CTLR2/S2-S6 & CTLR2P/S2-S6
SOLENOID CONTROLLERS

INSTRUCTION MANUAL

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Scanivalve Corp.

DECLARATION OF CONFORMITY

Manufacturer's Name:	Scanivalve Corporation
Manufacturer's Address	1722 North Madson Street Liberty Lake, Washington 99019 U.S.A.
Product Name:	Solenoid Controller
Model Number:	CTLR2/S2-S6 and CTLR2P/S2-S6

In compliance with the EMC Directive 89/336/EEC:

Electromagnetic Emissions:	E55022, Class A
Electromagnetic Immunity:	EN61000-4-2: ESD, SkV Air Discharge, 4KV contact ENV50140: Radiated RF Fields 3V/m ENV50141: Conducted RF, 3V Open Circuit EN61000-4-4: Fast Transients, 1kV
Safety Requirements:	EN61010-1 1883

Signed at:	Liberty Lake, Washington, USA
On:	November 24, 1997

Addison Pemberton, President

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FIGURES and ILLUSTRATION

INTRODUCTION

The Solenoid Controller (Scanivalve Part Number CTLR 2/S2-S6) is designed to control the step and home function of solenoid driven Scanivalves.

The unit is designed to provide two levels of power to the solenoid, affording the user the ability to extend the life if the solenoid or drive solenoids with a greater load.

The maximum stepping rates will vary with the solenoid size and load imposed by the driven units.

The outer dimensions of the unit are 4.5"high X 6.5" wide X 10" long. (11.4cm X 16.5cm X 25.4cm)

The unit contains an isolated power supply, solenoid circuit, homing circuit, home indicator, indicator relay, local manual control and remote manual or automatic control.

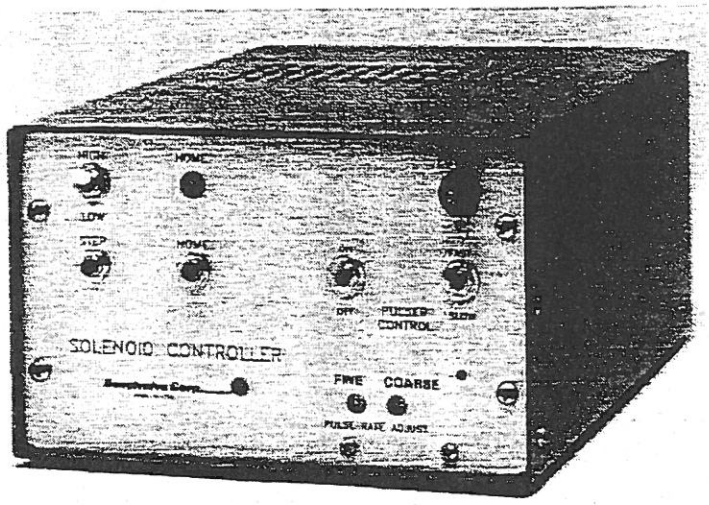


Figure 1 - CTLR2/S2-S6 Front View

GENERAL SPECIFICATIONS

Power requirements: 50-400Hz, single phase
110-120 vac or 220-240 vac, user optionable.
150VA

Note: The fuse carrier for the primary power is incorporated in the power entry module which provides primary input and switching. Both power line conductors are switched and fused, therefore it is necessary to that two (2) fuses, of the type and rating shown beneath the module are installed in the fuse carrier.

When changing the voltage range or replacing fuses, install the fuse carrier so that the desired voltage range appears upright and the arrow point for the range is opposite the indexing arrow point.

Commands: Remote Contact Closures, transistor (PNP) switches(see schematic diagram 150110-91, or manually push buttons S3 and S4 for "Step" and "Home".

Command Contact Protection: None required.

Command Input:		
	Command	5 milliseconds minimum
	Recovery	5 milliseconds minimum

WIRING INSTALLATION

A twelve circuit jack (J2) is provided on the rear panel of the controller for all signal, drive and remote operation connections. (A mating plug is provided). Refer to drawing numbers 8472, 8474, 81584 and 150110-91 for wiring details and configurations.

There are normally five connections between the controller and Scanivalve solenoid drive. If the homing section is not needed four connections are required and if the double step feature is used, six connections are required.

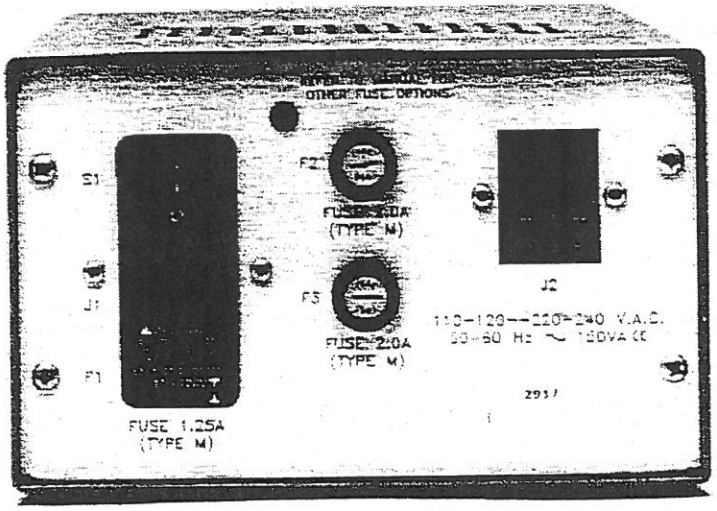


Figure 2 - CTLR2-S2-S6 Rear View

CONTROLS

Power On/Off

The controller is activated by moving the rocker switch to the "I" position. The switch is located on the rear panel. (Upper right viewed from the front)

Solenoid Power

Switch S2 provides high and low voltage output pulses to the solenoid. The high power setting should be used only where the load is great and the step is erratic or excessively slow.

COMMAND INPUTS

Two basic commands are readily available.

Step Command

The Step command allows the user to advance the solenoid drive one step at a time by depressing the step switch on the front panel of the controller, or by closing a remote switch connected between pins five (5) and eight (8) of connector P2 (Jones Plug). This command will pulse the solenoid once, causing the Scanivalve to to advance one port. The system will not allow the solenoid to advance further until the step switch is released and closed again.

Home Command

"Home" command allows the user to return the valve to the home position from any point of rotation except home. This function requires the closing of the home switch on the front panel or the closing of a switch connected between pins five (5) and nine (9) of connector P2. This function latches relay K2 which will hold the command until the drive switch system returns to the home position. The home function is disabled at the home position.

THEORY OF OPERATION

Basic Drive Circuit

The solenoid control circuit shown in the upper right hand corner of the schematic is driven by the power switch circuit consisting of transistors Q3 and Q4. The power switch circuit is, in turn, driven by the step logic switch Q2.

All transistors used in this device are always fully on or fully off.

With the power switch circuit on, the solenoid armature is energized with a voltage varying between 28 and 36 vdc causing the solenoid to rotate. Near the end of the solenoid rotation, the interrupter switch operates, thus interrupting current flow through transistor Q2. The interrupter switch is normally closed and opens during the final twenty percent of rotation and through the flyback during which Q2 is cutoff.

Step Cycle

The Step cycle is initiated by closing the step switch, S3.

Condition one:	The power switch circuit is turned on, Q3 and Q4 are forward biased.
Condition two:	The solenoid reaches the final twenty percent of rotation and the interrupter contact opens. Transistors Q3 & Q4 are reverse biased thus the power switch circuit is turned off.
Condition three:	The solenoid returns to the rest position. The interrupter contacts are closed and Q3 & Q4 are biased off.

Home Cycle

The Home cycle is initiated by closing the home switch, S4.

The closing of the Home switch (S4) closes relay K2 which latches supplying drive power to the control wafer switch. The contacts on the control wafer, except the home position, are interconnected. CR11 is forward biased which causes a voltage drop across R4 which forward biases Q2. The increased current flow through Q2 overrides the normal bias off condition of the power switch circuit setting Q3 & Q4.

This allows the circuit to reset as in the step function. However, in this case, Q2 remains in the set condition and when the interrupter contact closes, Q3 & Q4 are again forward biased and another step cycle is activated. This iteration will continue until an open contact is reached in the control wafer, which is, by design, home.

Home Indicator

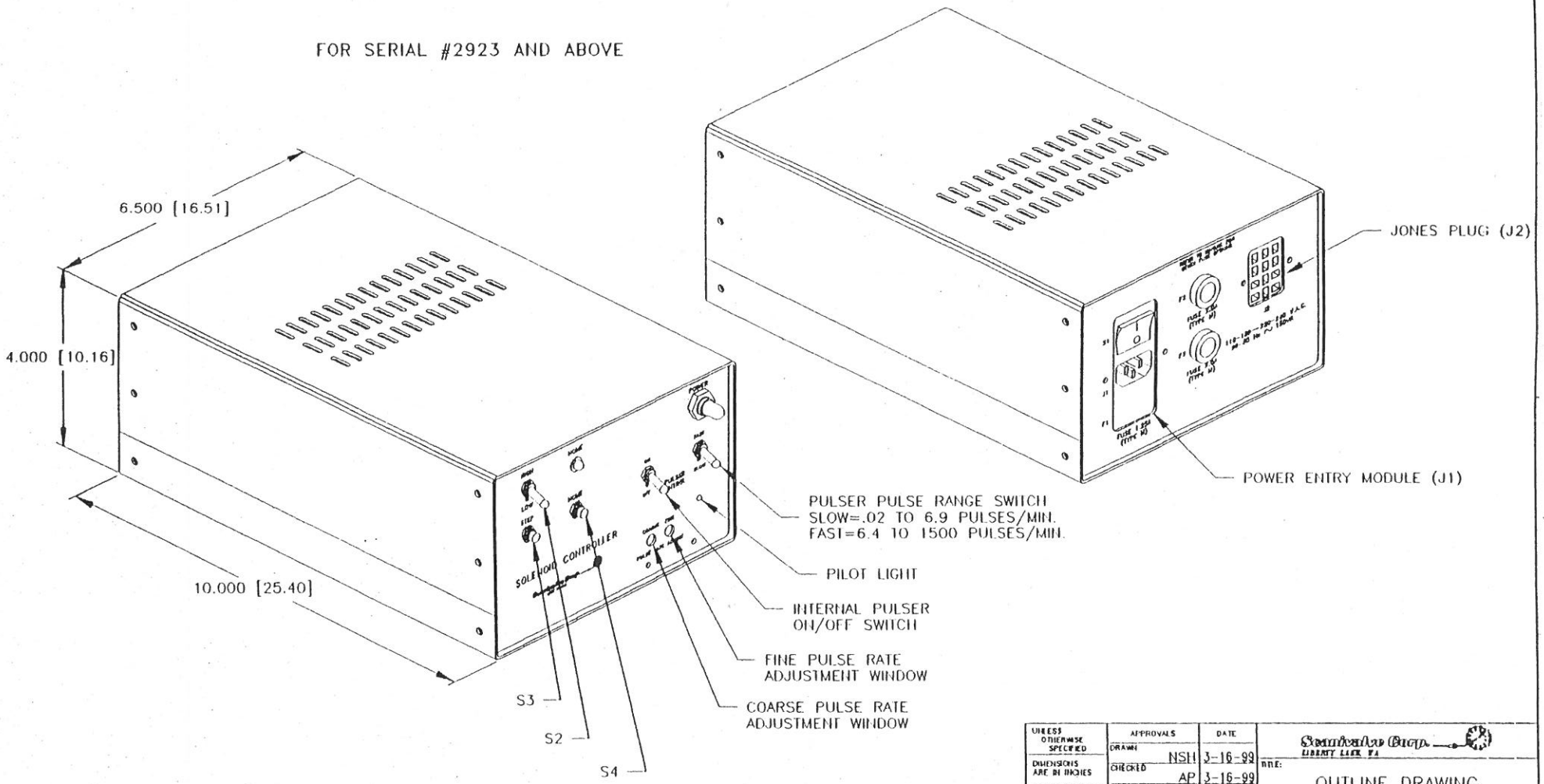
When the home position is reached, the circuit through CR7 is opened and the current through R2 forward biases Q1. This operates K1 which provides isolated contact closure for remote indication of the home condition. When double step control is used, CR6 clamps the base of Q1. This prevents the operation of relay K1 until the home position is reached.

8972

REVISIONS				
ZONE	REV	DESCRIPTION	BY AND DATE	CHECK

NOTES:
1. DIMENSIONS IN INCHES [CM].

FOR SERIAL #2923 AND ABOVE



UNLESS OTHERWISE SPECIFIED	APPROVALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN NSH	3-16-99
TOLERANCES ON:	CHECKED AP	3-16-99
DECIMALS XX = ± .010 .XXX = ± .005	ENGINEERING AP	3-16-99
DO NOT SCALE DRAWING	QUALITY	
DIM AND TOL PER ANSI Y14.5M	RELEASE	

Semtronics Corp.
LIBERTY LAKE, WA

TITLE:
OUTLINE DRAWING
CTLR2/S2-S6 & CTLR2P/S2-S6

SIZE	CAGE CODE	DWG NO.	REV
B		8972	
SCALE NONE		SHEET 2	

NOTES: UNLESS OTHERWISE SPECIFIED

1. CAUTION: INSUFFICIENT WIRE SIZE USED BETWEEN CONTROLLER AND SOLENOID WILL REDUCE TORQUE.
2. THE FOLLOWING FORMULA OR TABLE 1 SHOULD BE USED TO PREVENT TORQUE LOSSES.

$$D = \frac{10\% \; Rs \; C}{2}$$

D = DISTANCE BETWEEN SOLENOID AND CONTROLLER (ft.)

Rs = SOLENOID RESISTANCE (Ω)

C = WIRE CONDUCTANCE (ft/Ω)

SCANIVALVE® CORP.				
INSTRUCTIONS FOR WIRE SELECTION CTLR2(P)/S2-S6 AND CTLR10P/S2-S6				
DRWN BY RCF	DATE MAY 88	DESIGN BY KP	85057	SHT. 1 of 1

SOLENOID SIZE →		DISTANCE BETWEEN CONTROLLER AND SOLENOID FOR 10% DROP IN TORQUE				
WIRE GAGE	FT/Ω	S2 11.03Ω	S3 12.21Ω	S4 8.76Ω	S5 7.72Ω	S6 5.24Ω
30	9.7	5 ft.	6 ft.	4 ft.	4 ft.	2 ft.
26	24.5	13	15	11	10	6
22	62	34	38	27	24	16
20	98.5	54	60	43	38	25
18	156.5	86	95	68	60	41
16	249	137	152	108	96	65
14	397	218	242	173	152	103
12	629	384	374	272	242	164
10	1000	550	610	435	385	260
8	1592	876	971	692	613	414

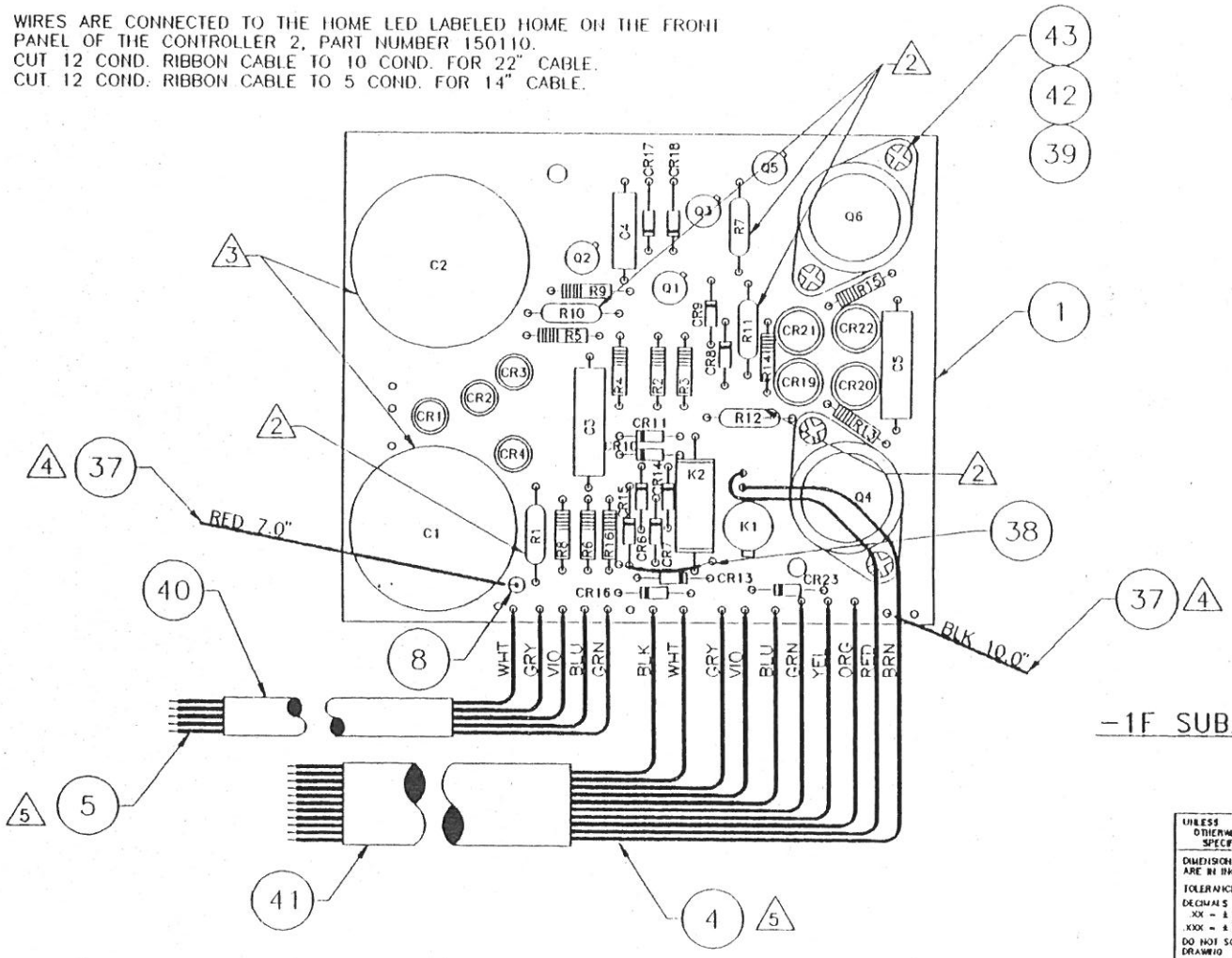
TABLE 1

150111 -1

NOTES:

1. LABEL BOARD WITH DASH NUMBER, REV LEVEL, AND SERIAL NUMBER.
2. MOUNT RESISTORS R1, R7, R10, R11 & R12 .250" OFF BOARD.
3. INSTALL C1, C2 Q4, Q6 & HARDWARE AFTER DISHWASHER.
4. WIRES ARE CONNECTED TO THE HOME LED LABELED HOME ON THE FRONT PANEL OF THE CONTROLLER 2, PART NUMBER 150110.
5. CUT 12 COND. RIBBON CABLE TO 10 COND. FOR 22" CABLE.
   CUT 12 COND. RIBBON CABLE TO 5 COND. FOR 14" CABLE.

REVISIONS				
ZONE	REV	DESCRIPTION	BY AND DATE	CHECK
	R	ECNC-016/CHG NOTE 3	MZ 7-30-97	MZ
	S	ECN C-152	NG 10-1-97	



-1F SUBASSY, SOLENOID CONTROLLER BOARD

SEE SEPARATE PARTS LIST

UNLESS OTHERWISE SPECIFIED	APPROVALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN MSZ	7-3-97
TOLERANCES ON:	CHECKED MSZ	7-31-97
DECIMALS .XX ± .010 .XXX ± .005	ENGINEERING	
DO NOT SCALE DRAWING	QUALITY	
DIM AND TOL PER ANSI Y14.5M	RELEASE	

Sensidyne Corp. LARGO, FLA

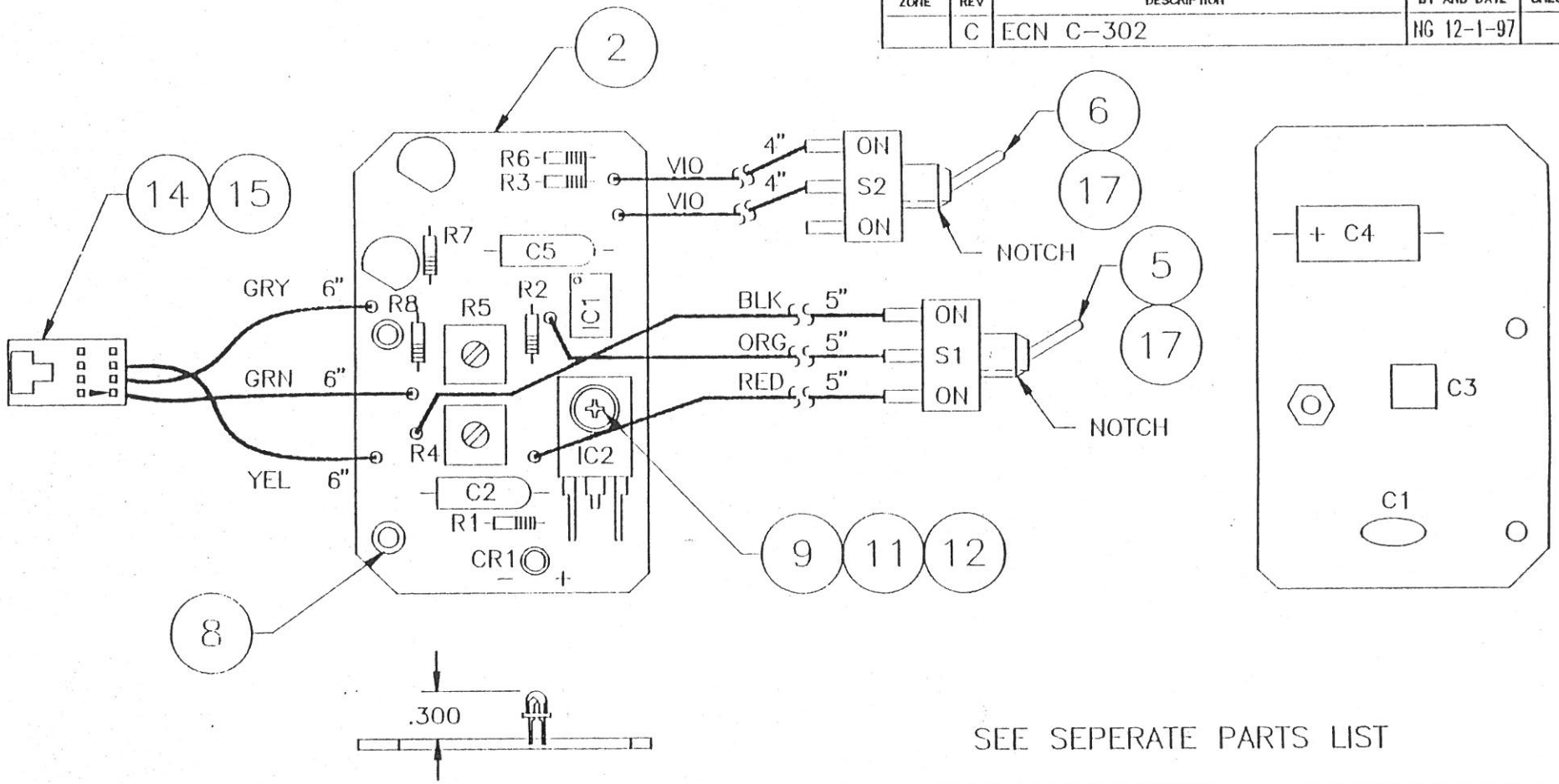
TITLE: SUBASSY, SOLENOID CONTROLLER BOARD

SIZE	CAGE CODE	DWG NO.	REV
B		150111	S

SCALE NTS SHEET 1

140400 -2

REVISIONS				
ZONE	REV	DESCRIPTION	BY AND DATE	CHECK
	C	ECN C-302	NG 12-1-97	



SEE SEPERATE PARTS LIST

-2 SA INTERNAL PULSER CIRCUIT BD

UNLESS OTHERWISE SPECIFIED	APPROVALS		DATE
DIMENSIONS ARE IN INCHES	DRAWN	NSG	11-21-97
TOLERANCES ON:	CHECKED	NSG	11-21-97
DECIMALS .XX = ±.015 .XXX = ±.005	ENGINEERING		
DO NOT SCALE DRAWING	QUALITY		
DIM AND TOL PER ANSI Y14.5M	RELEASE		

Semitron Corp. LIBERTY LAKE, WA

TITLE: SA INTERNAL PULSER CIRCUIT BOARD

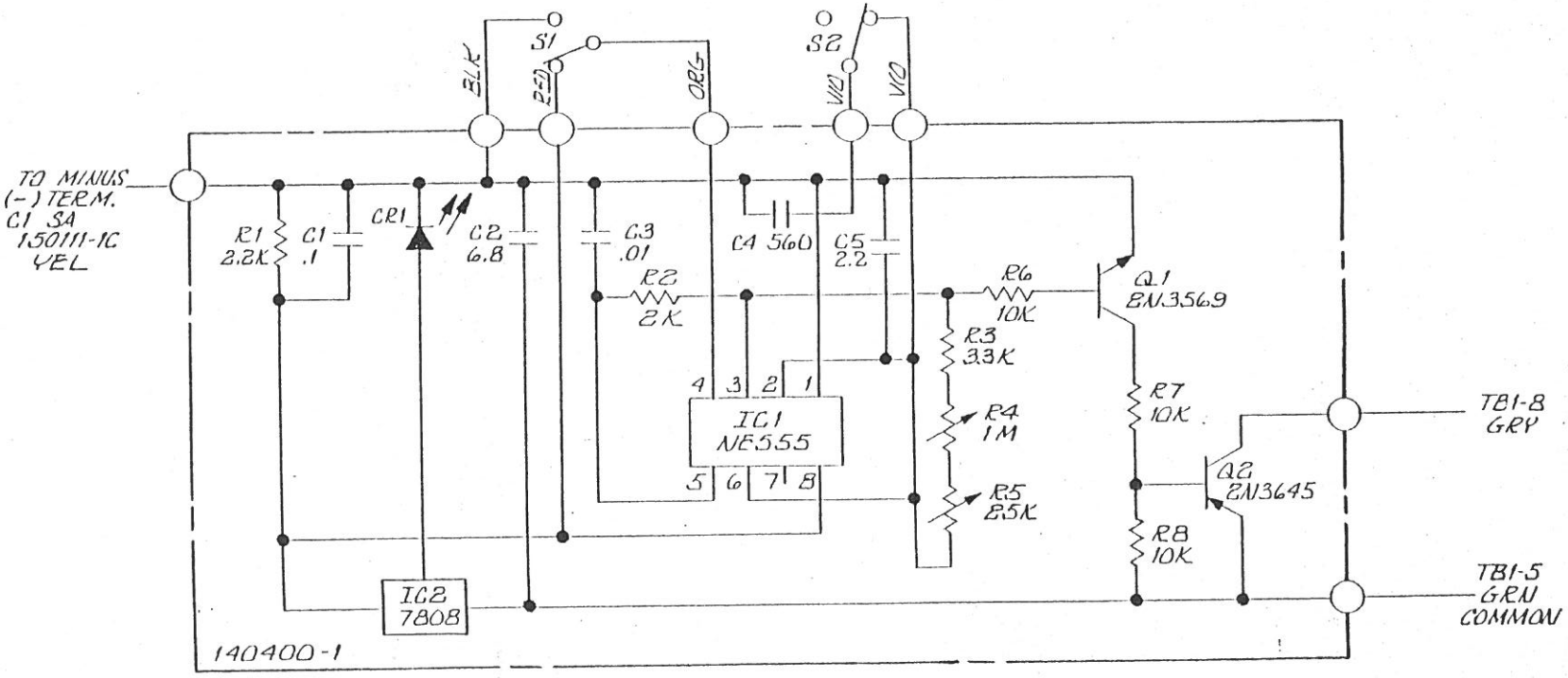
SIZE	CAGE CODE	DWG NO.	REV
A		140400	C
SCALE NONE		SHEET 1 OF 4	

SCANIVALVE® CORP.

SA INTERNAL PULSER CIRCUIT BD.

DWN BY JRA | DATE JUN/76 | CKD BY | 140400 SHT. 4 of

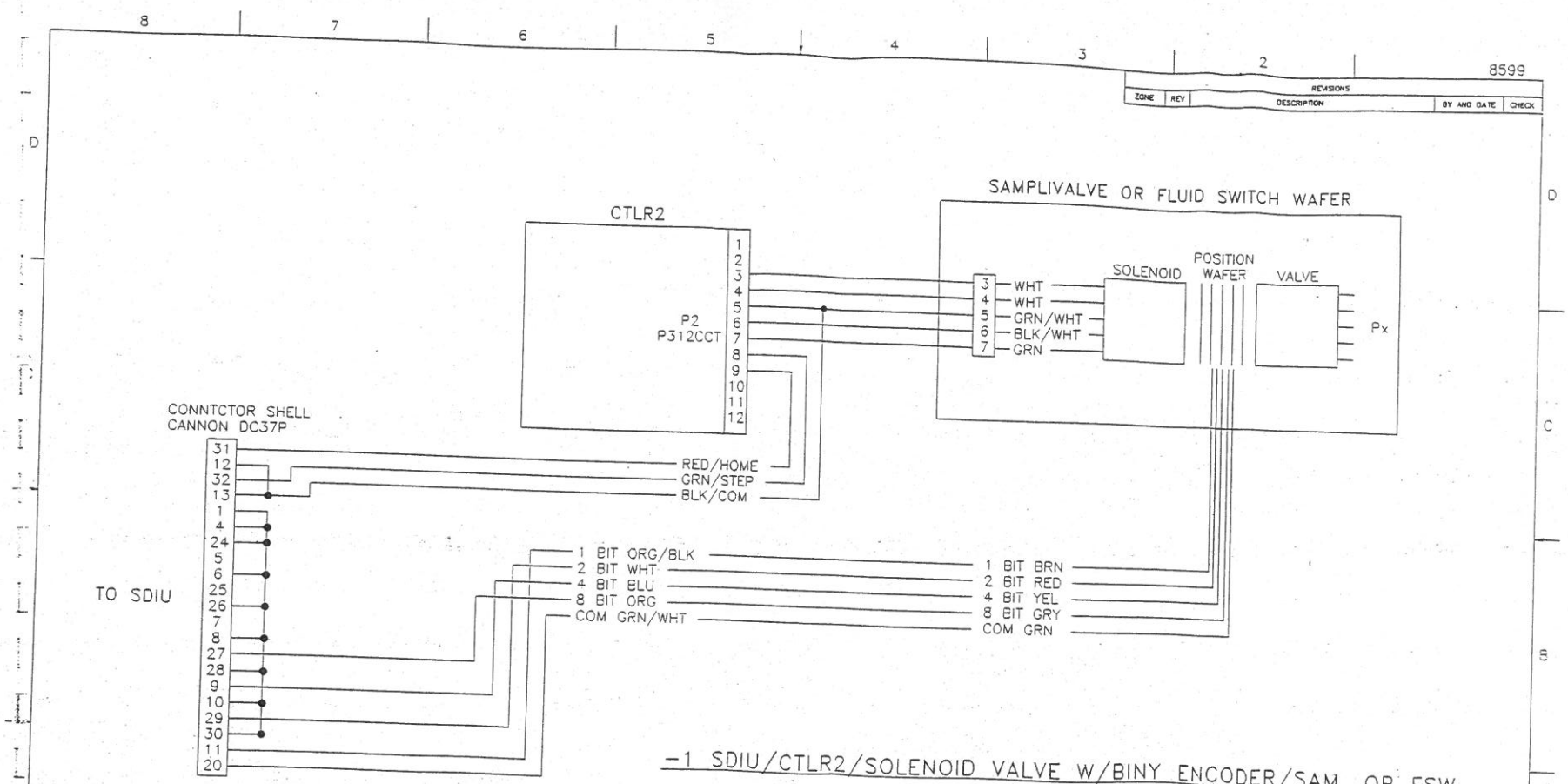
NOTES: UNLESS OTHERWISE SPECIFIED
1. FOR STD. ELECTRONIC NOTES USE DWG. NO. 0014, OTHER NOTES ARE THE EXCEPTIONS.



-90 SCHEM. DIAG. INTERNAL PULSER CIRCUIT BD.

8599

ZONE	REV	REVISIONS DESCRIPTION	BY AND DATE	CHECK



-1 SDIU/CTLR2/SOLENOID VALVE W/BINY ENCODER/SAM. OR FSW

UNLESS OTHERWISE SPECIFIED	APPROVALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN NSH	3-29-99
TOLERANCES ON: DECIMALS .XX = ±.015 .XXX = ±.005	CHECKED AP	3-29-99
DO NOT SCALE DRAWING	ENGINEERING AP	3-29-99
DIM AND TOL PER ANSI Y14.5M	QUALITY	
	RELEASE	

Semitelic Corp. LIBERTY LAKE WA

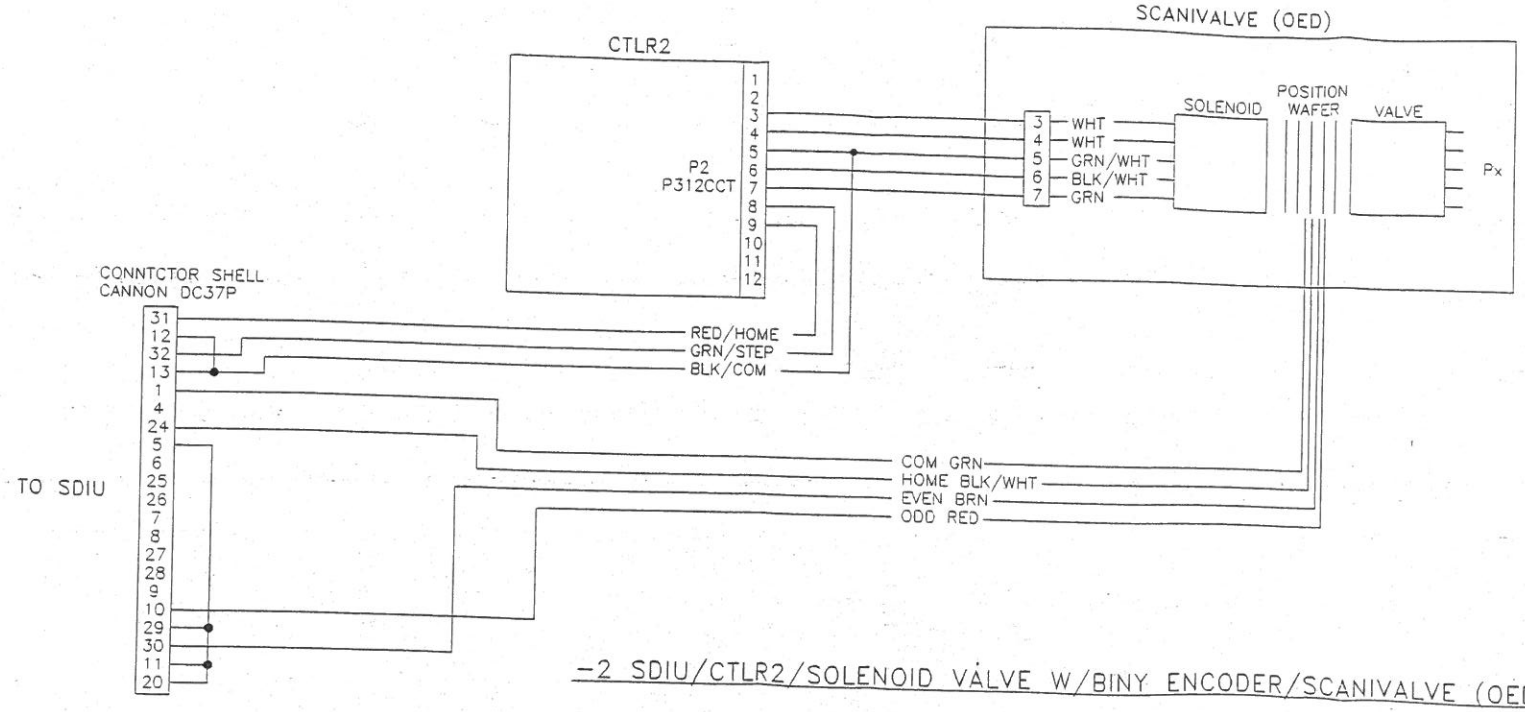
TITLE: SDIU/CTLR2/SOLENOID VALVE W/BINY ENCODER/SAM. OR FSW

SIZE	CAGE CODE	DWG NO.	REV
B		8599	

SCALE NONE SHEET 1 OF 1

8599 -2

ZONE	REV	REVISIONS DESCRIPTION	BY AND DATE	CHECK



-2 SDIU/CTLR2/SOLENOID VALVE W/BINY ENCODER/SCANIVALVE (OED)

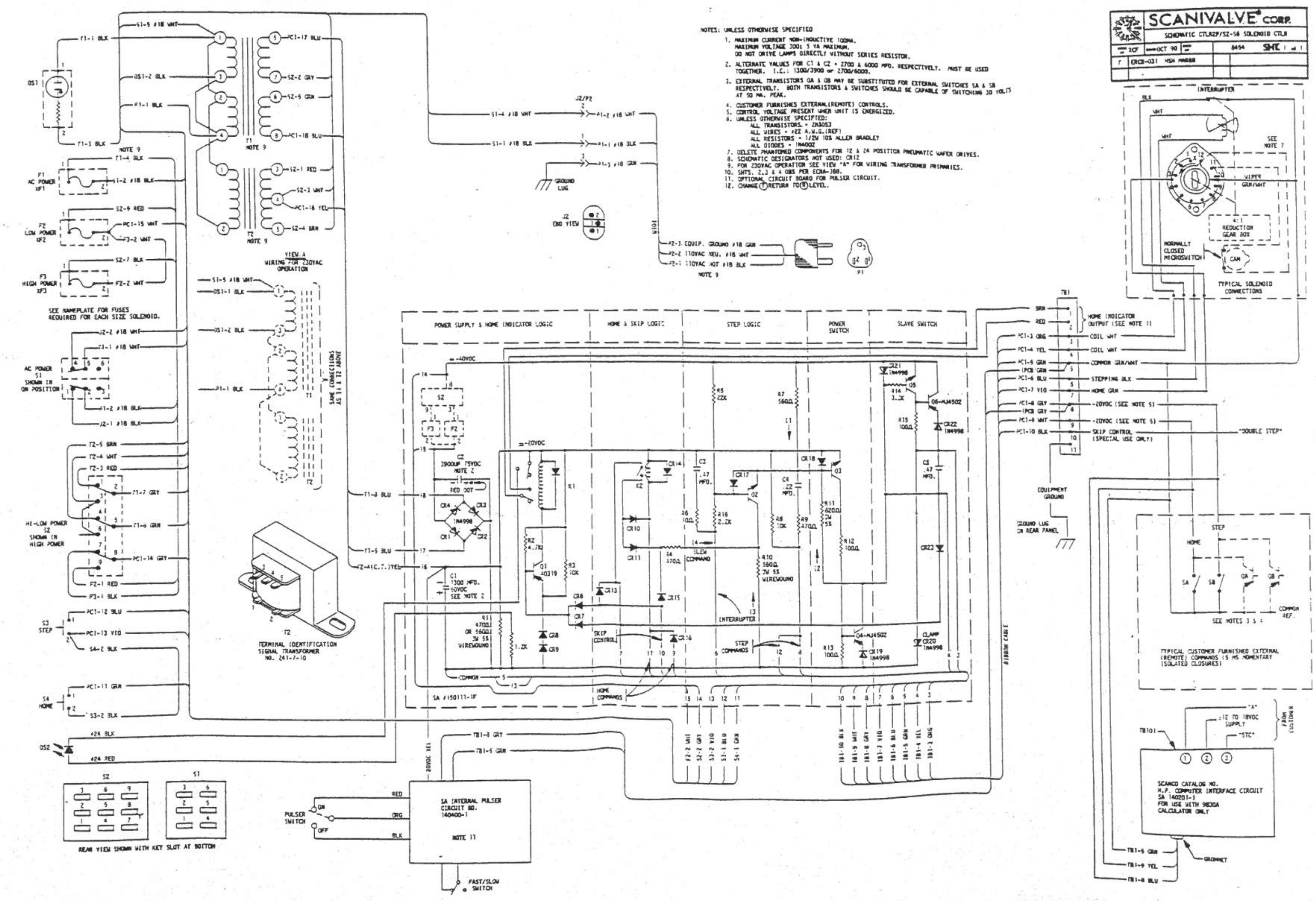
UNLESS OTHERWISE SPECIFIED	APPROVALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN NSH	3-29-99
TOLERANCES ON: DECIMALS .XX = ±.015 .XXX = ±.005	CHECKED AP	3-29-99
DO NOT SCALE DRAWING	ENGINEERING AP	3-29-99
DIM AND TOL PER ANSI Y14.5M	QUALITY	
	RELEASE	

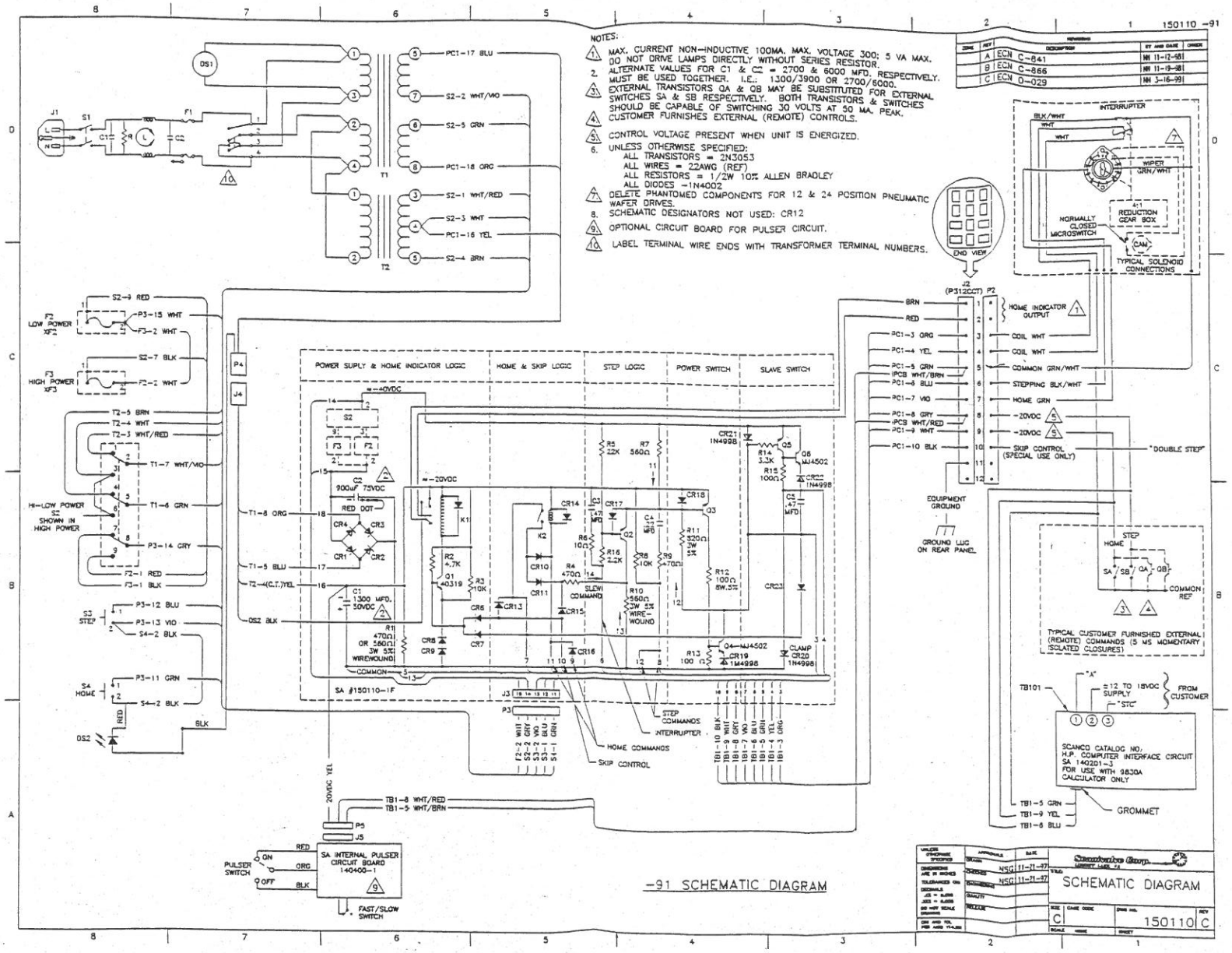
Scanivalve Corp. LIBERTY LAKE, WA

TITLE: SDIU/CTLR2/SOLENOID VALVE W/BINY ENCODER/SCANIVALE (OED)

SIZE	CAGE CODE	DWG NO.	REV
B		8599	

SCALE NONE SHEET 1 OF 1


SCANIVALVE CORP.
SCHEMATIC CTLR2P/SZ-S6 SOLENOID CTLR
OCT 90
8454
SHT 1 of 1
ERCB-021
NOTES: UNLESS OTHERWISE SPECIFIED
1. MAXIMUM CURRENT NON-INDUCTIVE 100MA. MAXIMUM VOLTAGE 300; 5 VA MAXIMUM. DO NOT DRIVE LAMPS DIRECTLY WITHOUT SERIES RESISTOR.
2. ALTERNATE VALUES FOR C1 & C2 = 2700 & 6000 MFD. RESPECTIVELY. MUST BE USED TOGETHER. I.E.: 1300/3900 or 2700/6000.
3. EXTERNAL TRANSISTORS QA & QB MAY BE SUBSTITUTED FOR EXTERNAL SWITCHES SA & SB RESPECTIVELY. BOTH TRANSISTORS & SWITCHES SHOULD BE CAPABLE OF SWITCHING 30 VOLTS AT 50 MA. PEAK.
4. CUSTOMER FURNISHES EXTERNAL(REMOTE) CONTROLS.
5. CONTROL VOLTAGE PRESENT WHEN UNIT IS ENERGIZED.
6. UNLESS OTHERWISE SPECIFIED:
ALL TRANSISTORS = 2N3053
ALL WIRES = #22 A.W.G.(REF)
ALL RESISTORS = 1/2W 10% ALLEN BRADLEY
ALL DIODES = 1N4002
7. DELETE PHANTOMED COMPONENTS FOR 12 & 24 POSITION PNEUMATIC WAFER DRIVES.
8. SCHEMATIC DESIGNATORS NOT USED: CR12
9. FOR 230VAC OPERATION SEE VIEW "A" FOR WIRING TRANSFORMER PRIMARIES.
10. SHTS. 2,3 & 4 OBS PER ECNA-388.
11. OPTIONAL CIRCUIT BOARD FOR PULSER CIRCUIT.
12. CHANGE (T) RETURN TO (R) LEVEL.
POWER SUPPLY & HOME INDICATOR LOGIC
HOME & SKIP LOGIC
STEP LOGIC
POWER SWITCH
SLAVE SWITCH
INTERRUPTER
TYPICAL SOLENOID CONNECTIONS
NORMALLY CLOSED MICROSWITCH
4:1 REDUCTION GEAR BOX
CAM
WIPER GRN/WHT
HOME INDICATOR OUTPUT (SEE NOTE 1)
COIL WHT
COMMON GRN/WHT
STEPPING BLK
HOME GRN
-20VDC (SEE NOTE 5)
SKIP CONTROL (SPECIAL USE ONLY)
"DOUBLE STEP"
EQUIPMENT GROUND
GROUND LUG ON REAR PANEL
TYPICAL CUSTOMER FURNISHED EXTERNAL (REMOTE) COMMANDS (5 MS MOMENTARY ISOLATED CLOSURES)
SEE NOTES 3 & 4
COMMON REF.
SCANCO CATALOG NO. H.P. COMPUTER INTERFACE CIRCUIT SA 140201-1 FOR USE WITH 9830A CALCULATOR ONLY
+12 TO 18VDC SUPPLY
GROMMET
RIBBON CABLE
SA #150111-1F
SA INTERNAL PULSER CIRCUIT NO. 140400-1
NOTE 11
PULSER SWITCH
FAST/SLOW SWITCH
TERMINAL IDENTIFICATION SIGNAL TRANSFORMER NO. 241-7-10
VIEW A WIRING FOR 230VAC OPERATION
SAME CONNECTIONS AS T1 & T2 ABOVE
SEE NAMEPLATE FOR FUSES REQUIRED FOR EACH SIZE SOLENOID.
AC POWER S1 SHOWN IN ON POSITION
HI-LOW POWER S2 SHOWN IN HIGH POWER
J2 END VIEW
GROUND LUG
REAR VIEW SHOWN WITH KEY SLOT AT BOTTOM


150110 -91
NOTES:
1. MAX. CURRENT NON-INDUCTIVE 100MA, MAX. VOLTAGE 300; 5 VA MAX. DO NOT DRIVE LAMPS DIRECTLY WITHOUT SERIES RESISTOR.
2. ALTERNATE VALUES FOR C1 & C2 = 2700 & 6000 MFD. RESPECTIVELY. MUST BE USED TOGETHER. I.E.: 1300/3900 OR 2700/6000.
3. EXTERNAL TRANSISTORS QA & QB MAY BE SUBSTITUTED FOR EXTERNAL SWITCHES SA & SB RESPECTIVELY. BOTH TRANSISTORS & SWITCHES SHOULD BE CAPABLE OF SWITCHING 30 VOLTS AT 50 MA. PEAK. CUSTOMER FURNISHES EXTERNAL (REMOTE) CONTROLS.
4. CONTROL VOLTAGE PRESENT WHEN UNIT IS ENERGIZED.
5. UNLESS OTHERWISE SPECIFIED:
ALL TRANSISTORS = 2N3053
ALL WIRES = 22AWG (REF)
ALL RESISTORS = 1/2W 10% ALLEN BRADLEY
ALL DIODES = 1N4002
6. DELETE PHANTOMED COMPONENTS FOR 12 & 24 POSITION PNEUMATIC WAFER DRIVES.
7. SCHEMATIC DESIGNATORS NOT USED: CR12
8. OPTIONAL CIRCUIT BOARD FOR PULSER CIRCUIT.
9. LABEL TERMINAL WIRE ENDS WITH TRANSFORMER TERMINAL NUMBERS.
REVISIONS
A ECN C-841 NH 11-12-981
B ECN C-866 NH 11-19-981
C ECN D-029 NH 3-16-991
INTERRUPTER
WIPER GRN/WHT
4:1 REDUCTION GEAR BOX
NORMALLY CLOSED MICROSWITCH
CAM
TYPICAL SOLENOID CONNECTIONS
END VIEW
J2 (P312CCT) P2
HOME INDICATOR OUTPUT
COIL WHT
COIL WHT
COMMON GRN/WHT
STEPPING BLK/WHT
HOME GRN
-20VDC
-20VDC
SKIP CONTROL (SPECIAL USE ONLY)
"DOUBLE STEP"
EQUIPMENT GROUND
GROUND LUG ON REAR PANEL
STEP
HOME
SA SB QA QB
COMMON REF
TYPICAL CUSTOMER FURNISHED EXTERNAL (REMOTE) COMMANDS (5 MS MOMENTARY ISOLATED CLOSURES)
TB101
"A"
±12 TO 15VDC SUPPLY
"STC"
FROM CUSTOMER
SCANCO CATALOG NO.
H.P. COMPUTER INTERFACE CIRCUIT
SA 140201-3
FOR USE WITH 9830A CALCULATOR ONLY
GROMMET
TB1-5 GRN
TB1-9 YEL
TB1-6 BLU
POWER SUPLY & HOME INDICATOR LOGIC
HOME & SKIP LOGIC
STEP LOGIC
POWER SWITCH
SLAVE SWITCH
SA #150110-1F
STEP COMMANDS
INTERRUPTER
HOME COMMANDS
SKIP CONTROL
SA INTERNAL PULSER CIRCUIT BOARD 140400-1
PULSER SWITCH
FAST/SLOW SWITCH
-91 SCHEMATIC DIAGRAM
SCHEMATIC DIAGRAM
150110 C