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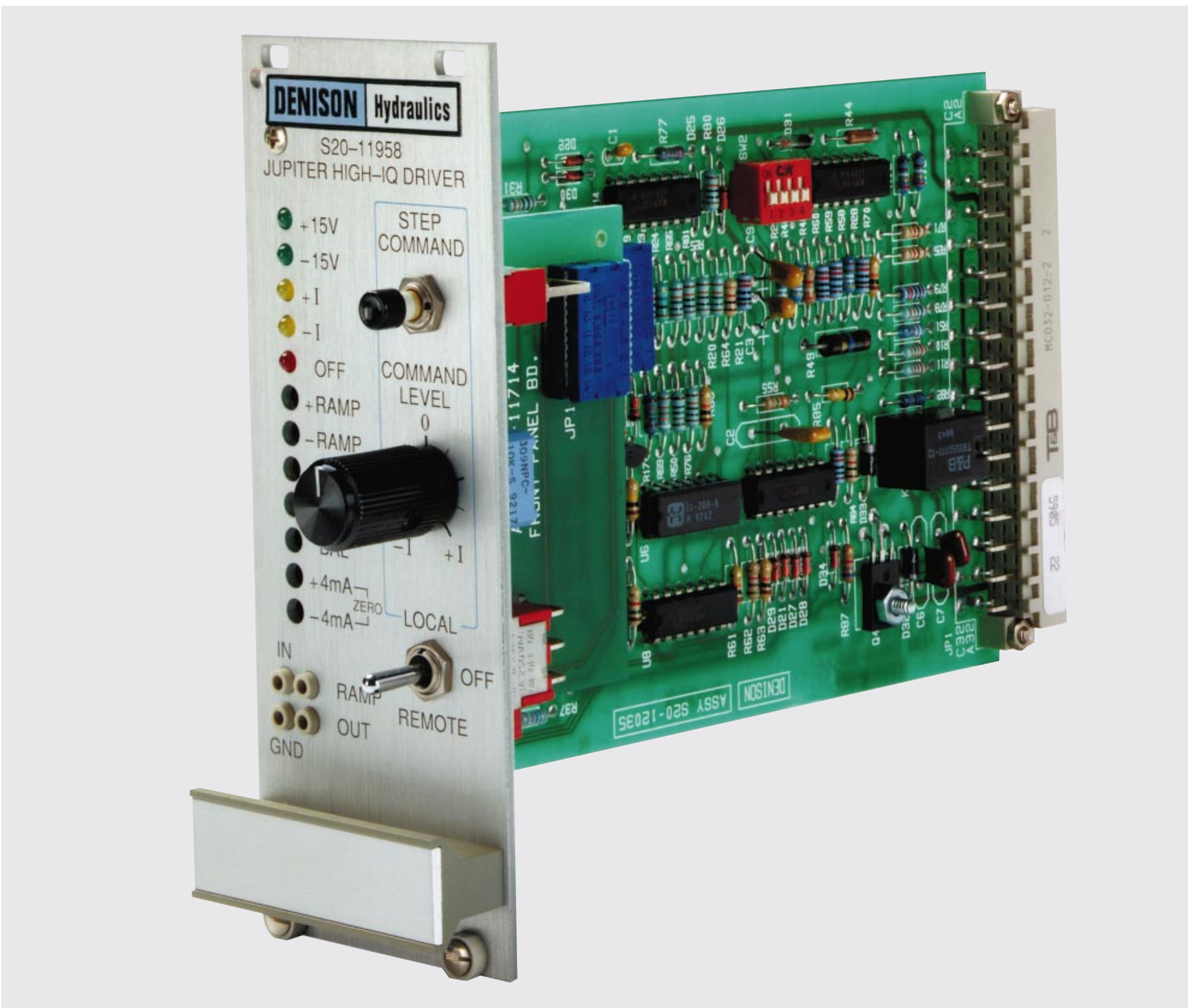
DENISON HYDRAULICS
electronic control systems
jupiter series Hi-IQ driver card
S20-11958 mod. F



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DENISON Hydraulics

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MANUFACTURER'S NAME	DENISON HYDRAULICS
MANUFACTURER'S ADDRESS	14249 Industrial Parkway Marysville, Ohio 43040-9504, USA

declares that the product

PRODUCT NAME **PRODUCT PART NUMBER**	Jupiter HI/IQ Driver Card S20-11958-0

conforms to the following product specificatios

EMC: EN50081-1: March 1993 generic emissions for residential, commercial & light industry[1]
EN55011:7/1992 radiated or conducted EMI - 30-1000MHz

EN50082-2: 1995 generic immunity for heavy industry[1]
ENV50140:8/1993 - 10V/m, 80 - 1000MHz - Performance Criteria B

EN61000-4-2, IEC801-2 electrostatic discharge (ESD)
8KV air discharge - Performance Criteria A
4KV contact discharge - Performance Criteria A

EN61000-4-4: 5/1995 fast transient rejection
2KV power supply wires - Performance Criteria B

SUPPLEMENTARY INFORMATION

The product was tested in an EMC TEST Laboratory in Germany and herewith complies with the EMC Directive 89/336 and the CE Marking requirements.

[1] The product was tested in a typical system configuration with DENISON HYDRAULICS Jupiter Series products or recommend second source products. The tested product was mounted in a NEMA 4 enclosure (or equivalent) and all cables exiting the enclo sure were shielded (screened). Enclosure and cable shields were connected to earth ground (PE).

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The Jupiter HI/IQ Driver Card, S20-11958 has been revised to Mod. F. The printed circuit board revision letter 'F' identifies this most recent PC board revision. The changes were significant to warrant this manual update. The following points highlight changes that may be of interest to users of previous versions.

1. Front panel test point FDBACK (previously ERROR) indicates the pump cam position. The range being 0 to ±2.5V full-scale after the proper BALANCE adjustment is completed.

2. The feedback voltage range at terminal A16 is ±1.2 to ±15VDC. The feed back input circuit with the BALANCE potentiometer scales that range to 0 to ±2.5VDC as measured at front panel test point FDBACK. The older versions had a ±2.1 to ± 12VDC feedback range.

3. The front panel test point IN will indicate the same polarity as the command signal polarity at terminal A10. The magnitude may be different depending on DIP switch selection. On previous versions the polarities were opposite.

4. Added the optically isolated 15 to 24VDC REMOTE SHUTDOWN function. Input is terminal C8 and return is at terminal C4. Applying 15 to 24VDC will enable the driver card to the remote command signals. Removing the voltage from C8 will disable the remote command signals. This 24V REMOTE SHUTDOWN is in addition to the SHUTDOWNEXT circuit at terminal A30 which requires grounding to enable the card. Only one circuit can be used at a time.

5. Added the optically isolated 15 to 24VDC REVERSE COMMAND function at C6 with return at C4. This function provides command polarity reversal via a DC voltage logic input. With the input to REV. CMD at C6 at zero volts (or open circuited) the voltage polarity at test point IN is the same as the command polarity at terminal A10. When the input to C6 is 15 to 24VDC the polarity at test point IN will be inverted from the applied command polarity at terminal A10. This feature permits ± polarity operation with a uni-polarity command signal. In pump servo control application this permits cross center operation with a uni-polarity signal.

6. The Front panel STEP COMMAND PUSH BUTTON is Functional in both LOCAL and REMOTE modes. Previous versions only worked in LOCAL mode.

CAUTION: When replacing an older version with the Mod. F, the leads to the servovalve from terminals A28 and A22 must be reversed to retain proper phasing of the servo system. The feedback polarity switch SW2-C should be open as in the older versions.

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TECHNICAL CHARACTERISTICS
Specifications

Remote command input-options: *(Only one input active at a time)*	potentiometer input: . . . . .10K ohms voltage input single or differential: . . . .± 0-5VDC, ...± 0-10VDC input impedance single ended: . . . . .100K ohms input impedance differential: . . . . .200K ohms current loop input differential: . . . .± 4-20mA, ...± 0-20mA, ...12 ± 8mA input impedance 4-20 mA, 12 ± 8mA: . . . . .309 ohms input impedance 0-20 mA: . . . . .249 ohms All inputs are switchable to uni-directional operation. 24VRMT SHUTDOWN . . . . .15-24VDC (isolated) to activate driver card input impedance . . . . .2.2K ohms REV CMD . . . . .15-24VDC (isolated) to activate input impedance . . . . .2.2K ohms SHUTDOWNEXT . . . . .ground input to activate driver card.
Auxiliary remote command inputs - options:	potentiometer input: . . . . .10K ohms voltage input single ended: . . . .± 0-10VDC input impedance . . . . .100K ohms voltage input single ended: . . . .± 0-1VDC input impedance: . . . . .10K ohms All inputs are switchable to uni-directional operation.
Ramp generator	switchable on or off . . . . . .positive ramp . . . . .range A: . . . . .0.1 - 6 sec . . . . .range B: . . . . .0.4 - 40 sec . . . . . .negative ramp . . . . .range A: . . . . .0.1 - 6 sec . . . . .range B: . . . . .0.4 - 40 sec
Output driver	linear with current feedback . . . . . .short-circuit current: . . . .± 12 mA . . . . . .open-circuit voltage . . . .± 14 VDC . . . . . .short-circuit protection . . . . . .gain adjustment: . . . . .0-55 mA/volt change at TP FDBACK . . . . . .balance adjustment: . . . .± 1.2 - to ± 15V @ A16 vs ± 10V @ TP IN . . . . . .zero adjustment: . . . .± 10% of full-scale feedback
Hi-IQ standard servo valve operating requirements	dual 1000 ohm coils parallel coils connections: 500 ohms equivalent current for full servo valve flow . . . .± 8 mA voltage nominal . . . .± 4 VDC series coils connections: 2000 ohms equivalent current for full servo valve flow . . . .± 4 mA voltage nominal . . . .± 8 VDC Servo valves with 11mA F. S. current and 11VDC max. compliance voltage can be driven with the Hi-IQ driver card.
Analog feedback inputs	horsepower limits: . . . .± 10 VDC major loop: . . . .± 10 VDC input command disable: . . . . .GND to disable feedback @ term. A16 . . . .± 1.2 - ±15 VDC
Front panel LED indicators *(see note 1)*	+15 VDC . . . .+15 VDC power supply operational -15 VDC . . . .- 15 VDC power supply operational + I . . . . .positive feedback @ TP FDBACK - I . . . . .negative feedback @ TP FDBACK OFF . . . . .indicates removal of all command and analog feedback signals except feedback @ term. A16 and ZERO potentiometer input.
Front panel potentiometer adjustments	+ ramp . . . . .adjusts positive command ramp time - ramp . . . . .adjusts negative command ramp time zero . . . . .adjusts zero pump output, or adjusts pump to . . . . .an output offset with zero command input. gain . . . . .adjusts output current per volt feedback error bal . . . . .balances the feedback @ term. A16 to the max. command signal. Balance range ± 1.2 to ± 15 VDC feedback against ± 10 VDC command.

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Front panel potentiometer adjustments *(con't.)*

+ 4 mA zero .adjusts for zero command @ TP IN when using the +4-20 mA current input. Also adjusts for zero @ TP IN when using the 12 ± 8 mA command input.
- 4 mA zero . . . . .adjusts for zero command @ TP IN when using the - 4 - 20 mA current input.

Front panel local controls *(see note 1)*

local-off-remote switch . . . . .selects the mode of operation for the driver card. Remote selects external command inputs and Local selects front panel command input. Off removes all commands except Zero/Offset; the pump will position to the Zero/Offset setting.

command level potentiometer . . . . . . .adjusts the input command from maximum input in one direction thru zero to maximum input in the opposite direction in Local mode. If Zero and Bal of the output stages are properly adjusted for full scale pump output, this adjustment can swing the pump output from positive full stroke to negative full stroke. If unidirectional output is selected only the positive side of the command is functional.

step command pushbutton . . . . .functions in both Remote and Local mode. It facilitates the ± Ramp adjustments. Pressing and holding the button will cause the Ramp output voltage measured at the front panel TP to decrease from the commanded set point to zero. When releasing the button the ramp will increase to the commanded set point. Hence the desired acceleration and deceleration ± Ramp times can be easily adjusted prior to energizing the hydraulics.

Front panel test points

IN . . . . .input command ± 10 VDC full - scale
RAMP . . . . .ramp output ± 10 VDC
FDBACK . . . .± 2.5 VDC F.S. with BAL adjusted for ±10 VDC command
GND . . . . .signal ground reference

DIP switch settings

O = open = off
C = closed = on
X = don't care

SWITCH 1

INPUT RANGE	1	2	3	4	5	6	7	8	INPUT +	INPUT -
± 0 - 5V	O	O	O	O	C	O	O	C	A10	C20
± 0 - 10V	O	O	O	C	C	O	O	C	A10	C20
± 0 - 20 mA	O	C	O	O	C	O	O	C	A10	C20
± 4 - 20mA	O	O	C	O	C	C	C	C	A10	C20
12 ± 8mA	C	O	C	O	O	C	O	O	A20	C20

SWITCH 2

RAMP CONTROL	1	2
OFF	O	X
0.1 - 6 seconds	C	O
0.4 - 40 seconds	C	C

SWITCH 2

FEEDBACK POLARITY	3
non-inverted	O
inverted	C

SWITCH 2

INPUT/OUTPUT TYPE	4
uni-directional (+)	O
bi-directional	C

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Driver card pin-out
(male DIN 32C)

A2 . . .+10VDC ref. out	C2 . . .command out (inverted)
A4 . . .-10VDC ref. out	C4 . . .return 24V RMT shutdown/REV CMD
A6 . . .command disable in	C6 . . .REV CMD (15-24VDC)
A8 . . .K1 fault monitor contact	C8 . . .24V RMT shutdown (15-24VDC)
A10 . . .+signal volts/current loop	C10 . . .N/C
A12 . . .signal ground	C12 . . .±1VDC aux in
A14 . . .major loop in	C14 . . .±10VDC aux in
A16 . . .pot/RVDT feedback	C16 . . .hp limit in
A18 . . .sig ground	C18 . . .K1 fault monitor contact
A20 . . .12+8mA current loop	C20 . . .current loop ret/Diff. Voltage Input
A22 . . .coil return	C22 . . .sig ground
A24 . . .+15VDC reg in	C24 . . .+15VDC reg in
A26 . . .-15VDC reg in	C26 . . .-15VDC reg in
A28 . . .coil out	C28 . . .not used +24V dedicated
A30 . . .remote shutdown (low logic)	C30 . . .not used -24V dedicated
A32 . . .power ground	C32 . . .power ground

Power supply requirements

+15VDC tracking regulated: . . . .+100mA
-15VDC tracking regulated: . . . .- 100mA

Additional power supply requirements when using the options card

+15VDC tracking regulated: . . . .+250mA*
- 15VDC tracking regulated 80mA
* includes 5VDC @ 300mA for optical shaft encoder.

Temperature range

0 - 60° F

Mechanical

dimensions, Eurocard: . . . . .3U x 160mm
dimensions, card w/front panel (mm) 128.4H x193D x50.5W
connector: . . . . .DIN 32C, male
weight: 241g (8.5oz.)

Accessories

Jupiter power supply w/Eurocard holder: S20-11715
power req'd 110/220 VAC, 50/60Hz
Eurocard holder only (32 screw terminals): 701-00007-8
Jupiter Options Card: S20-11716
panel-mounted command input potentiometers:
single turn . . . . .100-0-100 dial S17-22773
ten-turn . . . . 0-100 dial S17-22746
quadrant command input potentiometer: . . . . .consult factory

Notes:
use extreme caution when switching from **remote** thru **off** to **local** mode since the output will immediately change to output level set by command level potentiometer which may be set at some higher level or even in the opposite direction or both resulting in unexpected output. Always dwell in the off position first, checking proper command level settings. Before switching into local mode. Remember that the output is controlled by the front panel command potentiometer in local mode.
If the options card is used, additional ±15VDC current capacity is required as follows:

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GENERAL

The Jupiter HI/IQ Driver Card, S20-11958, may be used to control the displacement of a variable displacement pump, hydraulic actuator or other device with position feedback. It may also be used to control the speed and direction of a hydraulic servo motor.

The HI/IQ Driver is a linear bidirectional current driver used primarily for control of the Gold Cup HIGH IQ pump. Input commands to the card may be either voltage or current loop; potentiometer or active signal source; single-ended or differential. Multiple input commands are permitted but must be interlocked by the user to insure that the card is controlled by only one input at a time. The card also features command reverse option for single polarity commands from programmable controllers (PLC) or computers; two ranges of positive and negative ramp times; remote (high or low logic) emergency shutdown control; and provisions for closed-loop control of system parameters such as speed, pressure or position in conjunction with the Jupiter Options Card S20-11716.

The driver card is packaged in a 3U Eurocard size and may be operated with a separate (±) DC power supply or with Jupiter Power Supply Accessory S20-11715 which conveniently combines the required DC power supplies with a Eurocard holder in a single panel-mounted package.

Output

The output stage of the Driver Card is a linear, bi-directional, current driver. The output stage will output current only when the pump hanger position feedback does not equal the command. The GAIN adjustment controls the rate that the pump hanger position will change for a given position error.

ZERO and GAIN of the output stage are adjusted by potentiometers located on the front panel. The output stage is completely protected against short circuits across the coil and short circuits to ground.

Inputs

The driver card is controlled by either the COMMAND LEVEL potentiometer on the front panel or by user-wired remote inputs. LOCAL and REMOTE modes are selected via a switch located on the front panel. The COMMAND LEVEL potentiometer is a single-turn adjustment providing ± full scale and is recommended for set-up purposes only.

The remote inputs are the preferred method of connecting the driver card to standard industrial control sources such as voltage and current loop controllers and potentiometers. The auxiliary remote inputs permit the user to have a secondary input source in addition to the remote inputs. The user must interlock the remote input with the auxiliary remote input to insure that the driver card is controlled by only one input at a time. The provision for multiple inputs can, for example, allow the user to wire a current loop from a process controller into the remote inputs and a potentiometer from the operator's control station into the auxiliary remote input. Wiring both inputs thru a double-pole double-throw switch would give the operator a convenient choice of input sources and insure that the card is controlled by only one source at, a time.

The user has a choice of voltage, current loop or potentiometer when using the remote inputs; and a choice of voltage or potentiometer when using the auxiliary remote inputs. Voltage inputs may be ±5 or ±10 VDC, single-ended or differential. Current loop inputs are differential ±4-20, ±0-20, or 12 ±8mA. Potentiometer resistance should be 10K for bidirectional or 5K for unidirectional operation. On board ±10VDC zener regulated reference supplies provide convenient sourcing for the potentiometer excitation.

DIP switches embedded on the card are used to configure the user's choice of input. The DIP switch settings scale any choice of standard input signals to ±10V full scale (F.S.) at the front panel test point IN. For example, if the input signal source is ±4-20ma, at ±20ma the F.S. signal at TP IN will be ±10VDC. This design feature simplifies application of the driver card. The user has a wide choice of standard industrial signal sources while maintaining a constant relationship of ±10VDC F.S. command vs. ±2.5VDC F.S. feedback to the summing junction of the output driver. As a result the loop GAIN, BALANCE and ZERO adjusters maintain their same range of adjustment.

All command inputs, LOCAL or REMOTE, can be made unidirectional via a DIP switch setting. Some systems may require unidirectional operation where reverse direction must be avoided. Setting the DIP switch to unidirectional mode will prevent inadvertent reverse command signals such as may be present when using the LOCAL COMMAND potentiometer. In unidirectional mode only (+) positive command signals will drive the output stage.

CAUTION: Setting to unidirectional mode does not guarantee that pump will not cross center; that is, change output port. Mechanical means must be used to assure unidirectional operation if hazard exists.

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Ramp generator

Adjustable positive and negative ramping of the output for changes in the input command are provided in two ranges, 0 .1-6 and 0.4-40 seconds. Ramping and ramping ranges are selected by dip switches embedded on the card. The STEP COMMAND pushbutton located on the front panel may be used for accurate adjustment of ramp times, with either LOCAL or REMOTE signals.

Front panel controls and indicators

Key indicators, potentiometer adjustments, switches, and test points are brought out to the front panel for monitoring, set-up and calibration purposes. LEDs are provided for indicating the status of the ±15VDC internal supplies, the direction of output current, and the status of emergency shutdown network.

Potentiometer adjustments include ±RAMP, ZERO, GAIN, BAL, and ±4mA ZERO. Test points accepting industry standard probe tips are furnished for measurement of the command, feedback (pump hanger position), ramp, and signal ground.

A LOCAL-OFF-REMOTE switch is provided to switch control of the driver card from local front panel control to user-wired remote control. OFF commands the pump to a null position. The COMMAND LEVEL potentiometer provides the operator with a ±10V full-scale input signal as measured at front panel TP IN test point. *When GAIN, ZERO and BALANCE are properly adjusted the LOCAL COMMAND LEVEL pot can command the pump to (+/-) full output.*

WARNING: When switching from remote thru off to local mode: The output will immediately change to the level set by COMMAND LEVEL potentiometer, which may be set at some higher level or even in the opposite direction or both, resulting in unexpected output. Always dwell in the OFF position first, checking proper COMMAND LEVEL settings, before switching into LOCAL mode. Remember that the output is controlled by the front panel adjustment in LOCAL mode.

The STEP COMMAND pushbutton is used in conjunction with either the COMMAND LEVEL potentiometer or the REMOTE command inputs for set-up and calibration of the driver card. Pressing the STEP COMMAND pushbutton will ramp the signal at the RAMP test point from the set point to zero. When releasing the STEP COMMAND pushbutton the signal at TP RAMP will ramp to the set point. Preliminary ramp time adjustments can be performed without the hydraulics being energized. Once the hydraulics are energized fine tuning of the ramp times can be performed via the above method.

Reverse command

24VDC REVERSE COMMAND is a control logic function. This function provides command polarity reversal via an isolated DC voltage input. With the input to REV. CMD at zero volts (or open circuited) the voltage polarity at test point IN is the same as the REMOTE command polarity. When the REVERSE COMMAND logic is between 15 to 24VDC the polarity at test point IN will be inverted from the REMOTE command polarity. This feature permits ± polarity operation with a uni-polarity command signal. In pump servo control applications this permits cross center operation with a uni-polarity signal.

Emergency shutdown options

The EMERGENCY SHUTDOWN function must be user wired for the driver card to operate. In REV. F driver card, two logic level options are available to provide compatibility with most control system schemes. One, and only one, option must be implemented. Connect either 24VDC to the 24V RMT SHUTDOWN (input range of +15 to+24VDC) at Term. C8 through a normally-closed emergency stop switch (Connect the 24V power ground reference to Term. C4); or connect a logic level low, GND (A32), to Term. A30 (SHUTDOWNEXT) through a normally-closed emergency stop switch. When the emergency stop switch is opened the pump will be commanded to minimum output.

This EMERGENCY SHUTDOWN function assumes that the pump servo system is working normally and that the EMERGENCY SHUTDOWN requirement is the results of other system problems. If the shutdown is the result of a non-responsive pump servo system, see the section entitled FAULT MONITOR.

Note, when the Power Supply Accessory, S20-11715, is used, only the logic level low option, SHUTDOWNEXT (A30) is available at the terminal blocks of the power supply. The 24V RMT SHUTDOWN terminal C8 does come out to the power supply card terminal blocks. Wire the normally-closed contacts of the emergency stop switch between Terminal Block #10 (A30) and Terminal Block #11(A32).

Fault monitor

The FAULT MONITOR provides relay contacts, K1, to indicate servo system status. The user may optionally wire the relay contacts into the system control circuit as a safety-interlock to initiate a shutdown of the prime mover of the pump or merely to indicate a fault. The fault monitor relay, K1, is energized during normal operation providing closed contacts, K1, between Term. A8 and Term.C
user control circuit.

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Fault monitor *(con't.)*

If the pump position feedback is lost or the pump does not respond to the command, the FAULT MONITOR relay will de-energize opening the relay contacts.

The user must analyze his hydraulic system and determine what shutdown procedure to follow in the event of pump servo system failure.

When using the Power Supply Accessory, S20-11715, the K1 contacts are accessed at Terminal Block #21(A8) and Terminal Block #24 (C18).

CAUTION:.The electrical rating of the Fault Monitor relay contacts is 1 Amp @28VDC.

Power supply requirements

The driver card requires only a single ±15VDC dual tracking regulated power supply rated at 100mA. Jupiter Power Supply Accessory S20-11715 conveniently provides both +15VDC and -15VDC supplies combined with a Eurocard holder for the driver card in a single panel-mounted package. This power supply is also designed to handle the power required by Jupiter Options Card S20-11716 used for closed-loop applications. A separate Eurocard holder is required for the Jupiter Options card.

Closed-loop control

The driver card operating as a stand alone driver is used primarily for closed-loop pump hanger (rocker, swash plate) position control. With the Jupiter Options Card, S20-11716, the driver card can be used for closed-loop speed control systems. The options card accepts digital and DC tachometer feedback, horsepower limiting and PI control of feedback error in a single Eurocard, designed to accompany the driver card. Inputs from the summing junction of the power amplifier in the output stage of the driver card are brought out for feedback control by the options card in closed-loop systems. These feedback inputs are, however, general purpose enough to accept feedback from sources other than the options card making elementary closed-loop control possible with just the driver card.

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Jupiter HI/IQ Driver card with Gold Cup series HI/IQ pump

As stated in the GENERAL description, this control card can control hydraulic actuators with position or speed feedback, but it was primarily designed to control the Gold Cup series HI/IQ pump displacement. The following is a primer to determine proper phase relationship between the pump and the driver card. This primer is included to help those not familiar with the Denison product.

Terminology

Some Gold Cup Series pump nomenclature and conventions:

- The pump drive shaft end is, the front of the pump, the port block end is the rear of the pump.
- Facing the shaft-end of the pump with the valve block on top, the left side is the A-side and the right is the B-side.
- The pump system port on the A-side is referred to as the A-port and on the B-side, B-port.
- The pump is identified as an A-mounted pump, when the input control cover is mounted on the A-side.
- The control cover with the feedback device is always considered to be an output control and hence the opposite side cover is always considered to be the input-con trol. Therefore, when the feedback device is mounted on the A-side, the pump is a B-mount unit.

Phasing

With some diligence, correct phasing can be determined prior to energizing the hydraulic system. Two facts are necessary to establish correct phasing: 1) HI/IQ servo amplifier, S20-11958, output polarity and required feedback polarity for a given command polarity and 2) pump feedback polarity for a given pump rotation and output port.

The first fact depends on the design of the servo amplifier. The HI/IQ Driver Card produces a positive output current and requires a positive feedback signal at test point FDBACK to balance a positive command signal. In other words, the command, output current and feedback have the same polarity for proper phasing. The +I and -I front panel indicator lights (indicating feedback polarity) provide feedback polarity information; and the feedback polarity reversal switch provides a simple means to invert polarity if so required. The second fact, pump feedback polarity for given pump rotation and output port, requires diligence to determine.

To determine pump phasing, refer to the appropriate installation drawing supplied with the pump or request installation drawing per pump model number from your Denison Hydraulics, Inc. distributor. The installation drawing provides tables showing pump inlet and outlet ports for a given pump rotation and input-control cover shaft rotation. In addition the installation drawing also shows the servo valve (SV) ports as located on the pump and SV spool porting vs. current polarity.

What may not be clear on the installation drawing is, that if SV port 1 is near the pump A-port, then it is connected to the A-port compensator override tube and SV port 2 is thus connected to the B-port compensator override tube. Also, mechanically, the Gold Cup HI/IQ pump construction is such that when the A-port compensator override tube is ported to servo flow, the pump B-port is the “out” port during increasing displacement, independent of pump drive shaft rotation.

For example, refer to sample Gold Cup 700 control drawing included in this section. Servo valve port 1 is near the pump A-port, hence it is connected to the A-port override tube. Negative current to terminal A of servo valve ports servo flow to port 2 which is connected to the B-override tube, therefore the pump A-port will be the output port during increasing pump displacement.

As shown in the example, with the above information one can determine the pump output port for a given polarity SV current. With this information and the installation drawing, the input-control shaft rotation can be determined, and hence the resulting feedback polarity since the feedback device shaft rotation is the same as the input-side control shaft rotation. The electrical diagram of the feedback device indicates the feedback polarity for CW feedback shaft rotation. (Note, the volume indicator referenced on some installation drawings refers to the one mounted on the input-side control shaft and not the indicator mounted on the back of the feedback potentiometer.)

Expanding on the above example in which a negative current into terminal A of servo valve makes the pump A-port the output. Now, consider the pump drive shaft has CW rotation and the input-control is a B-mount. The input control shaft therefore rotates CW, per installation drawing. The feedback device shaft will rotate CW. If the feedback device is a potentiometer (wired per Denison standard) then the feedback polarity will be (-) negative and the electro-hydraulic circuit is in phase; ie, negative command, negative servo amplifier output current and negative feedback signal.

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Phasing *(con't)*

If the feedback device were a DC-RVDT, in the example,the feedback polarity would be (+) positive and the electro-hydraulic circuit would not be in phase. However, the HI/IQ driver card provides a feedback polarity inverting switch. Activate switch to invert polarity per switch-setting table on driver card block diagram provided in this manual. The electrohydraulic circuit will now be in phase.

Once the phasing is correct and the electro-hydraulic circuit is controllable it will be necessary to check if the system responds in the direction desired for a given polarity command signal. If not, correct response can be attained by reversing the servo valve and feedback polarity. To change SV polarity, reverse the two servo valve wires.
To change feedback polarity toggle the feedback polarity switch.

The following tables summarize the above explanation. Also, a representative pump installation drawing and three sample control circuit phasing exercises follow to support the explanation. Each exercise increases in difficulty to highlight the points in the explanation.

In the following three exercises, given the required system criteria, determine HI/IQ feedback polarity switch setting for proper circuit phasing and system direction. Refer to sample Gold Cup 700 control drawing and phasing tables. Assume (Abex) servo valve polarity and potentiometer feedback.

Example 1.
Given: B - mount pump
CW Pump drive shaft rotation
Direction -- A-port out for (-) command

Solution: Assume negative current into SV terminal A. Per sample installation drawing, servo supply will be ported to port 2 of SV and B port override tube. Per pump mechanics, the A-port will be the output. Referring to the B-side input control table on the installation drawing, for cw pump rotation and A-port output, the input control shaft rotation is CW. Therefore the feedback device rotation is CW, per explanation. And the feedback voltage is negative per electrical diagram on the installation drawing. Since the feedback corresponds with the servo valve current, the control circuit is in phase and the polarity switch should be in the NON-INVERT state. Checking the direction, a negative command will produce a negative servo current per HI/IQ Driver Card design and the negative servo current into terminal A of SV makes A-port the output. Therefore the system direction is as required.

Example 2.
Given: B - mount pump
CCW pump rotation
Direction -- A-port out for (-) command

Solution: Polarity switch must be set to INVERT for correct phasing.
Direction is correct -- negative command, negative SV current, A-port out.

Example 3.
Given: B - mount pump
CCW pump rotation
Direction -- A-port out for (+) command
(Hint: First determine correct phasing, then check for direction)

Solution: Same as Ex. 2 -- polarity switch INVERT to achieve correct phasing. However the direction requirements are A-port out for (+) command. Therefore, once correct phasing is established, direction can be changed by inverting the polarity switch and reversing the leads to the servo valve.

SET-UP PROCEDURE
Jupiter HI/IQ Driver card

Preparations

Make initial external electrical connections per pump installation drawing and block diagrams provided in this manual. Review all wiring to insure proper connections.

REMOTE SHUTDOWN: Refer to section describing the **EMERGENCY SHUTDOWN OPTIONS.** Choose one option for driver card to operate.

To prevent damage to the card, always remove power from the driver card before removing it from its holder.

Determine the type of input(s), feedback, ramp ranges, unidirectional or bidirectional operation and then set switches SW1 and SW2 per tables 1 thru 4 in the block diagrams.

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Preparations (Con't)

Only a digital voltmeter and a small plastic screwdriver will be required for set-up. The test points on the front panel accept industry standard probe tips.

The HI/IQ driver card provides test points, feedback polarity indicator lights and feedback polarity inverting switch to aid in setup. To minimize the number of possible variables during initial start-up, it is recommended that the LOCAL command mode be used to establish control, stability (GAIN) and full-scale output (BAL.) of the pump. The LOCAL command potentiometer provides ±10VDC full scale command -- clockwise for positive. The command level can be measured at the front panel test point IN. Once control is established, the driver card can be switched to REMOTE mode to fine tune the system with the remote command signal.

Adjustments

All voltage readings are referenced to signal ground unless otherwise noted.

CAUTION: Know the system. Use care at start-up. The pump may immediately produce full output flow (runaway condition) if phasing of the servo valve and feedback is incorrect. Assure that the hydraulic system relief valve is set to minimum to prevent equipment damage in case of incorrect control system phasing. If the possibility of system damage remains high, determine correct phasing before energizing the hydraulics.

Zero & phase check

- Normally a Gold Cup series HI/IQ pump is zeroed (i.e., zero feedback signal for zero pump output) at the factory and should not require re-zeroing. Zeroing can not be done statically since the pump does not have a mechanical detent to indicate its zero output position. The hydraulics must be energized to zero the feedback signal. However, to verify proper phasing prior to energizing the hydraulics, the feedback pot/RVDT may be rotated to determine feedback voltage polarity versus feedback device shaft rotation.

- Energize the HI/IQ driver card and note the feedback voltage and polarity at front panel test point, FDBACK, for reference.

- Remove the housing protecting the feedback device.

- Loosen the feedback device mounting cleats 1/4 turn; slowly turn pot/RVDT housing clockwise and note increasing amplitude and polarity on voltmeter or front panel yellow polarity indicator lights. Reset pot./RVDT to original reference reading and lock cleats. If the feedback polarity at test point, FDBACK, is correct as determined in the PHASING Primer, then the pump will be in phase.

- To check the driver card zero adjustment, set the front panel toggle switch to OFF; disconnect the feedback voltage at Term A16; increase the GAIN max CW and then adjust the front panel ZERO for minimum voltage at Term. A28. Reconnect Term. A16.

- Before starting pump set the mode switch to Local and the local command pot. to zero; set the GAIN pot. to mid-range and the BALANCE pot. to max CCW.

- Energize the hydraulics and slowly rotate the command pot. clockwise; observe that the +I feedback polarity light illuminates for proper phasing. If the -I light illuminates the phasing is incorrect and the pump will drive to max output. De-energize if run away occurs and reverse the polarity via the polarity invert switch on driver card. Energize the hydraulics again.

- Rotate the command potentiometer + and - to check pump control. (Proceed to GAIN adjustment section if pump is hunting during small rapid command changes before attempting pump feedback zero adjustment.)

- Set the command pot. for zero pump output. Read the feedback voltage at TP FDBACK. This voltage should be zero ±0.12VDC. If necessary, zero pump feedback device. **Note**: The system will operate with a zero offset greater then 0.12VDC. However, the front panel ±I indicators or feedback voltage relative to pump position may be incorrect.

- To zero feedback device set command signal to zero, then loosen feedback device cleats and rotate housing until zero feedback with zero pump out occurs. This may require readjusting the command pot. until zero feedback voltage and zero pump output is attained.Tighten feedback device. Now set command pot. to zero and adjust the front panel zero adjuster to bring pump back to zero output. Re-check, and repeat procedure to attain zero pump output at zero command with feedback voltage of 0.0 ±0.12VDC.

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Gain

- Adjust the front panel GAIN pot. to give quick response to rapid command changes. Excessive gain will cause overshoot of pump position or oscillations (hunting). Insufficient gain will cause slow pump response and poor speed regulation in a servo motor application.

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Direction

- Check for proper direction of pump output for a given command signal. If necessary, reverse direction of control system by reversing the servo valve leads on terminals A22 and A28; and inverting the feedback polarity via the polarity inverting switch, SW2-3.

Balance

- Adjust the front panel BAL. potentiometer for the desired pump output at max. command signal. A preliminary adjustment can be made with the local command source; however, final balance adjustment must be made against the max command source that will be used during actual system operation. The full scale feedback voltage at TP FDBACK, for full command, will be ±2.5VDC. If full pump out is required at full command, adjust the BALANCE control as follows: monitor feedback voltage at front panel TP FDBACK; with command at full, slowly adjust BALANCE CW until feedback no longer increases, then back-off adjustment until feedback volt age decreases 0.10 volts. Check servovalve voltage at Term. A28 for near zero reading.

  Slight variations may occur when reversing direction. To prevent forcing the pump control against its mechanical stop, check the opposite direction. Slowly reverse command to max opposite while observing the servovalve voltage at Term. A28. Servovalve voltage should settle near zero. If voltage remains high, the pump is against its mechanical stop. Observe the feedback voltage while adjusting the BALANCE control to decrease the feedback voltage by 0.10 volts from its max reading. Repeat procedure on both sides to assure max output without striking mechanical stops.

  The pump should now be controllable with the local command potentiometer from full-to-full. it should be responsive but stable and operate in the proper direction for a given polarity command signal. At this point it will be necessary to check the ±RAMP and REMOTE mode inputs adjustments. The following will discuss all remote inputs, but the user need only direct his attention to the input of choice.

CAUTION: TO AVOID UNEXPECTED RESULTS, IT IS BEST TO DE-ENERGIZE THE HYDRAULICS DURING THE FOLLOWING ADJUSTMENTS.

± *Ramp*

- De-energize hydraulics.
- If ramping is required, select desired ramp range switch 0.1-6 or .4-40 seconds per tables on block diagrams. The range switch is effective for both ±RAMP adjustment.
- Monitor TP IN with voltmeter. Set LOCAL COMMAND to maximum CW and wait until signal is steady. Now depress the STEP COMMAND pushbutton and observe the time required for the signal to decrease to zero. Now release the STEP COMMAND button and observe the time to reach max signal.
- Adjust +RAMP CW to increase time for positive ramping. Adjust -RAMP CW to increase time for negative ramping.
- Repeat third and fourth steps above, until desired rate is achieved

Remote inputs

- ±5V and ±10V: Set the DIP switches as required per tables on block diagrams. Apply max ± input to appropriate input terminals and observe ±10V ±5% at TP IN. Decrease signal to zero and observe 0.0 ±0.5 volts at TP IN. If voltages at test point are not correct, recheck DIP switch settings and input terminal connections.
- ±0-20ma: Set DIP switches as required per tables on block diagram. Connect signal wires to appropriate inputs terminals (observe proper polarity). Apply ± max signal and note ±10V at test point IN. Decrease current loop signal to zero and note 0.0 ±.5V at TP IN.
- ±4-20ma: Set DIP switches as required per tables on block diagrams. Connect signal wires to appropriate input terminals, observing polarity. Adjust the front panel +4mA ZERO adjuster max CCW. Apply +4ma signal. Observe test point IN while slowly adjusting +4mA ZERO adjuster for 0.0 volts. Do not adjust beyond this point.

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Remote inputs (Con't.)

- 12 ± 8mA ZERO: Select the DIP switches as required per tables on block diagrams. Make sure switch SW1-8 is in the open position. This activates the loss of current-loop detector shutdown circuit. Connect the signal wires to the 12±8mA input terminals. Apply +12mA input signal. Observe test point IN and adjust the +4mA ZERO adjuster for '0', volts reading.

WARNING: Negative full scale output is produced for a 4mA input signal in the 12 ± 8ma current loop. A broken current loop connection (0 ma input) will drive the output even more negative than full scale, resulting in an unintentional and possible hazardous hydraulic-mechanical situation. Remember to place switch SW1-8 in the open position to enable the automatic current loop shutdown detector which will disable the commands to the output driver stage.

- REV CMD: Can be used with all remote uni-polarity input signals, such as the 0-20mA or 4-20mA signals from programmable logic controllers (PLC). Select the required DIP switches for the choice of input signal. Connect signal wires and make adjustments as described above for the various input commands. To reverse the command signal, apply a DC source of +15 to 24VDC and ground return to the REV CMD input terminals. Note that the voltage at test point IN is reversed.

Final adjustments and checks

- Set front panel mode switch to OFF. Set remote input to zero. Energize the hydraulics. Set mode switch to remote.

- With remote command at zero check if pump is at zero output. If not check for zero command at test point IN (0.0 ±.5 volts) and adjust if required per above section on remote inputs.

- If command is in tolerance but pump is not nulled, adjust front panel ZERO adjuster for pump null.

- BALANCE: If pump maximum output is required, recheck balance adjustment with the remote command to avoid striking the pump mechanical stops. Follow above BALANCE procedure. If less than full output is required, adjust BALANCE control for desired output with max command.

- Recheck for proper direction for given polarity command.

- Make final **±Ramp** adjustments for desired system response to command. Use **STEP COMMAND** pushbutton as described above to facilitate adjustment.

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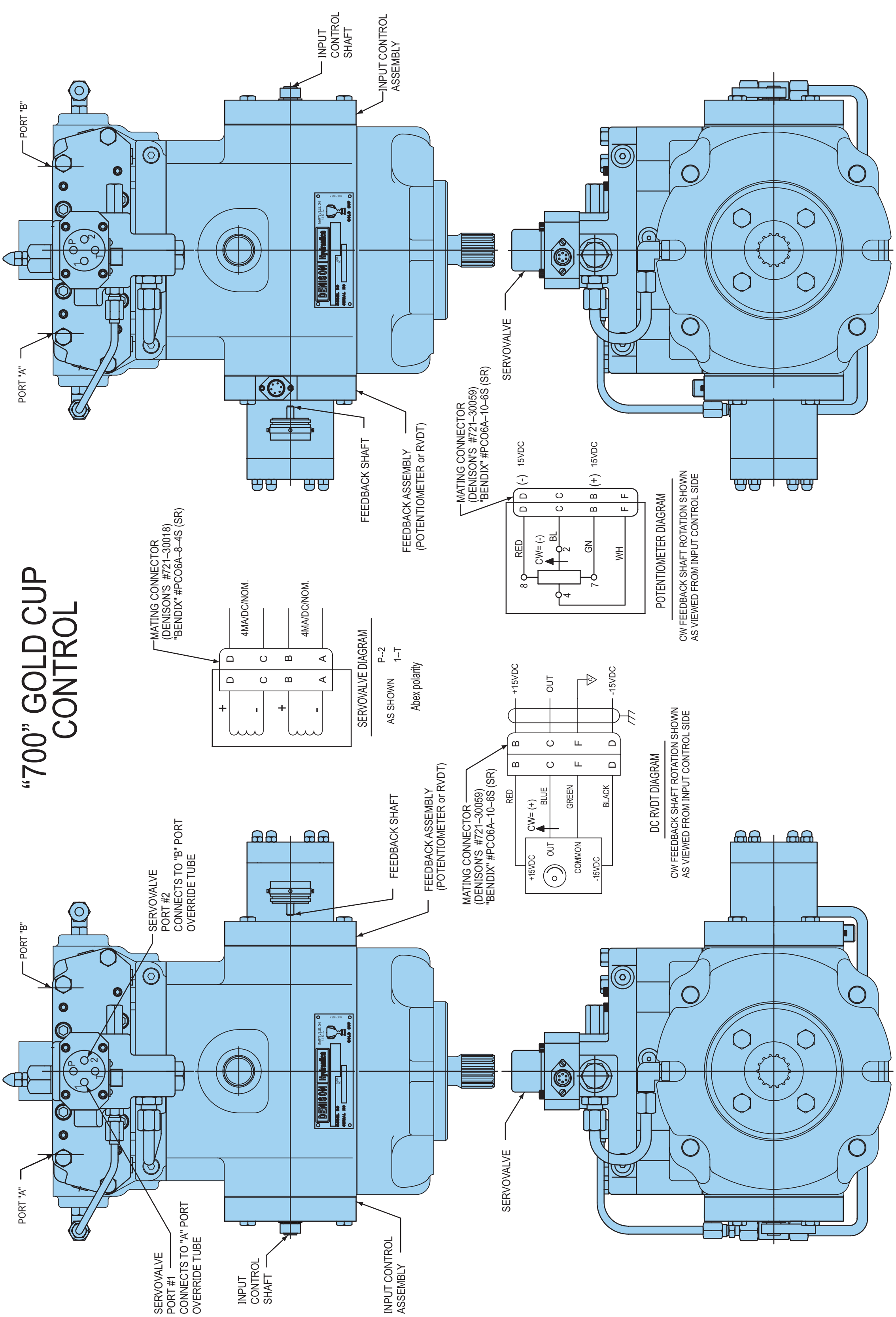
"700" GOLD CUP CONTROL



-B- SIDE INPUT CONTROL

PUMP ROT.	INPUT CONTROL SHAFT ROT. AS VIEWED FROM INPUT SIDE	PORT "A"	PORT "B"
CW	CW	OUTLET	INLET
CCW	CCW	OUTLET	INLET
CW	CCW	INLET	OUTLET
CCW	CW	INLET	OUTLET

-A- SIDE INPUT CONTROL

PUMP ROT.	INPUT CONTROL SHAFT ROT. AS VIEWED FROM INPUT SIDE	PORT "A"	PORT "B"
CW	CW	INLET	OUTLET
CCW	CCW	INLET	OUTLET
CW	CCW	OUTLET	INLET
CCW	CW	OUTLET	INLET

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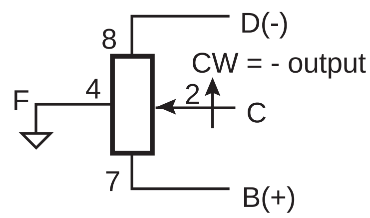
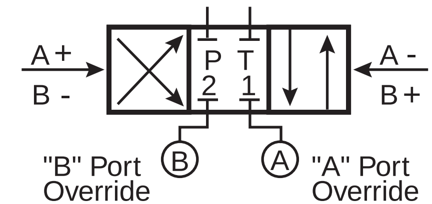
PHASE RELATIONSHIP TABLE 1:
High IQ Pump with Abex polarity servovalve, Feedback Pot assembly S23-02345 & S20-11958 Rev. F driver card



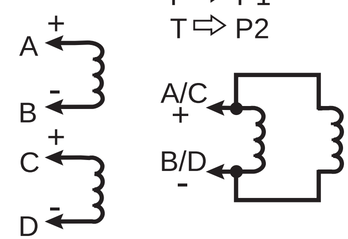
Denison standard wiring

Clockwise rotation of Pot shaft = negative output signal.
(looking at mount-end of shaft)



Mechanically the Gold Cup pump construction is such that during increasing displacement whichever port is "out" the opposite port override tube is ported to servo pressure thru the servovalve. Physically, on standard High-IQ pumps, Port "A" OR-Tube is connected to Port 1 of SV. Port "B" OR-TUBE is connected to Port 2 of SV. Refer to specific installation drawing to verify correct SV Pump porting.

Abex polarity vs. SV porting:
P ⇨ P1
T ⇨ P2



NON-INV = Switch OPEN
INV = Switch

Dual-Coil SV may be in series or parallel connection.

Therefore the following:

If Column 4 polarity = Column 7 polarity, then Column 8 is non-inverting

Column 1	Column 2	Column 3	Column 4	Column 5		Column 6	Column 7	Column 8
				input control				
(for) Port "A"	(and) Port "B"	(requires) SV Porting	(therefore) SV Coil Polarity (must be)	mounted on side	shaft rotation	Feedback device mounted on side	F.B. Pot Polarity (will be)	(hence) Polarity SW (must be)
For CW Pump Rotation:								
OUT	IN	P ⇨ P2	A-	B	CW	"A"	(-)	NON-INV
OUT	IN	P ⇨ P2	A-	A	CCW	"B"	(+)	INV
IN	OUT	P ⇨ P1	A+	B	CCW	"A"	(+)	NON-INV
IN	OUT	P ⇨ P1	A+	A	CW	"B"	(-)	INV
For CCW Pump Rotation:								
OUT	IN	P ⇨ P2	A-	B	CCW	"A"	(+)	INV
OUT	IN	P ⇨ P2	A-	A	CW	"B"	(-)	NON-INV
IN	OUT	P ⇨ P1	A+	B	CW	"A"	(-)	INV
	OUT	P ⇨ P1	A+	A	CCW	"B"	(+)	NON-INV

These conditions are primary and are defined by pump rotation choice (cw/ccw): SV choice (Abex polarity / industry standard); and feedback control assembly mounting side (A or B).
*To change direction for a given command polarity reverse both SV leads and feedback polarity switch <u>after</u> system is in phase.

These are defined by feedback device and servo amplifier characteristics. Denison standard wiring to potentiometer and S20-11985 Rev. F High-IQ driver.

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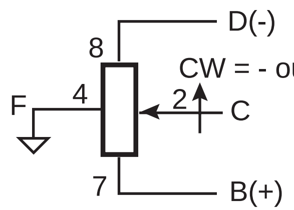
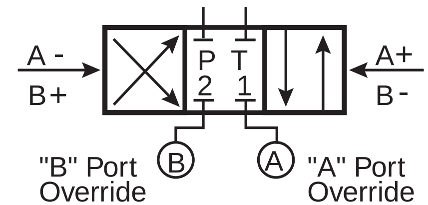
PHASE RELATIONSHIP TABLE 2:
High IQ Pump with Industry polarity servovalve, Feedback Pot assembly S23-02345 & S20-11958 Rev. F driver card



Denison standard wiring

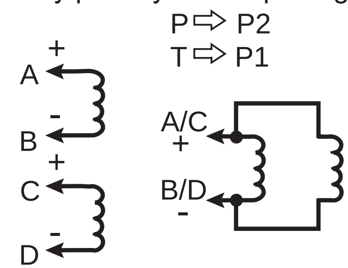
Clockwise rotation of Pot shaft = negative output signal.
(looking at mount-end of shaft)



NON-INV = Switch OPEN
INV = Switch

Mechanically the Gold Cup pump construction is such that during increasing displacement whichever port is "out" the opposite port override tube is ported to servo pressure thru the servovalve. Physically, on standard High-IQ pumps, Port "A" OR-Tube is connected to Port 1 of SV. Port "B" OR-TUBE is connected to Port 2 of SV. Refer to specific installation drawing to verify correct SV Pump porting.

Industry polarity vs. SV porting:



Dual-Coil SV may be in series or parallel connection.

Therefore the following:

If Column 4 polarity = Column 7 polarity, then Column 8 is non-inverting

Column 1	Column 2	Column 3	Column 4	Column 5		Column 6	Column 7	Column 8
				input control				
(for) Port "A"	(and) Port "B"	(requires) SV Porting	(therefore) SV Coil Polarity (must be)	mounted on side	shaft rotation	Feedback device mounted on side	F.B. Pot Polarity (will be)	(hence) Polarity SW (must be)
For CW Pump Rotation:								
OUT	IN	P ⇨ P2	A+	B	CW	"A"	(-)	INV
OUT	IN	P ⇨ P2	A+	A	CCW	"B"	(+)	NON-INV
IN	OUT	P ⇨ P1	A -	B	CCW	"A"	(+)	INV
IN	OUT	P ⇨ P1	A -	A	CW	"B"	(-)	NON-INV
For CCW Pump Rotation:								
OUT	IN	P ⇨ P2	A+	B	CCW	"A"	(+)	NON-INV
OUT	IN	P ⇨ P2	A+	A	CW	"B"	(-)	INV
IN	OUT	P ⇨ P1	A -	B	CW	"A"	(-)	NON-INV
	OUT	P ⇨ P1	A -	A	CCW	"B"	(+)	INV

These conditions are primary and are defined by pump rotation choice (cw/ccw):
SV choice (Abex polarity / industry standard); and feedback control assembly mounting side (A or B).
*To change direction for a given command polarity reverse both SV leads and feedback polarity switch after system is in phase.

These are defined by feedback device and servo amplifier characteristics. Denison standard wiring to potentiometer and S20-11985 Rev. F High-IQ driver.

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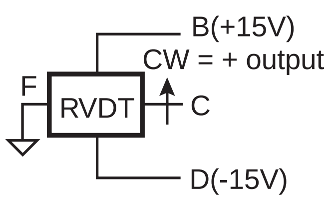
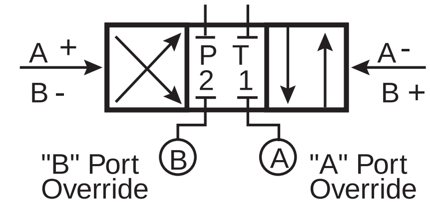
PHASE RELATIONSHIP TABLE 3:
High IQ Pump with Abex polarity servovalve, DC-RVDT assembly S23-03278 & S20-11958 Rev. F driver card



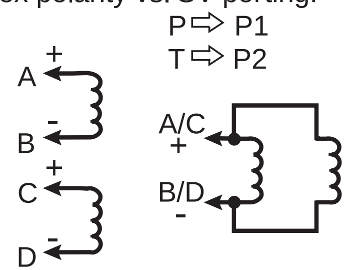
Denison standard wiring

Clockwise rotation of RVDT shaft = positive output signal.
(looking at mount-end of shaft)



Mechanically the Gold Cup pump construction is such that during increasing displacement whichever port is "out" the opposite port override tube is ported to servo pressure thru the servovalve. Physically, on standard High-IQ pumps, Port "A" OR-Tube is connected to Port 1 of SV. Port "B" OR-TUBE is connected to Port 2 of SV. Refer to specific installation drawing to verify correct SV Pump porting.

Abex polarity vs. SV porting:



NON-INV = Switch OPEN
INV = Switch CLOSED

Dual-Coil SV may be in series or parallel connection.

Therefore the following:

If Column 4 polarity = Column 7 polarity, then Column 8 is non-inverting

Column 1	Column 2	Column 3	Column 4	Column 5		Column 6	Column 7	Column 8
				input control				
(for) Port "A"	(and) Port "B"	(requires) SV Porting	(therefore) SV Coil Polarity (must be)	mounted on side	shaft rotation	Feedback device mounted on side	DC-RVDT Polarity (will be)	(hence) Polarity SW (must be)
For CW Pump Rotation:								
OUT	IN	P ⇨ P2	A-	B	CW	"A"	(+)	INV
OUT	IN	P ⇨ P2	A-	A	CCW	"B"	(-)	NON-INV
IN	OUT	P ⇨ P1	A +	B	CCW	"A"	(-)	INV
IN	OUT	P ⇨ P1	A +	A	CW	"B"	(+)	NON-INV
For CCW Pump Rotation:								
OUT	IN	P ⇨ P2	A-	B	CCW	"A"	(-)	NON-INV
OUT	IN	P ⇨ P2	A-	A	CW	"B"	(+)	INV
IN	OUT	P ⇨ P1	A +	B	CW	"A"	(+)	NON-INV
	OUT	P ⇨ P1	A +	A	CCW	"B"	(-)	INV

These conditions are primary and are defined by pump rotation choice (cw/ccw):
SV choice (Abex polarity / industry standard); and feedback control assembly mounting side (A or B).
*To change direction for a given command polarity reverse both SV leads and feedback polarity switch <u>after</u> system is in phase.

These are defined by feedback device and servo amplifier characteristics. DC-RVDT and S20-11985 Rev. F High-IQ driver.

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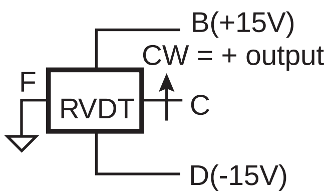
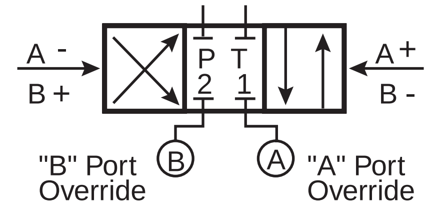
PHASE RELATIONSHIP TABLE 4:
High IQ Pump with Industry polarity servovalve, DC-RVDT assembly S23-03278 & S20-11958 Rev. F driver card



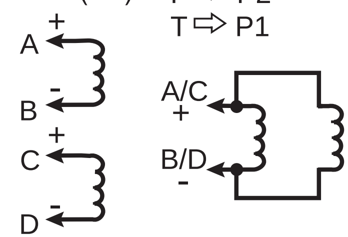
Denison standard wiring

Clockwise rotation of RVDT shaft = positive output signal.
(looking at mount-end of shaft)



Mechanically the Gold Cup pump construction is such that during increasing displacement whichever port is "out" the opposite port override tube is ported to servo pressure thru the servovalve. Physically, on standard High-IQ pumps, Port "A" OR-Tube is connected to Port 1 of SV. Port "B" OR-TUBE is connected to Port 2 of SV. Refer to specific installation drawing to verify correct SV Pump porting.

Industry polarity vs. SV porting:
Terminal (A+) = P ⇨ P2
T ⇨ P1



NON-INV = Switch OPEN
INV = Switch

Dual-Coil SV may be in series or parallel connection.

Therefore the following:

If Column 4 polarity = Column 7 polarity, then Column 8 is non-inverting

Column 1	Column 2	Column 3	Column 4	Column 5		Column 6	Column 7	Column 8
				input control				
(for) Port "A"	(and) Port "B"	(requires) SV Porting	(therefore) SV Coil Polarity (must be)	mounted on side	shaft rotation	Feedback device mounted on side	DC-RVDT Polarity (will be)	(hence) Polarity SW (must be)
For CW Pump Rotation:								
OUT	IN	P ⇨ P2	A+	B	CW	"A"	(+)	NON-INV
OUT	IN	P ⇨ P2	A+	A	CCW	"B"	(-)	INV
IN	OUT	P ⇨ P1	A -	B	CCW	"A"	(-)	NON-INV
IN	OUT	P ⇨ P1	A -	A	CW	"B"	(+)	INV
For CCW Pump Rotation:								
OUT	IN	P ⇨ P2	A+	B	CCW	"A"	(-)	INV
OUT	IN	P ⇨ P2	A+	A	CW	"B"	(+)	NON-INV
IN	OUT	P ⇨ P1	A -	B	CW	"A"	(+)	INV
IN	OUT	P ⇨ P1	A -	A	CCW	"B"	(-)	NON-INV
These conditions are primary and are defined by pump rotation choice (cw/ccw): SV choice (Abex polarity / industry standard); and feedback control assembly mounting side (A or B). *To change direction for a given command polarity reverse both SV leads and feedback polarity switch after system is in phase.							These are defined by feedback device and servo amplifier characteristics. DC-RVDT and S20-11985 Rev. F High-IQ driver.	

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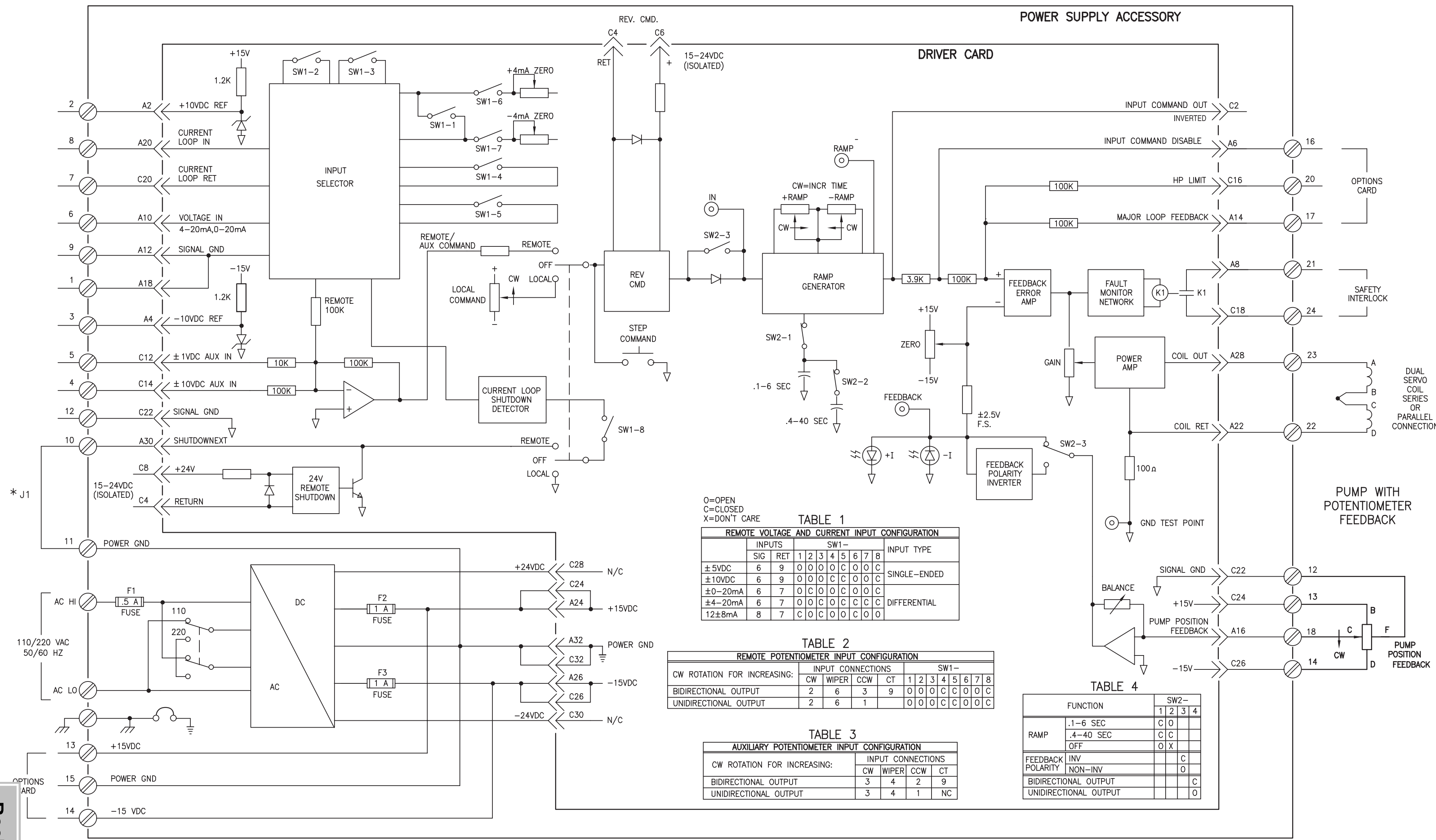

O=OPEN
C=CLOSED
X=DON'T CARE

TABLE 1

REMOTE VOLTAGE AND CURRENT INPUT CONFIGURATION											
	INPUTS		SW1-								INPUT TYPE
	SIG	RET	1	2	3	4	5	6	7	8	
±5VDC	6	9	O	O	O	O	C	O	O	C	SINGLE-ENDED
±10VDC	6	9	O	O	O	C	C	O	O	C	
±0-20mA	6	7	O	C	O	O	C	O	O	C	DIFFERENTIAL
±4-20mA	6	7	O	O	C	O	C	C	C	C	
12±8mA	8	7	C	O	C	O	O	C	O	O	

TABLE 2

REMOTE POTENTIOMETER INPUT CONFIGURATION												
CW ROTATION FOR INCREASING:	INPUT CONNECTIONS				SW1-							
	CW	WIPER	CCW	CT	1	2	3	4	5	6	7	8
BIDIRECTIONAL OUTPUT	2	6	3	9	O	O	O	C	C	O	O	C
UNIDIRECTIONAL OUTPUT	2	6	1		O	O	O	C	C	O	O	C

TABLE 3

AUXILIARY POTENTIOMETER INPUT CONFIGURATION				
CW ROTATION FOR INCREASING:	INPUT CONNECTIONS			
	CW	WIPER	CCW	CT
BIDIRECTIONAL OUTPUT	3	4	2	9
UNIDIRECTIONAL OUTPUT	3	4	1	NC

TABLE 4

FUNCTION		SW2-			
		1	2	3	4
RAMP	.1-6 SEC	C	O		
	.4-40 SEC	C	C		
	OFF	O	X		
FEEDBACK POLARITY	INV			C	
	NON-INV			O	
BIDIRECTIONAL OUTPUT					C
UNIDIRECTIONAL OUTPUT					O

*J1 MUST BE INSTALLED IF REMOTE SHUTDOWN FEATURE IS NOT USED

BLOCK DIAGRAM

HIGH IQ JUPITER DRIVER CARD S20-11958
WITH POWER SUPPLY ACCESSORY S20-11715
WITH PUMP POTENTIOMETER FEEDBACK

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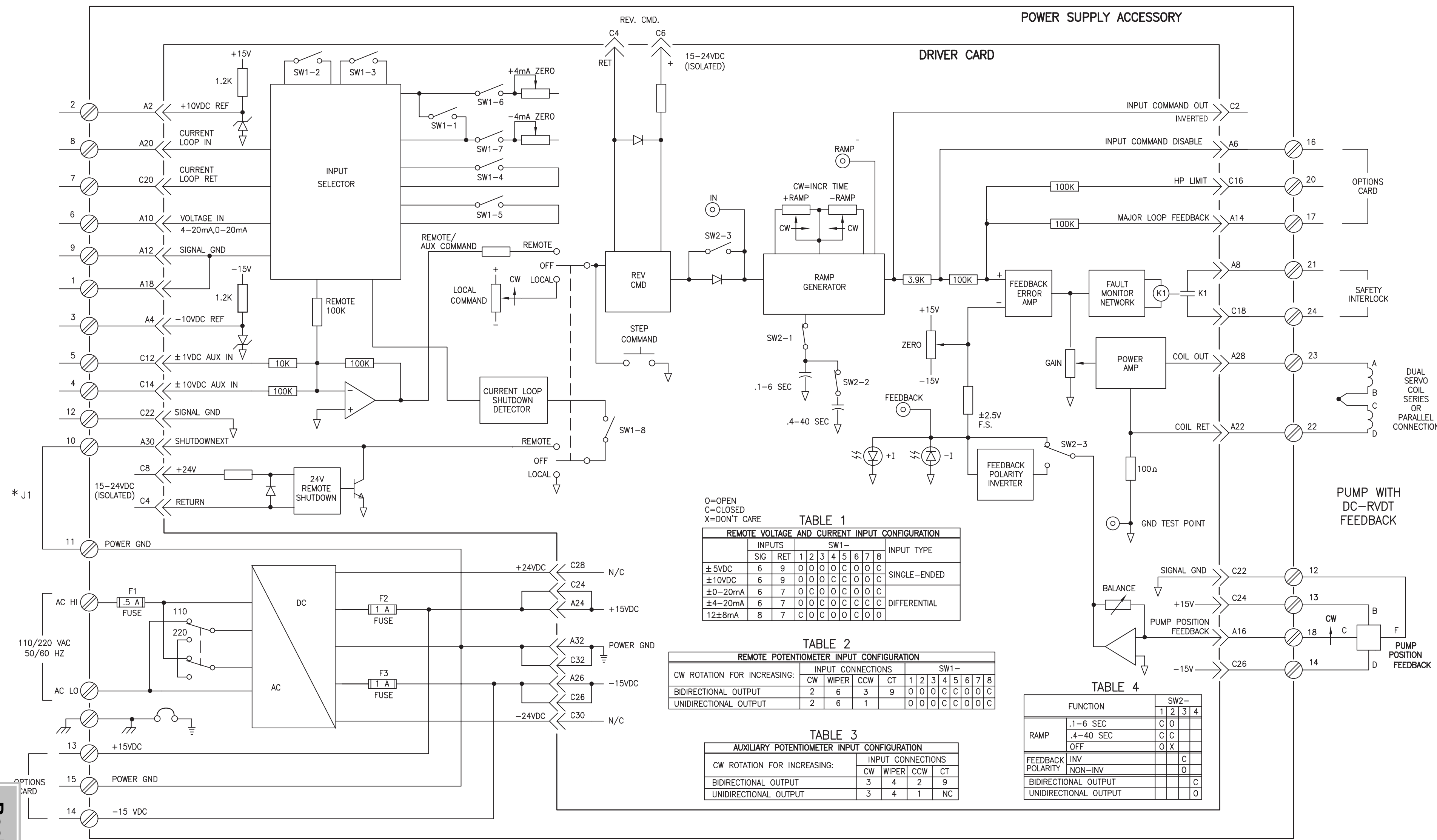

O=OPEN
C=CLOSED
X=DON'T CARE

TABLE 1

REMOTE VOLTAGE AND CURRENT INPUT CONFIGURATION											
	INPUTS		SW1–								INPUT TYPE
	SIG	RET	1	2	3	4	5	6	7	8	
±5VDC	6	9	O	O	O	O	C	O	O	C	SINGLE–ENDED
±10VDC	6	9	O	O	O	C	C	O	O	C	
±0–20mA	6	7	O	C	O	O	C	O	O	C	DIFFERENTIAL
±4–20mA	6	7	O	O	C	O	C	C	C	C	
12±8mA	8	7	C	O	C	O	O	C	O	O	

TABLE 2

REMOTE POTENTIOMETER INPUT CONFIGURATION												
CW ROTATION FOR INCREASING:	INPUT CONNECTIONS				SW1–							
	CW	WIPER	CCW	CT	1	2	3	4	5	6	7	8
BIDIRECTIONAL OUTPUT	2	6	3	9	O	O	O	C	C	O	O	C
UNIDIRECTIONAL OUTPUT	2	6	1		O	O	O	C	C	O	O	C

TABLE 3

AUXILIARY POTENTIOMETER INPUT CONFIGURATION				
CW ROTATION FOR INCREASING:	INPUT CONNECTIONS			
	CW	WIPER	CCW	CT
BIDIRECTIONAL OUTPUT	3	4	2	9
UNIDIRECTIONAL OUTPUT	3	4	1	NC

TABLE 4

FUNCTION		SW2–			
		1	2	3	4
RAMP	.1–6 SEC	C	O		
	.4–40 SEC	C	C		
	OFF	O	X		
FEEDBACK POLARITY	INV			C	
	NON–INV			O	
BIDIRECTIONAL OUTPUT					C
UNIDIRECTIONAL OUTPUT					O

*J1 MUST BE INSTALLED IF REMOTE SHUTDOWN FEATURE IS NOT USED

BLOCK DIAGRAM

HIGH IQ JUPITER DRIVER CARD S20–11958
WITH POWER SUPPLY ACCESSORY S20–11715
WITH PUMP DC RVDT FEEDBACK

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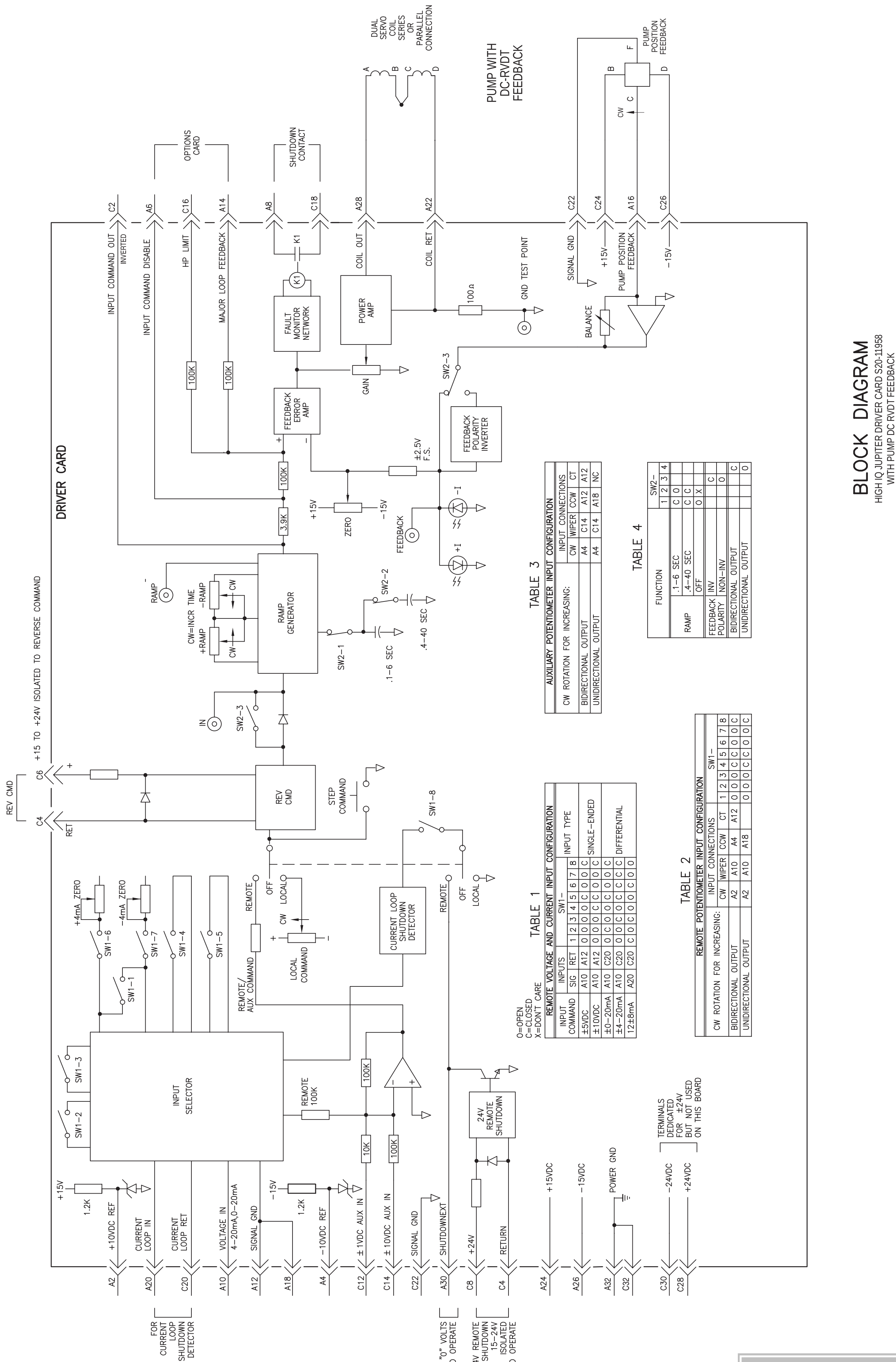

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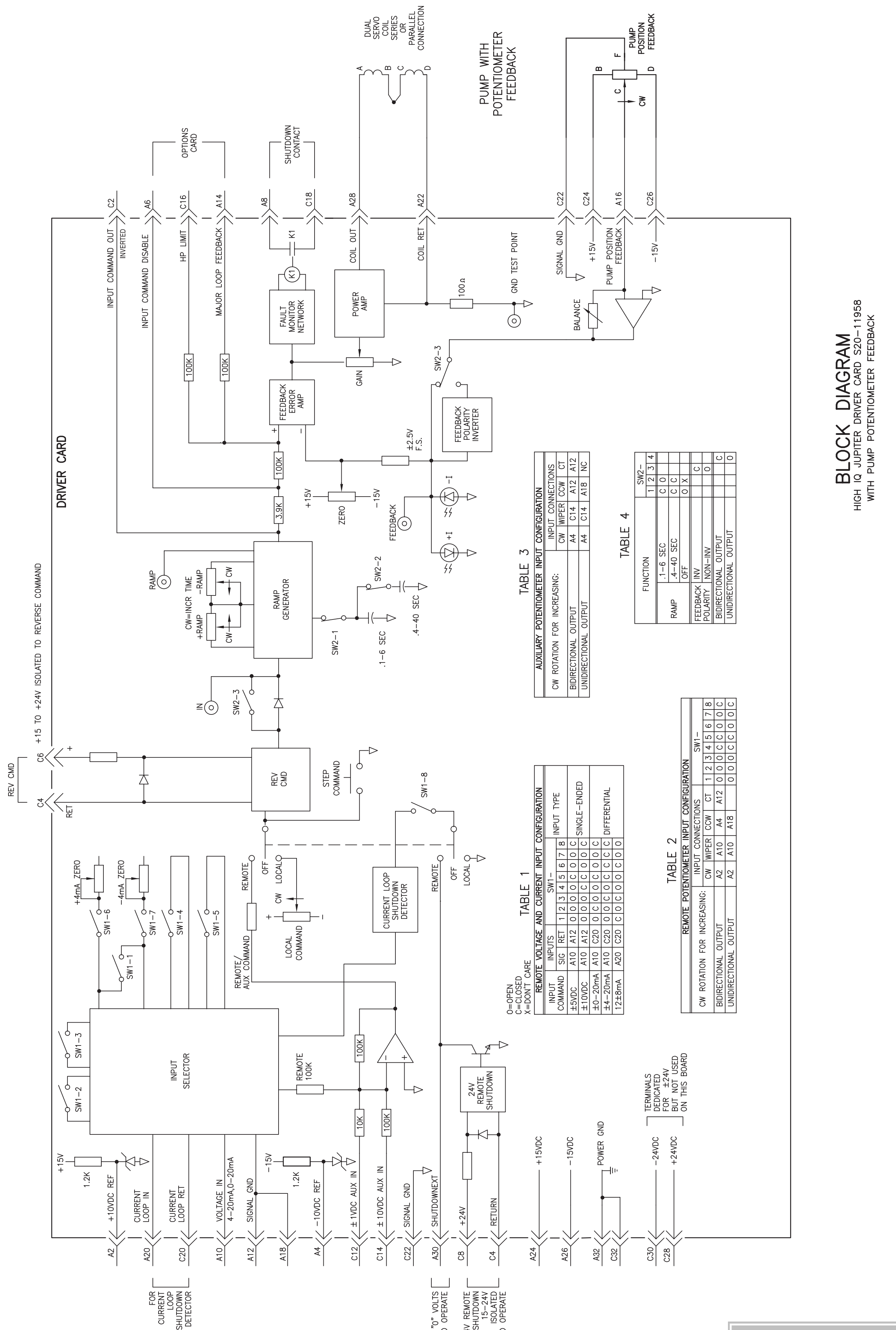

TABLE 1

REMOTE VOLTAGE AND CURRENT INPUT CONFIGURATION

INPUT COMMAND	INPUTS SIG	INPUTS RET	SW1- 1	2	3	4	5	6	7	8	INPUT TYPE
±5VDC	A10	A12	O	O	O	O	C	O	O	C	SINGLE-ENDED
±10VDC	A10	A12	O	O	O	C	C	O	O	C	
±0-20mA	A10	C20	O	C	O	O	C	O	O	C	DIFFERENTIAL
±4-20mA	A10	C20	O	O	C	O	C	C	C	C	
12±8mA	A20	C20	C	O	C	O	O	C	O	O	

TABLE 2

REMOTE POTENTIOMETER INPUT CONFIGURATION

CW ROTATION FOR INCREASING:	INPUT CONNECTIONS CW	WIPER	CCW	CT	SW1- 1	2	3	4	5	6	7	8
BIDIRECTIONAL OUTPUT	A2	A10	A4	A12	O	O	O	C	C	O	O	C
UNIDIRECTIONAL OUTPUT	A2	A10	A18		O	O	O	C	C	O	O	C

TABLE 3

AUXILIARY POTENTIOMETER INPUT CONFIGURATION

CW ROTATION FOR INCREASING:	INPUT CONNECTIONS CW	WIPER	CCW	CT
BIDIRECTIONAL OUTPUT	A4	C14	A12	A12
UNIDIRECTIONAL OUTPUT	A4	C14	A18	NC

TABLE 4

FUNCTION		SW2- 1	2	3	4
RAMP	.1-6 SEC	C	O		
	.4-40 SEC	C	C		
	OFF	O	X		
FEEDBACK POLARITY	INV			C	
	NON-INV			O	
BIDIRECTIONAL OUTPUT					C
UNIDIRECTIONAL OUTPUT					O

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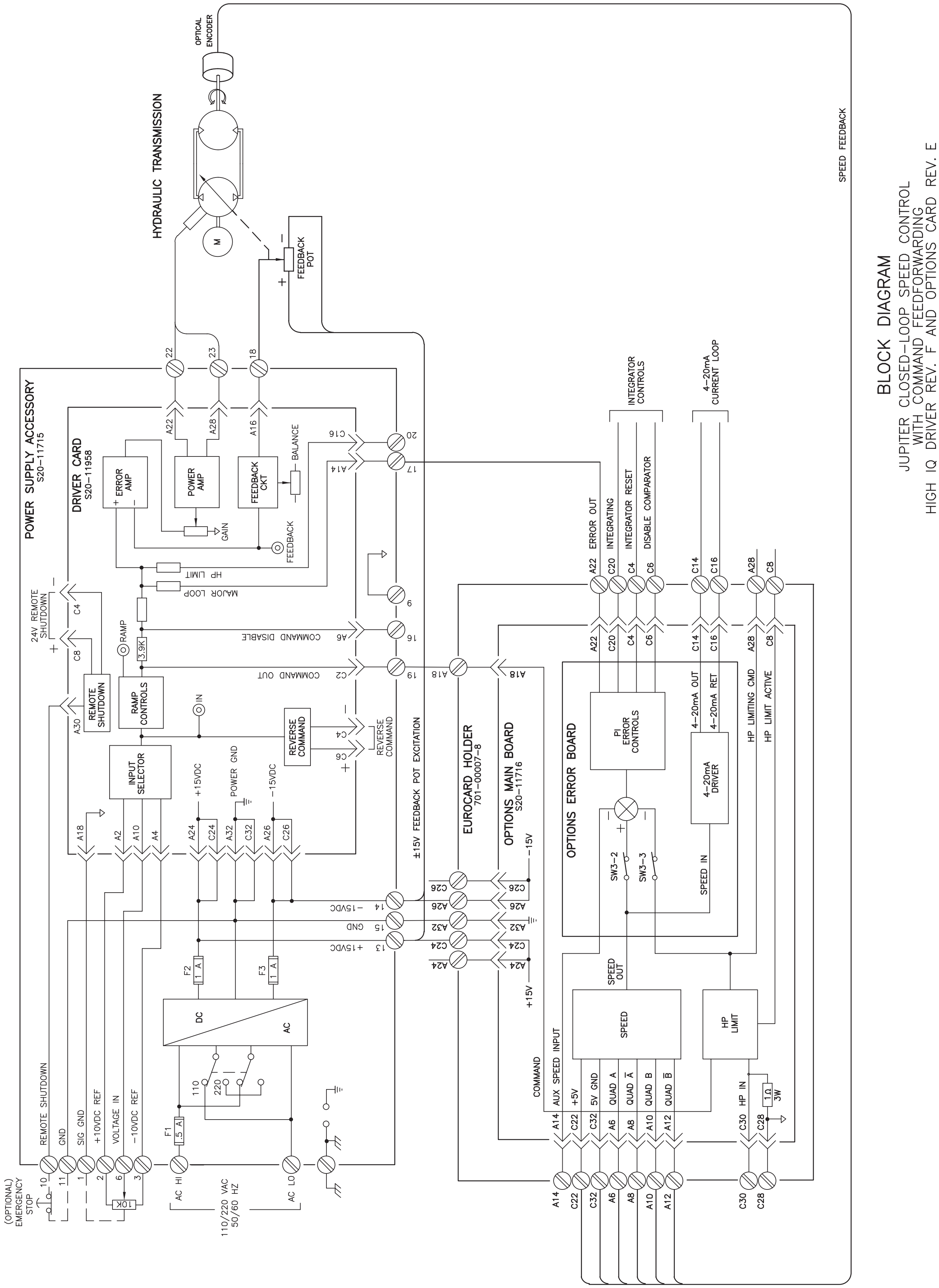

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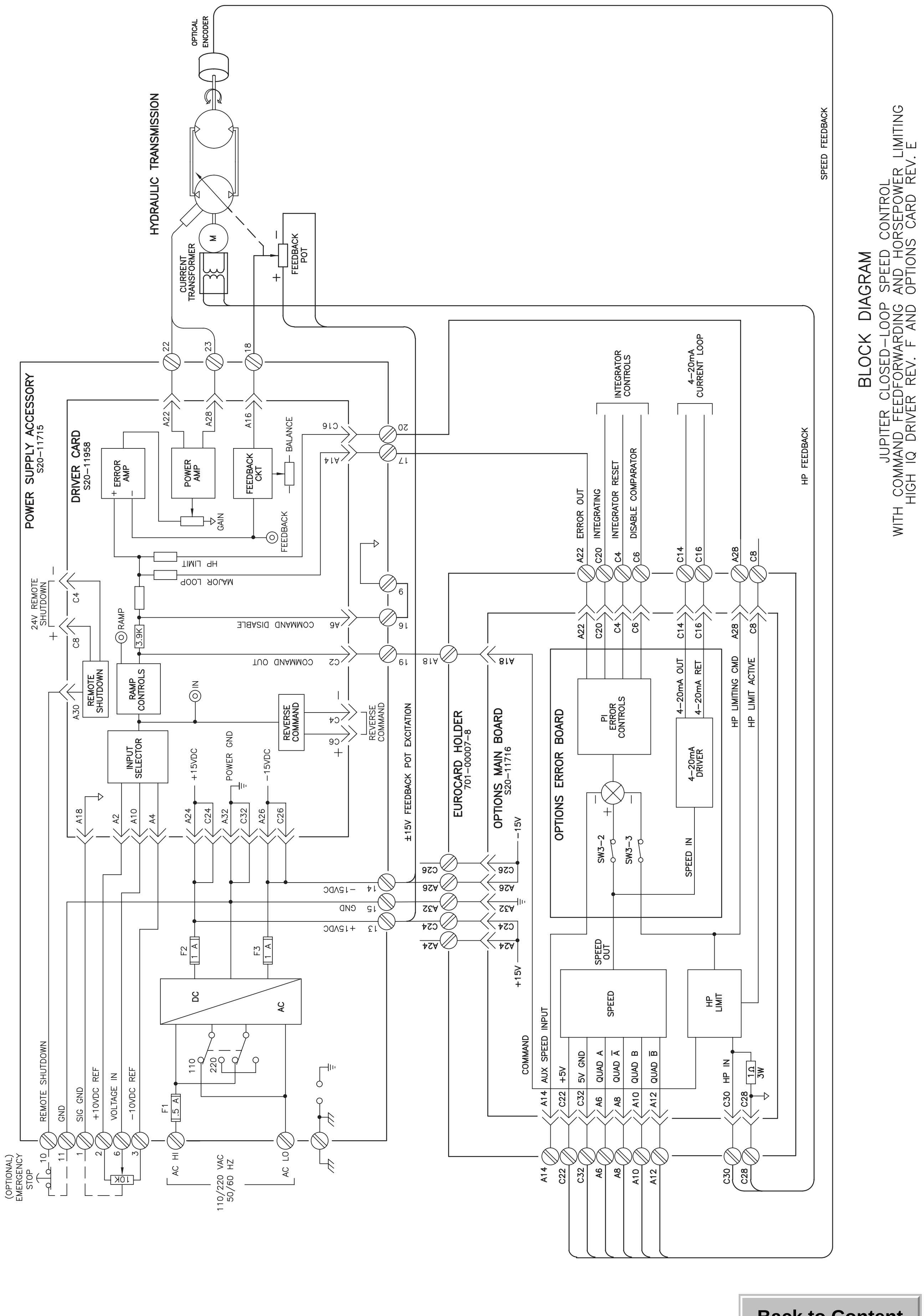

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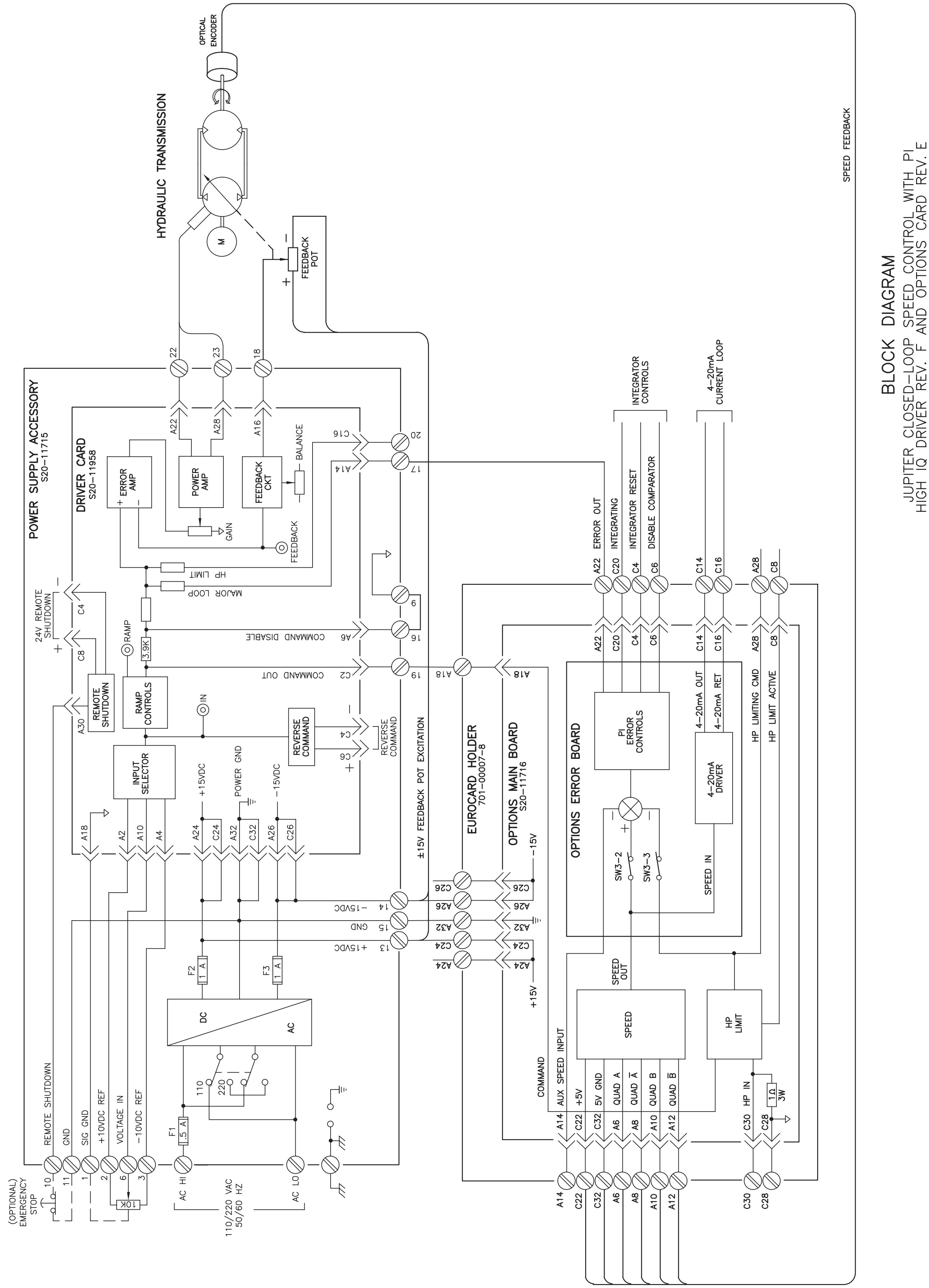

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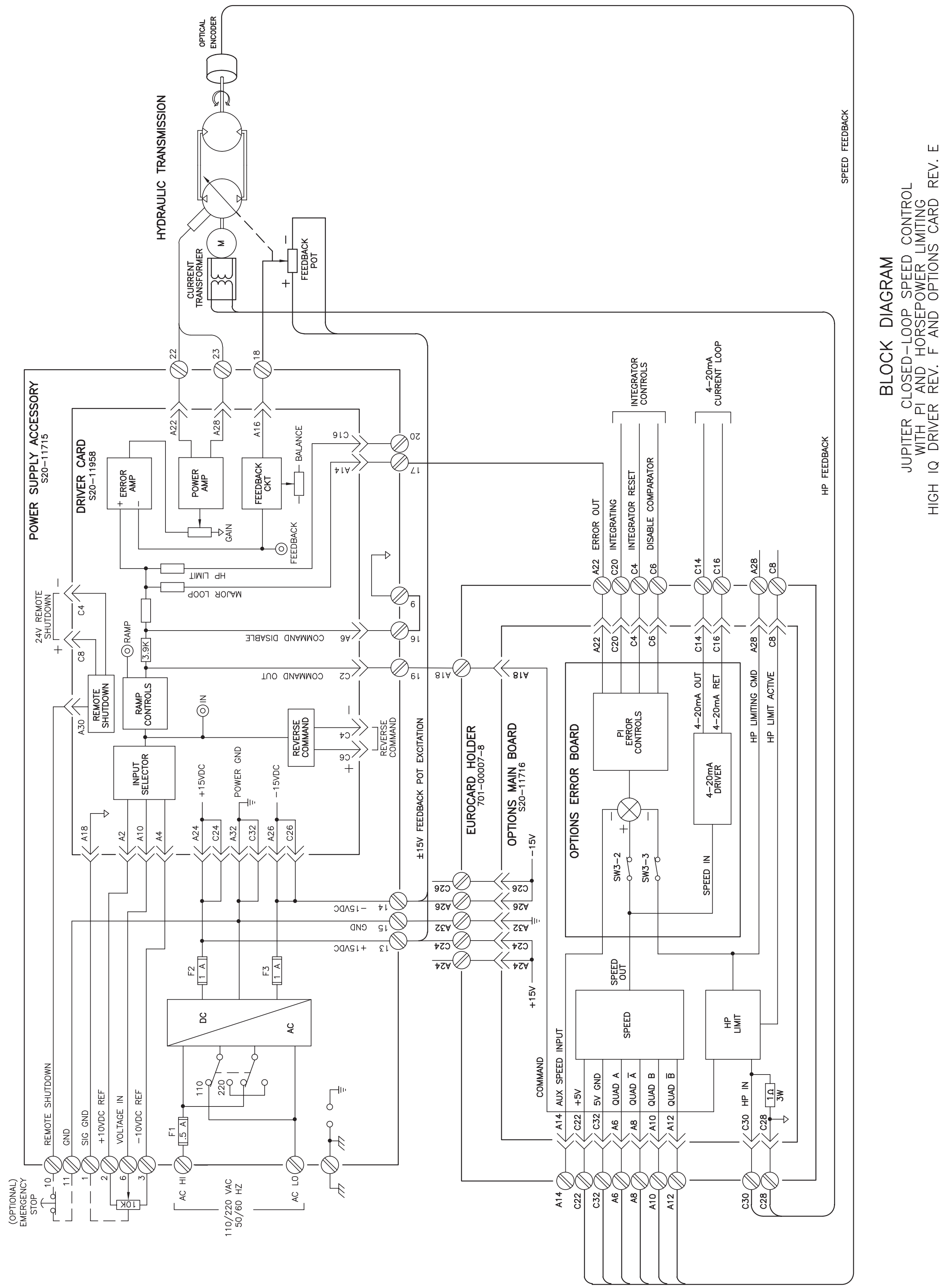

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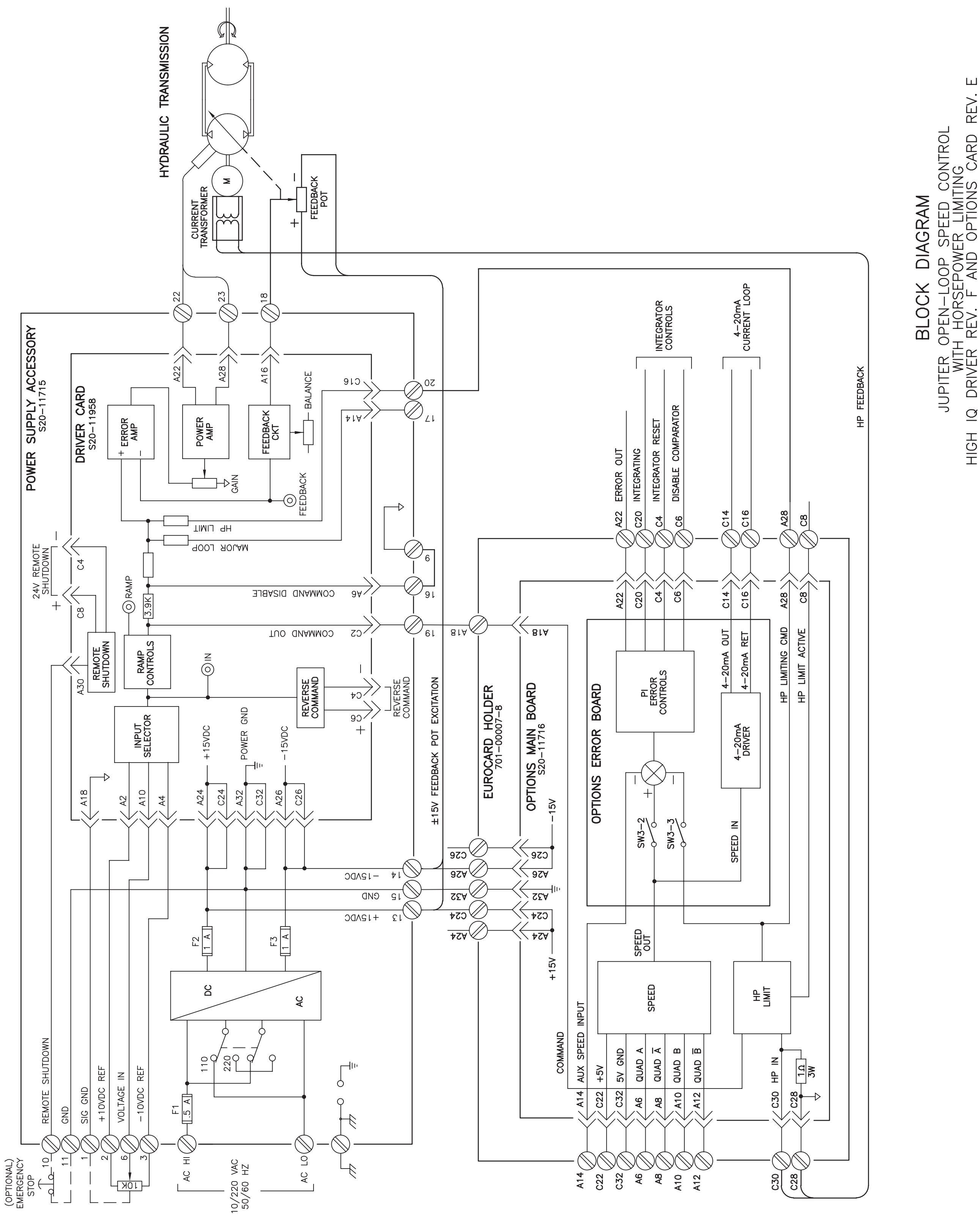

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