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7173-K MANUAL

February 2012



MODEL 7173-K INSTRUCTION MANUAL

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SELECTING AND INSTALLING ELECTRONIC REMOTE STEERING CONTROL

When a full follow-up remote electronic control becomes integrated with either a manual steering system (helm pump) or a jog lever, the full follow-up control must be de-energized before putting the manual steering devices or jog levers into service.

If the full follow-up control system is not turned off when maneuvering with other methods, the steering will remain in the position as requested by the full follow-up system. For example, if a 2-speed steering system is installed whereby the full follow-up system would receive a smaller volume and the jog lever, via a separate solenoid, would receive a bigger volume of oil, the steering system would follow the jog lever until it is released. Then the follow-up control would put the rudder back to its original position.

We, however, highly recommend having a switch installed on the pump starting panel capable of turning off the *7173* and associated components. If more than one full follow-up control unit is used in a given system, a station transfer system is required since the *7173* can only use a command from any one station at any one time. Feeding two separate signals into the electronic control system would obviously create problems. If an autopilot is installed aboard a vessel, all full follow-up signals should be coordinated via a station transfer system. In other words, the autopilot must be considered as an extra station (but wired directly to the solenoid). If a vessel is equipped with two full follow-up electronic control stations and one autopilot, it is recommended to install a 3-station transfer system: two stations for the full follow-up and one for the autopilot and, of course, a switch as indicated on our electronic drawings alongside the electric breaker which is supplied by the shipyard. The switch also becomes shipyard supply and should be incorporated into the pump control panel for the hydraulic pumping unit.



Electronic Full Follow-up Amplifier Model 7173-K

This unit is designed to accept the command signal from our Models 7165, 7166, 7167, 7169, 7171, 7172 and 7176 and co-ordinates the desired rudder position with our feedback unit Models 7168 and 7174. Models 7144, 7145 and 7148 are equipped with solenoid valves and can be activated by the Model 7173-K to disperse hydraulic fluid to the hydraulic steering system to maintain the desired position.

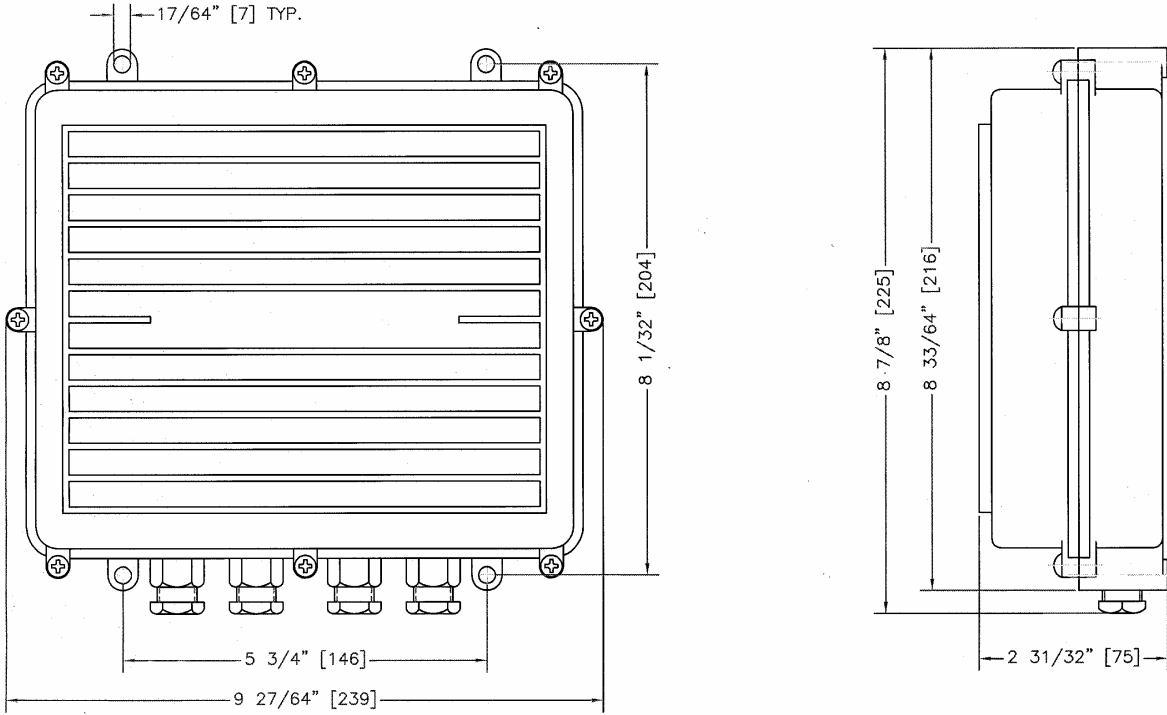
This device can be located anywhere aboard ship, even in the steering compartment, since its watertight and non-corrosive enclosure material will protect the electronics internally.

The Model 7173-K is a multi-optional driver board (12- or 24-Volt DC) which can control:

1. Single steering system
See drawings 7173-001 / 7173-005
2. Dual speed steering system
See drawings 7173-002 / 7173-006
3. Two independent steering systems controlled by the same controller (This is ideal for catamaran steering because of its electronic tie bar)
See drawings 7173-003 / 7173-007
4. Two independent hydraulic systems, i.e. steering and bucket control
See drawings 7173-004 / 7173-008

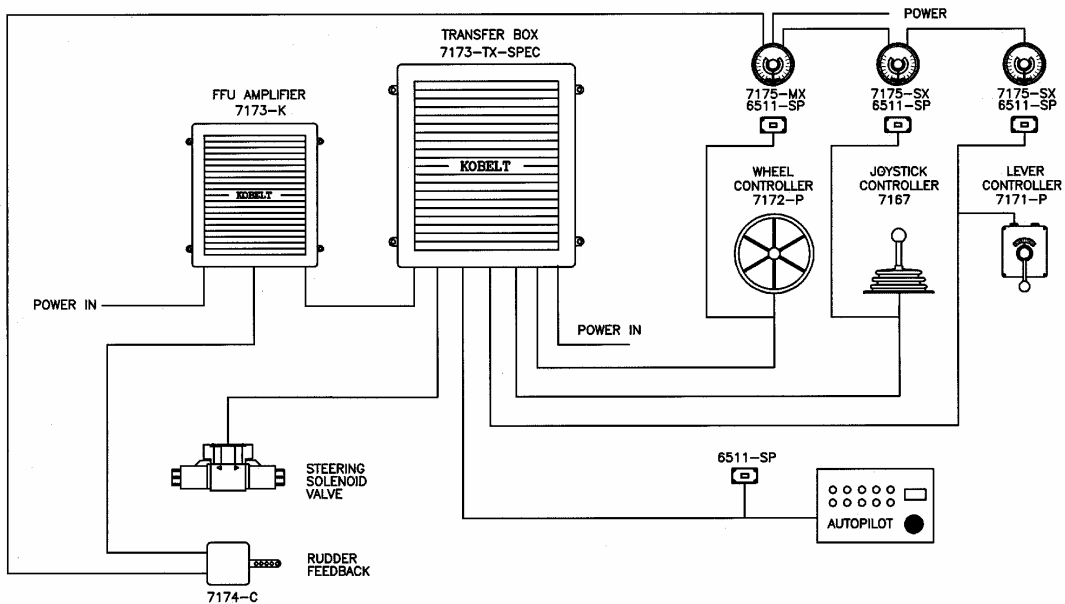
It can easily be changed in the field, see manual.

MODEL 7173-K



All dimensions in inches (mm)

TYPICAL MULTIPLE STATION ARRANGEMENT



MODEL 7173-K ELECTRONIC FULL FOLLOW-UP STEERING SYSTEM

The KOBELT *7173-K* System consists of the following components:

1. Electronic FFU Amplifier
2. Controller (Wheel Controller, FFU Lever or Joystick)
3. Follow-up (Rudder Feedback) Unit
4. Solenoid Interface Valve

The Model *7173-K* System is used to set the position (or the angle) to which the Rudder goes. The Amplifier Unit compares the respective command and feedback signals from the Controller and Follow-Up Unit. If the signals are not equal, the Amplifier Unit applies directional control to the hydraulic pressure to move the rudder in the appropriate direction. When the Controller and Follow-Up signals are equal, the Amplifier shuts off directional control and the rudder stops.

Mounting the Model 7173-K Amplifier Unit

The Model *7173-K* Amplifier Unit is mounted inside a waterproof housing. The housing should be mounted in a convenient, easily serviced location. Allow enough space to permit opening of the housing cover (see Model *7173-K* data sheet).

Mounting the FFU Controller Unit

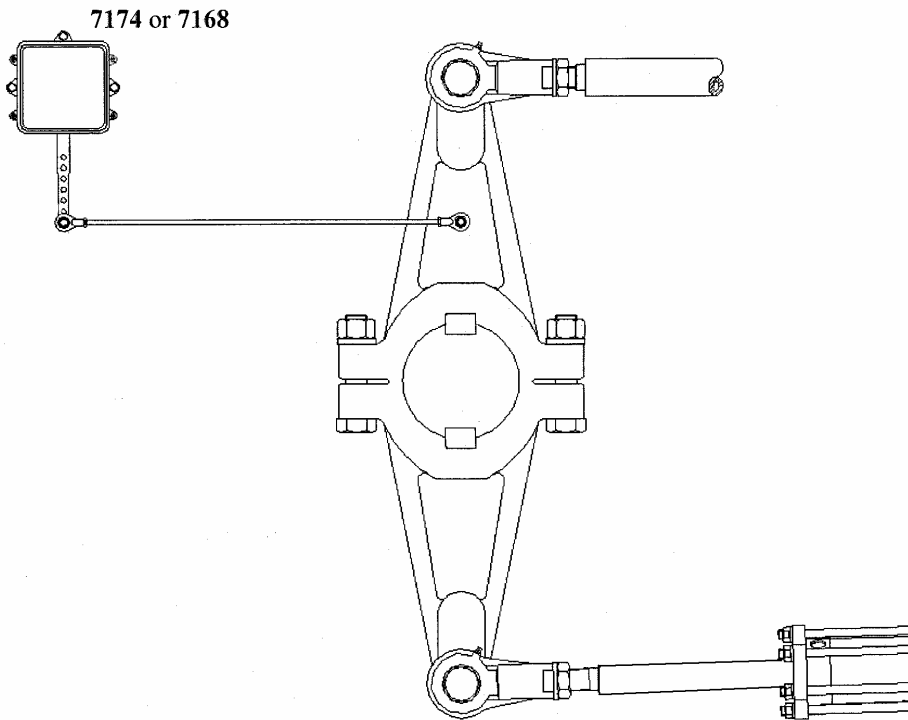
The following types of controllers are available:

- Model *7171* Lever Controller
- Model *7165* Joystick Controller
- Model *7169* Joystick Controller
- Model *7176* Walk-about Controller
- Model *7167* 2-Axis Joystick Controller
- Model *7166* Wheel Controller
- Model *7172* Wheel Controller
- Model *6655* Steering and Engine Control Head

The Models *7166* and *7172* Wheel Controller is normally bulkhead mounted. A steering wheel should be attached to this type of Controller (see individual data sheet). The Model *7171* FFU Lever Controller is waterproof and is normally mounted on a flat surface (see Model *7171* data sheet). The Model *7169* Joystick Controller should also be mounted on a flat surface.

MOUNTING THE MODEL 7174 RUDDER FEEDBACK UNIT

The Model 7174 or 7168 Follow-Up (Rudder Feedback Unit) must be mounted near the steering gear as shown in the diagram below. The output signals will then be calibrated with the tiller in place.



IMPORTANT: Hydraulic steering gears using a hydraulic Full Follow-Up System (often referred to as “Telemotor” or “Accumotor”) must drive the Feedback Unit from the Servo Cylinder, not the Rudder stock. In such a case, the Model 7174 Follow-Up should be mounted approximately two feet from the end of the Servo Cylinder. This is done to ensure proper linear motion. The cable for the Models 7174 or 7168 Feedback Unit should be a 3-conductor #18-gauge cable.

WIRING THE SYSTEM

All cables should be weatherproof marine type and be free of joints or splices. If it is necessary to join wires, a proper waterproof junction box should be used.

The input power to the Model *7173-K* Amplifier Unit is 11 VDC to 28 VDC. The power cable (2-conductor, #14-gauge) should be run from the switchboard through a customer-supplied on/off switch via a circuit breaker or fuse (8 amp).

The cable to the pumpset solenoid/relay should be 3-conductor #16 gauge wire.

A 3-conductor, #18 gauge cable should be used for the Controller. If more than one controller is used, a "Station Select" switch must be connected between the controller and the Model *7173-K*. The "Station Select" switch is optionally supplied. A mechanical selector switch requires a single pole, multi-position switch. Consult the factory for electronic station selector systems (Model *7173-T*). The 8 VDC reference supply from the Model *7173-K* terminals #9 and #12 or #13 and #16 is common to all Controllers. Only the output signals coming back from each FFU Controller are connected to the station selector. From the Station Selector switch, the FFU Controller output is connected to Model *7173-K* terminal #11 or #15.

The Model *7170* NFU Controller can also be connected to the Model *7173-K* System (see Model *7170* data sheet). Activating the Model *7170* Jog switch will temporarily override the FFU System. FFU Control will be returned automatically as soon as the Jog switch is deactivated. If the rudder moves in the wrong direction, reverse the black and white wires.

NOTE: See Drawing 7173-009 for how to interface a NFU Jog Switch to a FFU System where the Jog Switch can be used for backup.

TESTING THE SYSTEM

1. Check that the supply voltage is connected to the correct amplifier terminals. The circuit board has built-in polarity protection to prevent circuit damage, but the system will not initialize until polarity is correct.
2. Centre the rudder and ensure that the rudder follow-up unit is mechanically centered. Centre all FFU controllers.
3. Turn on power to the Model 7173-K Amplifier Unit.
4. Turn on the hydraulic pumpset or, in the case of an engine driven pumpset, start the engine.
5. The rudder should stay at midship and may hunt back and forth (see steps #9 and #10) at the midship position. If the rudder moves to a hardover position, shut off power to the amplifier and reverse the wires going to the solenoid or the black and white wires coming from the feedback unit (see applicable drawing) on the Model 7173-K circuit board. Re-apply power to the Model 7173-K Amplifier Unit.
6. Move the FFU controller to the 20° port. The rudder should move in the port direction. If the rudder moves to starboard, reverse the black and white wires coming from the controller.
7. Repeat step #6 for any additional controllers wired via a station selector.
8. Move the FFU controller to a hardover position and adjust the internal FFU controller trim pot until the rudder stops just before the hardover position. Also, rudder limit adjustment can be achieved by adjusting rudder limit trim pots on 7173-K board or by adjusting the stroke on the feedback unit. **NOTE:** You must not allow the cylinder to continually push against the mechanical stops (hardover position).
9. Move the FFU controller to the centre position and adjust the deadband adjustment trim pot (R17 or R31) clockwise until the rudder begins to hunt back and forth (rudder may already be doing this).
10. Carefully adjust the R17 or R31 deadband control counterclockwise until the hunting effect stops. This setting will be the maximum useable gain for your system. Check the adjustment several times by moving the controller to various positions. If hunting starts, re-adjust R17 or R31 counterclockwise to correct.

CAUTION: In order to avoid overheating/damaging the solenoid coils or the 7173-K amplifier, power to the amplifier should be disconnected if hydraulic power is not available.

TROUBLESHOOTING

<u>SYMPTOM</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
System dead	<ul style="list-style-type: none">- power off- fuse blown- DC power input polarity reversed	<ul style="list-style-type: none">- turn on power- replace fuse- reverse connection
Erratic operation	<ul style="list-style-type: none">- follow-up pot of FFU or controller potentiometer defective	<ul style="list-style-type: none">- check follow-up and controller potentiometer- meter output voltage, replace if necessary
Rudder hunts back and forth	<ul style="list-style-type: none">- R17 or R31 deadband control in Model 7173-K Amplifier incorrectly adjusted	<ul style="list-style-type: none">- reduce gain by turning counter-clockwise
Rudder goes to a hardover position	<ul style="list-style-type: none">- defective potentiometer- damaged cable- sticky solenoid valve or relay- loose follow-up linkages- solenoid wires reversed- feedback wires reversed	<ul style="list-style-type: none">- replace- repair- repair or replace- repair- reverse wires- reverse wires
Rudder does not travel same number of degrees hardover to hardover	<ul style="list-style-type: none">- control potentiometer not centered- feedback unit or potentiometer not centered	<ul style="list-style-type: none">- meter output voltage or resistance- meter output voltage or resistance
L1 and L2 continuously ON	<ul style="list-style-type: none">- U1 damaged	<ul style="list-style-type: none">- replace
L3 and L4 continuously ON	<ul style="list-style-type: none">- U2 damaged	<ul style="list-style-type: none">- replace

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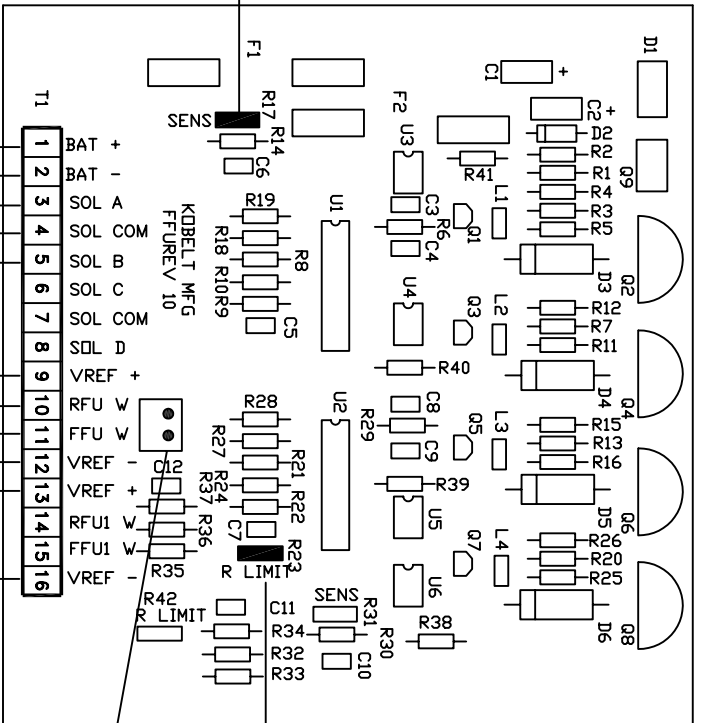
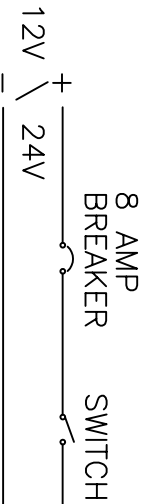
Periodic Inspection Notes

All mechanical and electronic components should be inspected at regular intervals, once every 6 – 12 months is recommended depending on the operating environment and frequency of use. Some Kobelt components are equipped with inspection covers which can be removed for examination of internal parts.

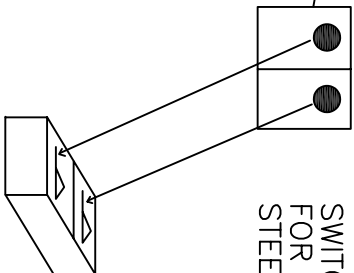
The following serves as a general inspection guideline for Kobelt engine control and steering control system components. All deficiencies have to be fixed and defective parts be replaced by a certified technician to ensure a reliable and safe operation.

1. Inspect all mechanical linkages for proper movement and the bolts and nuts are tight for their functions.
2. Inspect all push / pull cable connections for free movement, adjust if necessary.
3. Check for corrosion and excessive wear at all moving parts that could cause problem in normal operation.
4. Apply lubricating oil / grease to mechanical parts at all available greasing points. Make sure that no oil or grease will come into contact with any electronic parts. For gears and rotating shafts, use of graphite-base grease is recommended.
5. Check for signs of moisture ingress or condensation that could cause short-circuit or corrosion problem to electrical / electronic components. Surfaces of all electronic parts should be free from moisture, dust or foreign particles.
6. Check seals and holding screws on housings for damage and tightness.
7. Verify that primary and secondary power sources are at normal values.
8. Inspect system wiring for insulation breakdown, loose connections or potential for short-circuit failure.
9. Check limit switches and potentiometers for corrosion, smooth operation and correct positioning. It is recommended that these components be replaced at least every five years or more frequently when working in hot and humid environment.
10. With the engine stopped, perform functional test for each system – refer to individual component operating and test procedures.

DEADBAND ADJUSTMENT R17 (10 TURNS)
 CW TO INCREASE SENSITIVITY



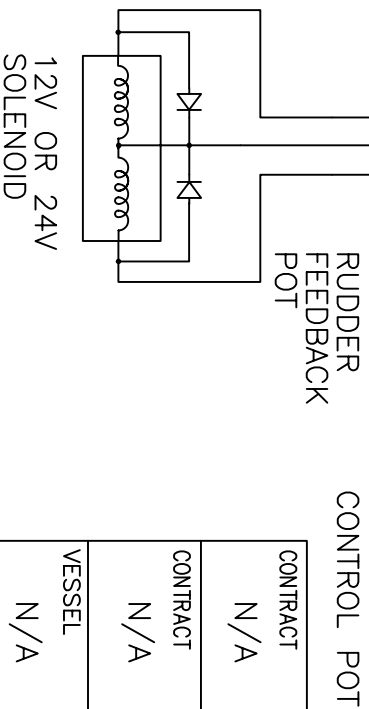
RUDDER LIMIT R23 (1 TURN)
 CW TO REDUCE RANGE OF TRAVEL



SWITCH POSITION FOR SINGLE SPEED STEERING

- 1 BAT +
 - 2 SOLENOID OUTPUT
 - 3 SOLENOID COM (VDC +)
 - 4 SOLENOID OUTPUT
 - 5 SOLENOID OUTPUT
 - 6 SOLENOID COM (VDC +)
 - 7 SOLENOID OUTPUT
 - 8 VREF+
 - 9 RFU WIPER
 - 10 FFU WIPER
 - 11 VREF-
 - 12 RFU WIPER
 - 13 VREF+
 - 14 FFU WIPER
 - 15 VREF-
 - 16
- F1 = 8 AMP
 F2 = 1/2 AMP

NOTE:
 THE 7173-K SWITCHES NEGATIVE. SOLENOID COMMON IS CONNECTED TO VDC +. MUST ADD DIODES OR MOV'S TO REDUCE VOLTAGE SPIKES. SUGGESTED DIODES 1N4005 - 1N4007.



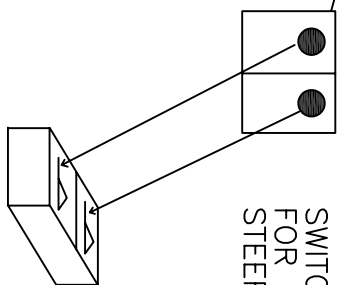
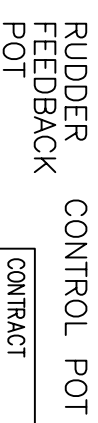
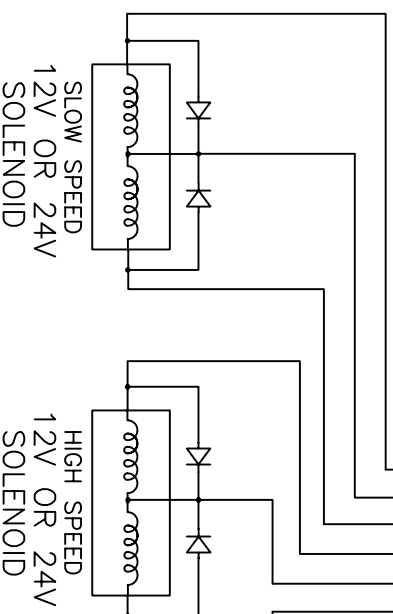
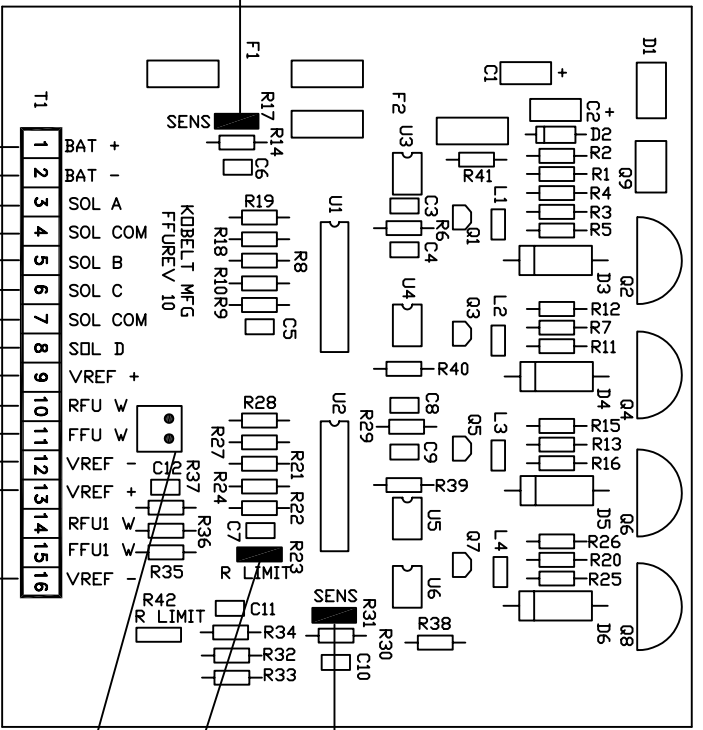
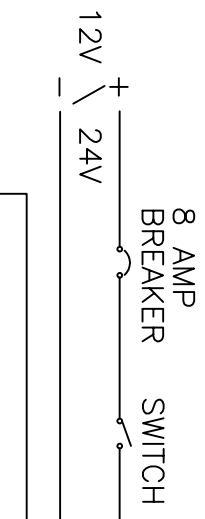
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CONTRACT		N/A			
VESSEL		N/A		DWN H.A. 090702 CHK S.C. 090702	
SCALE		N/A			
DRAWING NO		7173-001		DY MO YR TITLE	
REV		B		SINGLE SPEED STEERING SYSTEM WIRING DIAGRAM	

NOTE:
 THE 7173-K SWITCHES NEGATIVE.
 SOLENOID COMMON IS CONNECTED
 TO VDC +. DIODES ARE CONNECTED
 TO VDC +. DIODES OR MOV'S TO REDUCE
 VOLTAGE SPIKES.
 SUGGESTED DIODES 1N4005 - 1N4007.

(SLOW SPEED)
 DEADBAND
 ADJUSTMENT R17 (10 TURNS)
 CW TO INCREASE
 SENSITIVITY

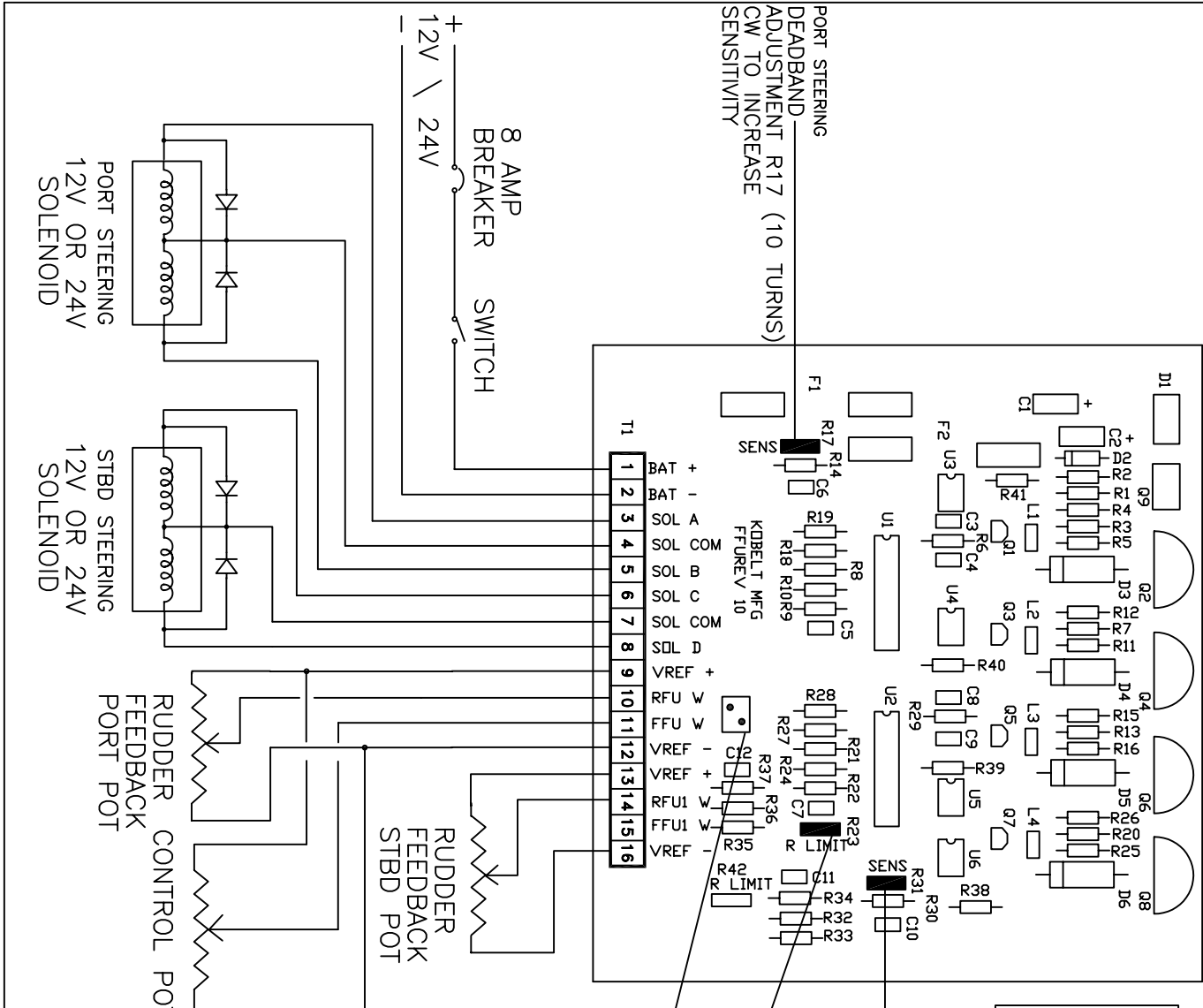
(HIGH SPEED)
 DEADBAND
 ADJUSTMENT R31 (10 TURNS)
 CW TO INCREASE
 SENSITIVITY

RUDDER
 LIMIT R23 (1 TURN)
 CW TO REDUCE
 RANGE OF TRAVEL



- 1 BAT +
 - 2 SOLENOID OUTPUT
 - 3 SOLENOID COM (VDC +)
 - 4 SOLENOID OUTPUT
 - 5 SOLENOID OUTPUT
 - 6 SOLENOID COM (VDC +)
 - 7 SOLENOID OUTPUT
 - 8 SOLENOID OUTPUT
 - 9 VREF+
 - 10 RFU WIPER
 - 11 FFU WIPER
 - 12 VREF-
 - 13 VREF+
 - 14 RFU WIPER
 - 15 FFU WIPER
 - 16 VREF-
- F1 = 8 AMP
 F2 = 1/2 AMP

CONTRACT		N/A		HOBELT MANUFACTURING COMPANY LIMITED	
CONTRACT		N/A			
VESSEL		N/A		DUAL RATE SPEED STEERING SYSTEM WIRING DIAGRAM	
SCALE		N/A		DRAWING NO 7173-002	
SHEET		1/1		REV B	

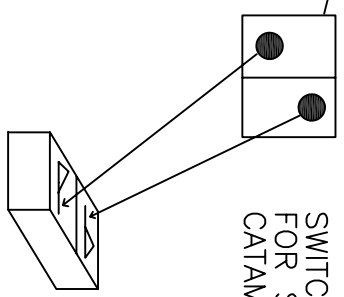


NOTE:
 THE 7173-K SWITCHES NEGATIVE. SOLENOID COMMON IS CONNECTED TO VDC +. MUST ADD DIODES OR MOV'S TO REDUCE VOLTAGE SPIKES. SUGGESTED DIODES 1N4005 - 1N4007.

- 1 BAT +
 - 2 BAT -
 - 3 SOLENOID COM (VDC +)
 - 4 SOLENOID OUTPUT
 - 5 SOLENOID OUTPUT
 - 6 SOLENOID COM (VDC +)
 - 7 SOLENOID OUTPUT
 - 8 SOLENOID OUTPUT
 - 9 VREF+
 - 10 RFU WIPER
 - 11 VREF-
 - 12 FFU WIPER
 - 13 VREF+
 - 14 RFU WIPER
 - 15 FFU WIPER
 - 16 VREF-
- F1 = 8 AMP
 F2 = 1/2 AMP

STBD STEERING DEADBAND ADJUSTMENT R31 (10 TURNS) CW TO INCREASE SENSITIVITY

RUDDER LIMIT R23 (1 TURN) CW TO REDUCE RANGE OF TRAVEL

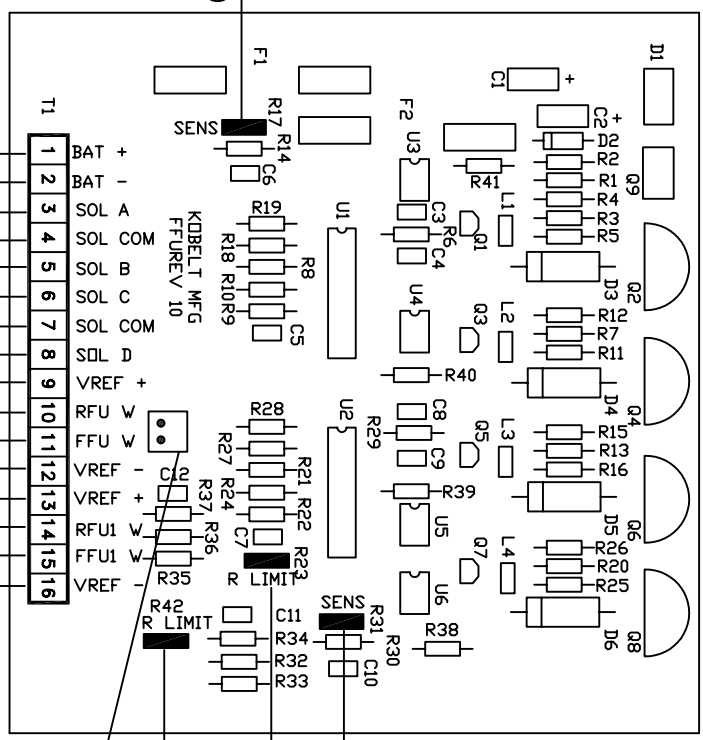


SWITCH POSITION FOR SINGLE SPEED CATAMARAN STEERING

CONTRACT	N/A	 MANUFACTURING COMPANY LIMITED				
CONTRACT	N/A					
VESEL	N/A	DWN	DY	MO	YR	TITLE
		H.A.	09	07	02	SINGLE SPEED CATAMARAN STEERING SYSTEM WIRING DIAGRAM (ELECTRONICS THE BAR)
		CHK	S.C.	09	07	02
		SCALE	SHEET	DRAWING NO		
		N/A	1/1	7173-003		
				REV	B	

NOTE:
 THE 7173-K SWITCHES NEGATIVE.
 SOLENOID COMMON IS CONNECTED
 TO VDC +.
 MUST ADD DIODES OR MOV'S TO REDUCE
 VOLTAGE SPIKES.
 SUGGESTED DIODES 1N4005 - 1N4007.

- 1 BAT +
 - 2 SOLENOID OUTPUT
 - 3 SOLENOID COM. (VDC +)
 - 4 SOLENOID OUTPUT
 - 5 SOLENOID OUTPUT
 - 6 SOLENOID COM. (VDC +)
 - 7 SOLENOID OUTPUT
 - 8 VREF+
 - 9 VREF+
 - 10 RFU WIPER
 - 11 FFU WIPER
 - 12 VREF-
 - 13 VREF+
 - 14 RFU WIPER
 - 15 FFU WIPER
 - 16 VREF-
- F1 = 8 AMP
 F2 = 1/2 AMP



SOLENOID 1
 DEADBAND
 ADJUSTMENT R17 (10 TURNS)
 CW TO INCREASE
 SENSITIVITY

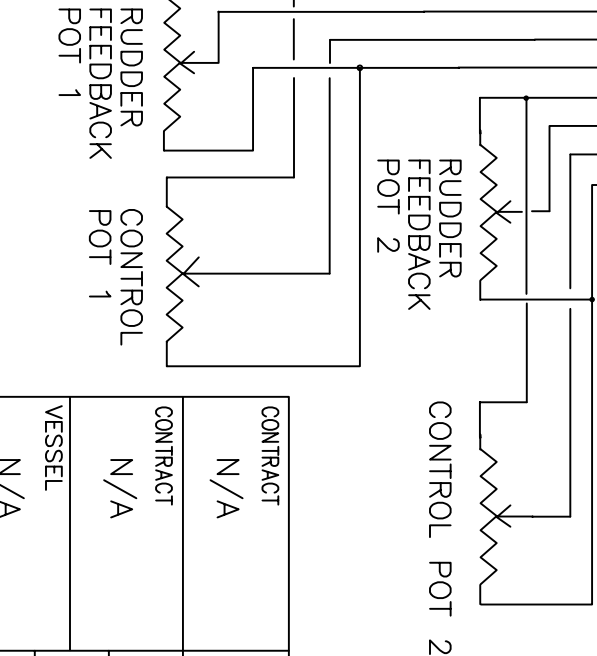
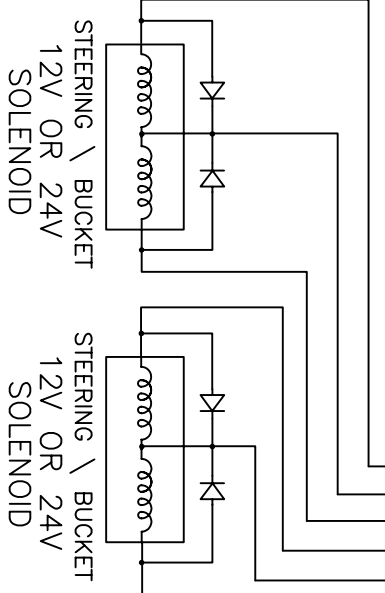
SOLENOID 2
 DEADBAND
 ADJUSTMENT R31 (10 TURNS)
 CW TO INCREASE
 SENSITIVITY

SOLENOID 1
 RUDDER LIMIT R23 (1 TURN)
 CW TO REDUCE
 RANGE OF TRAVEL

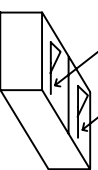
SOLENOID 2
 RUDDER LIMIT R42 (1 TURN)
 CW TO REDUCE
 RANGE OF TRAVEL

8 AMP
 BREAKER
 SWITCH

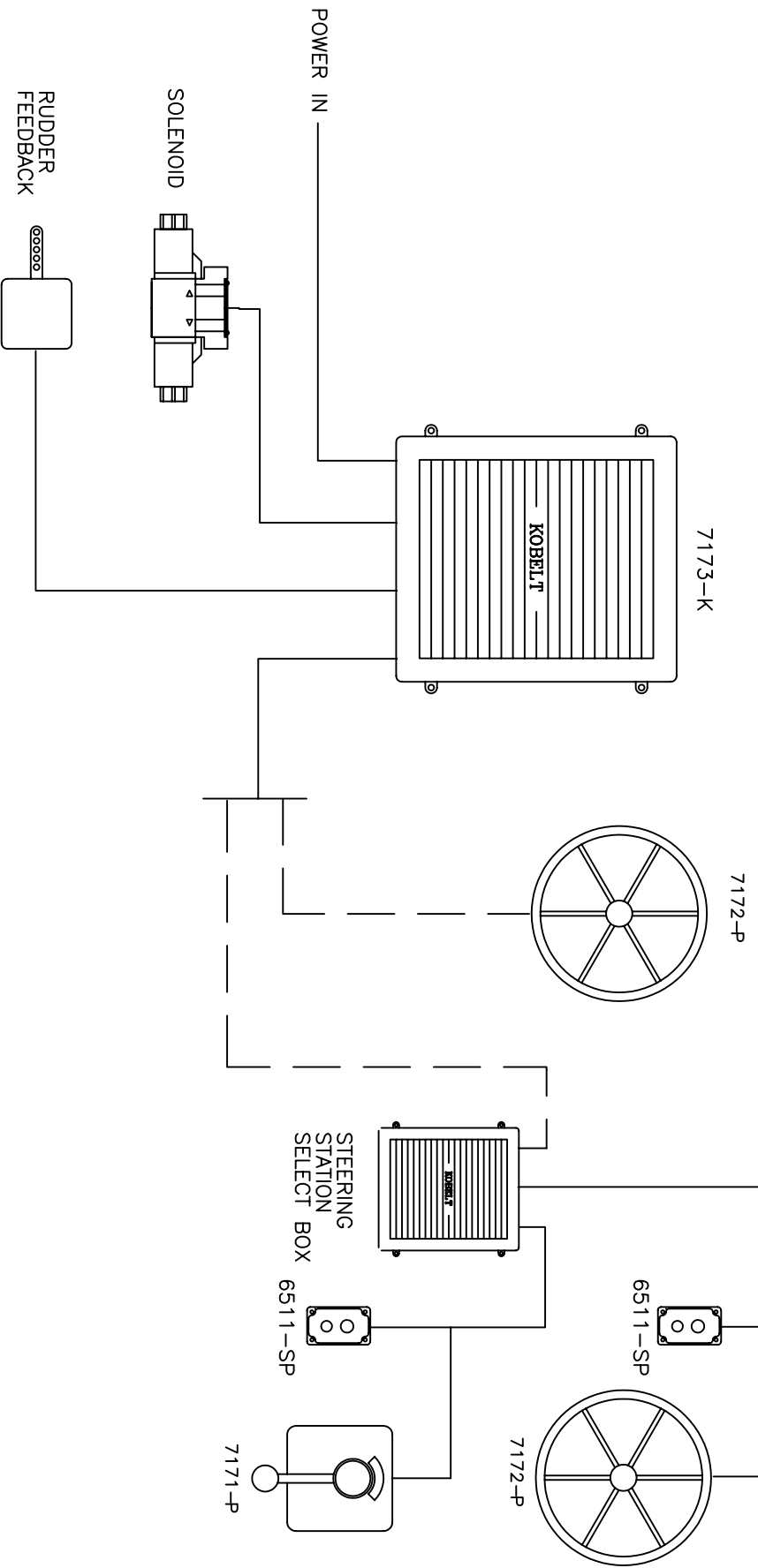
12V \ 24V



SWITCH POSITION
 FOR TWO INDEPENDENT
 STEERING \ BUCKET
 SYSTEM

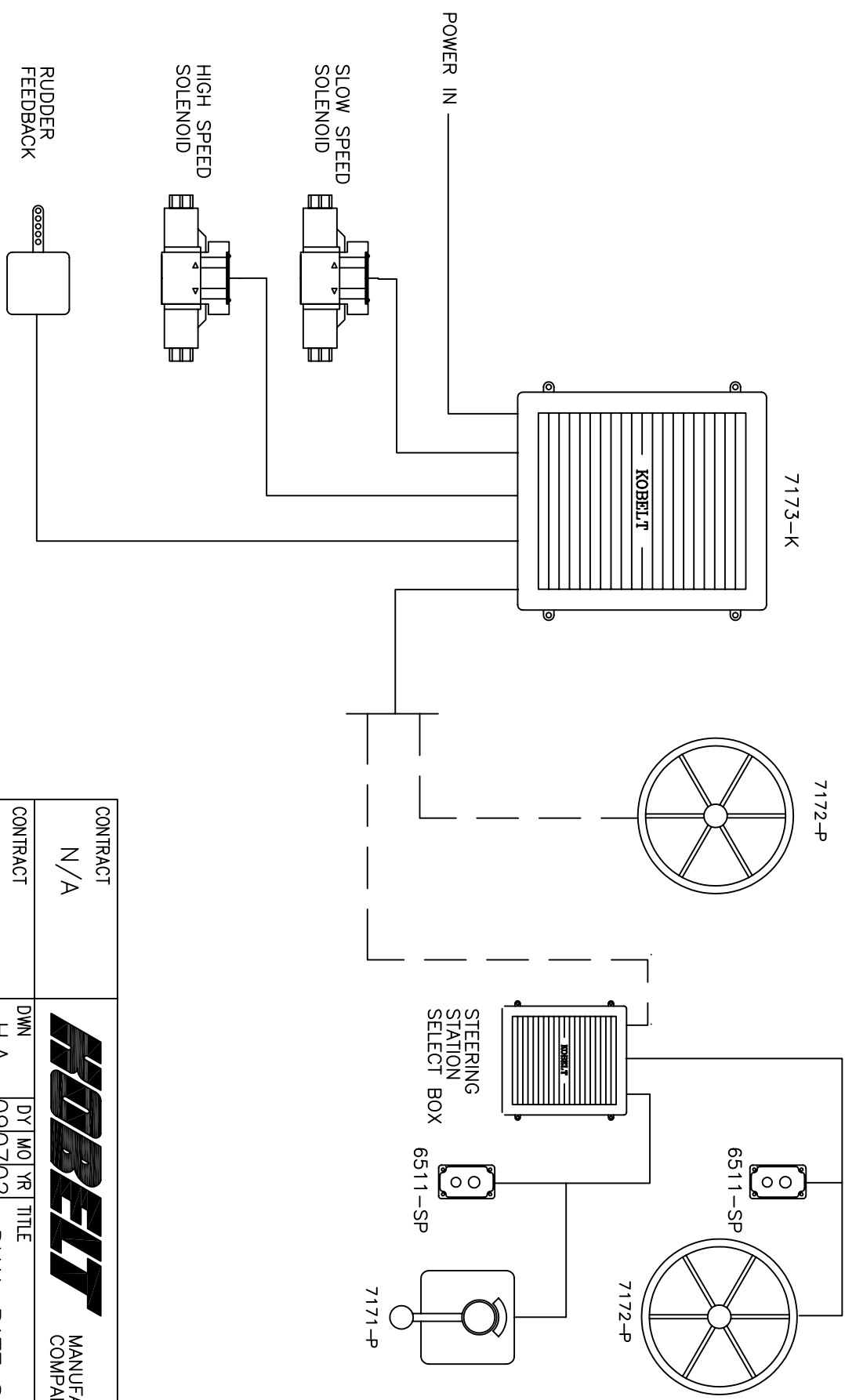


CONTRACT	N/A	ROBELO		MANUFACTURING COMPANY LIMITED	
CONTRACT	N/A	DWN	DY	M0	YR
	N/A	H.A.	09	07	02
		CHK			
VESSEL	N/A	S.C.	09	07	02
		SCALE		SHEET	
	N/A		N/A	1/1	
		DRAWING NO	7173-004		
REV	B	TWO INDEPENDENT SINGLE SPEED STEERING SYSTEM WIRING DIAGRAM (STEERING / BUCKET)			



CONTRACT N/A		KOBELT MANUFACTURING COMPANY LIMITED	
CONTRACT N/A	DWN H.A.	DY 090702	MO YR 090702
VESEL N/A	CHK S.C.	090702	
SCALE N/A	SHEET 1/1	DRAWING NO 7173-005	
			REV B

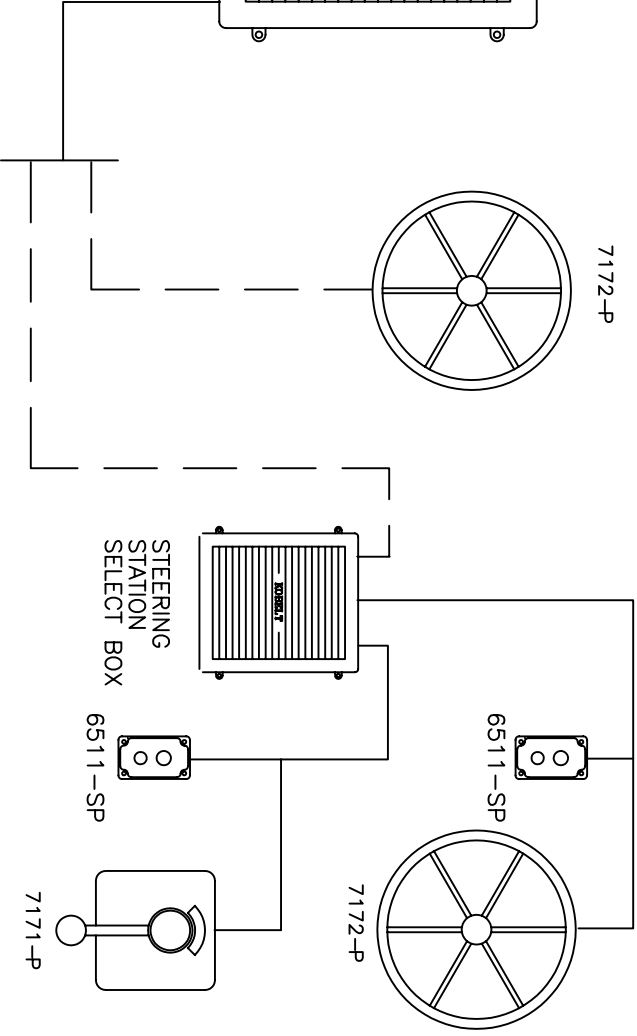
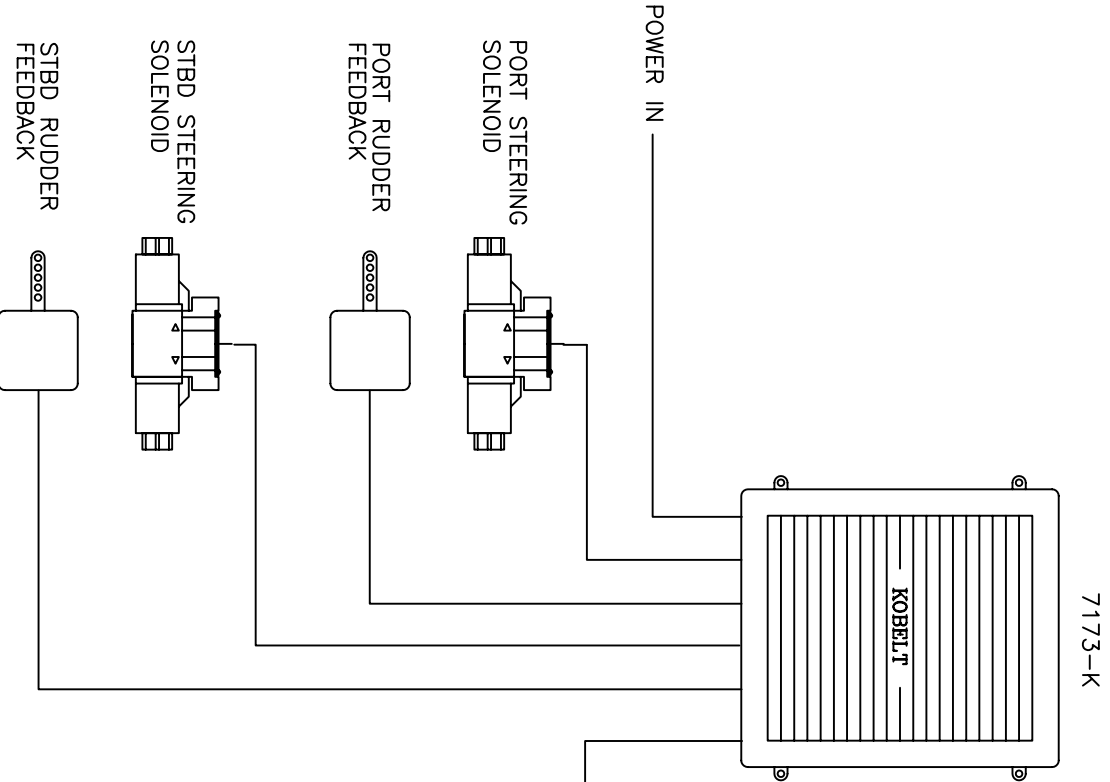
SINGLE SPEED
STEERING SYSTEM
BLOCK DIAGRAM



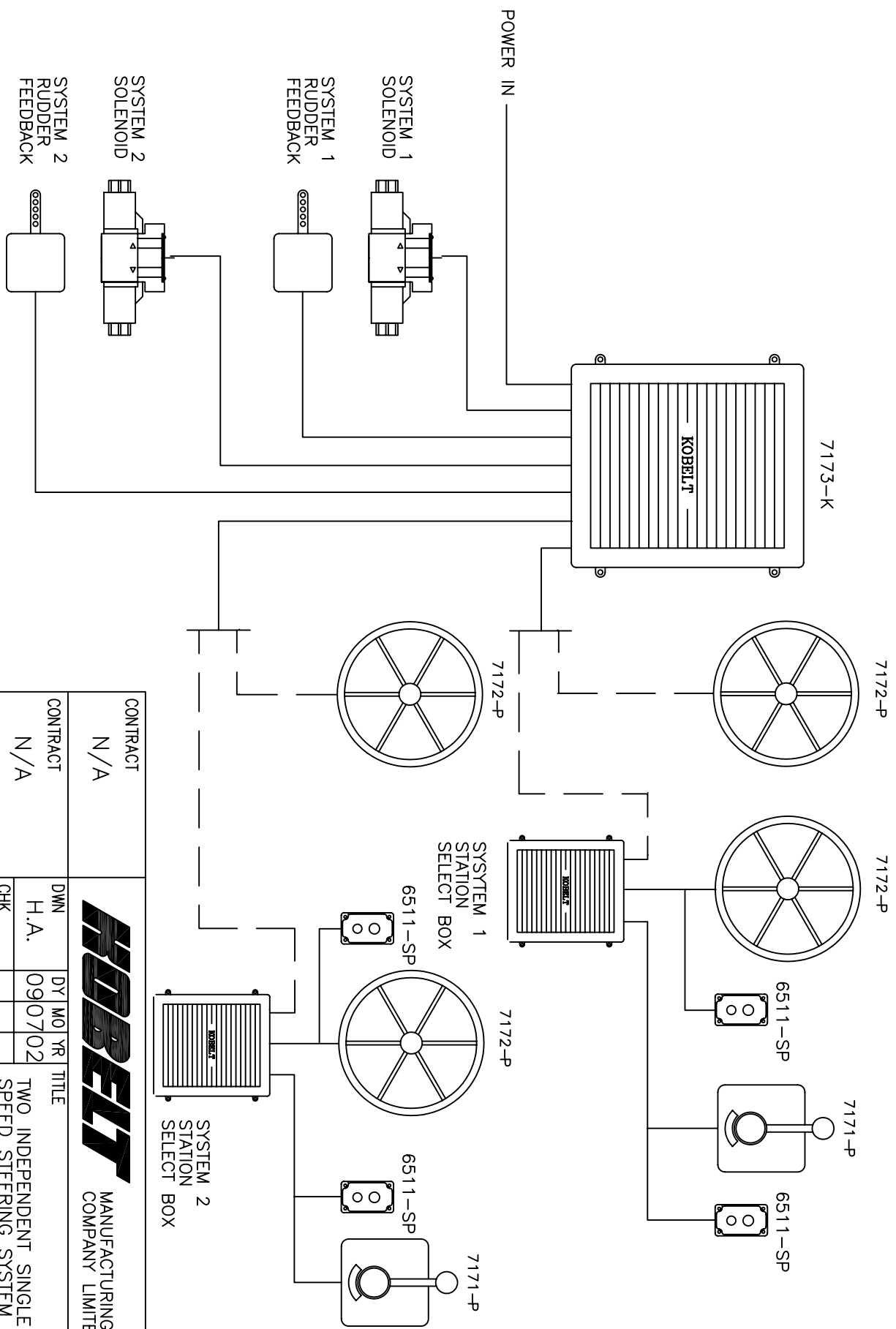
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CONTRACT		N/A				H.A.		09 07 02		DUAL RATE SPEED STEERING SYSTEM BLOCK DIAGRAM	
VESSEL		N/A		CHK		S.C.		09 07 02		DRAWING NO	
VESSEL		N/A		SCALE		N/A		SHEET		1 / 1	
										DRAWING NO	
										7173-006	
										REV	
										B	

KOBELT

MANUFACTURING COMPANY LIMITED

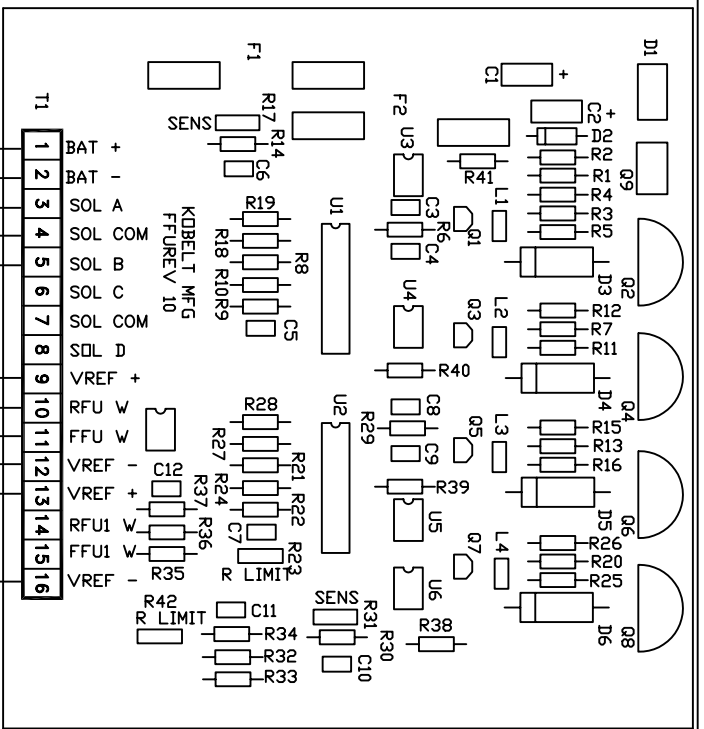


CONTRACT		N/A		KOBELT		DWN		DY MO YR		TITLE	
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VESSEL		N/A		CHK		S.C.		090702		SYSTEM BLOCK DIAGRAM	
VESSEL		N/A		SCALE		N/A		SHEET		DRAWING NO	
								1/1		7173-007	
										REV	
										B	
										MANUFACTURING COMPANY LIMITED	



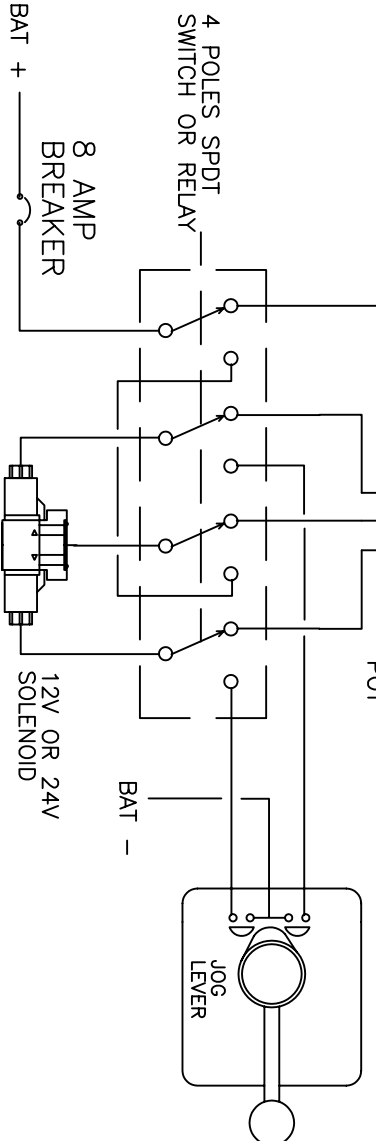
CONTRACT		N/A		HOBELT		DWN		DY		MO		YR		TITLE	
CONTRACT		N/A				H.A.		09		07		02		TWO INDEPENDENT SINGLE SPEED STEERING SYSTEM BLOCK DIAGRAM	
VESSEL		N/A		S.C.		09		07		02		SHEET		DRAWING NO	
SCALE		N/A		1		1		1		1		7173-008		REV	
														B	

HOBELT MANUFACTURING COMPANY LIMITED

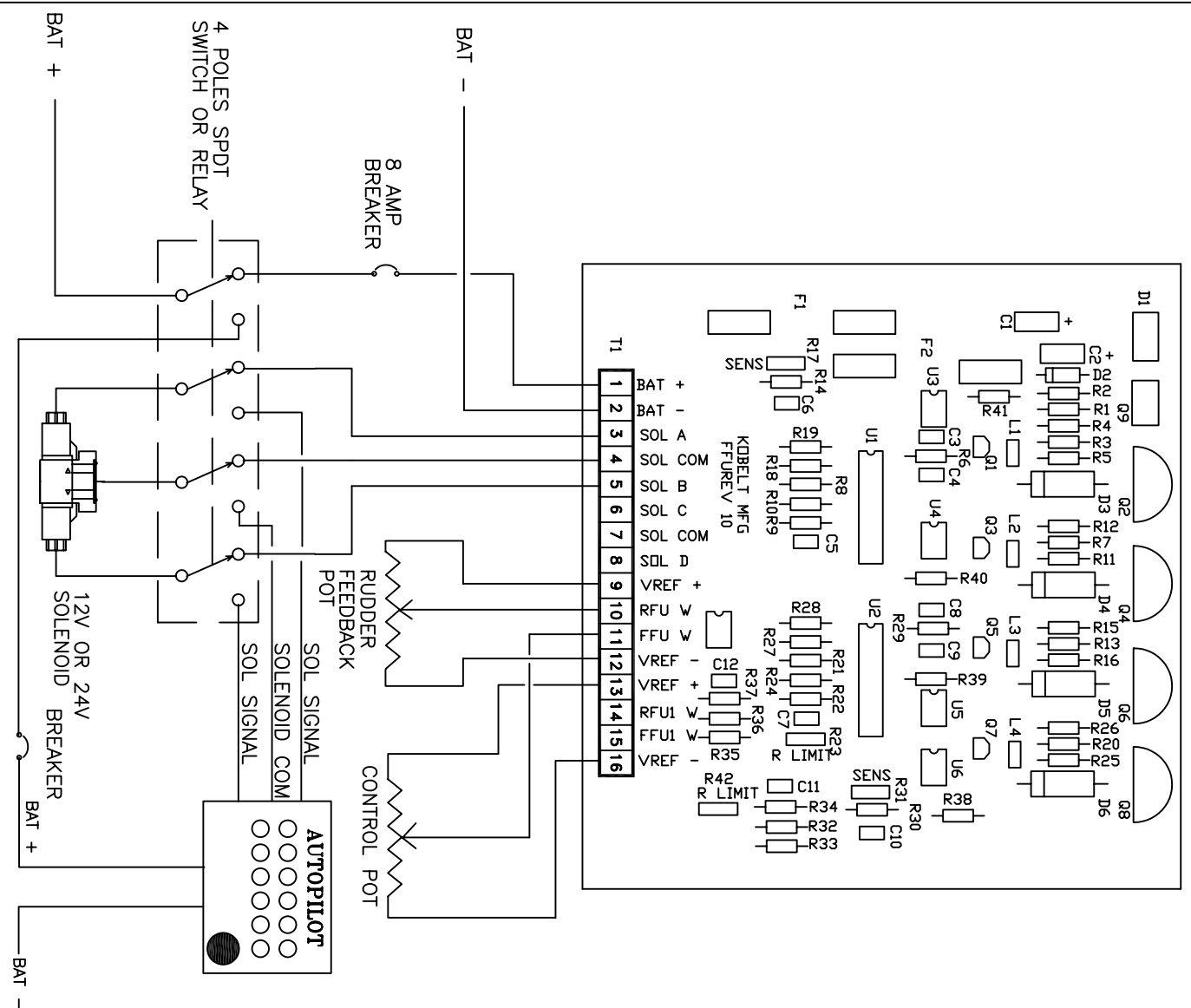


- 1 BAT +
 - 2 BAT -
 - 3 SOLENOID OUTPUT
 - 4 SOLENOID COM (VDC +)
 - 5 SOLENOID OUTPUT
 - 6 SOLENOID OUTPUT
 - 7 SOLENOID COM (VDC +)
 - 8 SOLENOID OUTPUT
 - 9 VREF +
 - 10 RFU WIPER
 - 11 FFU WIPER
 - 12 VREF -
 - 13 VREF +
 - 14 RFU WIPER
 - 15 FFU WIPER
 - 16 VREF -
- F1 = 8 AMP
F2 = 1/2 AMP

NOTE:
SWITCH OR RELAY MUST BE
ABLE TO HANDLE SYSTEM CURRENT.
SWITCH OR RELAY IS
CUSTOMER SUPPLIED.




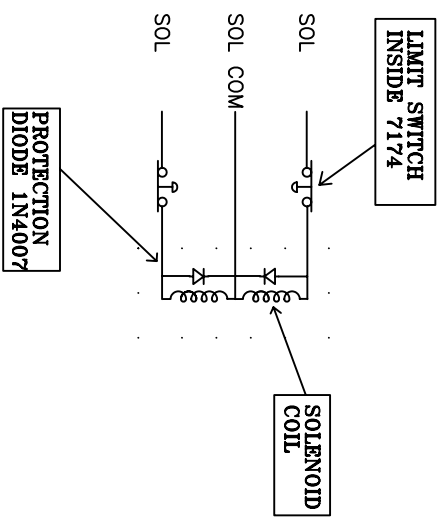
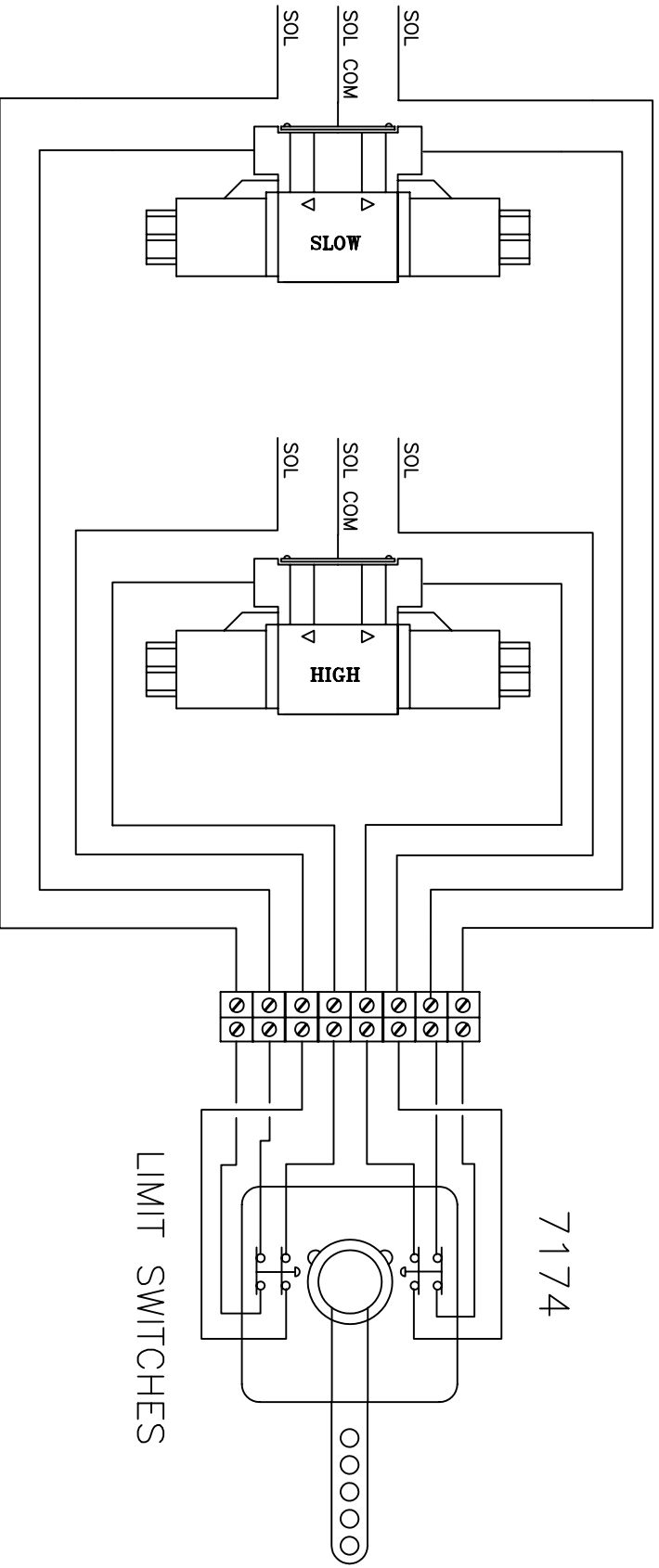
CONTRACT	N/A		ROBELT	MANUFACTURING COMPANY LIMITED			
CONTRACT	N/A						
VESEL	N/A		DWN	DY	M0	YR	TITLE
	N/A		H.A.	09	07	02	SINGLE STEERING SYSTEM WITH OPTIONAL JOG LEVER CONNECTION DIAGRAM
	N/A		CHK	09	07	02	
	N/A		S.C.	09	07	02	
	N/A		SCALE	SHEET		DRAWING NO	
	N/A		N/A	1/1		7173-009	
	N/A						REV
	N/A						B



- 1 BAT +
 - 2 BAT -
 - 3 SOLENOID OUTPUT
 - 4 SOLENOID COM (VDC +)
 - 5 SOLENOID OUTPUT
 - 6 SOLENOID OUTPUT
 - 7 SOLENOID COM (VDC +)
 - 8 SOLENOID OUTPUT
 - 9 VREF+
 - 10 RFU WIPER
 - 11 FFU WIPER
 - 12 VREF-
 - 13 VREF+
 - 14 RFU WIPER
 - 15 FFU WIPER
 - 16 VREF-
- F1 = 8 AMP
F2 = 1/2 AMP

NOTE:
SWITCH OR RELAY MUST BE
ABLE TO HANDLE SYSTEM CURRENT.
SWITCH OR RELAY IS
CUSTOMER SUPPLIED.

CONTRACT	N/A	 MANUFACTURING COMPANY LIMITED				
CONTRACT	N/A					
VESEL	N/A	DWN	DY	MO	YR	TITLE
		H.A.	09	07	02	SINGLE STEERING SYSTEM WITH OPTIONAL AUTOPILOT CONNECTION DIAGRAM
		S.C.	09	07	02	
SCALE	N/A	SHEET	1/1		DRAWING NO	7173-010
REV	B					



NOTE:
 DWG SHOWN FOR DUAL SPEED
 STEERING SYSTEM.
 MUST ADD PROTECTION DIODES
 TO SOLENOID COILS TO REDUCE
 VOLTAGE SPIKES.
 7173-K AMPLIFIER SWITCHES
 NEGATIVE, MUST SET AUTOPILOT
 TO SWITCH NEGATIVE.

CONTRACT	N/A	DWG	7174	MANUFACTURING COMPANY LIMITED
CONTRACT	N/A	H.A.	090702	7174 FEEDBACK UNIT
VESEL	N/A	S.C.	090702	LIMIT SWITCHES WIRING
	N/A	SCALE	2/2	DIAGRAM
	N/A			DRAWING NO
	N/A			A-400899
	N/A			REV
	N/A			A