires both connect to ground at the battery terminal to eliminate noise that may be present on the tractor chassis.

The linear actuator switching circuits in the AHC receives power from a connection on the input side of the 20 amp fuse. A wire in the sensor wiring loom carries this power to the 4 amp fuse located on the back of the AHC. Because the linear actuators can produce electrical noise as they extend and retract, a separate ground wire for them is run in the sensor wiring loom and connects to chassis ground near the tractor's main fuse panel.



AUTOMATIC HEIGHT CONTROL SYSTEM
POWER DISTRIBUTION
FIGURE 1.2

Control Functions

Operation of the Automatic Height Control system is described in detail in the AUTOMATIC HEIGHT CONTROL OPERATORS MANUAL. Control functions which are useful in performing maintenance are presented below.

The self test function is included in the automatic control to assist the operator or service person in identifying problems in the sensing system. An abbreviated self test is initiated on power up and a more comprehensive self test is available when the self test button on the front panel is pushed. Below is a description of the self test:

1. When the self test is initiated, the following message will be displayed:

   ARE SENSORS
   CLEAR? <Y or N>

If there is nothing breaking the sensor light beams then the Y button should be pressed. Otherwise: the N key should be pressed or the obstruction should be cleared.

2. Assuming tire sensors are clear, the following message will appear for a short time:

   TESTING SENSORS
   PLEASE WAIT ....

The signals from the sensors are then tested and if no problems are detected, the following message is displayed before the control goes back to the operational mode:

   ALL SENSORS TEST NORMAL

3. Following this message the control offers the option of viewing all sensors. See step 6 for details.

4. If a problem was detected, the self test specifies which sensor is not indicating correctly, then prompts the operator to push Y to continue or N to exit. For example, if there is a problem associated with the right top sensor the following message would be displayed:

   CHECK RIGHT BUT.
   SENSOR NEXT?

If the Y key is pressed, the display will indicate other problems it has detected, or if no other problems exist, the option of viewing all sensors is offered. See step number 6 for explanation.

5. If the N key is pressed the following message will appear:

   NEED HELP? <Y OR N>

If the N key is pressed, the option of viewing all sensors is offered as outlined in step 6. If the Y key is pressed, suggestions as to possible problems are displayed on the screen. Help can then be repeated by pressing Y or all sensors can be viewed by pressing N.

6. It is possible to view the status of all sensors simultaneously. This is useful in trouble shooting because the display is constantly being updated. The option to view all sensors appears as follows:

   VIEW STATUS OF
   ALL SENSORS ?

If the N key is pressed, the option of viewing control parameters is offered as described in step 7. If Y is pressed, the following message is displayed:

PUSH & HOLD Y TO
VIEW ALL SENSORS

At this point the Y key should be pressed and held. Below is an example of how the display would look if all sensors except the bottom right were *indicating* normal.

TOP Lok Cok Rok
BOT Lok Cok R ?

Releasing the Y key causes the control to leave the sensor view option.

7. The last option of the self test routine is that of viewing the control parameters. The display would appear as follows:

   VIEW CONTROL
   PARAMETERS ?

If N is pressed, self test is complete and the control returns to the operational mode. If Y is pressed, the following two messages are displayed for about two seconds each:

FILTER CONSTANT
VALUE = 001

TIMING CONSTANT
VALUE = 170

These are the default values and normally these values will be displayed. After the control parameters have displayed, the self test is finished and the control returns to the operational mode.

7.2 System Maintenance

Trouble Shooting and Repair

This section provides information relative to trouble shooting, repairing, and maintaining the Automatic Height Control on the Pioneer built wheelpuller.

Sensors

Failure Modes and Symptoms

A failure of most any kind in the sensing system will appear to the control as a sensor with it's light beam either always broken or never broken. Below are the possible failure modes and the symptoms one would observe.

Mode 1: Top sensor normal
Bottom sensor light beam always broken

Symptom: Puller unit will remain at the level of the highest plants encountered and will never lower.

Mode 2: Top sensor light beam always broken
Bottom sensor normal

Symptom: Puller unit will ride several inches higher than normal. Although it may not be obvious, the puller unit will always be in vertical motion.

Mode 3: Top sensor normal
Bottom sensor light beam never broken

Symptom: Puller will always be in the lowest position and will not move.

Mode 4: Top sensor light beam never broken
Bottom sensor normal

Symptom: Puller unit will move to the position of the lowest plants encountered and will never raise.

Mode 5: Both sensor light beams always broken

Symptom: Puller unit will move to its highest position and stay there.

Mode 6: Both sensor light beams are never broken

Symptom: Puller unit will move to its lowest position and stay there.

Using Self Test

Using the self test diagnostics of the control was described in section 7.1. It is important to remember when using the self test that it is not a 100 percent test. Some problems may not be detected by the self test and others problems may look like bad sensors but actually relate to another problem. Section 7.2 describes the latter situation. Problems that may not be detected by the self test are:

- Sensor output shorted
- Sensor signal wire in loom shorted to ground
- Failed circuits inside AHC

If you have reason to believe the self test is not detecting one of the problems stated above, go to the "view all sensors" option of the self test and observe the sensor in question while someone breaks it-ls light beam: The indicator should go from "ok" to "?". If it doesn't, one of the problems mentioned above may have occurred.

Problems That Appear to be Bad Sensors

Although the self test specifies a problem by sensor location, it does not imply that the sensor itself is bad. It simply means that the control is not receiving the signal it expects from the sensor. Common problems detected by the self test include:

- Sensors or reflectors out of alignment
- Foreign material on sensor lenses or on reflectors
- Sensor connector or wiring loom damage
- Failed sensor

These problems are treated in greater detail in the following sections.

Checking Sensor and Wiring Loom Integrity

Procedures for checking the condition of sensors and loom wiring are presented in this section. The chart below indicates the function associated with each sensor connector pin.

Connector Pin Designation	Function
A	+12 V
B	Output
C	Ground
D	Shield

1. CHECK FOR LIGHT EMISSION

When the sensor is powered it emits a visible red light. Look deep into the bottom half of the sensor lens. If a red glow is not seen, the sensor is not emitting light and procedure 3 should be performed next.

If a red glow can be seen in the sensor then it is receiving power and is emitting light. Go to procedure number 2.

2. CHECK LIGHT RECEPTION

Although you may have to shade it to see it, the red LED on the back side of the sensor should glow brightly when the sensor is aligned with the reflector. It will glow very slightly or not at all when the sensor is out of alignment.

Note

The sensor alignment indicator is only valid when checked with the tractor engine off. Ignition noise can result in false indications.

If the alignment indicator is not illuminated, wiggle the sensor mounting and/or reflector. If it illuminates during this process, proceed to section 7.2. If the indicator still does not illuminate, make sure the sensor lens is clean, then take a single reflector and put it a few inches away from the sensor lens. If the indicator still does not illuminate, the sensor is probably bad and should be replaced as outlined in section 7.2. If the indicator illuminates and if the lenses are clear and in good condition, proceed to section 7.2 and align the sensors and reflectors.

3. CHECK SENSOR POWER INPUT

A sensor that is not emitting light may to so because it is failed or because it is not receiving power. To check sensor input power, un-plug the sensor connector from the sensor wiring loom and measure the voltage on the loom connector between pins A and C. If the voltage measured is about 12 volts, then the sensor, it's connector or it's cable may be bad. If 12volts is not present at the loom connector, check continuity of the wires in the sensor wiring looms by referring to drawing number ES110-SWL in section 7.2. If

the wiring loom checks ok but no power is present on any of the sensors, the automatic control box maybe the problem.

4. CHECK SENSOR OUTPUT

A quick check of the sensor output can be accomplished (with the tractor engine shut off) by breaking the sensor light beam and watching to make sure the alignment LED goes out or goes dim in the case of the Opcon sensor. If it doesn't, the sensor is probably at fault.

If the LED does go out or goes dim, repeat the procedure while someone observes the control display while in the "view all sensors" option of self test. If the display doesn't alternate between "ok" and "?" as the light beam is broken, there may be a problem in the sensor wiring loom.

The wiring loom can quickly be checked by disconnecting the sensor connector and measuring between pins B and C. This should measure about 5 volts. Alternatively, while viewing the sensors in self test, one can jumper between pins B and C in the loom connector and the display should alternate between "?" and "ok".

5. CHECK SHIELD CONNECTION A variety of problems can occur if the shield on the sensor wiring loom is not connected. To check this measure continuity between pins C and D on the loom connector.

Alignment and Adjustment

Because the puller units are constructed of many sliding parts, alignment of the sensors with the reflectors can be difficult to obtain and maintain.

Alignment should begin by making sure the sensor upright and the reflectors are parallel. The linear actuator should be completely retracted and the reflector gang should be in its lowest position.

If some shade is provided over the puller unit, the light beam from the sensor should be visible in the reflector as one looks down the "line of sight" of the sensor from behind it. When properly aligned, the light from the bottom sensor should appear in the center of the bottom reflector and the top sensor should be in the center of the third reflector from the bottom.

Vertical alignment can be accomplished by loosening the sensor mounting screws, rocking the sensor into the proper position, and then re-tightening the screws.

Centering of the light beam on the reflector can be accomplished on early machines by removing the screws and placing flat washers between the sensor and the mount. Later machines have modified mounts that can be bent to alter sensor alignment.

Repairing Sensor Connectors

Parts and tools for repair and replacement of sensor connectors are provided in the service kit. The removal tool has a black handle and a tubular bit.

The sensor connectors are removed by first un-clipping the retainer on the back of the connector and bending it out of the way. The removal tool then slid over the terminal that can then be pulled out the back of the connector body.

Replacing Sensors

When replacing sensors one should pay attention to the number and placement of washers so that alignment can be more easily restored when the new sensor is installed. The wires should be secured properly to prevent damage and should have a sufficient loop to allow for movement throughout the range of adjustment.

Control

The automatic height control is not field serviceable but can easily be replaced as a unit if there is a problem with it. This section deals with checking the control inputs and outputs to determine if it is functioning properly.

Operational Problems

There are several problems that appear in the operation of the control but are actually related to some other part of the system. They are listed my problem below:

1. Control appears stuck on a particular display and will not change as keys are pressed.

This problem can occur if the tractor was started with AHC power switch turned on. If so, turning the AHC off for a few seconds and back on again will solve the problem.

A short in the footswitch or footswitch wiring can also look this way. See section 7.2 for details.

2. The message "DEFAULT VALUES LOADED" appears at power up.

This indicates the control parameters loaded on power up were not valid numbers so the control loaded default values. Unless the operator is trying to use non-standard values, this will not effect operation. It does however indicate that some circuits in the control have failed. The operator will most likely notice that the auto/manual mode for each puller unit was not saved when the unit was powered down the last time.

Verifying Outputs to the SDU

The AHC outputs 10 different signals to the SDU. These consist of an up signal and a down signal for each puller unit, a charge signal, and an auto/man or mode output for each puller unit.

The up, down, and charge outputs are easily checked by putting the control in automatic mode and observing the SDU LED's as someone blocks the appropriate sensors to cause the desired output to come on. The mode outputs can be checked by putting a given puller unit in the auto mode *then pressing* the manual up and down keys. If the mode output is getting to the SDU, the manual keypad functions will not be functional.

If it appears as though an output is not getting to the SDU, the appropriate wires in the control wiring loom should be checked for *continuity. Refer* to section drawing number ES110-CWL in section 7.3.

Verifying Inputs From the Sensors

The best way to verify that sensor inputs are being recognized by the AHC is to use the "view all sensors" option of the self test. While observing the sensor signals, it should be

noted that each input changes as someone breaks the appropriate light beam. See section 7.1 for details on the use of the self test.

SDU Problems Caused by the Control

Some problems that appear to be the SDU can actually be the result of influence from the AHC. Some examples of problems and associated trouble shooting procedures are presented below.

1. Blown 1/2 amp fuse on SDU

The AHC receives power through the SDU and it's fuse. One can isolate the AHC by turning it off or disconnecting the control wiring loom from the back. If the fuse continues to blow, the control wiring loom may be suspect. This can be tested by un-plugging the loom at the SDU.

2. One or more groups of raise/lower functions do not operate in the manual mode.

The AHC may be holding the SDU in the auto mode even though the manual mode is selected. Disconnecting the control wiring loom at the AHC will isolate the AHC. If the problem persists, the control wiring loom can be checked by removing it from the SDU.

Effect of Lock System Failures

The lock system holds the puller units in position when the toolbar is folded up. When the toolbar is folded down and the machine is operating, a solenoid is energized by mercury switches located on the toolbar wings. If one of the components of the lock system should fail, the solenoid would be de-energized. In this condition, the right and left puller units will move down but not up and the center unit will operate as normal. One should be aware of this condition so that it is not mistaken as a problem with the ABC or SDU.

Replacing the Control

The ABC mounts with wing nuts and incorporates easy to remove connectors so that it can quickly be replaced in the field. Removal of the control should proceed as follows

1. Disconnect the two cables on the back of the ABC. Make sure the rubber seals are not lost. They should remain in the connectors on the control.
2. Remove wing nuts.
3. Remove plastic cover.
4. Remove control by pushing one side out then the other.

Footswitch

Symptoms of a Failed Switch

The most obvious switch failure is one in which the switch contacts do not close. In this case the control will operate normally except that it will not exit the manual override mode when the footswitch is pressed.

A footswitch that is always closed or shorted however may appear as a different problem. If this failure occurs, the ABC will display either of the following messages and will be stuck at that point:

ARE SENSORS
CLEAR? <Y or N>

Or

COPYRIGHT 1989
PIONEER BI-BRED

A shorted switch can be disconnected and the control operated as described in section 7.2. To disconnect the switch, trace its cable back until two quick disconnect terminals are located. Unplug the two terminals.

Operating With the Switch Disconnected

The control can still be operated with the footswitch disconnected. Pushing any of the front panel AUTO/MAN switches will take the control out of the manual override mode after power up. When entering or exiting a set of rows in the field, the operator can use the front panel AUTO/MAN keys.

Replacing the Switch

Early machines used a Cole-Hersy brand button type switch for the footswitch. It is recommended that as these switches fail, they be replaced with the new style switch. The new switch consists of a cast iron housing and a waterproof gold contact switch.

Two holes about 1/4 inch in diameter should be drilled in the floorboard for mounting the switch. Another hole 3/8 inch in diameter should be drilled in the floorboard an inch or so above footswitch strain relief. This hole is for routing the cable under the floorboard and the grommet supplied on the footswitch cable should be inserted into it.

Caution

When drilling holes in the floorboard be careful not to drill into hydraulic lines or wires under the floor board.

Repairing the Switch

The Cole Hearsy switch cannot be repaired. Newer switches can be repaired to some extent.

To check a footswitch take out the mounting screws and turn the switch upside down, then remove the two screws holding the bottom cover in place. The black rubberized switch should click when the foot pedal is depressed about half way. If it does not click, adjust the bracket holding it until proper operation is achieved. If the switch still does not operate when the mechanism has proper travel, then the switch itself has probably failed. Repair footswitches are supplied as complete units.

Troubleshooting Guide

The trouble shooting guide from the Operators Manual is reprinted here for reference. See section 7.2 for more detailed trouble shooting information.

Problem	Procedure	Solution
1. Self test indicates failed sensors	1. Check lenses and reflectors. If they are clean go to procedure #2, if not go to solution #1	1. Clean lenses and/or reflectors with a non-abrasive cloth
	2. Check sensor alignment by moving reflectors and/or sensor mounts while observing the red indicator light on the sensor just above its cable (may have to shade light to make it visible in sunlight). If the light never comes on, go to procedure #3, otherwise see solution #2.	2. Adjust reflector and/or sensor alignment so that indicator light stays on. Make sure alignment will be maintained under vibration.
	3. Look in the sensor lens and deep in the bottom half a red glow should be visible. If so, go to solution #3. If not, go to procedure #4.	3. If alignment with the reflector appears OK, the sensor has probably failed. Replace sensor.
	4. Inspect the sensor connector and the wiring loom back to the control box. If a broken wire is found, see solution #4. If not, call TIS for assistance.	4. Repair broken wire as necessary.
2. Automatic control operates but all linear actuators are inoperative	1. Check fuse on the back panel of the Automatic Height Control. If fuse is blown, go to solution #1. If fuse is OK, go to procedure #2	1. Replace with 4 amp type 3AG fast blow type fuse
	2. Check wiring to linear actuators and to the tractor's main fuse block. If a broken wire or bad connection is found, see solution #2. If not, call TIS for assistance.	2. Repair wiring as necessary. Replace parts as needed.
3. Automatic control operates but one or two linear actuators are inoperative	1. Check wiring to the linear actuators. If a problem is found, see solution #1. If not go to procedure 2.	1. Repair wiring as necessary. Replace parts as needed
	2. Swap linear actuators with another puller unit. If problem follows linear actuator, replace linear actuator. If not, see solution #2.	2. Problem may be in control unit. Call TIS for assistance.

4. Automatic Height Control displays: "AUTO HEIGHT" "CONTROL V2 .2" and display never changes	1. Trace manual override footswitch wiring back to the two quick disconnect terminals and disconnect them. If problem persists, see solution #1. If not see solution #2.	1. Problem may be in control unit. Call TIS for assistance.
		2. Switch or wiring is shorted. To operate with switch removed, push any front panel mode key once after power up to disable manual override mode. 1.See solution 1 above.
5. Automatic Height Control displays: "COPYRIGHT 1989" "PIONEER HI-BRED" and never changes.	1. See solution 1 above.	
6. Linear actuators operate but automatic and manual controls don't function. Display on the Automatic Height Control is blank.	1. Check fuse in Solenoid Drive Unit. If failed, see solution #1. If fuse is ok, go to procedure #2.	1. Replace fuse with 1/2 amp fast blow AGC 3 type.
	2. With tractor ignition switch on, check to see if the red indicator light labeled +12V in the Solenoid Drive Unit is on. If it is, go to procedure #3. If not, see solution #2.	2. Check the tractor's main fuse block for a blown fuse and replace with identical type.
	3. Check cables for broken wire or bad connection. Go to solution #3.	3. Repair broken wire or bad connection if found. If not call TIS for assistance.
7. Height adjust functions on manual keypad do not work.	1. Check mode of Automatic Height Control. If control is in Auto Mode, see solution #1. If not go to procedure #2.	1. Manual height adjust functions are disabled in the automatic mode. If manual operation is desired, press the mode key for the appropriate puller unit.
	2. Shut off Automatic Height Control and disconnect the smaller of the two cables on the back panel. If problem still exists go to procedure #2 in problem #8. If not see solution number 2.	2.Automatic Height Control is forcing the automatic mode. Call TIS for service of Automatic Height Control.
8. One or more manual keypad functions do not work but Automatic	1. Go to procedure #2 in. problem #6. If problem still persists, go to procedure #2.	

Height Control is on and display has information in it.	2. Push any key on manual keypad and check that the appropriate light in the Solenoid Drive Unit assistance.	2. Problem is in keypad, wiring, or Solenoid Drive Unit. Call TIS for assistance.
	3. Check the wire number of the wire connected to that function on the Solenoid Drive Unit. Find the other end of the wire on the solenoid. With a volt meter see if that point has 12 volts on it with the key NOT pressed. If it does, go to procedure #5. If not go to procedure #4.	
	4. Check other contact of the solenoid for 12 volts. If present, see solution #4. If not, go to procedure #5.	4. Solenoid coil is burned out and should be replaced.
	5. Voltage on the side of the solenoid that goes to the Solenoid Drive Unit should go to zero when the appropriate key is pressed. If it does, there is a problem in the hydraulic system. If not check the wire and connectors for breaks.	

If you experience problems with the Automatic Height Control system that you cannot solve or have questions regarding its operation, please contact TIS.

Routine Maintenance

Pre-Season Checkout

Before the detasseling season begins, the Automatic Height Control system should be checked out to make sure it is in good operating *condition. One* should start up the machine and make sure all automatic and manual functions operate. In addition, the following items should be checked:

1. Condition of the sensors

Make sure alignment has not been disturbed. Look at the lenses to make sure they are clear and that water has not condensed inside them. Check the reflectors to see that they are securely in place.

2. Linear actuator movement

If any rusting of the moving parts has occurred, it should be cleaned and treated. Run each linear actuator up and down while *listening for* any places where it might bind.

3. Condition of wiring looms

Carefully inspect the wiring looms for broken wire ties that may allow the wires to dangle or become pinched or pulled. Check for rodent damage.

Daily Maintenance

It is a good idea to check the sensors and reflectors each day before operation begins. Sensor lenses should be cleaned of any foreign material with a non-abrasive cloth. The reflectors should also be cleaned if any build up of foreign material is noted.

The sensor *mounting hardware* should be checked to make sure *alignment is* maintained, and the wiring loom should be visually inspected to make sure it will not be pinched as the tool bar is folded and unfolded.

Off Season Storage

This manual contains a separate section on storage. Please refer to that section for details on storage considerations for the AHC.

7.3 General

Returning Failed Components

Importance Of Returning Failed Components

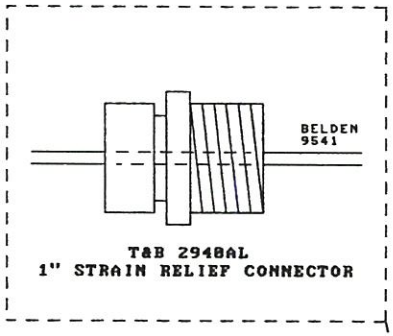
The Electronics group maintains a supply of spare parts for support during detasseling season. That supply can only remain at an adequate level if failed components are quickly returned so that they can be repaired and returned to the spare parts inventory.

Returning all failed parts also gives us the opportunity to analyze the failures and identify trends that may indicate problems that can be prevented. 3.1.2 Packaging parts for return.

It is important that failed parts be packaged so that further damage does not occur in shipping. Static sensitive parts should be wrapped in antistatic material and all parts should be packed with an adequate amount of shock absorbing material.

Schematics and Reference Materials

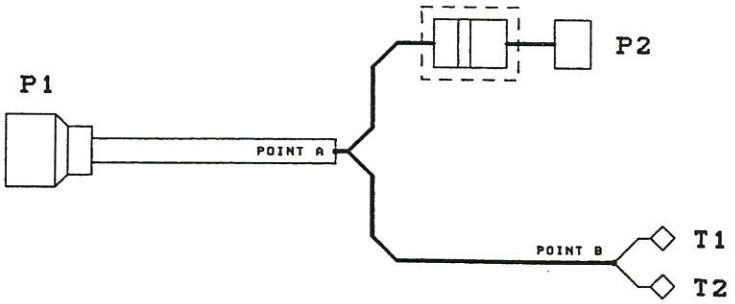
This section contains schematics of the wiring looms and other reference materials associated with the Automatic Height Control.



T&B 294BAL
1" STRAIN RELIEF CONNECTOR

CONNECTORS

PART ID	MANUFACTURER	PART NO.	DESCRIPTION
P1	AMP	286037-1	CPC PLUG (W/SHELL)
P2	AMP	1-350246-9	MR SOCKET HOUSING
T1, T2		(FULLY INSULATED)	1/4" F. DISCONNECT



LEGEND

BRAIDED COVER

MULTI-CONDUCTOR CABLE

SINGLE CONDUCTOR

Title: CONTROL WIRE LOOM
Size: B
Number: ES110-CWL
Revision: C
Date: 16-MAY 1989
File: PH10CULC/1
Sheet 1 of 2
Drawn By: TJW

INTERCONNECTIONS

NO.	ORIG.	WIRE/CABLE TYPE	COLOR	DEST.	FUNCTION
1	P1 - 1	BELDEN 9541	BLACK	P2 - 23	+12 V
2	P1 - 2		WHITE	P2 - 24	GROUND
3	P1 - 3		RED	P2 - 1	(R) UP
4	P1 - 4		GREEN	P2 - 2	(R) DOWN
5	P1 - 5		ORANGE	P2 - 5	(C) UP
6	P1 - 6		BLUE	P2 - 6	(C) DOWN
7	P1 - 7		WHITE/BLACK	P2 - 9	(L) UP
8	P1 - 8		RED/BLACK	P2 - 10	(L) DOWN
9	P1 - 9		GREEN/BLACK	P2 - 16	CHARGE
10	P1 - 10		ORANGE/BLACK	P2 - 13	(R) MODE
11	P1 - 11		BLUE/BLACK	P2 - 14	(C) MODE
12	P1 - 12		BLACK/WHITE	P2 - 15	(L) MODE
13	NO CONN.		DRAIN	P2 - 20	SHIELD
14	P1 - 13	BELDEN 9501	BLACK	T1	MODE SWITCH
15	P1 - 14		RED	T2	MODE SWITCH (GND)
16	P1 - 15		DRAIN	NO CONN.	SHIELD

LENGTHS

P1 TO POINT A	2 ft. 6 in.
POINT A TO T&B S.R.	3 ft. 10 in.
T&B S.R. TO P2	1 ft. 8 in.
POINT A TO POINT B	1 ft. 11 in.
POINT B TO T1, T2	1 in.

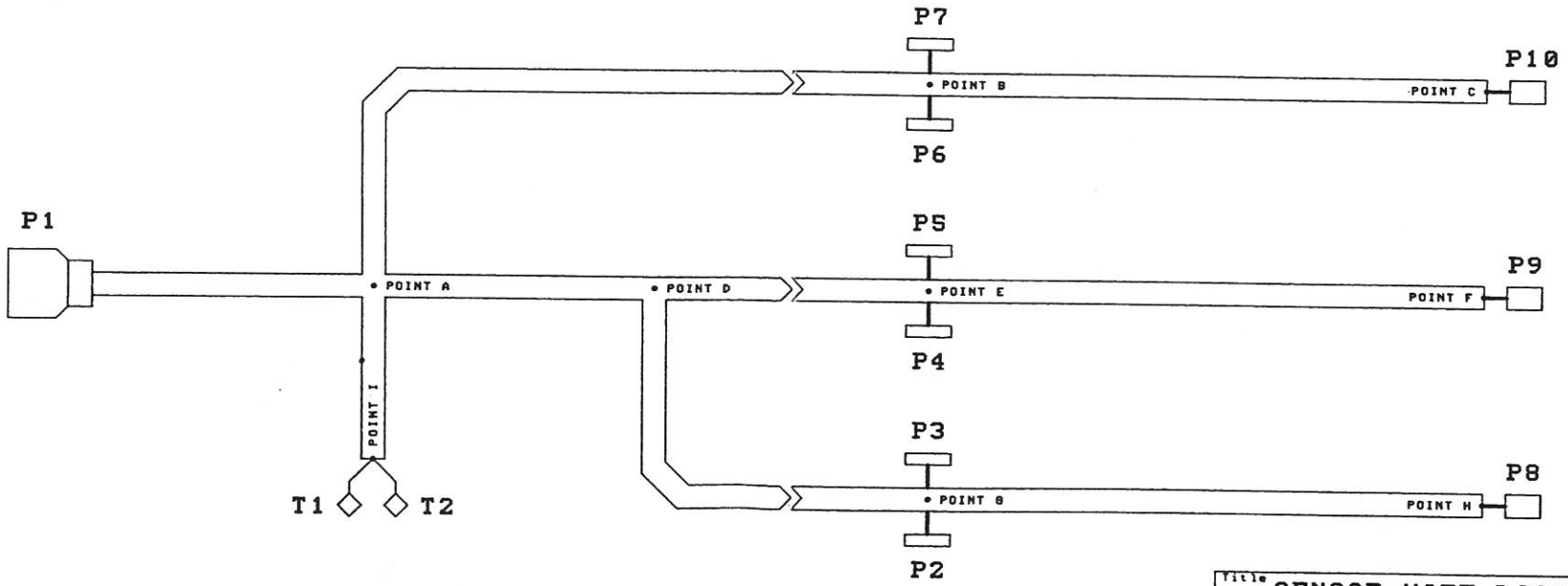
Title: CONTROL WIRE LOOM		
Size: B	Number: ES110-CWL	Revision: C
Date: 16-MAY 1989		Sheet 2 of 2
File: PM10CWLC/2		Drawn By: TJU

CONNECTORS

PART ID	MANUFACTURER	PART NO.	DESCRIPTION
T1, T2			NO.6 RING TERMINAL
P1	AMP	206837-1	CPC PLUG (W/SHELL)
P2, P3, P4	PACKARD ELECTRIC	12015797	WEATHER PACK TOWER
P5, P6, P7	PACKARD ELECTRIC	12015797	WEATHER PACK TOWER
P8, P9, P10	PACKARD ELECTRIC	8911772	PACK-CON FEMALE

LEGEND

- BRAIDED COVER
- MULTI-CONDUCTOR CABLE
- MULTIPLE CONDUCTORS
- SINGLE CONDUCTOR



Title: SENSOR WIRE LOOM		
Size: B	Number: ES110-SWL	Revision: B
Date: 16-MAY 1989		Sheet 1 of 2
File: PH10SULB/1		Drawn By: TJW

INTERCONNECTIONS

NO.	ORIG.	WIRE/CABLE TYPE	COLOR	DEST.	FUNCTION
1	P1 - 1	BELDEN 9364	RED	P2 - A	(RT) +12
2	P1 - 2		WHITE	P2 - B	(RT) SIGNAL
3	P1 - 4		BLACK	P2 - C	(RT) GROUND
4	P1 - 5		DRAIN	P2 - D	(RT) SHIELD
5	P1 - 1	BELDEN 9364	RED	P3 - A	(RB) +12
6	P1 - 3		WHITE	P3 - B	(RB) SIGNAL
7	P1 - 4		BLACK	P3 - C	(RB) GROUND
8	P1 - 5		DRAIN	P3 - D	(RB) SHIELD
9	P1 - 6	BELDEN 9364	RED	P4 - A	(CT) +12
10	P1 - 7		WHITE	P4 - B	(CT) SIGNAL
11	P1 - 9		BLACK	P4 - C	(CT) GROUND
12	P1 - 10		DRAIN	P4 - D	(CT) SHIELD
13	P1 - 6	BELDEN 9364	RED	P5 - A	(CB) +12
14	P1 - 8		WHITE	P5 - B	(CB) SIGNAL
15	P1 - 9		BLACK	P5 - C	(CB) GROUND
16	P1 - 10		DRAIN	P5 - D	(CB) SHIELD
17	P1 - 11	BELDEN 9364	RED	P6 - A	(LT) +12
18	P1 - 12		WHITE	P6 - B	(LT) SIGNAL
19	P1 - 14		BLACK	P6 - C	(LT) GROUND
20	P1 - 15		DRAIN	P6 - D	(LT) SHIELD
21	P1 - 11	BELDEN 9364	RED	P7 - A	(LB) +12
22	P1 - 13		WHITE	P7 - B	(LB) SIGNAL
23	P1 - 14		BLACK	P7 - C	(LB) GROUND
24	P1 - 15		DRAIN	P7 - D	(LB) SHIELD
25	P1 - 16	18 AWG STRANDED	YELLOW	P8 - A	RAA
26	P1 - 17	18 AWG STRANDED	RED	P8 - B	RAB
27	P1 - 18	18 AWG STRANDED	YELLOW	P9 - A	CAA
28	P1 - 19	18 AWG STRANDED	RED	P9 - B	CAB
29	P1 - 20	18 AWG STRANDED	YELLOW	P10 - A	LAA
30	P1 - 21	18 AWG STRANDED	RED	P10 - B	LAB
31	P1 - 22	16 AWG STRANDED	RED	T1	(LA) +12
32	P1 - 23	16 AWG STRANDED	BLACK	T2	(LA) GROUND

LENGTHS

POINT A TO POINT B	23 ft. 6 in.
POINT B TO POINT C	4 ft.
POINT A TO POINT D	2 ft.
POINT D TO POINT E	12 ft.
POINT E TO POINT F	4 ft.
POINT D TO POINT G	16 ft.
POINT G TO POINT H	4 ft.
POINT A TO POINT I	1 ft. 3 in.
P1 TO POINT A	4 ft.
T1, T2 TO POINT I	3 in.
P2, P3 TO POINT G	2 in.
P4, P5 TO POINT E	2 in.
P6, P7 TO POINT B	2 in.
P8 TO POINT H	1 in.
P9 TO POINT F	1 in.
P10 TO POINT C	1 in.

Title: SENSOR WIRE LOOM

Size: B | Number: ES110-SWL | Revision: B

Date: 16-NOV 1989 | Sheet 2 of 2

File: PN10SWLB/2 | Drawn By: TJW

Section 8

Hydraulic Control System

8.1 Description and Operation

Pump

The main pump (18C**) is a fixed displacement, gear pump that is mounted on the rear of the hydrostatic traction drive pump, and is driven off the main shaft of that pump. This gear pump delivers a constant flow of oil (25 GPM @ 3000 engine RPM) in proportion to engine speed. When the engine is running, the pump draws oil from the reservoir through a strainer and pumps the oil to the inlet of the electro-hydraulic control valve (20C).

Electro-Hydraulic Valve

The electro-hydraulic control valve controls all hydraulic functions on the wheelpuller except the hydrostatic traction drive. The valve features cartridge-type valves that are mounted in a valve body specifically designed for this vehicle. The valves are electronically actuated from the keypad positioned at the right hand of the operator. The electronic control system is discussed in the Electronics Section of this manual.

Oil from the pump enters the valve and passes through a flow control [1]*** that diverts 3.5 GPM of oil to the power steering circuit. The remaining oil enters the common passage of the control valve and flows over the main unloading valve [11] and back to the reservoir until required to actuate a cylinder or puller motor.

When the operator presses a button on the keypad, the control solenoid [12] is energized, which causes the unloading valve to partially close and create pressure and flow to actuate the intended cylinder or motor. Simultaneously the cartridge valves that control flow to the selected component are actuated and the component produces the intended movement or function. Pressure compensated cartridges permit several components to be actuated at the same time. For example, operating the puller motors and the lift-lower cylinders simultaneously.

Two relief valves are built.into the valve to protect against high pressures. The main relief [3] is set at 2500 PSI and protects the entire system. The other relief [2] is set at 1600 PSI to protect the power steering circuit.

Caution

Under no circumstances should these reliefs be adjusted in the field. They are pilot operated reliefs and can be easily misadjusted if not adjusted while on a test stand where the setting can be accurately determined.

** Refer to sheets 2 and 3 of Hydraulic Schematic D9091 for component and circuit information.

*** Refer to sheet 18 of Electro-hydraulic control valve 4235 for location of solenoids and cartridges.

Power Steering

The power steering circuit consists of a steering valve (14C,15C) that is spline d to the steering wheel and a cylinder (13C) attached to the steering linkage. Oil from the control valve flows to the steering valve. When the steering wheel is turned, oil is metered by the valve to the proper side of the steering cylinder to produce the intended degree of turn. Oil from the other side of the cylinder passes through the steering valve and returns to the control valve.

Puller Motors

The puller motor circuit includes the six motors (26C) that are connected to the puller wheels. The motors are connected in series, so the oil flowing from the control valve passes through each motor (in series) and returns to the valve. The two large solenoid cartridge valves [7] on the side of the valve body control and two adjacent flow controls [5] direct and maintain a constant flow to the motors. The adjustable needle valve [4] on the top of the valve permits the operator to override the automatic flow control to adjust the flow and thus the speed of the puller motors.

Lift-Lower Circuit

The lift-lower circuit controls the three cylinders (21C,27C) on the parallel link puller frames. The-three rearmost solenoid valves [2A] control the lift, and the three similar valves on the opposite side [2B] control the lower function of the cylinders. Flow controls [1], located just below the lift solenoid valves, can be adjusted to vary the lift speed. Turn the capscrew in to increase lift speed and out to decrease lift speed. Fixed orifice disks are installed behind valves [2B] to control the speed of lower, which can only be changed by changing the diameter of the orifice.

A lock valve (12C) automatically blocks the flow of oil from the rod side of the two outer lift cylinders when the toolbar is folded. This prevents the outer parallel frames from dropping when they are in the folded position. Mercury switches on the folding portion of the boom break the circuit to the lock valve, which causes the valve to move to the closed position. DO NOT PRESS THE LIFT-LOWER CYLINDER BUTTONS ON THE KEYPAD WHEN THE BOOM IS FOLDED, TO PREVENT POSSIBLE DAMAGE TO THE LIFT CYLINDERS.

Tread Adjusting and Toolbar Circuit

The tread adjusting (9C) and fold cylinders (22C,35C), and the cylinders (23C,24C) that move.the pullers units laterally on the toolbar are controlled by the bank of solenoid cartridges on the RH side of the valve [8A, 8B] .

Each lateral toolbar cylinder is controlled by an individual pair of solenoid valves, thus only-one cylinder moves as its keypad button is pressed. The fold cylinders are connected in parallel to the control valve so one cylinder may move before the other because oil flows to

the cylinder offering the least resistance to movement. All four tread adjusting cylinders are connected in parallel to one set of control valves, so again, probably only one cylinder will move at a time until all four cylinders are fully extended or contracted.

Cooler And Filter

After the oil leaves the electro-hydraulic control valve, it passes through an oil cooler (8) mounted in front of the engine radiator. The oil then passes through a reservoir mounted filter (6) before returning to the reservoir.

Reservoir

The reservoir (3C) provides oil for the hydrostatic traction drive and the hydraulic control system. Its other functions are: provide a dwell (resting) time for the oil so entrapped air can escape, and additional cooling can occur. Sight gauges (11C,34C) are located on the reservoir to help determine the fluid level in the reservoir.

8.2 System Maintenance and Service

Note

When servicing or repairing any hydraulic system? Use every precaution to prevent dirt and other contaminants from entering the system. The added care will mean longer component service life and reduced downtime.

Warning

Never use your hands to seek out escaping hydraulic oil, use a piece of wood or cardboard. When hydraulic oil is escaping under pressure from a small hole, it can 'penetrate the skin and cause serious injury.

Warning

Always allow the oil to cool and make sure the circuit is not under pressure before servicing or repairing the circuit, to prevent burns from escaping hot oil.

Routine Service

The hydraulic control system should be relatively maintenance free as long as the oil remains clean, and moisture and other contaminants do not enter the system.

Regular inspections for leaking fittings, worn or pinched hoses, missing or worn tube mounting bushings, tubes in metal-to-metal contact, loose mounting bolts, leaking pumps, motors, and cylinders, loose or corroded electical connections, and pinched or rubbing wires,

and their prompt repair will insure more reliable performance' and improved service life of the system.

Filter Change

Change the return filter element following each detasseling season. Remove the four nuts that.retain the top cover. Then remove the entire element assembly from the housing and remove the bottom retaining bolt and spring. The filter element should drop off. exposing a stack of magnets. Wipe the magnets clean of any metal filings that may be present, install a new element, reassemble, and install in the filter housing. Inspect the used element for evidence of high pressures, which would be indicated by a bulging or parting of the outer perforated metal liner of the element.

Oil Change

Refer to Section 4.2 under Hydrostatic Traction Drive.

8.3 Oil Specification

Refer to Section 4.3 under Hydrostatic Traction Drive.

8.4 Troubleshooting the System

When trying to determine the causes and solutions of performance problems with the system, the following service tips. may help. Before proceeding with troubleshooting always check the following:

1. Proper oil level in the reservoir.
2. Proper oil temperature (+200F oil can cause malfunctions).
3. Check pump condition and relief valve settings by attaching a 3000 PSI gauge to the hose connected to valve port G1. With oil at operating temperature and the engine set at 1800 RPM, conduct the following tests:

Condition	Proper Gauge Reading
no load	400-600 PSI
turn steering wheel to extreme left or right and hold	1500-1700 PSI
raise a lift cylinder to full lift and hold	2400-2600 PSI

   The above readings will not completely confirm that the pump is in top condition but will indicate it is pumping and is able to produce pressure.

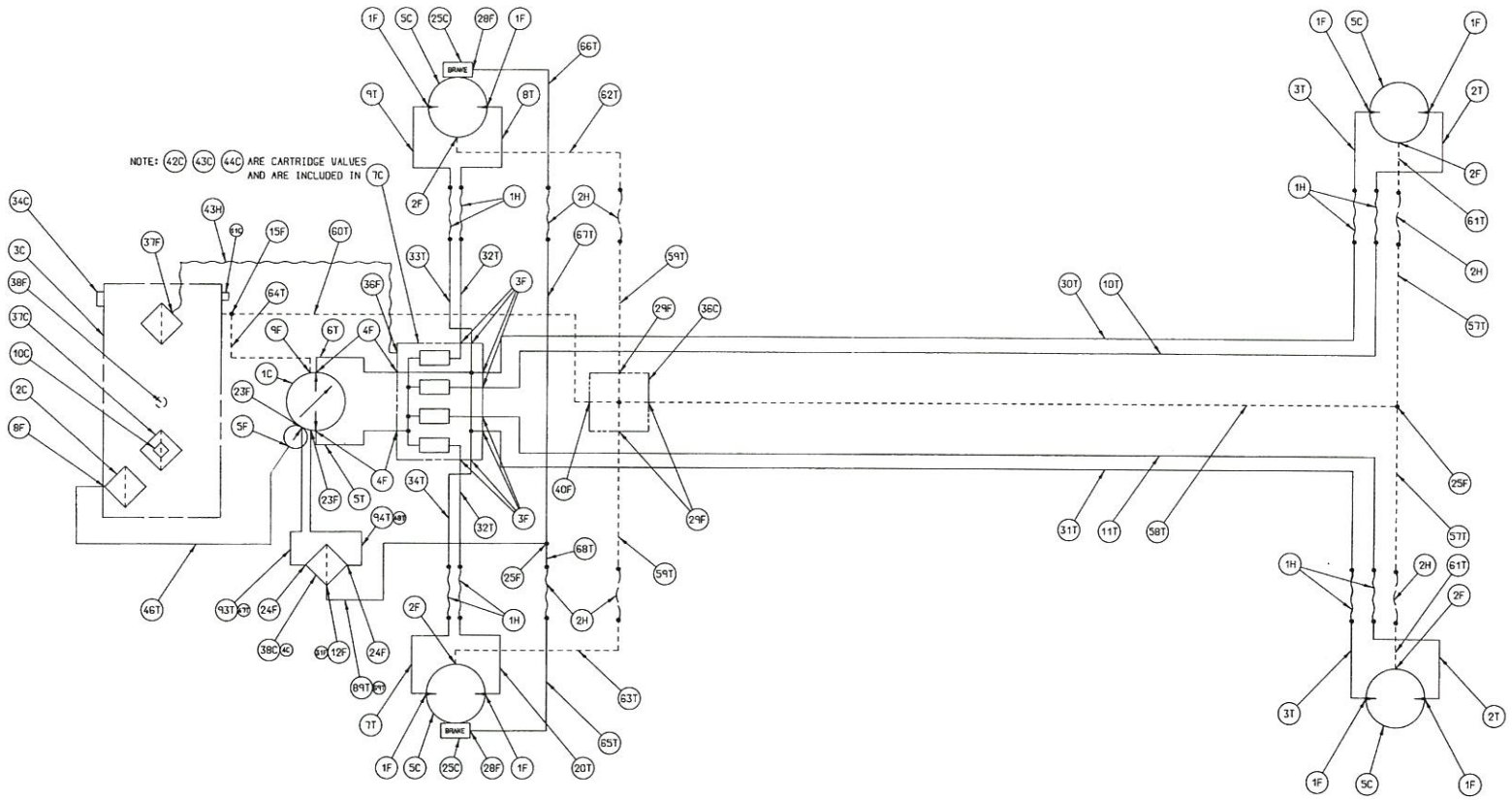
4. Proper voltage across the terminals of the solenoid controlling the function that is being checked. A minimum of 10 volts is necessary for proper solenoid operation. If lower refer to the Electronics Section of this manual for assistance.
5. With proper voltage and the engine shut off, actuate solenoid and listen for a clicking or tapping sound when the solenoid engages.

Condition	Possible Cause	Corrective Action
• no power steering	• no pump flow	• replace pump
	• defective flow control [1]	• remove [1], inspect and clean, or replace
	• defective relief valve [2] ,. G1 port gauge should read 1600 PSI at full turn	• replace [2]
	• defective steering valve	• replace valve
• high (+1800 PSI)steering pressure	• defective relief valve [2], see above	• see above
• slow steering	• low pump flow	• replace pump
	• defective flow control [2]	• see above
	• internal leakage cylinder (13C)	• repair or replace
• reduced steering power	• defective relief valve, see above	• see above
	• defective main relief valve [3]. G1 port gauge should read 2500 PSI when a lift cylinder is fully extended	• replace
• high main system pressure (+2700 PSI)	• defective main relief valve [3] see above	• replace
• pump leaks at mount with hydro pump	• loose mounting bolts	• tighten
	• failed 0 ring	• replace
• power steering okay, but no other functions	• charge solenoid [12] not operating	• inspect and repair, or replace
• pump loads up but no flow from work ports	• valve [1] sticking or defective	• remove, clean or replace
• puller wheels do not turn	• adjustable speed valve [4] closed	• turn open
	• valve [7] defective or sticking	• remove, clean or replace
	• valve [5] defective or sticking	• remove, clean or replace
	• sense valve [9] sticking	• remove, clean and inspect
• puller wheel speed varies	• valve [5] sticking	• remove, clean or replace
	• valve [7] sticking	• remove, clean or replace

Condition	Possible Cause	Corrective Action
• pump is slow to react to load changes	• clogged sense orifice [0]	• remove and clean
	• valve [11] sticking	• remove, clean or replace
• no flow or erratic flow from individual work ports, Cl-C13	• valve that controls port sticking	• remove, clean or replace
	• sense check [5] that controls port sticking	• remove, clean and inspect
• lift cylinders will not drop	• valve [2B] sticking	• remove, clean or replace
	• clogged orifice	• remove [2B] clean disk orifice
• lift cylinder lift speed incorrect	• misadjusted valve [1] (located under valve [2A])	• turn capscrew in for faster lift; out for slower lift
• lift cylinder no lift, or erratic lift	• sticking or defective valve [1] sticking or defective valve [2A] sticking sense check [5]	• remove, clean or replace remove, clean or replace remove, clean and inspect
• outer lift cylinders will not raise	• defective mercury switch in lock circuit	• replace
	• defective or sticking lock valve	• remove, clean or replace
• incorrect flow(speed) from ports C4-C13	• sticky valve [6]	• remove, clean or replace
	• misadjusted valve [6]	• turn capscrew in for more flow; out for less flow

8.5 Parts And Service Assistance

Refer to Section 4.5 under Hydrostatic Traction Drive. The pump used in the Hydraulic Control System is under the Fauver Company repair agreement.



XXC → COMPONENTS
XXT → TUBES
— SEE SHEET 4 FOR SPECIFICATIONS

XXH → HOSES
XXF → FITTINGS
— SEE SHEET 5 FOR SPECIFICATIONS

OTE: PART NUMBERS IN SMALL CIRCLE DENOTES PARTS
SED ON WHEELPULLERS BUILT PRIOR TO 1989.

HOSE
TUBE

REVISED 08-01-92, JC, GENERAL UPDATES

PIONEER HI-BRED INTERNATIONAL, INC.

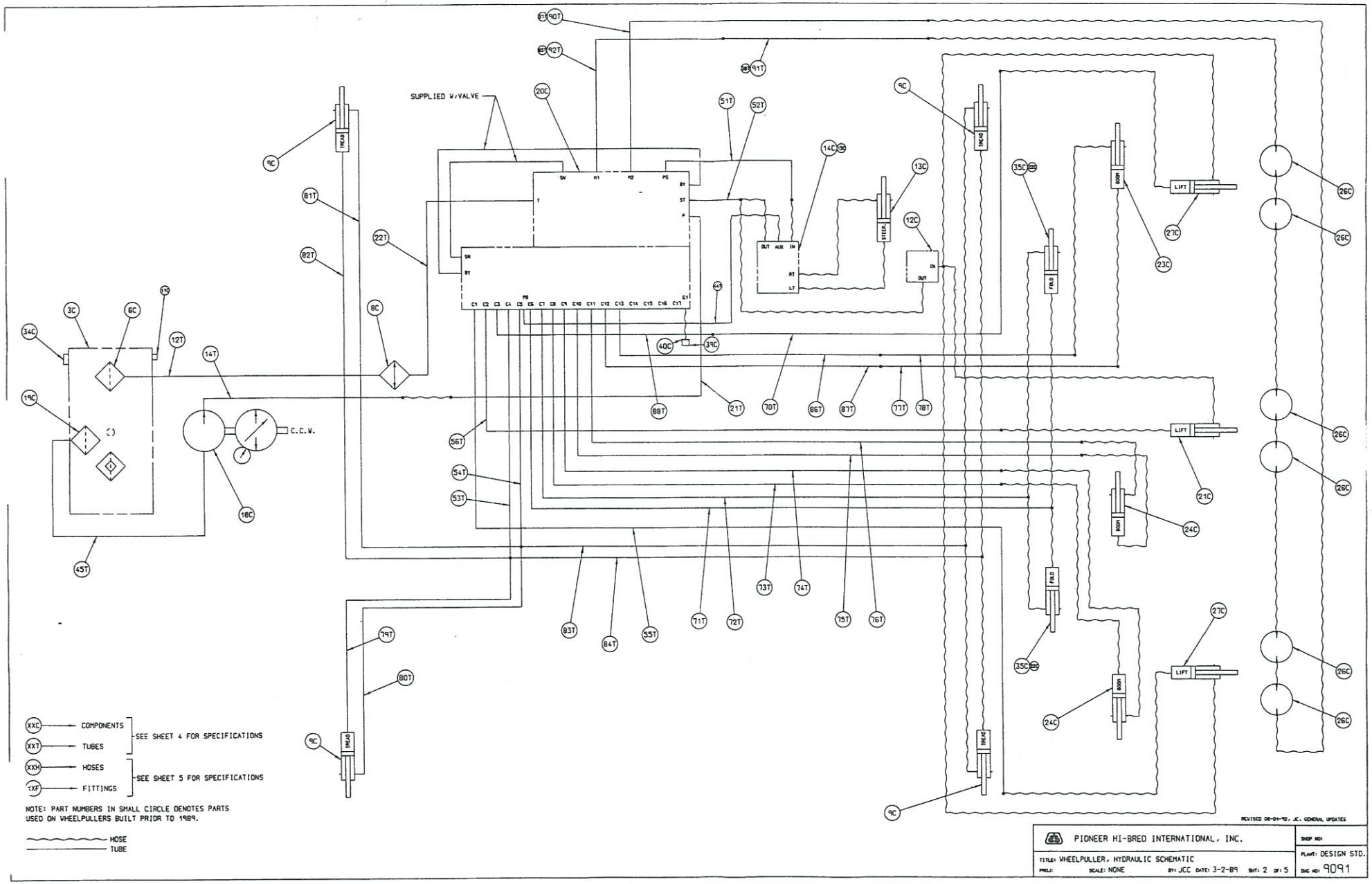
SHOP NO:

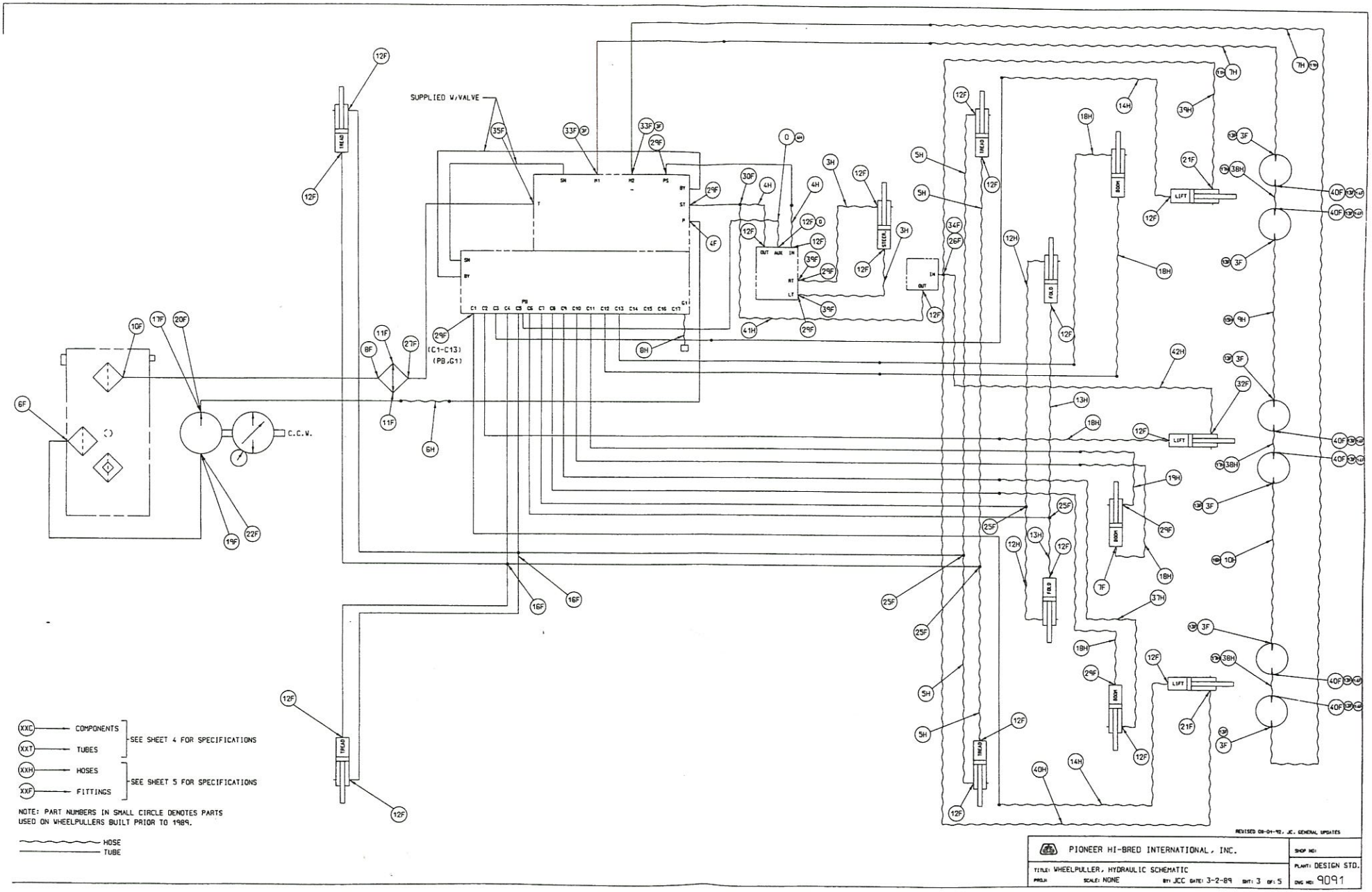
TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC, GROUND DRIVE

PROJ: SCALE: NONE BY: JCC DATE: 3-2-89 SHT: 1 OF: 5

PLANT: DESIGN STD.

DWG NO: 9091


SUPPLIED W/VALVE
C.C.W.
LIFT
BOOM
FOLD
STEER
INCLD
(XXC) COMPONENTS
(XXT) TUBES
SEE SHEET 4 FOR SPECIFICATIONS
(XXH) HOSES
(XF) FITTINGS
SEE SHEET 5 FOR SPECIFICATIONS
NOTE: PART NUMBERS IN SMALL CIRCLE DENOTES PARTS USED ON WHEELPULLERS BUILT PRIOR TO 1989.
HOSE
TUBE
REVISED 08-01-90, JC, GENERAL UPDATES
PIONEER HI-BRED INTERNATIONAL, INC.
TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC
PROJ#:
SCALE: NONE
BY: JCC DATE: 3-2-89
SHT: 2 OF: 5
SHOP NO#:
PLANT: DESIGN STD.
DWG NO: 9091


SUPPLIED W/VALVE
C.C.W.
(C1-C13)
(PB,G1)
XXC — COMPONENTS
XXT — TUBES
SEE SHEET 4 FOR SPECIFICATIONS
XXH — HOSES
XXF — FITTINGS
SEE SHEET 5 FOR SPECIFICATIONS
NOTE: PART NUMBERS IN SMALL CIRCLE DENOTES PARTS USED ON WHEELPULLERS BUILT PRIOR TO 1989.
HOSE
TUBE
REVISED 08-01-92. JC. GENERAL UPDATES
PIONEER HI-BRED INTERNATIONAL, INC.
TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC
SCALE: NONE
BY: JCC DATE: 3-2-89
SHT: 3 OF: 5
SHOP NO:
PLANT: DESIGN STD.
DWG NO: 9091

HYDRAULIC COMPONENTS

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	VENDOR NUMBER
1C	1	1	6-		PUMP, SUNDSTRAND PVO46C-ABAB-AB-CJJ-AAC-B
2C	1	1	6-		STRAINER, ZINGA TF-1030-0
3C	1	1	6-		RESERVOIR, PIONEER 4235, SHT 1
4C	1	1	6-8	38C	FILTER, FAIREY-ARLON, GAGO-SAE16-TXW2-CC10-BLOCKED
5C	4	1	6-		MOTOR, POCLAIN S5 (28.6 CID)
6C	1	2	6-		FILTER, FAIREY-ARLON, TTF-170-SAE24-TXW4-CC10-B-T-22
7C	1	1	6-1	41C	VALVE, FAUVER FV-D-2062-JJJJ
8C	1	2	6-		COOLER, BLISSFIELD 65027
9C	1	2	6-		CYLINDER, CROSS DB250-800-106-CCAO
10C	1	1	6-		BREATHER, OILRITE A3432-4
11C	1	1	6-7	34C	SIGHT LEVEL, HYDROCRAFT HC-SP-8
12C	1	2	6-		VALVE, LOCK, MODULAR SV3-10-C-6T-120T
13C	1	2	6-		CYLINDER, STEER, ROSENBOOM 6931
14C	1	2	8-		VALVE, STEER, ROSS HGA-10-121
15C	1	2	6-7	14C	VALVE, STEER, ROSS HGA-10-127 (NOTE 2)
16C					BLANK
17C	1	2	2-		CYLINDER, LIFT, CTR, ROSENBOOM 6288 (NOTE 4)
18C	1	2	6-		PUMP, SUNDSTRAND TAP 22/90 33.5DSC07
19C	1	2	6-		STRAINER, ZINGA 1230-5
20C	1	2	6-		VALVE, HYDRA-POWR HMA-139
21C	1	2	6-1	17C	CYLINDER, LIFT, CTR, ROSENBOOM 6259
22C	2	2	6-8	35C	CYLINDER, FOLD, ROSENBOOM 6947
23C	1	2	6-		CYLINDER, BOOM, LH, ROSENBOOM 6732
24C	2	2	6-		CYLINDER, BOOM, CTR, RH, ROSENBOOM 6731
25C	2	1	6-		BRAKE, POCLAIN S5
26C	6	2	6-1	45C	MOTOR, WHITE MS-100401
27C	2	2	6-		CYLINDER, LIFT, RH, LH, ROSENBOOM 6288
28C	55		6-		SPLIT BUSHING, PARKER C-SB-10-6
29C	40		6-		SPLIT BUSHING, PARKER C-SB-10-10
30C	2		6-		SPLIT BUSHING, PARKER C-SB-16-16
31C	1		6-		SPLIT BUSHING, PARKER C-SB-32-16
32C	1		6-		CLAMP, PARKER C-PH-10-2
33C	1		6-		CLAMP, PARKER C-PH-16-2
34C	1	1	8-		LEVEL GAUGE, UC-FL-31112
35C	2	2	9-		CYLINDER, FOLD, ROSENBOOM 63110
36C	1	1	6-		MANIFOLD, FAUVER FV-2599
37C	1	1	9-		STRAINER, FILL, ZINGA TF-1220-0
38C	1	1	9-		FILTER, DONALDSON HMK04, P16-4378, BLOCKED
39C	1	2	6-		COUPLER, MALE TIP, PIONEER 4010-3
40C	1	2	6-		DUST CAP, PIONEER 5209-3
41C	1	1	2-		VALVE, 4WD, FAUVER FV-2062-AJJJJK W/SHUTTLE
42C	4	1	6-		CARTRIDGE, FLOW, 4WD VALVE, FAUVER J2A60 W/TC-1124 CAP
43C	1	1	2-		CARTRIDGE, CHARGE RELIEF, 4WD VALVE, FAUVER A8B60
44C	1	1	2-		CARTRIDGE, SHUTTLE, 4WD VALVE, FAUVER K3A60-10.0
45C	6	2	2-		MOTOR, PARKER 04008BAS

NOTES:

(1) PARTS ARE USED ON MACHINES WITH SERIAL NUMBERS ENDING IN THE INCLUSIVE DIGITS SHOWN. FOR EXAMPLE, 6- MEANS ALL MACHINES, 6-8 MEANS SERIAL NUMBERS ENDING IN 6, 7, AND 8.

(2) WHEN FURNISHING HGA-10-121 FOR SERVICE, INCLUDE ONE O RING PLUG, 6P5ONS

(3) PIONEER STANDARDS FOR HYDRAULIC SYSTEMS PROCUREMENT, STORAGE, HANDLING, ASSEMBLY, AND TESTING APPLY.

(4) MADE CENTER LIFT CYLINDER SAME AS RIGHT AND LEFT LIFT CYLINDERS IN 1992, TO CONNECT ROD SIDE OF CENTER LIFT CYLINDER TO TANK.

TUBE ASSEMBLIES

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	TUBE SIZE	FITTING	FITTING
1T					BLANK		
2T	2	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
3T	2	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
4T					BLANK		
5T	1	1	6-		1.000 X .095W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
6T	1	1	6-		1.000 X .095W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
7T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
8T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
9T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
10T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
11T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
12T	1	2	6-		1.2500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
13T					BLANK		
14T	1	2	6-		1.000 X .065W	JIC NUT & SLEEVE	1.0 SAE FLANGE
15T					BLANK		
16T					BLANK		
17T					BLANK		
18T					BLANK		
19T					BLANK		
20T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
21T	1	2	6-		1.000 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
22T	1	2	6-		1.000 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
23T					BLANK		
24T					BLANK		
25T					BLANK		
26T					BLANK		
27T					BLANK		
28T					BLANK		
29T					BLANK		
30T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
31T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
32T	2	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
33T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
34T	1	1	6-		.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
35T					BLANK		
36T					BLANK		
37T	1	2	6-8	90T	.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
38T	1	2	6-8	91T	.62500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
39T					BLANK		
40T					BLANK		
41T					BLANK		
42T					BLANK		
43T					BLANK		
44T	1	2	6-7	NONE	.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
45T	1	2	6-		1.2500 X .065W	JIC NUT & SLEEVE	1.25 SAE FLANGE
46T	1	1	6-		1.2500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
47T	1	1	6-8	93T	.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
48T	1	1	6-8	94T	.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
49T					BLANK		
50T					BLANK		
51T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
52T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
53T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
54T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
55T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
56T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
57T	2	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
58T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
59T	2	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
60T	1	1	6-		.62500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
61T	2	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
62T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
63T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
64T	1	1	6-		.62500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
65T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
66T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE

TUBE ASSEMBLIES

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	TUBE SIZE	FITTING	FITTING
67T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
68T	1	1	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
69T	1	1	6-8	89T	.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
70T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
71T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
72T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
73T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
74T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
75T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
76T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
77T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
78T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
79T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
80T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
81T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
82T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
83T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
84T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
85T	1	2	6-8	92T	.62500 X .065W	JIC NUT & SLEEVE	#10 JIC MALE WELD
86T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	#6 JIC MALE WELD
87T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	#6 JIC MALE WELD
88T	1	2	6-		.37500 X .035W	JIC NUT & SLEEVE	#6 JIC MALE WELD
89T	1	1	9-		.37500 X .035W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
90T	1	2	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
91T	1	2	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
92T	1	2	9-		.7500 X .065W	JIC NUT & SLEEVE	#12 JIC MALE WELD
93T	1	1	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE
94T	1	1	9-		.7500 X .065W	JIC NUT & SLEEVE	JIC NUT & SLEEVE

REVISED 08-04-92, JC, GENERAL UPDATES

PIONEER HI-BRED INTERNATIONAL, INC.

SHOP NO:

TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC

PROJ: SCALE: NONE BY: DK DATE: 3-2-89 SHT: 4 OF: 5

PLANT: DESIGN ST

DWG NO: 9091

HYDRAULIC FITTINGS

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	DESCRIPTION & PARKER NUMBER
1F	8	1	6-		STRAIGHT THREAD CONNECTOR, 10-12F40XS
2F	4	1	6-		STRAIGHT THREAD CONNECTOR, 6-6F40XS
3F	14	1,3	6-		STRAIGHT THREAD CONNECTOR, 10F50XS
4F	5	1,3	6-		STRAIGHT THREAD ELBOW, 16C50XS
5F	1	1	6-		STRAIGHT THREAD ELBOW, 20-16C50XS
6F	1	3	6-		MALE ELBOW, 20CTXS
7F	1	3	9-		STRAIGHT THREAD 45 ELBOW, 6V50XS
8F	2	1	6-		MALE ELBOW, 20-16CTXS
9F	1	1	6-		STRAIGHT THREAD CONNECTOR, 10-12F50XS
10F	1	3	6-		STRAIGHT THREAD CONNECTOR, 20-24F50XS
11F	2	3	6-		HEX PLUG, 1HPS
12F	20	1,3	6-		STRAIGHT THREAD ELBOW, 6C50XS
13F	12	3	6-8	NOTE (3)	STRAIGHT THREAD CONNECTOR, 8-10F50XS
14F	6	3	6-8	NOTE (3)	SWIVEL NUT ELBOW, 8C6XS
15F	1	1	6-		MALE BRANCH TEE, 10-12STXS
16F	2	3	6-		UNION CROSS, 6KTXS
17F	2	3	6-		SAE FLANGE, 51H-16
18F					PIPE REDUCER, 3/8 X 1/4 PTRS (FOR PRESSURE GAUGE)
19F	2	3	6-		SAE FLANGE, 51F-20
20F	1	3	6-		O RING, 711510-4
21F	2	3	6-		STRAIGHT THREAD CONNECTOR, 6-8F50XS
22F	1	3	6-		O RING, 711510-3
23F	2	1	6-		STRAIGHT THREAD ELBOW, 12-10C50XS
24F	2	1	6-		STRAIGHT THREAD ELBOW, 12-16C50XS
25F	6	1,3	6-		UNION TEE, 6JTXS
26F	1	3	6-		STRAIGHT THREAD BRANCH TEE, 6S50XS
27F	1	3	6-		MALE ELBOW, 16CTXS
28F	2	1	6-		STRAIGHT THREAD CONNECTOR, 6F40XS
29F	24	3	6-		STRAIGHT THREAD CONNECTOR, 6F50XS
30F	1	3	6-		SWIVEL NUT RUN TEE, 6R6XS
31F	1	1	6-8	12F	MALE ELBOW, 6-2CTXS
32F	1	3	NOTE (5)		STRAIGHT THREAD CONNECTOR, 6-8F50XS
33F	2	3	6-		STRAIGHT THREAD CONNECTOR, 12-10F50XS
34F	1	3	NOTE (5)		SWIVEL NUT RUN TEE, 6R6XS
35F	1	3			STRAIGHT THREAD CONNECTOR, 16F50XS
36F	1	1	NOTE (6)		STRAIGHT THREAD ELBOW, 6C50XS
37F	1	1	NOTE (6)		MALE ELBOW, 6CTXS
38F	1	1			PLUG, 3/4HPS
39F	2	3			SWIVEL NUT ELBOW, 6C6XS
40F	7	1,3			STRAIGHT THREAD ELBOW, 10C50XS
41F	1	1	6-8	15F	MALE BRANCH TEE, 10STXS

HOSE ASSEMBLIES

P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	HOSE SPEC. NOTE (2)	END FITTING	END FITTING	LENGTH
1H	8	1	6-		.50ID, SAE 100R2	#10 JIC MALE RIGID	#10 JIC MALE RIGID	43
2H	6	1	6-		.25ID, SAE 100R6	#6 JIC MALE RIGID	#6 JIC MALE RIGID	43
3H	2	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	58
4H	2	3	6-		.25ID, SAE 100R1	#6 JIC MALE RIGID	#6 JIC FEMALE SWIVEL	34
5H	4	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 FIC FEMALE SWIVEL	27
6H	1	3	6-		1.0ID, SAE 100R2	#16 JIC MALE RIGID	#16 JIC FEMALE SWIVEL	26
7H	2	3	9-		.62ID, SAE 100R2	#10 JIC FEMALE SWIVEL	#12 JIC MALE RIGID	176
8H	1	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	3/8 MALE RIGID PIPE	18
9H	1	3	9-		.62ID, SAE 100R2	#10 JIC FEMALE SWIVEL	#10 JIC FEMALE SWIVEL	242
10H	1	3	9-		.62ID, SAE 100R2	#10 JIC FEMALE SWIVEL	#10 JIC FEMALE SWIVEL	220
11H	2	3	6-8	7H	.50ID, SAE 100R1	#8 JIC FEMALE SWIVEL	#8 JIC MALE RIGID	176
12H	2	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	42
13H	2	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	36
14H	2	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	134
15H	1	3	6-8	9H	.50ID, SAE 100R1	#8 JIC FEMALE SWIVEL	#8 JIC MALE RIGID	242
16H	1	3	6-8	10H	.50ID, SAE 100R1	#8 JIC FEMALE SWIVEL	#8 JIC MALE RIGID	220
17H	3	3	6-8	38H	.50ID, SAE 100R1	#8 JIC FEMALE SWIVEL	#8 JIC FEMALE SWIVEL	34
18H	5	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	54
19H	1	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	40
37H	1	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC MALE RIGID	65
38H	3	3	9-		.62ID, SAE 100R2	#10 JIC FEMALE SWIVEL	#10 JIC FEMALE SWIVEL	34
39H	1	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	190
40H	1	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	180
41H	1	3	6-		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	24
42H	1	3	NOTE (5)		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	66
43H	1	1	NOTE (6)		.25ID, SAE 100R1	#6 JIC FEMALE SWIVEL	#6 JIC FEMALE SWIVEL	24

REPAIR PARTS AND KITS

FOR P/N	QTY	APPEARS ON SHEET	EFFECTIVE NOTE (1)	NEW NO.	DESCRIPTION & VENDOR NUMBER
1C	1	1	6-		GASKET, PUMP, SUNDSTRAND 46941
1C	1	1	6-		O RING, PUMP/MOUNTING PLATE,
5C	1	1	6-		O RING, MOTOR, POCLAIN U1830496
9C	1	2	6-		SEAL KIT, CYLINDER, CROSS 1C4433
13C	1	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 20192031
18C	1	2	6-		O RING, PUMP, DASH #044
21C	1	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 6259SK
22C	2	2	6-8	35C	SEAL KIT, CYLINDER, ROSENBOOM 20112008
23C	2	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 10021005
24C	2	2	6-		SEAL KIT, CYLINDER, ROSENBOOM 10021005
25C	12	1	6-		CAPSCREW, BRAKE, M10X45, POCLAIN M1332953
25C	1	1	6-		O RING, BRAKE, PARKER 2-258
25C	1	1	6-		SNAP RING, BRAKE, POCLAIN VD036276
35C	2	2	9-		SEAL KIT, CYLINDER, ROSENBOOM 631103034
42C	4	1	6-		SEAL KIT, CARTRIDGE, FAUVER 8SK3-0001-N
43C	1	1	2-		SEAL KIT, CARTRIDGE, FAUVER 8SK3-0005-N
44C	1	1	2-		SEAL KIT, CARTRIDGE, FAUVER 8SK3-0020-N

NOTES:

(1) PARTS ARE USED ON MACHINES WITH SERIAL NUMBERS ENDING IN THE INCLUSIVE DIGITS SHOWN. FOR EXAMPLE, 6- MEANS ALL MACHINES, 6-8 MEANS SERIAL NUMBERS ENDING IN 6, 7, AND 8.

(2) HOSE SPECIFICATIONS:
SAE 100R1 SHALL BE PARFLEX 560 OR EQUAL. FOR FIELD SERVICE STANDARD SAE 100R1 MAY BE USED.
SAE 100R2 SHALL BE PARFLEX 590 OR EQUAL. FOR FIELD SERVICE STANDARD SAE 100R2 MAY BE USED.

(3) FITTINGS USED AT MOTOR (26C) ON 9- PRODUCTION ARE 3F IN ONE PORT, AND 40F IN THE OTHER PORT.

(4) PIONEER STANDARDS FOR HYDRAULIC SYSTEMS PROCUREMENT, STORAGE, HANDLING, ASSEMBLY, AND TESTING APPLY.

(5) ADDED IN 1992, PART USED FOR CONNECTING ROD SIDE OF CENTER LIFT CYLINDER TO TANK.

(6) ADDED IN 1992, PART USED IN SHUTTLE VALVE DRAIN SYSTEM.

REVISED 08-04-92, JC, GENERAL UPDATES

PIONEER HI-BRED INTERNATIONAL, INC.

SHOP NO:

TITLE: WHEELPULLER, HYDRAULIC SCHEMATIC

PROJ: SCALE: NONE BY: DK DATE: 3-2-89 SHT: 5 OF: 5

PLANT: DESIGN STD.

DWG NO: 9091

Section 9

Storage

9.1 General

Prior to placing the wheelpuller into storage it is suggested that the machine be given an overall inspection to detect areas of needed repair and/or replacement. This would include cracked or failed welds, loose or missing fasteners, oil or other fluid leaks, damaged hoses, loose or damaged electrical wires and terminals, hydraulic tubes in metal-to-metal contact, and areas of bare metal in need of touch-up paint.

Remove mud and accumulated debris from the machine. It is a good idea to pressure wash the machine so failures will be easier to see. There will be less chance of contaminants entering the hydraulic and electronic systems and the engine when changing filters and performing repairs.

9.2 Engine

Please refer to page 23 in the Ford Maintenance and Operator's Manual for information on preparing the engine for long-term storage. Instead of filling the crankcase with SAE 10 oil as recommended in the manual, it is suggested that the same grade of oil normally used during the detasseling season be used for the fresh fill.

Change the oil filter and clean or replace the air filter.

9.3 Chassis and Electrical

Inspect the machine as recommended in the Chassis Section of this manual and perform needed repairs. Lubricate all points that have zerks and apply dry graphite lubricant to the slide surfaces of the leg attachment crossmembers, and the puller wheel (small) toolbar.

9.4 Hydraulic Systems

Check the entire system for leaking fittings, leaking seals on the pumps, motors, and cylinders, frayed or damaged hoses, rubbing of metal tubes, missing or damaged tube mounting bushings, missing or loose hose clamps and perform necessary repair.

Inspect the hydraulic oil for presence of water (appears milky) and change the charge and return filters.

Remove all debris trapped between the fins of the oil cooler.

9.5 Electronic Systems

Proper care of the Automatic Height Control system during the off-season will help insure proper operation in the seasons to come. Based on where the machine will be stored, the following steps should be taken.

Indoor Storage

If the machine is stored indoors one only needs to insure that the control unit will not be subjected to temperatures below –5 °F or above 158 °F, and that measures have been taken to prevent damage to the wiring harness by rodents. If the temperature is expected to be outside the range specified, the control can be removed and stored elsewhere.

Outdoor Storage

If no other options exist and the machine must be stored outside, the following preventative measures should be taken:

- Take the control off and store indoors.
- Cove the connectors that mate to the control to make sure they are not exposed to rain.
- Cover the sensors to protect them from rain and sunlight.
- Cover the manual control keypad to protect from rain and sunlight.
- Take appropriate measures to prevent rodents from damaging the wiring harness.