INSTRUCTIONS
and
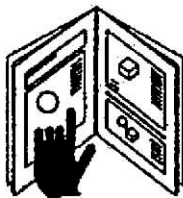# PARTS MANUAL

SE-4PT
PROGRAMMABLE
PASS THROUGH

SAFETY

PROTECT YOURSELF AND OTHERS FROM SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

ELECTRIC SHOCK can kill.

1. The equipment is not waterproof. Using the equipment in a wet environment may result in serious injury. Do not touch the equipment when wet or standing in a wet location.

2. Never open the equipment without first unplugging the power cord or serious injury may result.

3. Verify the customer supplied power connections are made in accordance with all applicable local and national electrical safety codes. If none exist, use International Electrical Code (IEC) 950.

4. Never remove or bypass the equipment power cord ground. Verify the equipment is grounded in accordance with all applicable local and national electrical safety codes. If none exist, use International Electrical Code (IEC) 950.

READ INSTRUCTIONS.

Read the instruction manual before installing or using the equipment.

MOVING PARTS can cause injury.

1. Keep hands, clothing, and tools away from any moving parts, such as the rotating chuck or pipe, or the arm holding the torch.

2. Do not operate the machine with any of the protective panels or covers removed.

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

1. Always use equipment of adequate capacity to lift and move the machine.

2. Use the lifting lugs on the unit to lift the **machine** only, and not the workpiece, pipes, or any other accessories.

PLASMA CUTTING can produce destructive High Voltage at High Frequency.

1. If using plasma, see that the machine as well as the plasma power source is properly grounded.

2. Do not use older model plasma machines meant for manual operation. These can leak high frequency at high voltages, which can cause dangerous shock, as well as destroy control circuits.

3. Read the instruction manual page on plasma cutting carefully, and follow all precautions.

SE-4PT PROGRAMMABLE PASS THROUGH

INSTRUCTIONS AND PARTS MANUAL

TABLE OF CONTENTS

PAGE

----- **CAUTION** -----
DO NOT LEAVE EQUIPMENT UNATTENDED.
Remove from worksite and store in a safe location
WHEN NOT IS USE!

INTRODUCTION

The Programmable Pass Through machine automates the end preparation of pipes for fabrication using a program that makes saddle cuts, offset (hillside) cuts, lateral cuts and mitre cuts. The SE-4PT rotates a pipe held in its three-jaw chuck while driving a cutting torch back and forth along the pipe axis, so that the torch cuts a contour on one pipe to fit onto another pipe of larger diameter. Pipes from 8¼ (263 mm) to 12.5" (318 mm) outside diameter can be chucked internally in the machine. Smaller pipes require optional extension jaws. The SE-4PT is suitable for plasma and oxy-fuel cutting and eliminates the need to make templates or layout complex cuts.

DESCRIPTION

The SE-4PT is designed to sit on a work table. The machine can be used with oxy-fuel torches or plasma. If the machine is set up for oxy-fuel cutting, the 3-hose cutting torch is connected to the solenoid manifold located on the left hand side of the machine. If the machine is set up for plasma, it will be equipped with a rotary ground and holding clamp for a plasma torch. The suggested method of plasma cutting will be air plasma. Power requirements are 240 VAC single phase and a clean air supply for the plasma source. The SE-4PT should be operated from a separate power line; it can be supplied for voltage ratings of 120, 240, or 42 VAC.

Panel Controls include Start, Stop, and Reset push buttons, a joystick for manual positioning, and speed control knob which are shown on page 6, Panel Controls. All programming is done using a hand held terminal, with keypad and display. (see page 8)

SET-UP

Place the SE-4PT on a work table, preferably bolting it down through the mounting holes located in the legs of the machine. Plug the power cord into the power line. The torch arm should be already inserted into the linear drive located on top of the SE-4PT. If it is not, throw the power switch on, and *carefully* insert the slide into the V-wheels inside the linear drive from the chuck end. Slide the arm in until the rack teeth touch the drive gear. Then, using the manual joystick control, drive the arm back into the machine. Push the reset button so the machine holds its position.

Insert the cutting torch into the torch holder by loosening the clamping lever and adjusting its position so that the torch is centered in line with the the chuck axis. Then, lock the torch holder in place.

For plasma, mount the relay contact box on the short post located on the top right hand side of the machine above the control panel. Plug the relay into the contact output. Wire the trigger leads for the plasma machine to the supplied connector and plug into the relay box.

Loop the gas hose or plasma cable over the cable hanger located on the top right hand side of the machine above the control panel, for support. Plug the programming pendant cable into the 6-pin connector located on the control panel.

The adjustable pipe support (**A**) is attached to the rear of the machine, for use with long pipes, to help keep the pipe (**B**) aligned (see below). Make sure to adjust the height of the rollers (**C**) so that the pipe runs true when rotating. Two threaded rods are provided for different diameter ranges; use the 4 1/4" (108 mm) rod (**D**) for diameters from 8" (203 mm) to 12" (305 mm) and the 7 1/4" (184 mm) rod for diameters from 4" (102 mm) to 8" (203 mm).

The SE-4PT is now ready to be programmed for operation.

PIPE SUPPORT
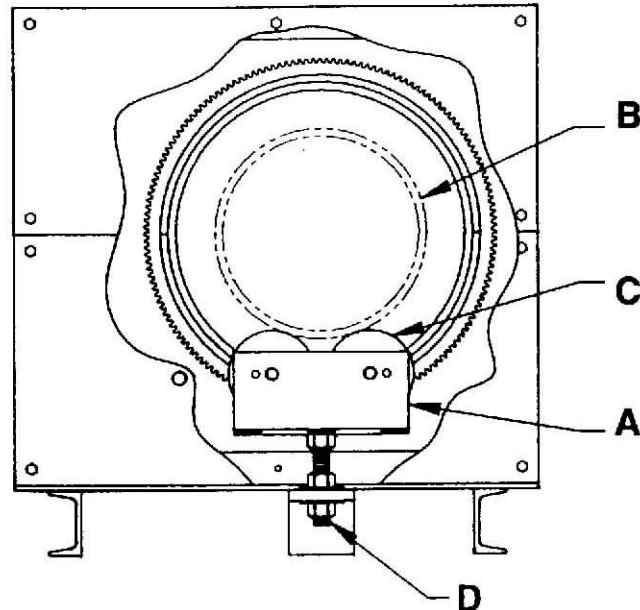
SE-4PT REAR VIEW

PLASMA CUTTING

The SE-4PT can be used successfully for plasma cutting; however it is important to take certain precautions to avoid interference and protect the control circuits. (These comments also apply to TIG welding or any process that uses high frequency to strike an arc.) An external relay box is available separately or in the welding kit to provide the contact signal to the plasma source.

PRECAUTIONS:

1.   NEVER lay the plasma gun cable across the top of the machine. The further away from the machine it can be routed and supported, the better.

2.   See that all grounding procedures specified for the plasma source are followed diligently.

3.   If the high frequency is produced using a spark gap, adjust the points so that the gap is as small as possible. The larger the gap, the higher the voltage and stronger the interference.

4.   We strongly recommend you disconnect the Hand Held Terminal (programming pendant) when running the machine. Any length of wire acts as an antenna to receive HF radiation, and though the cable is shielded, it is possible for some induced voltage to leak through.

5.   Use separate power line branches whenever possible to power the plasma source and the machine. Do not plug them into the same outlet box.

6.   Though there is an internal power line filter, an external protective device will always help. Computer equipment line protection boxes are readily available at low cost, with surge suppression and line filtering circuitry. The machine can be plugged into the power line through one of these boxes.

PANEL CONTROLS

The functions of various buttons and knobs on the Control Panel are described below:

START (Black push-button):

Push to start cutting or resume cutting after a pause. If the torch has been manually positioned off the cut path, the machine will move it towards the cut and swing it into the cut line when reached.

STOP (Red push-button):

Computer control is interrupted when pushed until the Start button or Reset button is pushed. If pushed while running, the torch is shut off and the SE-4PT stops. Pushing the Start button again will resume the cut. When Stop is pushed, the machine can be manually positioned by the joystick switch; this does not change the home reference position unless the Reset button is again pushed.

RESET (Small push-button):

Resets the computer when pushed and makes whatever position the machine is in the home reference position. If the torch or pipe is moved by the joystick, upon releasing it, the SE-4PT will return to the home position.

SPEED Knob:

Controls the tangential speed of the torch along the cut, from zero to maximum. The speed will depend on the diameter of the pipe. When the torch arm is moving in or out, the rotational speed will slow down to keep the resultant speed constant.

SE-4PT PANEL CONTROLS

WELD CONTACT — RESTART — START — STOP — MANUAL JOG

QUADRANT NUMBERS

X
Y — O — Y
X

1
2   4
3

TO PENDANT CONTROL

SPEED CONTROL

POWER CORD

POWER INDICATOR LIGHT

POWER ON/OFF

CIRCUIT BREAKER
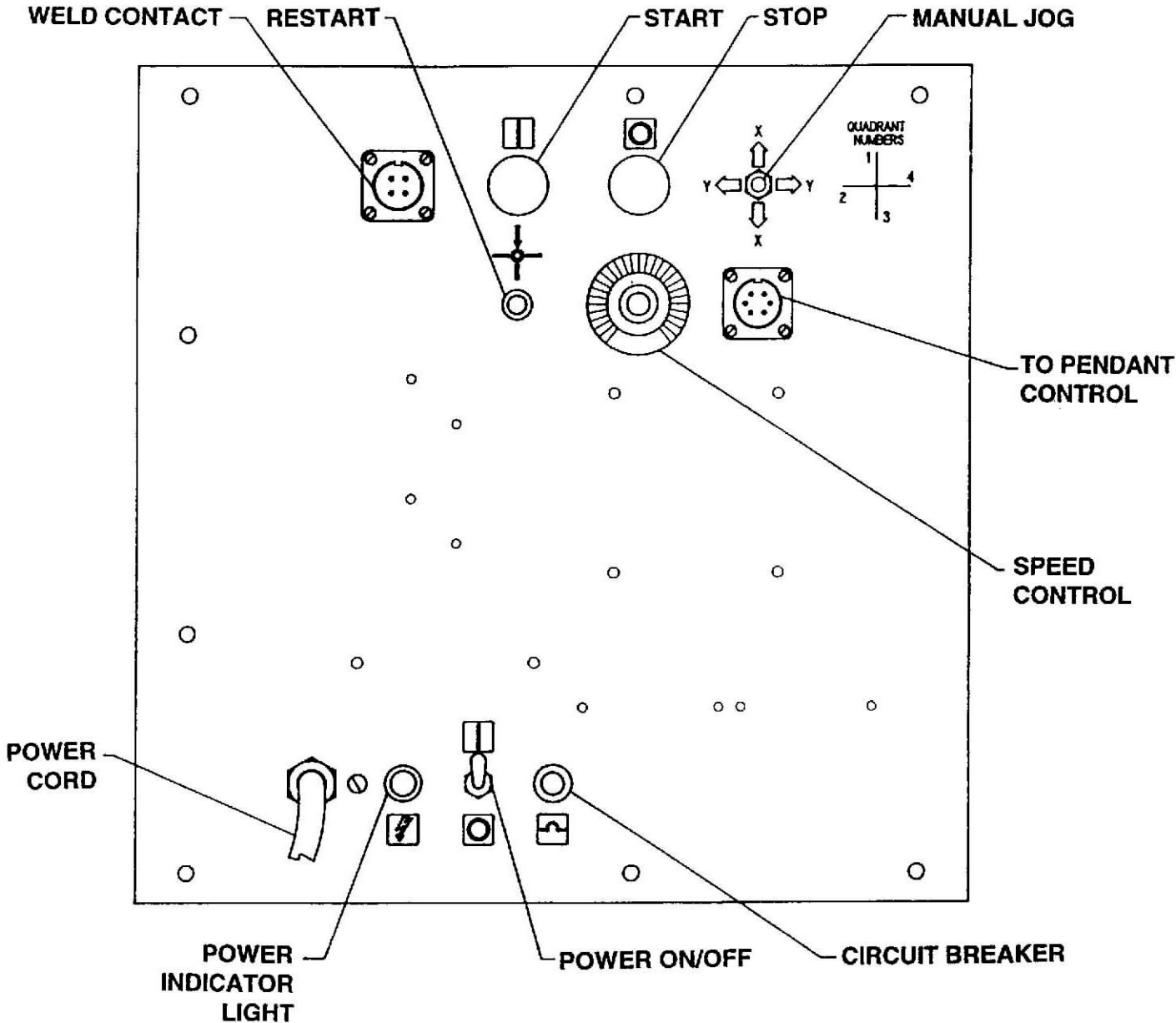
OPERATION

To make a cut:

1.   Set up the SE-4PT with pipe in position and power up.

2.   Program the desired cut. (Refer to the instructions under Programming.)

3.   Push the red Stop button and use the joystick to manually move to the starting point.

4.   Push the Reset button to fix the starting point here.

5.   For oxy-fuel, turn on and ignite the pre-heat gases, and wait until it is hot enough to start the cut. Push the Start button; the solenoid for cutting oxygen or plasma trugger is turned on and the machine starts the cut (after the delay which has been set for plasma).

NOTE: TYPE 4, MITRE
      If a cutback dimension has been entered, the SE-4PT will make one cut, shut off the gas or arc, back up for the given distance, and rotate the pipe 180°. The machine will pause here until the Start button is pressed again, and then repeat the same cut but rotated 180° from the first.

To make a dry run without cutting:

1.   Push Stop button and hold down.

2.   Push Start button and hold down.

3.   Release Stop button (quickly, after No. 2. above).

4.   Release Start button.

The machine will move along the programmed cut without turning on the contacts for plasma, or the cutting solenoid.

PROGRAMMING MODULE
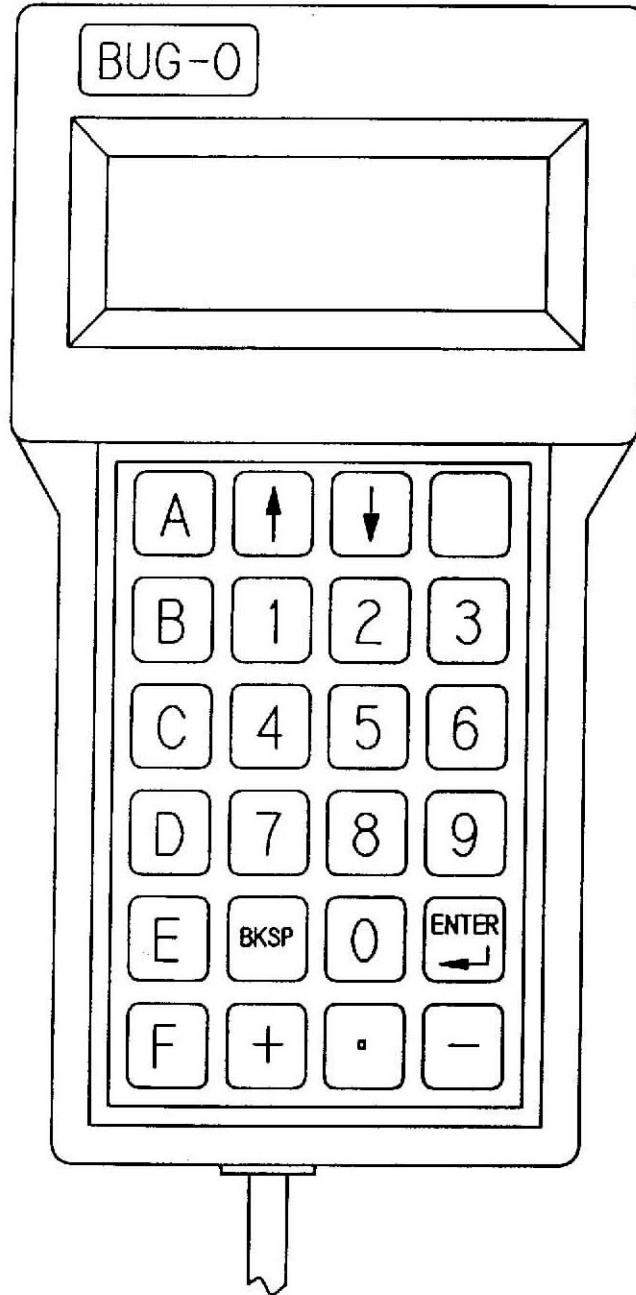
This is a hand held terminal with keypad and display which plugs into the control panel. Press keys A, B, C, D, or E for the function desired, as described in the Programming Instructions on page 9. Use the digit keys to enter pipe diameters or other dimensions; push the Enter button to store the numeric value entered. The Backspace key removes the last digit before pushing the Enter button, in case a correction is required.

PROGRAMMING

For programming, the following keys on the keypad are used:

Push A: To select the type of cut and enter dimensions.

B: To enter the time delay for plasma cutting.

C: To change Cut No. in memory (Nos. 0 to 99)

D: To display the type and dimensions of cut.

E: To enter end of cut slowdown.

To program a cut, select one of five types as follows:

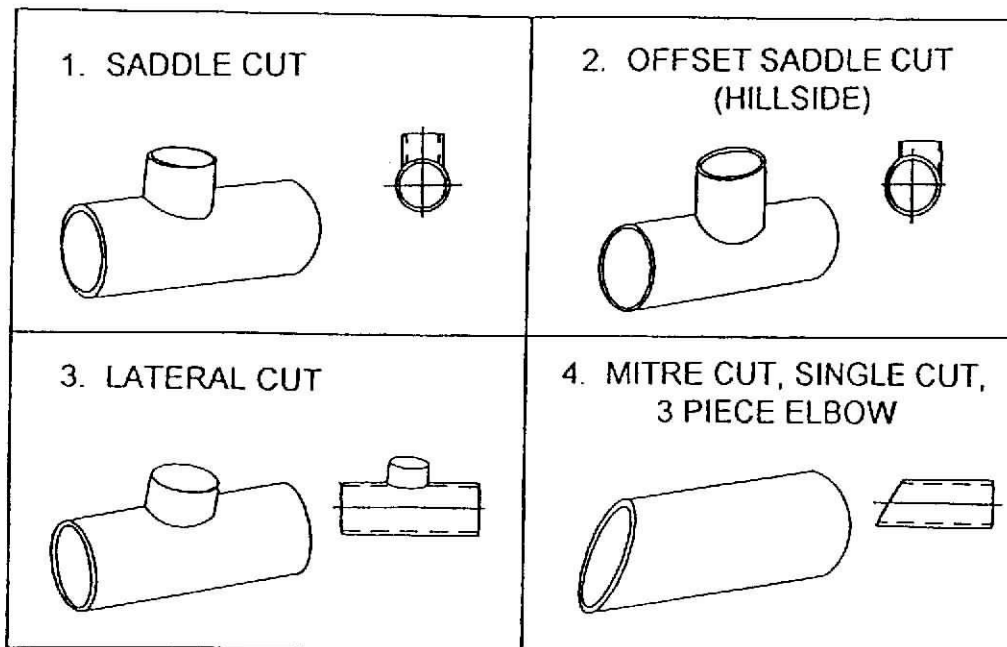TYPE 1:   Saddle Cut on centerline

TYPE 2:   Saddle Cut offset (hillside)

TYPE 3:   Lateral Cut, offset or on centerline
(for centerline, put offset = 0)

TYPE 4:   Mitre Cut

TYPE 5:   Holes (see next page)

CUT TYPES 1 to 4:

1. SADDLE CUT

2. OFFSET SADDLE CUT (HILLSIDE)

3. LATERAL CUT

4. MITRE CUT, SINGLE CUT, 3 PIECE ELBOW

9

CUTTING HOLES : TYPE 5

Select Type 5 to cut a hole on the side of a pipe. Using Type 5, the machine is programmed to cut holes in pipes for branch joints, either square (T-joints) or angled (laterals). The joint must be on centreline.
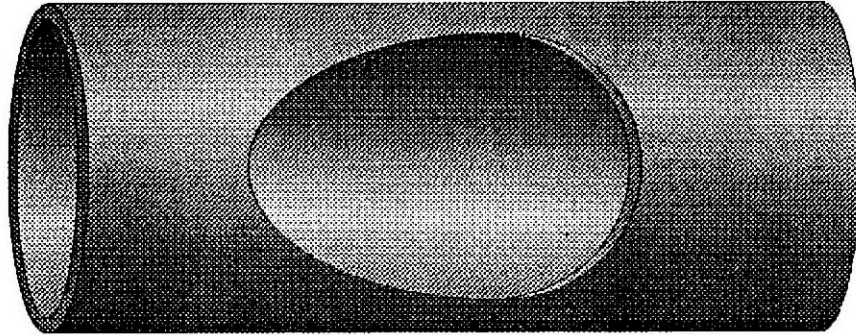
The display will ask for small diameter, and then large diameter. Enter the diameter of the branch pipe for small diameter, as shown in the diagram, and the diameter of the pipe being cut for the large diameter. Next the display will prompt for the angle. Enter the angle, in degrees x 100 (e.g. for 60° enter 6000). For square cuts you must enter 9000 (for 90°).
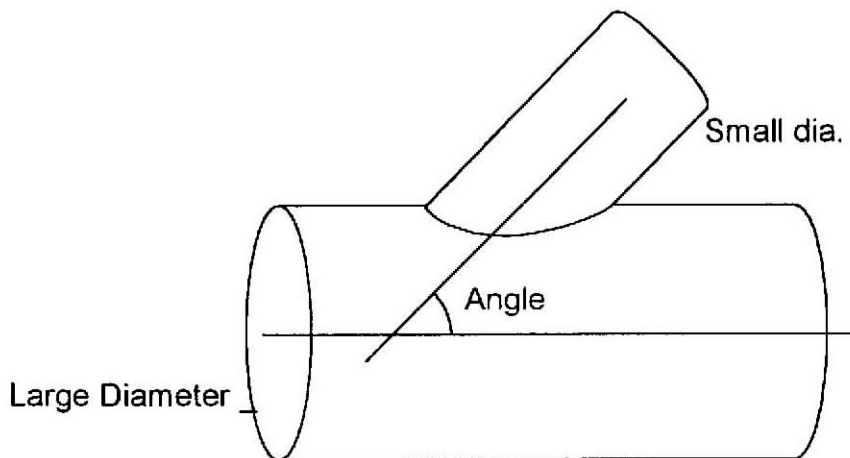
NOTE:
The Type 5 Cut is provided on both the standard SE-4PT and the Dual program SE-4PTD machines.

Data Entry:

When entering data on the keypad, multiply inches, degrees, or seconds by 100 and enter the number without a decimal point. For metric dimensions, multiply mm x 10 or cm x 100.

For example: 350 for 3.5 inches,
                     800 for 80 mm, on metric machines
                     1500 for 15°

Press the return button after the number is entered.

Data Required:

TYPE 1:   Requires 1. Small diameter (pipe being cut)

                    2. Large diameter (pipe it fits on)

TYPE 2:   Requires 1. Small diameter

                    2. Large diameter

                    3. Offset distance between centerlines

TYPE 3:   Requires 1. Small diameter

                    2. Large diameter

                    3. Offset

                    4. Angle between pipes

TYPE 4:   Requires 1. Small diameter

                    2. Cutback distance

                    3. Angle of mitre cut

For plasma cutting, a value for the time delay is also required to allow for the delay in striking the arc. A commonly used delay is 3 seconds (enter 300 on the terminal keypad).

Data Entry (cont)

When entering diameters, use the diameters of the surfaces along whose intersection the cut has to be made. Usually they will be the inside diameter of the pipe being cut, and the outside diameter of the pipe it fits on. This will also allow for any bevel, if necessary.

In TYPE 4, cutback refers to the distance on the centerline when making two cuts opposed to each other, for the middle piece of an elbow. If only one cut is to be made, enter 0 or just press Return for cutback.

NOTE: If the red Stop button is pushed, the machine will be in the pause mode, and cannot be programmed. Push the Reset button to get back to the Ready mode for programming.

Program Memory:

The SE-4PT has memory storage for 100 cuts. These are numbered Cut No. 0-99. To switch to a different Cut No., push "C" on the keypad and enter the number. Cut data is retained until reprogrammed.
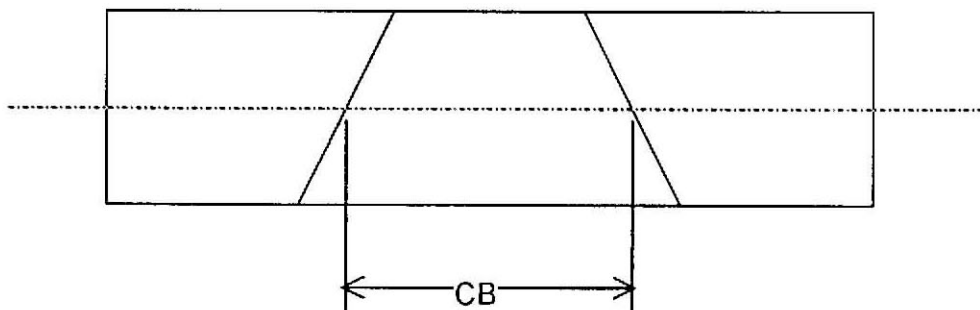
Type 4 Mitre Cut: Showing Cutback Length CB.

TECHNICAL DATA

Power Requirements:	SEO-4400	120 VAC / 50-60 Hz / 1.0 A
	SEO-4402	240 VAC / 50-60 Hz / 0.7 A
	SEO-4404	42 VAC / 50-60 Hz / 3.0 A

Cutting Diameter: Pass through 8" to 12.5" O.D. (200 to 315 mm),
or 4 to 8" (100 to 200 mm) with optional extension jaws.
Smaller diameters can be handled at lower cutting speeds
- see chart below.

Additional
Capacity: Short lengths of pipe up to 20" (508 mm) diameter can
be chucked internally.

Maximum Length: 18" (457 mm)
Maximum Weight: 150 lb (68 kg) *

Rotation Speed: 0.15 to 3.0 rpm
(see chart for surface speed at various diameters)

MAXIMUM CUTTING SPEED

PIPE DIAMETER
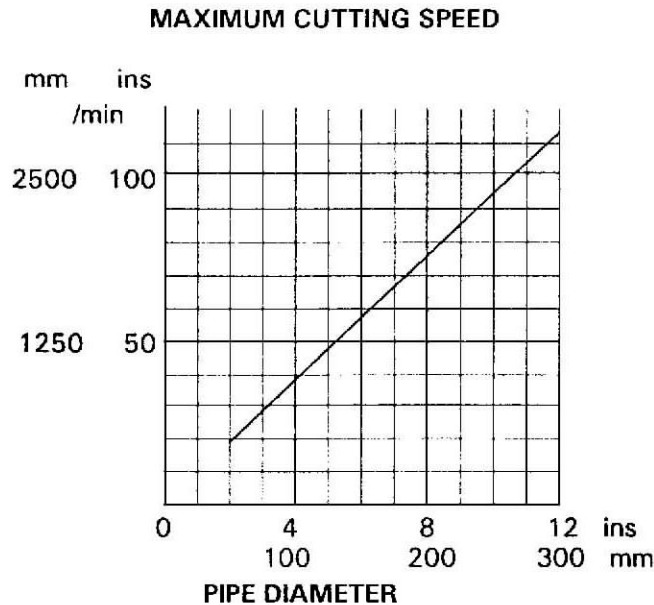
*NOTE: When using the pass through feature, the maximum weight of the pipe should not exceed 500 lb (227 kg). It is *very* important to have the pipe supports in alignment with the machine to support the pipe in back of the SE-4PT. If the pipe is projecting from either end of the machine, more than 30" (760 mm), it must be supported in rotating pipe stands.

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TECHNICAL DATA / DIMENSIONS

Cut Types:
    1. Saddle Cuts
    2. Offset (Hillside) Cuts
    3. Lateral Cuts
    4. Mitre Cuts, Single Cut or 3-Piece Elbow
    5. Holes

Dimensions: 53" L x 24" W x 37" H
    (1343 x 610 x 940 mm)

Net Weight: 830 lb (377 kg)

Shipping Weight: 1030 lb (467 kg)

SE-4PT PROGRAMMABLE PASS THROUGH

36.38
(924 mm)

41.88
(1064 mm)

15.00
(381 mm)

24.00
(610 mm)

52.88
(1343 mm)

14
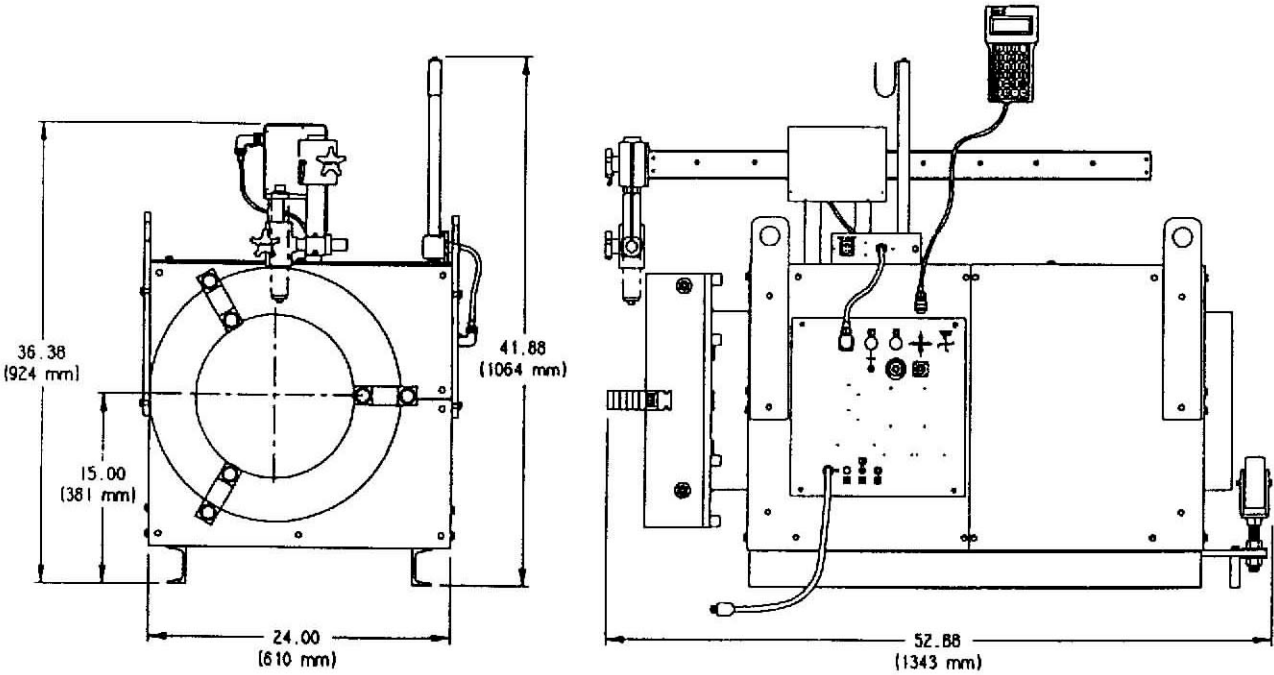
SEO-4400 SE-4PT PROGRAMMABLE PASS THROUGH 120 VAC
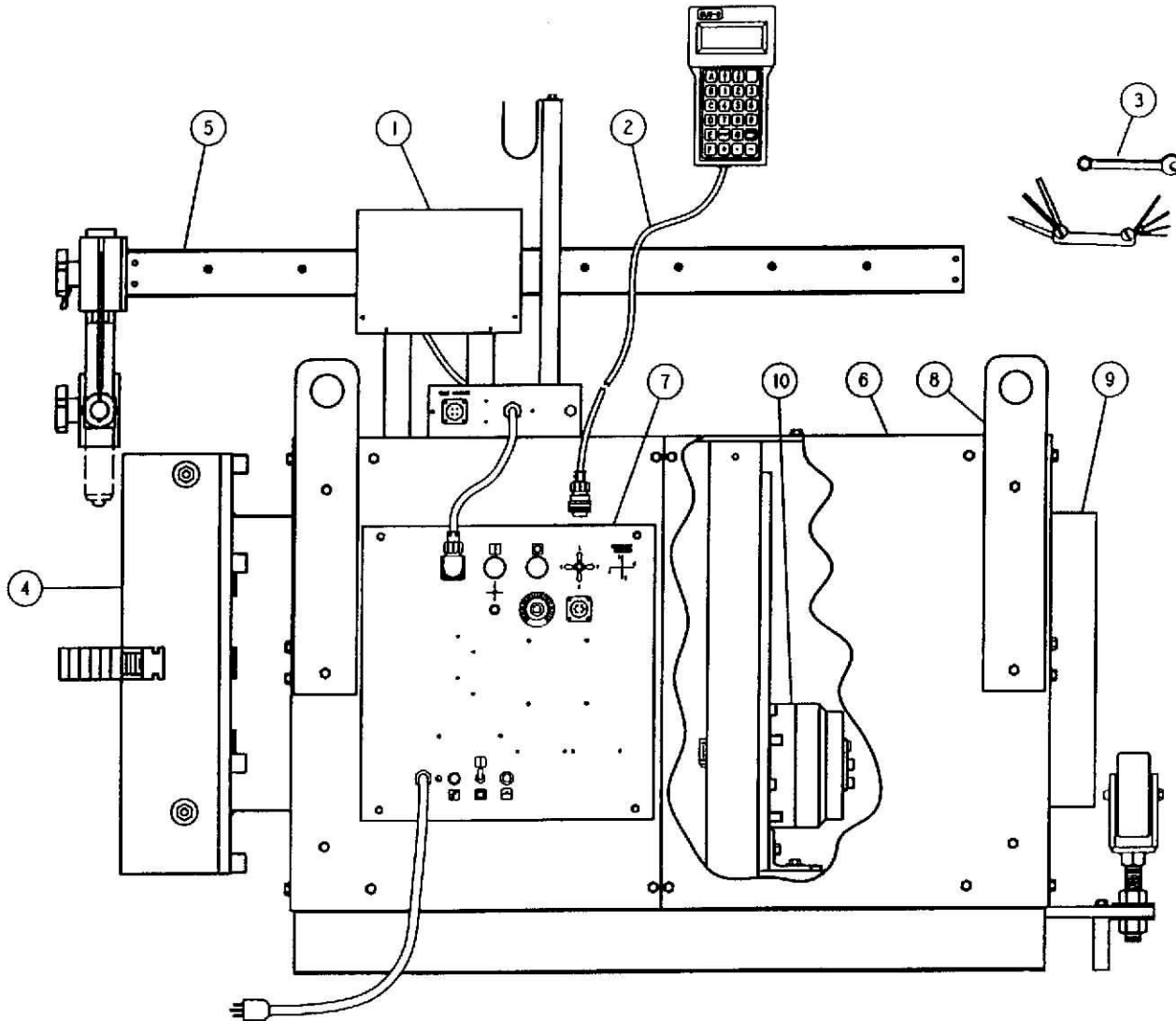
PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	BUG-5605-PT	Linear Drive (100:1)
2	1	BUG-6050	Hand Held Pendant
3	1	BUG-9444	Tool Kit
4	1	CWO-9238	Chuck with 3 Master Jaws
5	1	SEO-4145	V-Guide with Torch Mount
6	1	SEO-4405	Cabinet, Bare
7	1	SEO-4410	Control Panel 120 V
8	4	SEO-4449	Lifting Lug
9	1	SEO-4460	Main Spindle Assembly
10	1	SEO-4465	Rotating Drive

SEO-4410 CONTROL PANEL 120 V / COMPONENT LAYOUT
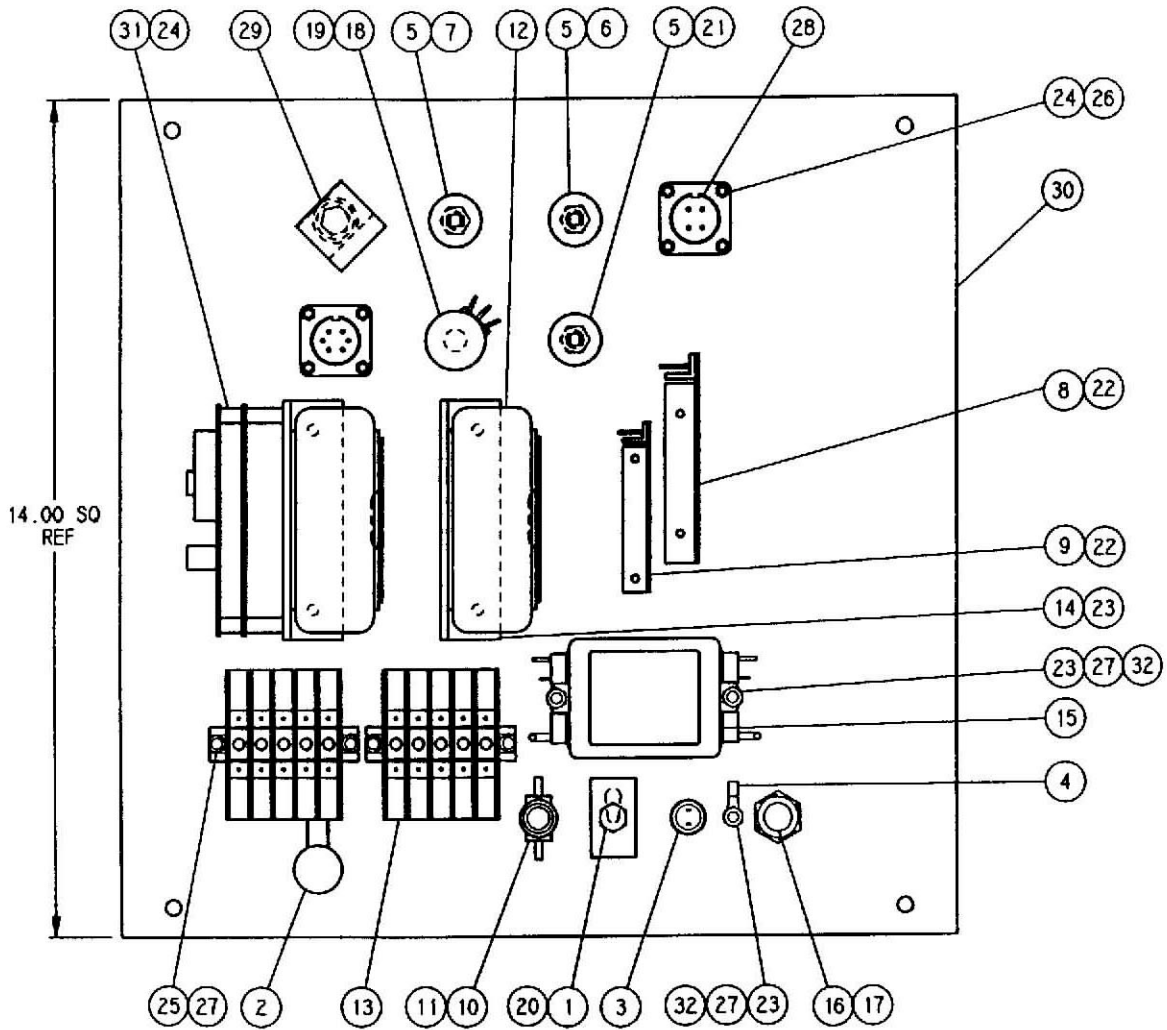
(INSIDE VIEW)

PARTS LIST

ITEM	PART NO	QTY	DESCRIPTION	ITEM	PART NO	QTY	DESCRIPTION
1	ARM-2279	1	Toggle Switch, DPST, On-Off	17	BUG-9446	1	Cord Grip
2	BUG-1393	1	Volt Trap 120 VAC	18	BUG-9686	1	Potentiometer Control
3	BUG-1415	1	Pilot Light	19	BUG-9688	1	Dial
4	BUG-1435	1	Sta-kon Connector	20	BUG-9884	1	On-Off Switch Plate
5	BUG-1536	3	Pushbutton Switch SP NO	21	CAP-0223	1	Cap, .022, Film
6	BUG-1537	1	Cap, Black	22	FAS-0114	4	Pan Hd Screw 6-32 x 3/8
7	BUG-1557	1	Cap. Red	23	FAS-0124	7	Pan Hd Screw 8-32 x 3/8
8	BUG-1770	1	Motor Control Board	24	FAS-0204	12	Rnd Hd Screw 4-40 x 3/8
9	BUG-1775	1	Motor Control Board	25	FAS-0225	4	Rnd Hd Screw 8-32 x 1/2
10	BUG-2924	1	Reset Button Seal	26	FAS-1305	8	Hex Nut 4-40
11	BUG-2931	1	Circuit Breaker 1.0 A	27	FAS-1320	7	Hex Nut 8-32
12	BUG-5218	2	Transformer 117V 50/60Hz	28	MUG-1156	1	Panel Connector, 4-T, F
13	BUG-6028	2	Terminal Block	29	PRS-1065	1	Joystick
14	BUG-6029	2	Bracket	30	SEO-4151	1	Panel
15	BUG-6069	1	Filter	31	SEO-6030	1	Control Module
16	BUG-9445	1	Power Cord 120 V	32	WAS-0221	3	# 8 Star Lockwasher

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SE-4PT PROGRAMMABLE PASS THROUGH WIRING DIAGRAM
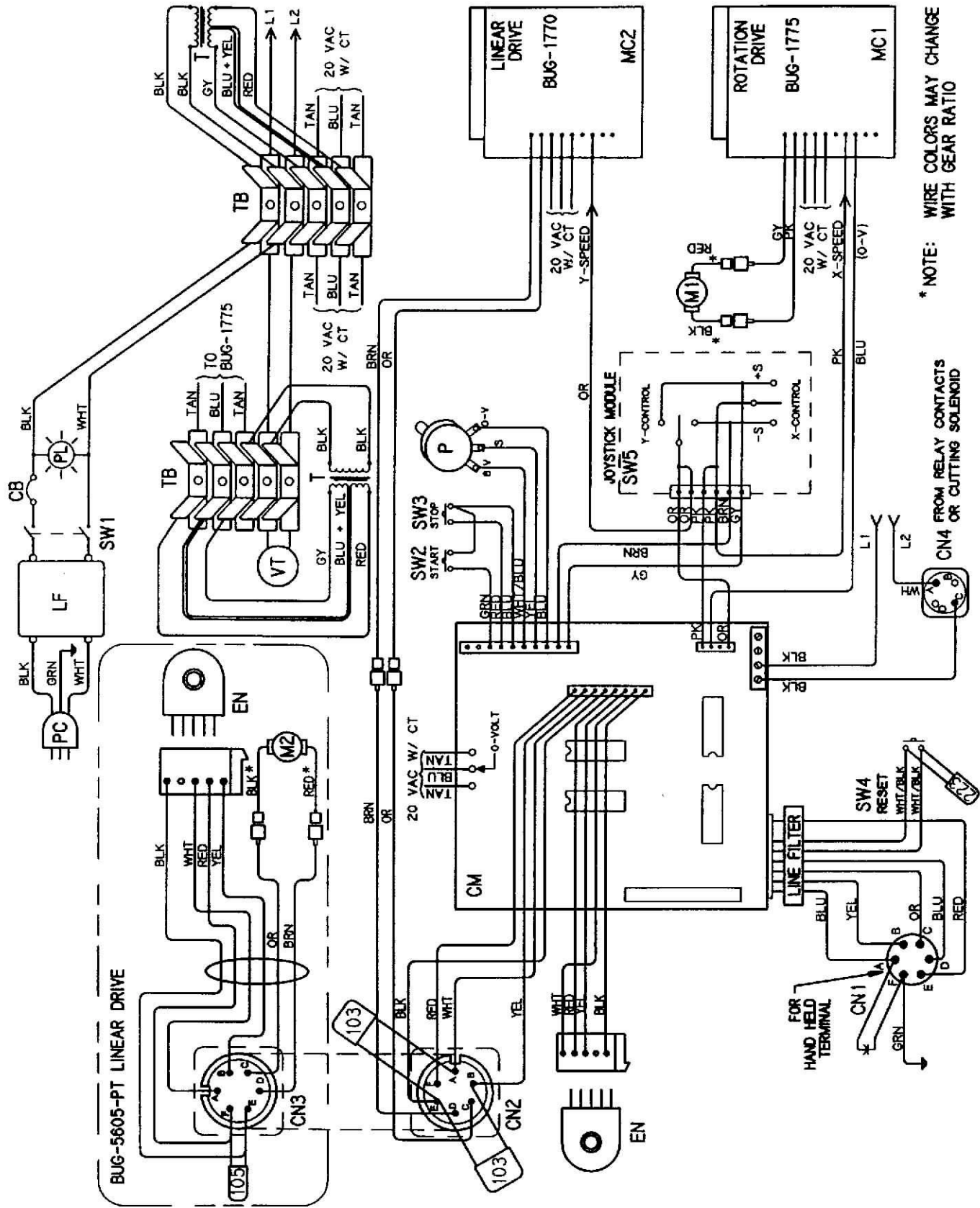
SE-4PT PROGRAMMABLE PASS THROUGH

ITEM	DESCRIPTION	SEO-4400 120 VAC	SEO-4402 240 VAC	SEO-4404 42 VAC
		ELECTRICAL COMPONENT CHART		
PC	Power Cord	BUG-9445	GOF-3115	BUG-9442
CB	Circuit Breaker	BUG-2931 1.0A	BUG-2923 0.7A	ARM-2278 3.0A
PL	Pilot Light	BUG-1415	BUG-1428	BUG-1427
VT	Volt Trap	BUG-1393	BUG-1563	BUG-1393
T	Transformer	BUG-5218	BUG-5231	BUG-5232
P	Potentiometer		BUG-9686	
SW1	Toggle Switch (Power)		ARM-2279	
SW2	PB Switch (Start)		BUG-1536	
SW3	PB Switch (Stop)		BUG-1536	
SW4	PB Switch (Reset)		BUG-1536	
SW5	Joystick Switch		PRS-1065	
TB	Terminal Block		BUG-6028	
LF	Line Filter		BUG-6069	
CM	Control Module		BUG-6030	
MC1	Motor Control Board		BUG-1775	
MC2	Motor Control Board		BUG-1770	
EN	Encoder		BUG-6039	
CN1	Connector (Pendant)		BUG-9902	
CN2	Connector (Rotating Drive)		BUG-9902	
CN3	Connector (Linear Drive)		BUG-9909	
CN4	Connector (Auxiliary)		MUG-1156	
M1	Gear Motor (100:1)		BUG-5209	
M2	Gear Motor (100:1)		BUG-1595	

SE-4PT INTERNAL STRUCTURE
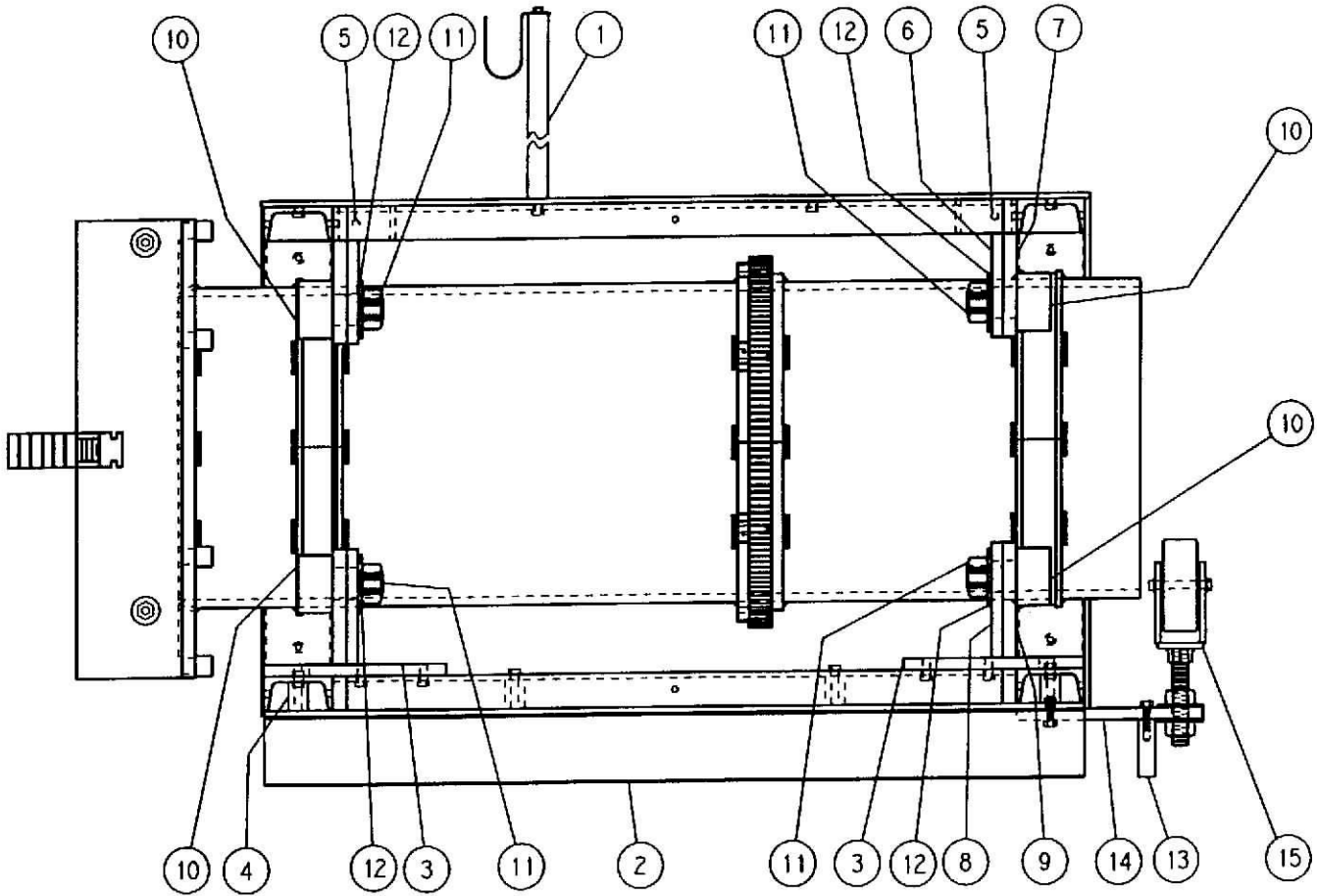
PARTS LIST

ITEM	QTY	PART NO	DESCRIPTION
1	1	SEO-4106	Cable Support
2	2	SEO-4415	Leg
3	4	SEO-4426	Gusset Plate
4	10	SEO-4427	Stand Off
5	4	SEO-4428	Joining Angle
6	2	SEO-4429	Top Cam Roll Plate
7	2	SEO-4430	Top Filler Plate
8	2	SEO-4431	Bottom Cam Roll Plate
9	2	SEO-4432	Bottom Filler Plate
10	8	SEO-4433	Cam Roll Follower
11	8	SEO-4434	Hex Nut 1" x 14 Thread
12	8	SEO-4439	1" Flat Washer
13	1	SEO-4453	Support Foot
14	1	SEO-4454	Support Plate
15	1	SEO-4455	Support Assembly

SEO-4465 ROTATING DRIVE
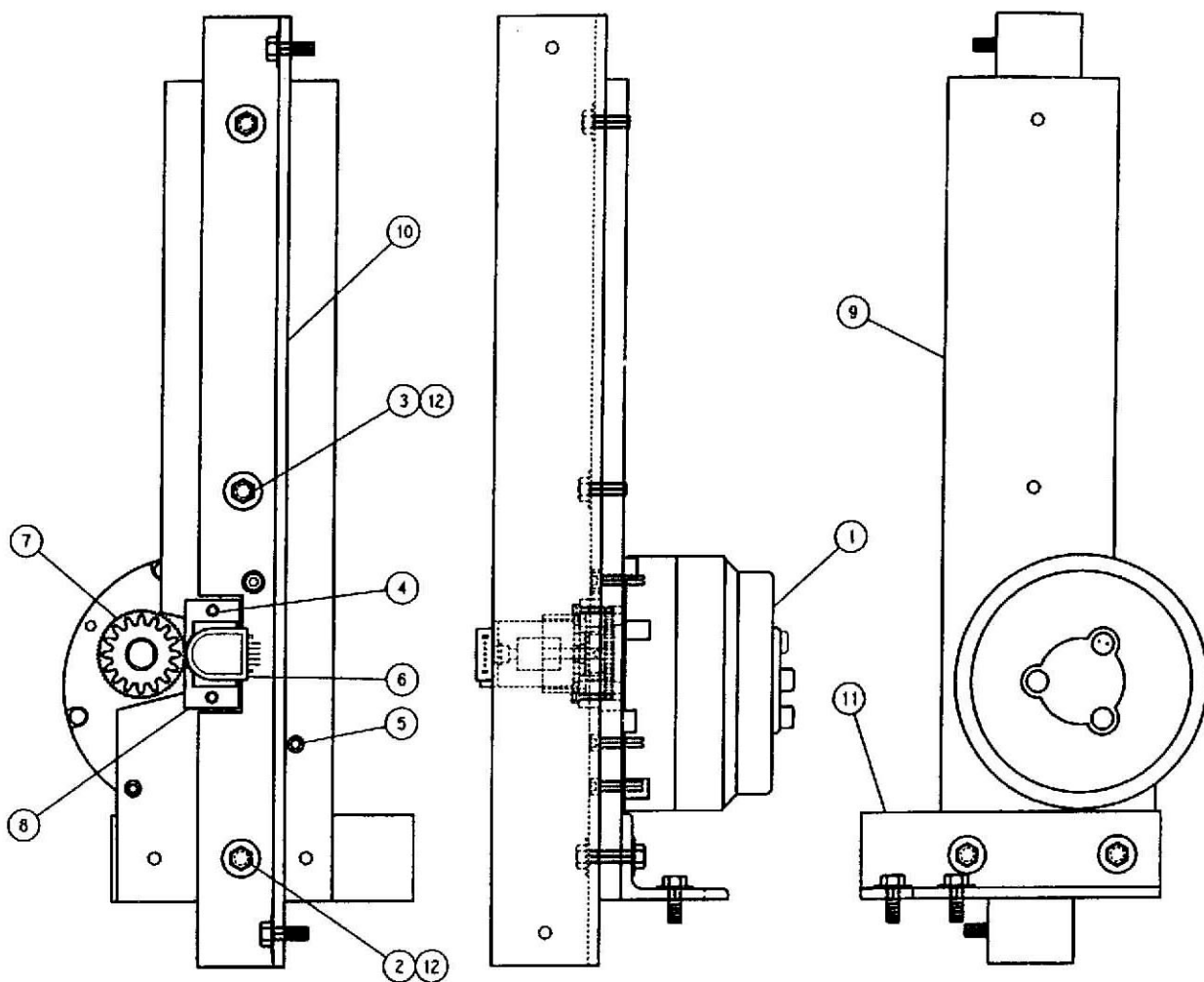
PARTS LIST

ITEM	QTY	PART NO	DESCRIPTION
1	1	BUG-5209	Gear Motor (100:1)
2	1	FAS-0386	Hex Hd Cap Screw 5/16-24 x 5/8 Lg
3	8	FAS-0388	Hex Hd Cap Screw 5/16-24 x 7/8 Lg
4	2	FAS-0527	Soc Hd Cap Screw 8-32 x 3/4 Lg
5	3	FAS-0559	Soc Hd Cap Screw 1/4-20 x 1" Lg
6	1	SEO-4125	Encoder Assembly [Includes (1) BUG-6039 Encoder]
7	1	SEO-4435	Gear Assembly
8	1	SEO-4441	Encoder Block
9	1	SEO-4446	Motor Mount Plate
10	1	SEO-4447	Motor Mount Angle
11	1	SEO-4448	Motor Mount Support Angle
12	9	WAS-0250	5/16 SAE Washer

SEO-4113 ENCODER WIRING HARNESS

BUG-9902

CAP-0103
TRIM LEAD TO
MINIMUM LENGTH

(8) BUG-6106

CNN-0128

RED 18" LG
YEL 18" LG
WHT 18" LG
BLK 18" LG

A F
B
C E
D

RED 18" LG
YEL 18" LG
WHT 18" LG
BLK 18" LG

CNN-0125

(6) TIE WRAPS

BRN 14" LG
OR 14" LG
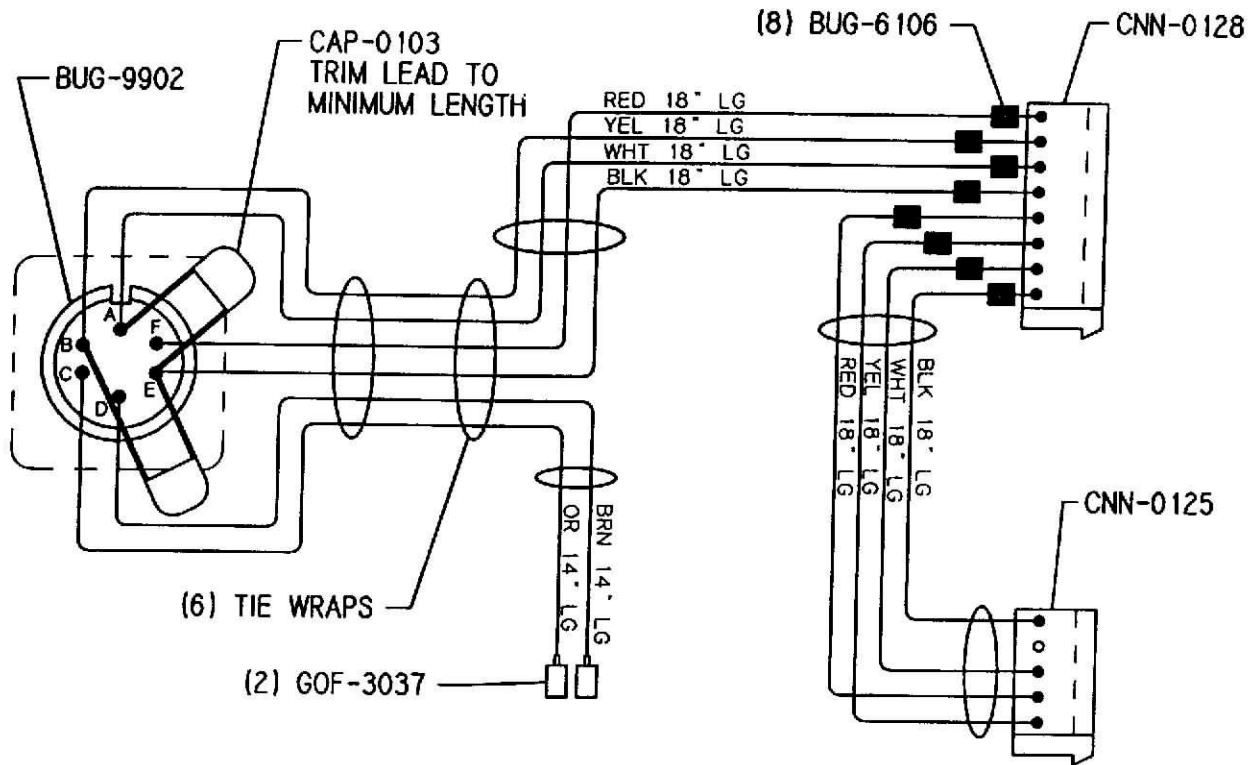
(2) GOF-3037

PART NO.	DESCRIPTION	WIRE
BUG-6106	Ferrite Bead	10x30 20 AWG
BUG-9902	Panel Connector, 6-T, Female	
CAP-0103	Capacitor, .01 Film	
CNN-0125	5-Pin Housing Assembly	
CNN-0128	8-Pin Housing Assembly	
GOF-3037	Male Connector	

SEO-4119 INTERCONNECTING WIRING HARNESS
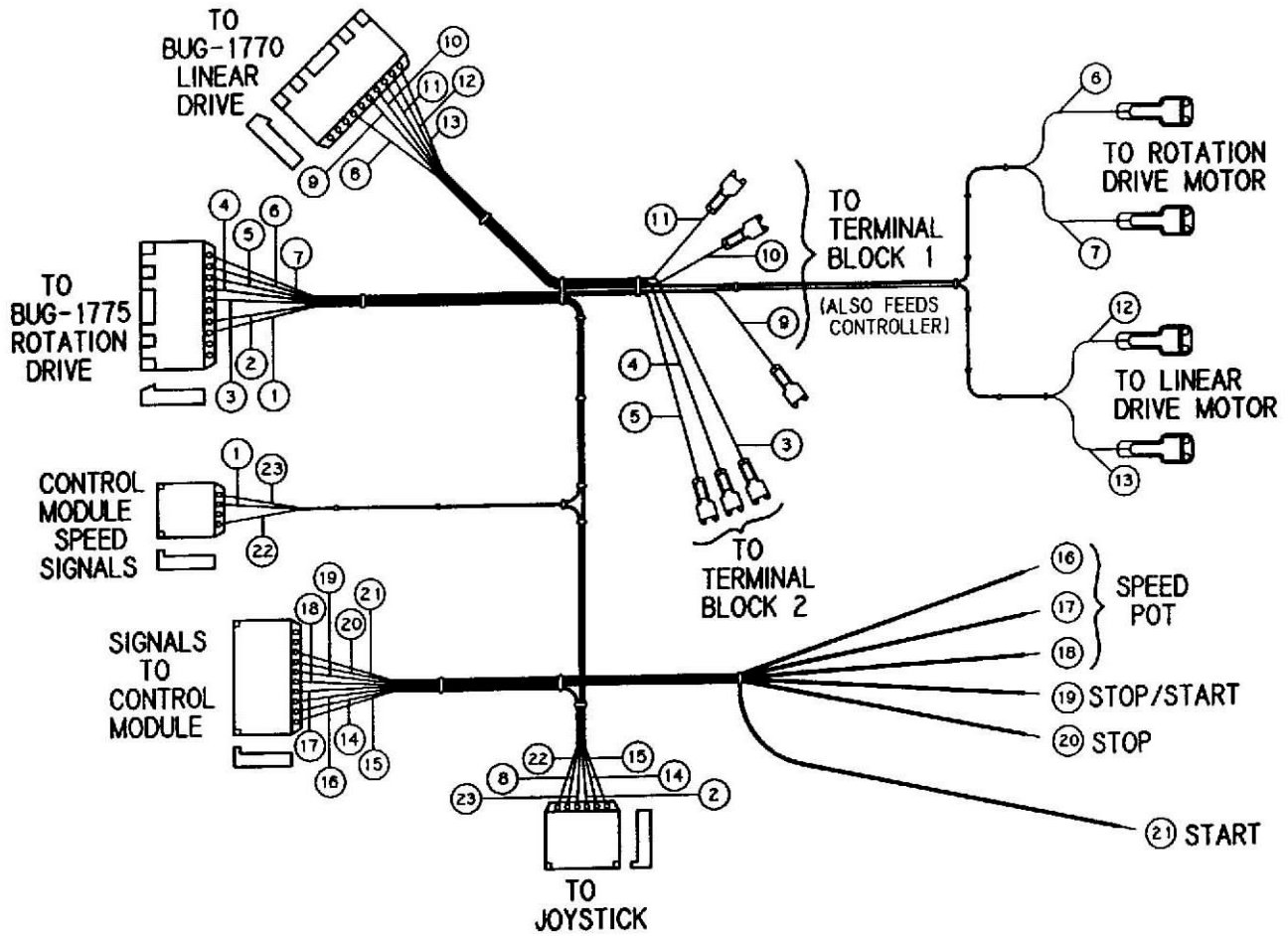
WIRE NO.	COLOR	WIRE NO.	COLOR
1	Blue	13	Brown
2	Pink	14	Brown
3	Tan	15	Gray
4	Blue	16	Blue
5	Tan	17	Yellow
6	Pink	18	White/Blue
7	Gray	19	Blue
8	Orange	20	Red
9	Tan	21	Green
10	Blue	22	Orange
11	Tan	23	Pink
12	Orange		

BUG-5605-PT LINEAR DRIVE (100:1)
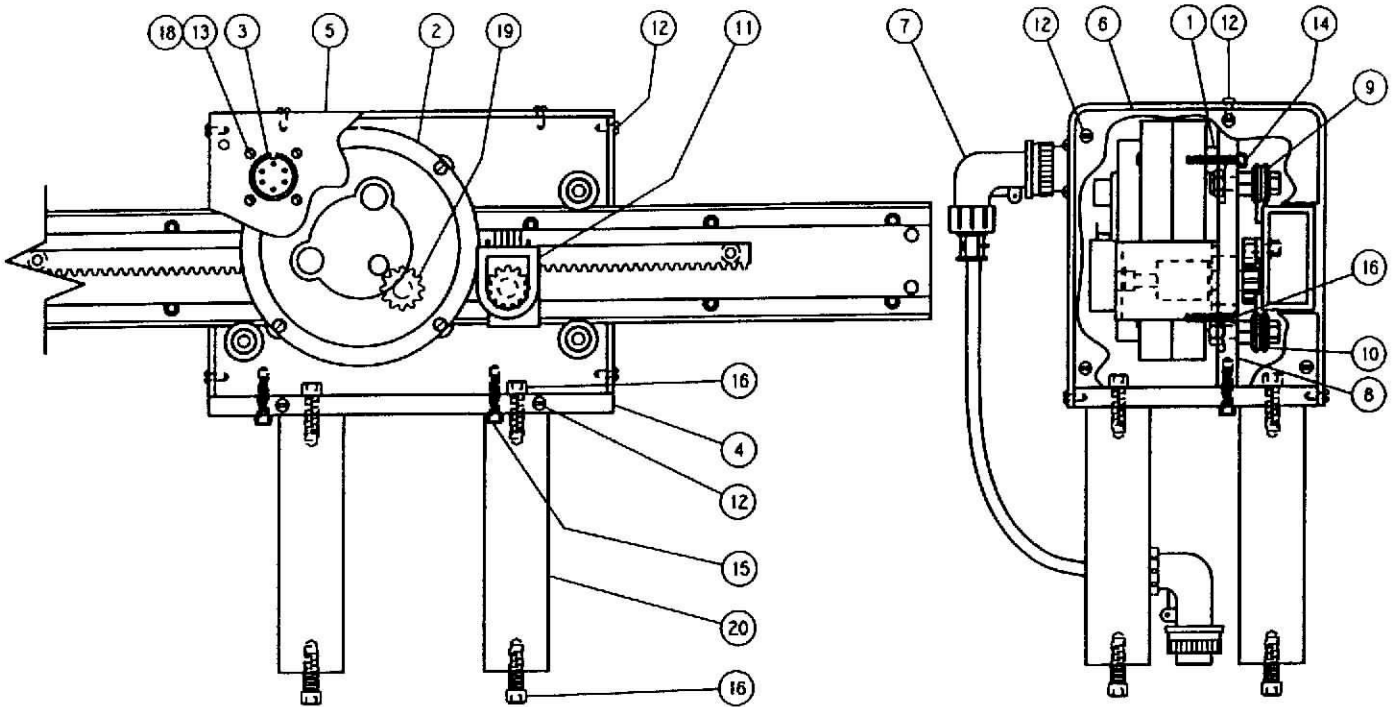
PARTS LIST

ITEM	QTY	PART NO	DESCRIPTION
1	4	BUG-1528	Spacer
2	1	BUG-1595	Gear Motor (100:1)
3	1	BUG-5607	Wiring Harness
4	1	BUG-5611	Base, Linear Drive
5	1	BUG-5612	Cover
6	2	BUG-5613	Side Panel
7	1	BUG-5617	Cable Assembly
8	1	BUG-5618	Mounting Plate
9	2	BUG-5670	Adj Leg & Wheel Assembly
10	2	BUG-5675	Fixed Leg & Wheel Assembly
11	1	BUG-6040	Gear/Encoder Assembly
12	14	FAS-0114	Pan Hd Screw 6-32 x 3/8 Lg
13	4	FAS-0204	Rnd Hd Screw 4-40 x 3/8 Lg
14	3	FAS-0529	Soc Hd Cap Screw 8-32 x 1" Lg
15	2	FAS-0537	Soc Hd Cap Screw 10-24 x 3/4 Lg
16	8	FAS-0557	Soc Hd Cap Screw 1/4-20 x 3/4 Lg
17	1	FAS-0829	Flt Hd Slotted Screw 8-32 x 1" Lg
18	4	FAS-1305	Hex Nut 4-40
19	1	GOF-3014	Pinion
20	4	SEO-4444	Stand Off 1 1/4 Dia x 5" Lg

BUG-5607 LINEAR DRIVE WIRING HARNESS
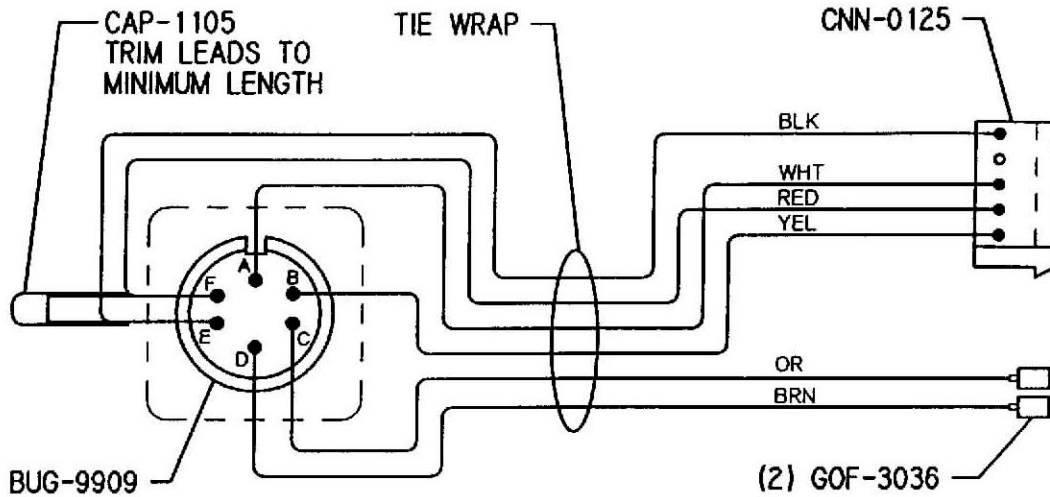
PART NO.	DESCRIPTION	WIRE
BUG-9909	Panel Connector, 6-T, Male	10x30 20 AWG
CAP-1105	Capacitor, 1.0 Ceramic (CK06BK105K)	all wires 9" long
CNN-0125	5-Pin Housing Assembly	
GOF-3037	Male Connector	

PENDANT CONTROL WIRING DIAGRAM

BUG-6050
HAND HELD TERMINAL

BUG-9906
CABLE CONNECTOR, 6-T, MALE

(FRONT VIEW)
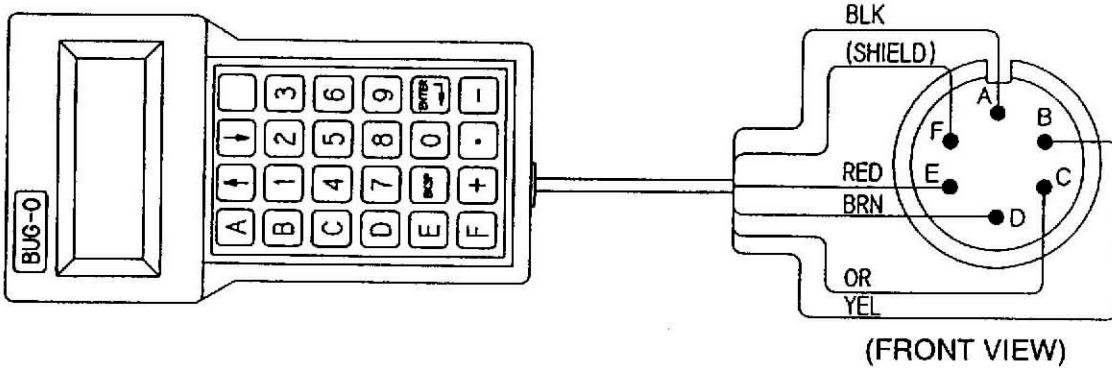
A _____ BLACK: CIRCUIT COM
B _____ YELLOW: TX (TRANSMIT)
C _____ ORANGE: RX (RECEIVE) 9600 BAUD
D _____ BROWN: SIGNAL GROUND
E _____ RED: POWER (5 V)
F _____ SHIELD DRAIN WIRE, BARE,
          TOUCHING FOIL SHIELDING

NOTE: OTHER WIRES SHOULD BE TRIMMED,
AND UNABLE TO TOUCH TERMINAL PINS

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OPERATION CHECKLIST and TROUBLESHOOTING

1. Plug in the machine and turn on the Power switch. Operate the manual joystick in all 4 directions in turn. This overrides any speed command from the computer control. If the drive runs in a corresponding direction, and the speed can be varied with the Speed pot, this indicates
    a) the speed control boards are OK
    b) the controller circuit is supplying the required voltages.

    If only one motor does not run correctly and the other one does, then it is likely that the motor's speed control is faulty.

    If both do not operate properly, then there may be a bad component on the control module that prevents proper voltages to be supplied to the joystick.

    A bad connection in the speed signal line to the speed board may also run the motor in one direction only at full speed.

    Manual control must function correctly before checking the computer control.

2. Attach the Handheld Pendant and push the Reset button. The display should read "Reset OK". Push "D" on the keypad and push "Return" until the display shows the Cut No. and all the data for that cut.

    If the display functions, this indicates
    a) the communication line is functioning
    b) the computer is operating its program.

    If the message "Reset OK" comes up but pushing "D" or any other key has no effect, there could be a false signal coming in from the Stop button, due to a wire short or damaged switch.

3. Disconnect the Handheld Terminal and turn power on.

    Toggle the joystick in all 4 directions after pushing "Reset". When the joystick is let go, the machine should go back to its original position.

OPERATION CHECKLIST and TROUBLESHOOTING (cont.)

This confirms the computer is running its program, and also interfacing correctly with the encoders and the speed signal outputs to the speed boards.

If one motor returns home and not the other, then the computer may not be receiving the encoder signals properly from that axis - encoder pick up gear or coupling may be loose or the pins in the encoder plug may not be making a good connection.

If a motor returns home from one direction but not from the other, the speed control may be faulty and drive only in one direction.

ADDENDUM

INSTRUCTIONS FOR THE DUAL FUNCTION SE-4P

SHAPE PROGRAMMING

The following pages describe the shape programming capabilties of the dual function machines. Arbitrary shapes can be programmed and cut on a pipe mounted in the chuck.

PROGRAMMING SHAPES ON THE SE-4

This capability is provided only on the Dual function SE-4PTD. Cuts of any arbitrary shape can be programmed, by building up the shape from a sequence of straight lines and circular arcs.

Programming is very similar to the Shape Machine - see detailed Shape Machine programming instructions.

ONE IMPORTANT DIFFERENCE is that for every change of pipe diameter in the machine, the new diameter has to be entered in the machine. If the machine is set to cut a square hole on a 4 inch or 100 mm pipe, and an 8 inch or 200 mm diameter pipe is put in the chuck, the hole will be rectangular, stretched out to twice the dimension in the circumferential direction.

Press 'E' on the keypad to enter diameter; the display will ask for pipe diameter first, and then the segment end slowdown as in the Shape machine.

The shapes are laid out on a flat surface as if the pipe is slit and opened up flat, and the cut line developed on it.

If the Shape machine PC program is used to download shapes, the pipe diameter has to be entered manually as the program does not handle it. This can be done from the computer if desired, by the F9 function "emulate pendant". From there, press E (Upper Case) and follow the prompts.

Note: the machine must be connected to the PC for "emulate pendant" function; turn power ON and press the Reset button.

SWITCHING FUNCTION IN DUAL FUNCTION MACHINE

The dual function SE-4P machine runs under either the Shape program, for custom programmed shapes, or the Pipe program, for pipe intersections.

To switch functions,
>Press 'C' on the keypad,
>Release the key immediately,
>Press 'F' immediately (within half a second).

The machine should change to the other program:
>if the machine is in the Pipe program, the message "Shape Prog" should be displayed;
>if in the Shape program, the message "Pipe Prog" should be displayed.

DESCRIPTION

The machine has 10 storage areas in memory for different programmed shapes, numbered 0 to 9. At any time, one of these shape numbers is active, and will stay selected even when power is shut off and turned back on, until the shape number is changed by the operator.

All programming is done with the hand-held terminal provided; this may be plugged into the connector on the control panel of the machine or unplugged at any time. The terminal is not needed to run the machine once programmed.

Shapes are built up only from the segments provided: circular arcs and straight lines, square or inclined, by selecting type and quadrant for each segment. A shape can have up to 50 segments. Some other operations, like solenoid On/Off, time delay, or repeat another shape, also count as one segment each if used.

In normal operation, first position the torch at the starting point. Next turn on the preheat gases, and wait until the required preheat is reached. Push the Run button; the machine will turn on the cutting oxygen and start cutting the current shape. At the end of the shape the machine will turn off the cutting oxygen and stop. Manually turn off the preheat gases.

When plasma cutting, an external contact relay is used instead of the cutting oxygen solenoid. A delay to allow for striking the arc should be the first segment programmed.

OPERATION

When power is turned on, the position of the torch becomes the reference Start position.
There are three options (the hand held terminal is not needed for the first two):
1. MOVE
    To change the Start position, push the STOP button, move the machine manually to the required position using the 4-way joystick, and push the RESET button.

2. RUN
    Push the START/RUN button to cut a shape.

3. PROGRAM (entry or change)
    The Programming operation is selected by pressing keys A,B,C,D, E.
    A: All segments; data entry for a new shape consists of total number of segments.
    Data for each: Type   (arc, x/y line or slope)
                    Quadrant   1-4
                    Size   (radius, or x/y dimension)
    See Shape programming for details.

OPERATION (CONT)

For example, a 2 inch diameter circle could be four segments:

1.	2, 1, 100	Counterclockwise arc, quadrant 1,	1.00 inch radius	
2.	2, 2, 100	" quadrant 2,	"	
3.	2, 3, 100	" quadrant 3,	"	
4.	2, 4, 100	" quadrant 4,	"	

The data should be tabulated on paper from a diagram before entering.

B: Program Segment
Press B on terminal to re-program a single segment. This is useful if there is an error in data for just one segment, so the whole shape does not have to be re-entered.

C: CHANGE Shape Number
Press C on terminal to change the current shape number, and enter the desired number at the prompt. The program switches to the new number in memory, and to whatever shape is stored there.

D: DISPLAY Shape Data
Press D to display the data for the current shape.
The terminal display shows Total No. of Segments, and data for each segment one by one each time you press Enter.

E: END of Segment Slowdown
Press E to set deceleration value for the shape, when the machine approaches the end of each segment. This is useful when the shape has sharp corners, to prevent overshoot. 99 is maximum slowdown, 0 is no slowdown.

IMPORTANT:

1. Once the HOLD button is pressed, computer control is halted until the RUN or the Reset button is pressed. Therefore the programming cannot be done with the handheld terminal in this state; the Reset button should be pressed first.

2. After pushing A and programming a new shape, End of Segment Slowdown will still have the old value unless reprogrammed.

To set a new value, push E.

SHAPE PROGRAMMING

The shape to be cut on the pipe must be first laid out flat as if the pipe is slit along the length and opened out.

1. Draw the required shape on paper to some convenient scale.

2. Refer to the Segment Chart and divide the shape into straight line and arc segments.

3. Decide on the operation sequence and mark any other operations such as turning torch on or off, or delay.

4. Number all the segments in sequence, including other operations if any, and make a table with required data. Example for a clockwise circle starting from the top: (dimensions described for metric version)

Segment No.	Type	Quadrant	Dimensions
1.	1	1	300 (30 mm)
2.	1	4	300
3.	1	3	300
4.	1	2	300

5. With the machine turned on and the pendant plugged in, select which shape number this will be - for instance, No. 3.
   Push C: display reads Shape No._
   Push 3 for No. 3, press Enter key (backward arrow).
   The program is now in Shape No. 3.

6. Push A: display reads "Total segments ?"
   Push 4 for 4 segments and Enter.
   Display reads "1. Type?" waiting for Segment 1 data.

7. Push 1 for type, clockwise arc. (Refer to Programming Chart on next page)
   Display reads "Quadrant?"
   Push 1 for quadrant 1.
   Display reads "mm x 10"
   Push 3, 0, 0, Enter, for 300, which is 30.0 mm.
   Segment 1 has now been entered,
   display reads "2. Type ?", asking for data for Segment 2.

8. Repeat above steps to enter data for all segments, in sequence.
   Display will read " Ready " after all segments are entered.
   The shape program is now stored in memory as Shape No. 3,
   and the machine is ready to cut the shape.

PROGRAMMING CHART

SEGMENT TYPES: **QUADRANT:**

	#1	#2	#3	#4
1. Clockwise 90° Arc				
2. Counterclockwise 90° Arc				
3. X or Y Axis Line				
4. Oblique Line				
5. Functions	WELD/OXY ON	WELD/OXY OFF	WAIT FOR START BUTTON	TIME DELAY
6. Functions	REPEAT ANOTHER SHAPE		AUXILIARY MODES	PERCENT SPEED
7. Clockwise Partial Arc				
8. Counterclockwise Partial Arc				

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DATA ENTRY required for Programming:

To program a complete new shape (press 'A').

Count the number of segments or operations and enter the total.
For each segment, enter

Type:	select form 1 through 8
Quadrant:	1,2,3 or 4; refer to chart
Size:	one or more dimensions per segment as described below; 100 per inch or 10 per mm (depending on machine version); or for time, 100 per second of delay. (e.g. 150 = 1.5", or for metric 375 = 37.5 mm)

Detailed description of Types:

Type 1.
Clockwise, 90° arc segments.
Quadrant determined by which quarter of a full circle makes the arc. (See chart)
Dimensions required: Radius only.

Type 2.
Counterclockwise, 90° arc segments.
Quadrant determined by which quarter of a full circle makes the arc. (See chart)
Dimensions required: Radius only.

Type 3.
Line along X or Y axis.
Quadrant determined by direction of movement. (See chart)
(East: 1, North: 2, West: 3, South: 4).
Dimensions required: Length only.

Type 4.
Angled straight line.
Quadrant determined by direction of movement. (See chart)
(NE: 1, NW: 2, SW: 3, SE: 4).
Dimensions required: (1) X - dimension; movement along X axis
                     (2) Y - dimension; movement along Y axis

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DATA ENTRY (CONT)

Type 5.
Functions or other operations.
Quadrant by selecting function. (See chart)
 1. Weld/oxygen ON: turn ON Contact Relay or cutting oxygen solenoid.
Dimensions required: None.
 2. Weld/oxygen OFF.
     Dimensions required: None.
 3. Pause: Machine stops and waits until Start/Run button is pushed again.
     Dimensions required: None.
 4. Delay: Machine stops and holds position for a programmed time period, up
     to 99.99 seconds.
     Dimensions required: time in .01 second units. (e.g. 250 for 2.5 seconds)

Type 6.
Special functions.
Quadrant by selecting function.
 1. Repeat: Another complete shape will be repeated the specified number of
     times. Shape No. of the repeated shape MUST BE LOWER then the
     Shape No. of the current shape being programmed.
     Therefore it CANNOT BE USED IN SHAPE No. 0.
     Data required: (1) Shape No. to be repeated.
                         (2) Number of times.

 2. Ellipse: This is provided for making a complete true ellipse, always starting
     from the left (west extremity) and moving clockwise.
     Dimensions required: (1) diameter along X-axis.
                                   (2) diameter along Y-axis.

 3. Auxiliary modes: Provides commands to turn ON or OFF two line-switching
     outputs independently, and also switch speeds from set speed to Rapid
     Traverse and back. Mode numbers are from 0 to 7; see table page 36 to
     select mode.

 4. Set percent speed.
     Used to change speed of the machine in the middle of a shape to a lower
     speed. See details page 37.

Type 7.
Clockwise arc, must be less than 180°.
Quadrant determined by direction of end point of arc relative to the start point.
(See chart)
Dimensions required:
        (1) X-dimension; offset along X-axis from start to end point.
        (2) Y-dimension; offset along Y-axis from start to end point.
        (3) Radius of arc.

DATA ENTRY (CONT)

Type 8.
Counterclockwise arc, must be less than 180°.
Quadrant determined by direction of end point of arc relative to the start point.
(See chart)
Dimensions required:
      (1) X-dimension; offset along X-axis from start to end point.
      (2) Y-dimension; offset along Y-axis from start to end point.
      (3) Radius of arc.

AUXILIARY MODES: Type 6, Quadrant 3

These are additional controls to independently turn the two internal Solid State Relay outputs ON and OFF, and to switch the machine into Rapid Traverse mode or Set Speed.

The machine is shipped with OUTPUT (1) wired to the external relay or solenoid connector. By default, this output turns ON when the Start button is pressed to run a shape, and turns OFF at the end. The output is taken from screws (3) and (4) on the 4-terminal strip, on the controller inside the machine.
ONLY OUTPUT (1) IS NORMALLY USED.

OUTPUT (2) is present at screws (1) and (2) on the controller, but not wired. By default the output is OFF when a shape is started, until turned ON by command Type 5, Quad 1. Both the SEO-4470 Plasma Cutting Kit and the SEO-4490 Oxyfuel Cutting Kit use only output (1). Subsequently while running, the Type 5 ON and OFF commands turn both outputs On and Off together, and both turn Off at the end.

When programming Type 6 Quad 3, a Mode Number is required to be entered. The eight auxiliary modes, numbered 0 through 7, allow the setting of a mode with any combination of outputs On or Off, and choice of Set Speed by the speed knob, or maximum speed regardless of setting. The combinations are listed in the table below:

Mode No	Output 1	Output 2	Speed
0	Off	Off	Set
1	Off	On	Set
2	Off	Off	HI
3	Off	On	HI
4	On	Off	Set
5	On	On	Set
6	On	Off	HI
7	On	On	HI

SET % SPEED, FRACTION OF SET SPEED: Type 6, Quadrant 4

Selecting Type 6-4 allows the speed to change to a fraction of the set speed. Display will read "Speed %", and data entry is accepted from 1 to 99. Entering 0 or just Return will make the speed 100%, which is the same as set speed.

When the program reaches a Type 6-3 segment while running, the speed will change to the percent entered, and continue at this setting until there is a later Type 6-3 segment which changes it to another % setting or back to 100%.

Note: If Type 6-3 has been set for HI (rapid traverse), then this setting will cut down the HI speed to the same %.

Settings below 10% are not recommended.

PROGRAMMING EXAMPLE

To cut a slot in a pipe like the one in the diagram shown below:

The cut is split into a sequence of straight lines or circular arcs that make up the desired pattern.

Next, these should be listed in a table, with the Type, Quadrant, and required dimensions (refer to the Programming Chart). The table for the shape is listed below.

To program the shape, press 'A', then enter the total segments at the prompt. (6 in the example below)

Next enter the data for each segment - Type, Quadrant, and dimensions - as prompted.

Finally an End of Segment slowdown value is entered, and the display will read 'Ready'.

FOR THE FIRST CUT OF A GIVEN DIAMETER, IN THE SHAPE PROGRAM, THE PIPE DIAMETER MUST BE ENTERED.

Press "E" on the keypad, when the display will first ask for the diameter, and then the Slowdown value.

Free End

Segment	Type	Quad	Dimension
1	1	3	400
2	3	2	600
3	1	2	400
4	1	1	400
5	3	4	600
6	1	4	400

The first segment is a clockwise 90° arc, which is Type 1, Quad 3 and the required dimension is the radius, set here as 40 mm.

Chuck End

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