

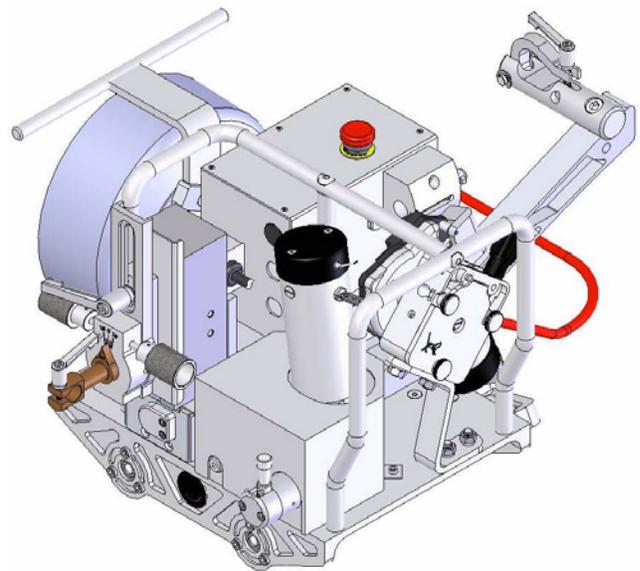


# PIPE KAT<sup>®</sup>

## WELDING SYSTEM

**LINEAR  
OSCILLATOR  
MODELS:  
PK-500-LG-\*  
PK-500-LH-\*  
PK-500-LW-\***

(\*INDICATES VOLTAGE REFERENCE)



### OPERATING INSTRUCTIONS

Website: [www.gullco.com](http://www.gullco.com)

Distributed by:

**GULLCO INTERNATIONAL LIMITED – CANADA**

Phone: 905-953-4140 Fax: 905-953-4138 e-mail: [sales@gullco.com](mailto:sales@gullco.com)

**GULLCO INTERNATIONAL INC. – U.S.A.**

Phone: 440-439-8333 Fax: 440-439-3634 e-mail: [ussales@gullco.com](mailto:ussales@gullco.com)

**GULLCO INTERNATIONAL [U.K.] LIMITED - EUROPE**

Phone: +44 1257-253579 Fax: +44 1257-254629 e-mail: [uksales@gullco.com](mailto:uksales@gullco.com)

**GULLCO INTERNATIONAL PTY LIMITED - AUSTRALIA**

Phone: 61 (0) 7 3348-5515 Fax: 61 (0) 7 3348-5510 e-mail: [ausales@gullco.com](mailto:ausales@gullco.com)

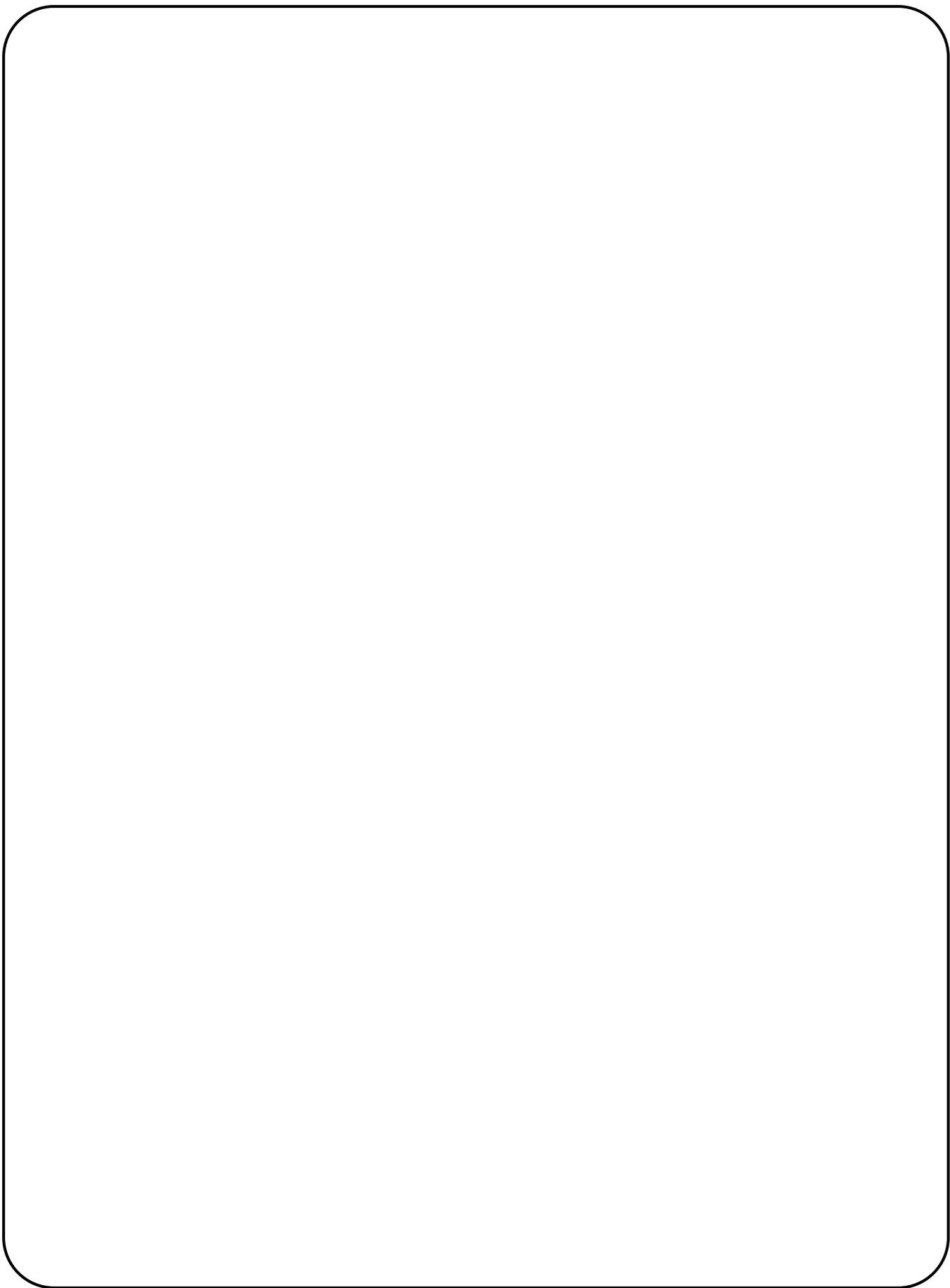
**GULLCO INTERNATIONAL INDIA PRIVATE LIMITED**

Phone: 91-20-65260382 Fax: 91-20-26836656 e-mail: [india.io@gullco.com](mailto:india.io@gullco.com)

**GULLCO INTERNATIONAL SHANGHAI – LIMITED**

Phone: +8621-50460341 Fax: +8621-50463554 e-mail: [c.zhang@gullco.com](mailto:c.zhang@gullco.com)







## TABLE OF CONTENTS

<b>SAFETY INSTRUCTIONS</b> .....	2
<b>SAFETY PRECAUTIONS</b> .....	3
<b>PIPE KAT® SYSTEM COMPONENTS</b> .....	4
<b>GENERAL DESCRIPTION</b> .....	5
<b>PIPE BAND</b> .....	6
PIPE BAND SIZING .....	6
MOUNTING PIPE BAND (TRACK) ON THE PIPE .....	7
MOUNTING THE CARRIAGE ON THE PIPE BAND (TRACK) .....	8
<b>CARRIAGE UMBILICAL</b> .....	9
<b>REMOTE PENDANT</b> .....	11
<b>PIPE KAT® CARRIAGE</b> .....	13
<b>MAIN CONTROL BOX OPERATION</b> .....	16
FRONT PANEL .....	16
LEFT SIDE PANEL .....	17
RIGHT SIDE PANEL .....	18
<b>CARRIAGE OSCILLATOR CONTROL</b> .....	19
OSCILLATOR CONTROL PROGRAMMING .....	20
GENERAL PROGRAMMING MODE .....	22
ADVANCED PROGRAMMING MODE .....	25
PIPE KAT® OSCILLATOR CONTROL ERROR CODES .....	27
OSCILLATOR CONTROL FACTORY DEFAULTS .....	29
<b>CARRIAGE CONTROL</b> .....	30
CARRIAGE CONTROL PROGRAMMING .....	34
GENERAL PROGRAMMING MODE .....	35
ADVANCED PROGRAMMING MODE .....	36
PIPE KAT® CARRIAGE CONTROL ERROR CODES .....	39
CARRIAGE CONTROL FACTORY DEFAULTS .....	41
<b>WELDING POWER SOURCE INTERFACE CONNECTION</b> .....	43
<b>AUTOMATIC CYCLE OPERATION</b> .....	45
<b>AUTOMATIC CYCLE SEQUENCE OF EVENTS</b> .....	46
<b>GENERAL SPECIFICATIONS</b> .....	48
<b>OPTIONAL EQUIPMENT</b> .....	49

## **SAFETY INSTRUCTIONS**

Although the PIPE KAT® is manufactured for safe and dependable operation, it is impossible to anticipate those combinations of circumstances which could result in an accident. An operator of the PIPE KAT® is cautioned to always practice "**Safety First**" during each phase of operation, set-up and maintenance.

Read and understand the operation manual before operating or performing service of this equipment. Become familiar with the machines operation, applications and limitations. Keep the operation manual in a clean and readily available location.

This equipment is normally used to automate / semi-automate welding processes. These processes usually have any combination of the following; bright and hot arcs, flying sparks, fumes, ultraviolet and infrared radiated energy, hot work-pieces, compressed gases, etc. The onus is on the operator of this equipment to know, understand and follow all the safety precautions associated with the process being used.

A careless operator invites trouble, and failure to follow safety practices may cause serious injury or even death. Important safety precautions are given in the following:

### **Electrical Shock Prevention**

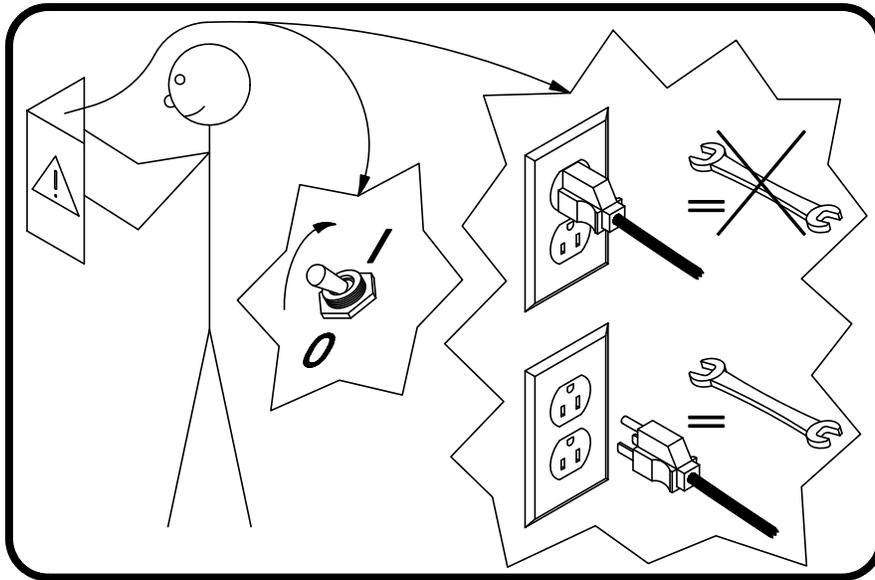
- ❖ Do not use this equipment in damp or wet locations.
- ❖ Do not expose this equipment to rain.
- ❖ Never carry this equipment by the cables or pull the cables to disconnect from the receptacle.
- ❖ Keep all cables from heat, oil and sharp edges.
- ❖ Inspect all cables periodically and replace if damaged.
- ❖ Inspect the security of all cables periodically and repair if loose.
- ❖ Disconnect the power cord when not in use.
- ❖ Disconnect the power cord **positively** to prevent electrical shock before repair and service of the equipment.

### **Bodily Injury Prevention**

- ❖ Do not wear loose clothing, jewelry and loose, long hair which may get caught into automatic systems or moving parts.
- ❖ Ensure that the Pipe Band/track is well secured when installed.
- ❖ Keep lifting handles dry, clean and free from oil and grease.
- ❖ Keep hands away from the underside of the PIPE KAT® carriage when there is the slightest possibility of it moving.
- ❖ Always wear protective gloves when handling the track, to prevent injury from sharp edges.

## SAFETY PRECAUTIONS

The following cautionary/warning label is attached to each "PIPE KAT"<sup>®</sup> main control box



The above label pictorially represents the following:

*"Warning:-*

*Read the manual before turning the unit on and before performing service. Also, positively disconnect the unit from all power supplies before servicing!"*

## IMPORTANT

### READ THIS BEFORE OPERATING THE PIPE KAT<sup>®</sup> CARRIAGE

**WARNING!** Always turn the main power off before connecting/disconnecting any cables to/from the PIPE KAT<sup>®</sup> carriage and main control box. Failure to comply may result in control damage.

Do not cycle the power on and off in quick succession to the PIPE KAT<sup>®</sup> system, as this may have diverse affects.

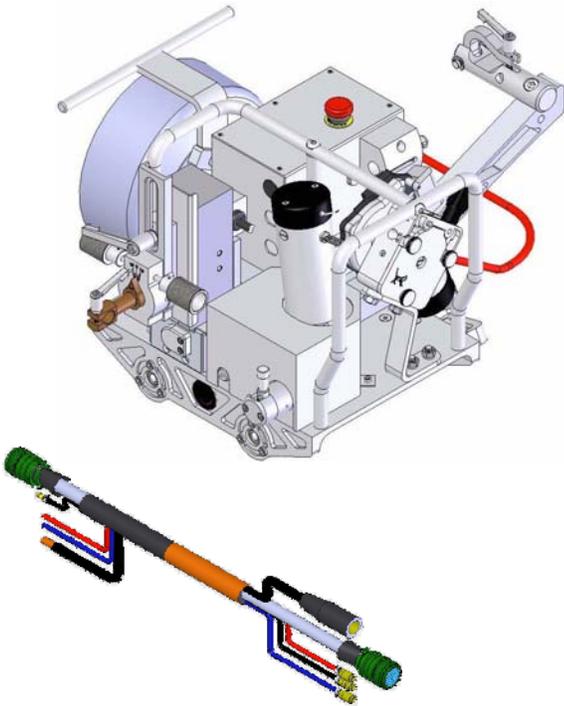
Ensure that an adequate and well-maintained weld return path is provided with good electrical contact. Failure to do so may result in the welding current passing through the carriage and damaging the wiring and electrical components.

**ALL THE SAFE PRACTICES AND PRECAUTIONS MAY NOT BE GIVEN IN WRITING. SOME ARE BASED ON COMMON SENSE, BUT OTHERS MAY REQUIRE TECHNICAL BACKGROUND TO EXPLAIN.**

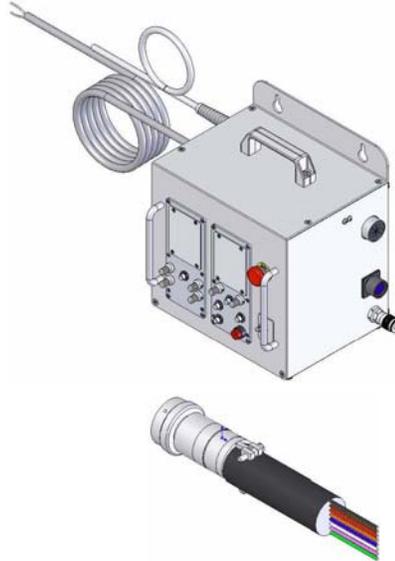
## **THE PIPE KAT® WELDING SYSTEM COMPONENTS**

This manual covers the operation instructions of the following PIPE KAT® systems  
PK-500-LG-\*, PK-500-LH-\*, PK-500-LW-\* (\* indicates input voltage: "A"=42 VAC; "B" =115  
VAC; "C"= 230 VAC).

**PIPE KAT® CARRIAGE  
WITH UMBILICAL**



**PIPE KAT® MAIN CONTROL  
WITH WELDING POWER SOURCE  
INTERFACE CABLE ASSEMBLY**



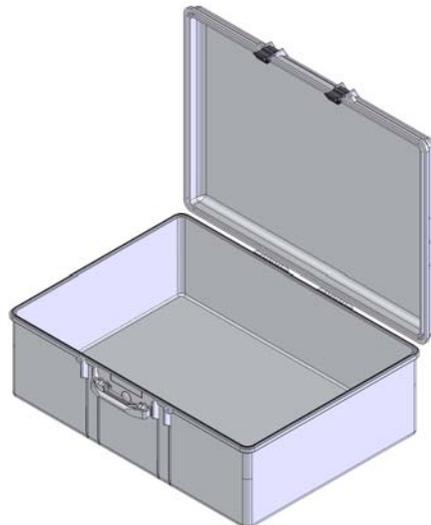
**PIPE KAT®  
REMOTE  
PENDANT**



**PIPE KAT® PIPE BAND**



**STORAGE / TRANSPORTATION CASES**



## **GENERAL DESCRIPTION**

The PIPE KAT® is an advanced portable travel carriage designed for orbital welding. It is an electrically powered track guided carriage that travels in forward and reverse directions at precisely controlled speeds. It consists of 24 VDC permanent magnet gear motor which engages the aluminum pipe band (track) through the self-aligning wheel system. Pipe bands are designed and manufactured to customer specific applications (pipe diameter). The band is typically constructed from extruded aluminum which insures a long life and durability in harsh conditions.

The onboard wire feeder and wire spool holder is driven by a 24 VDC motor which feeds wire to the welding torch at precisely controlled speeds. The wire spool holder accepts standard 8" / 10 lbs [20.3cm/4.54kgs] spools.

The Gullco Linear Oscillator is a compact, light weight, yet durable, reciprocating device with a high torque, high resolution and low vibration stepper motor. It imparts a linear motion to the weld gun. The low voltage Oscillator control provides a large, easy to read, multi-page graphical display and offers programmable and electronic adjustment over the following functions.

- Oscillation width
- Oscillation speed
- Independent left and right dwells
- Oscillation centre positioning (steering)
- Multiple oscillation program storage

The precise control of these features enables accurate and repetitive weld oscillation.

The Gullco Carriage control provides control and adjustment over vertical slide, wire feeder and carriage drive motor.

A motorized torch slide provides 2" or 50mm of tip-to-work distance adjustment, this serves as a fine adjustment to control and maintain the proper torch to pipe height during setup and welding. This motorized torch slide is connected to the linear oscillator by an adjustable radial Lead & Lag mounting bracket

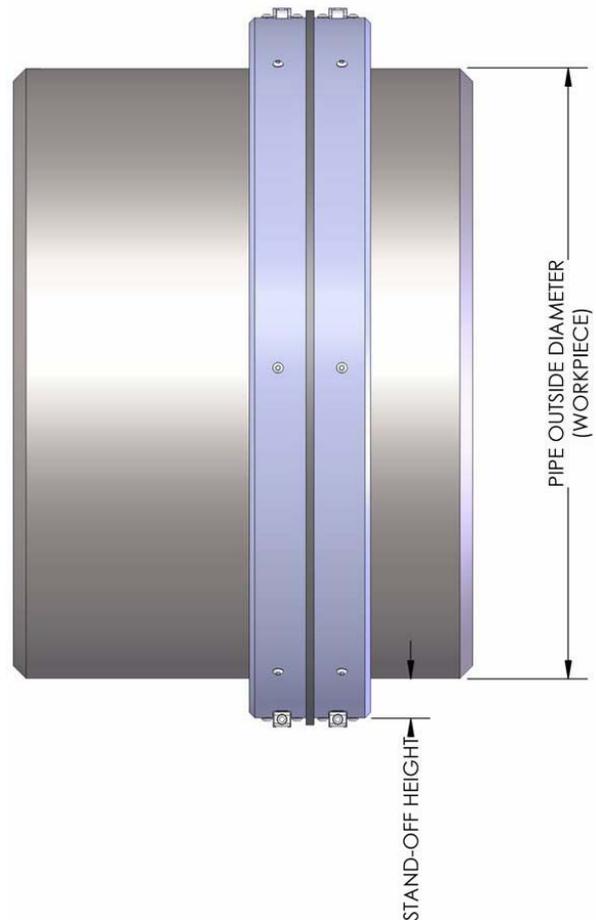
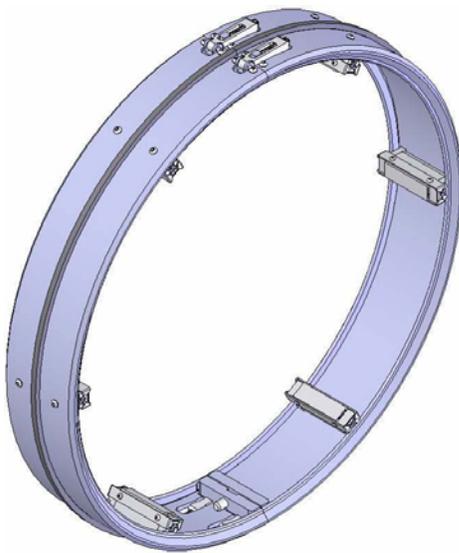
The versatile torch mounting bracketry provides a greater variation of torch mounting/positioning flexibility.

## **INTENDED / FORESEEN USAGE**

The Gullco PIPE KAT® is intended to automate and improve the quality of the welding operation at precisely controlled speeds, along the Pipe Band as well as providing the interface between the welding motion and the arc start and stop signals. The PIPE KAT® operates with precise motion from start to finish regardless of the number of passes or the work pieces involved, improving the quality, efficiency and repeatability of the process. Detrimental factors such as poor or awkward accessibility, operator fatigue, or inconsistent workmanship are eliminated. Required quality levels are consistently attained and productivity and profitability increased.

## PIPE BAND

The Pipe Band is constructed from extruded aluminum and uses adjustable stand-offs that serve as spacers to maintain the correct distance from the band to the pipe. The Pipe Band utilizes a quick adjustment latches that allows the operator to mount and remove the band easily. It is important that the Pipe Band is properly maintained and not subjected to any abuse as it serves an important role in the carriages drive system. The operator must play close attention to the condition of mating edge of the band that the PIPE KAT® carriage wheels run on. Care must be taken to ensure that the band is kept clean from dirt and debris that could damage the band. Also premature wear or damage to the band could result from improper mounting of the PIPE KAT® carriage.



## PIPE BAND SIZING

All Pipe Bands are manufactured to customer specified pipe diameters & stand-off lengths.

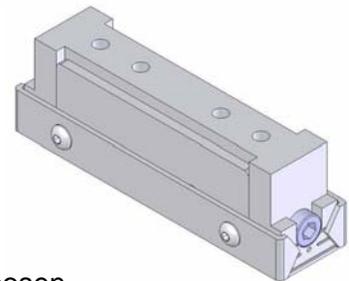
The standard (minimum) stand-off height is 1.75" [44.5mm]. Spacers can be used to increase the height off the stand-offs.

The minimum spacer height can be used in conjunction with standard stand-offs is 0.50" [12.7mm]

## MOUNTING PIPE BAND (TRACK) ON THE PIPE

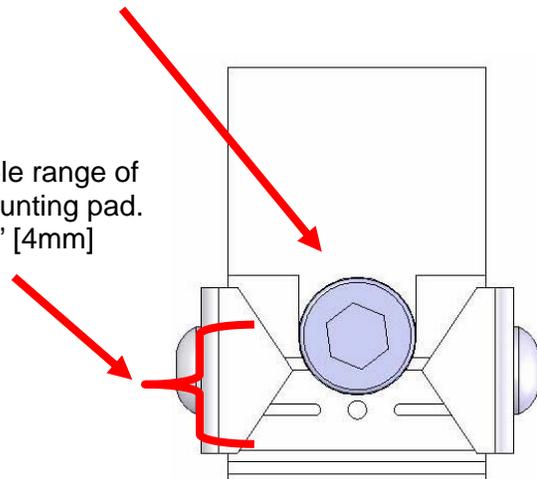
1. Loosen latch screws on both top swing latches and bottom fixed latches. Do not remove these screws.
2. Swing open the top pair of latches.
3. Separate or split the two bottom halves (fixed latches) of track away from each other.  
**Important !** The bottom halves must be a minimum of 3/16" [5mm] apart from each other. This minimum distance will allow the track to safely open without causing interference between the two track halves.
4. Place track on pipe by sliding over the end, or by opening the track to fit over the pipe outside diameter.
5. Close latch over catch and tighten adjustment screw enough to allow the track to move, but still remain on the pipe.
6. Align track to weld joint. The optimal distance is approximately 8.00" [203.2 mm] between the inside edge of track and the center of the weld joint. NEVER use a hammer or other such object to hit the Pipe Band into position, doing so will damage the edge that the self-aligning wheels run on and result in poor performance.
7. Back off the adjustable standoffs on the pipe band. This is done by rotating the adjustment screw counter clock-wise.
8. Finish tightening the top and bottom latch screws. The track must be sufficiently fastened to remove any gaps between the ends of track at the joint. Do not over-tighten!
9. Verify track position on the pipe and then begin to tight each adjustable track standoff. It is important that each standoff be adjusted by the same amount. By not doing this the track will not be concentric with the pipe. See below for more details.

### Track standoff assembly



Adjustment screw:  
-Counter clock-wise to loosen  
-Clock-wise to tighten

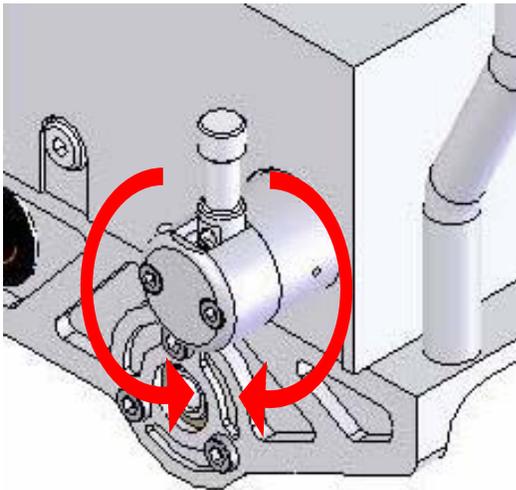
Adjustable range of track mounting pad.  
+/-0.157" [4mm]



## MOUNTING THE CARRIAGE ON THE PIPE BAND (TRACK)

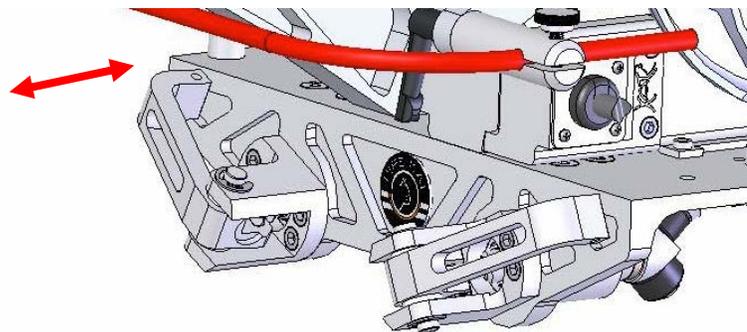
The drive engagement lever (shown below) extends out the side of the carriage drive assembly and allows the operator to engage or disengage the drive gear the rack on pipe band. The drive gear can either be engaged or disengaged when mounting the carriage on the track. It also permits free-wheeling for rapid positioning of the PIPE KAT® carriage. To engage the drive, pull the lever away from the carriage body and turn in either direction until the lever arm is facing down. **Important:** always make sure the drive is properly engaged by verifying the lever is locked into position.

**WARNING** Never disengage the drive when there is a possibility that this action may result in the equipment moving expectantly and causing injury.



### MOUNTING PROCEDURE:

- 1) With both Carriage Locking Handles open, both handles have a built in detent to hold them open, place the carriage directly over the Pipe Band/track.
- 2) Rest the carriage so that the top shoulder of all four wheel assemblies is resting on the outer face of the band.
- 3) Close the locking handles securing the carriage to the track.



## CARRIAGE UMBILICAL

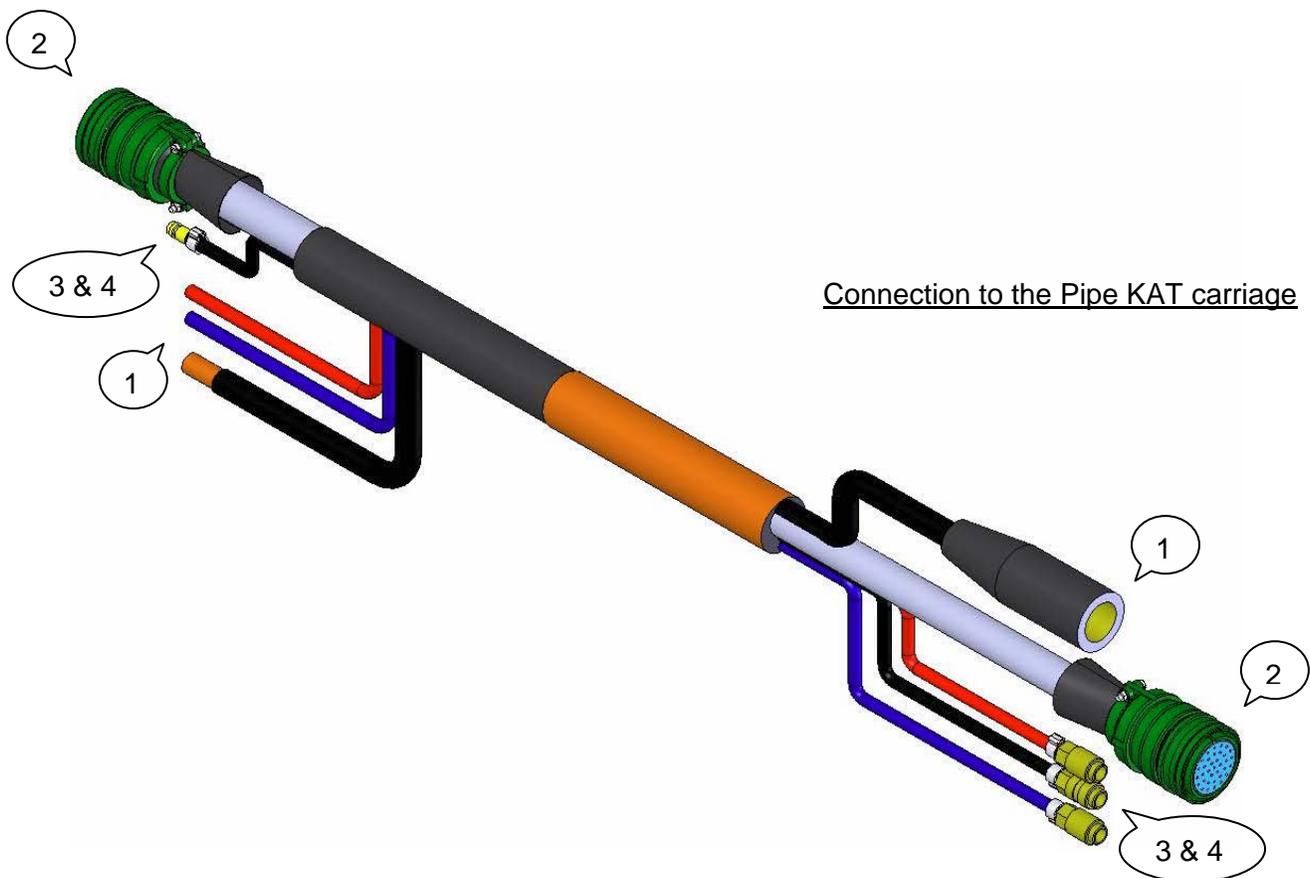
The umbilical assembly provides communication between the Main Control Box and the PIPE KAT<sup>®</sup> carriage, in addition to supplying cooling water, shielding gas and electrical welding power to the torch.

The umbilical comprises of one control cable that provides power and communication to the carriage, two water hoses (supply and return), shielding gas hose and welding electrode cable. The umbilical is wrapped in a heat and abrasion resistant cover and uses a clamp to secure the umbilical assembly to the carriage (see pages 13 & 14 to see where the umbilical attaches to the PIPE KAT<sup>®</sup> carriage).

**Note:** It is important that the umbilical does not become tangled, coiled, or caught in anyway that would impede the motion of the carriage and possibly damage electrical cables and restrict water supply and/or shielding gas supply to the torch.

It is good practice to frequently inspect the carriage umbilical for damage and worn components, any suspect parts should be replaced immediately to prevent further damage to the PIPE KAT<sup>®</sup> system.

### Connection to the Pipe KAT main control



**Connection to the PIPE KAT® Main Control includes:**

- 1) Additional 15 ft welding power supply electrode cable
- 2) One (1) large electrical connector for communication supply to the carriage
- 3) One (1) male plug for the shielding gas supply to the torch
- 4) Additional 15 ft of water cooling hoses (supply & return)

**Connection to the PIPE KAT® carriage includes:**

- 1) One (1) twist connect welding power supply cable connection
- 2) One (1) large electrical connector for carriage communication
- 3) One (1) quick-disconnect fitting for the torch shielding gas
- 4) Two (2) quick-disconnect fittings cooling water, supply (blue) and return (red)

## REMOTE PENDANT

The Remote pendant is used in conjunction with the main control to provide adjustment during setup, initiate the weld cycle, provide fine adjustment during welding, and to stop the weld cycle.

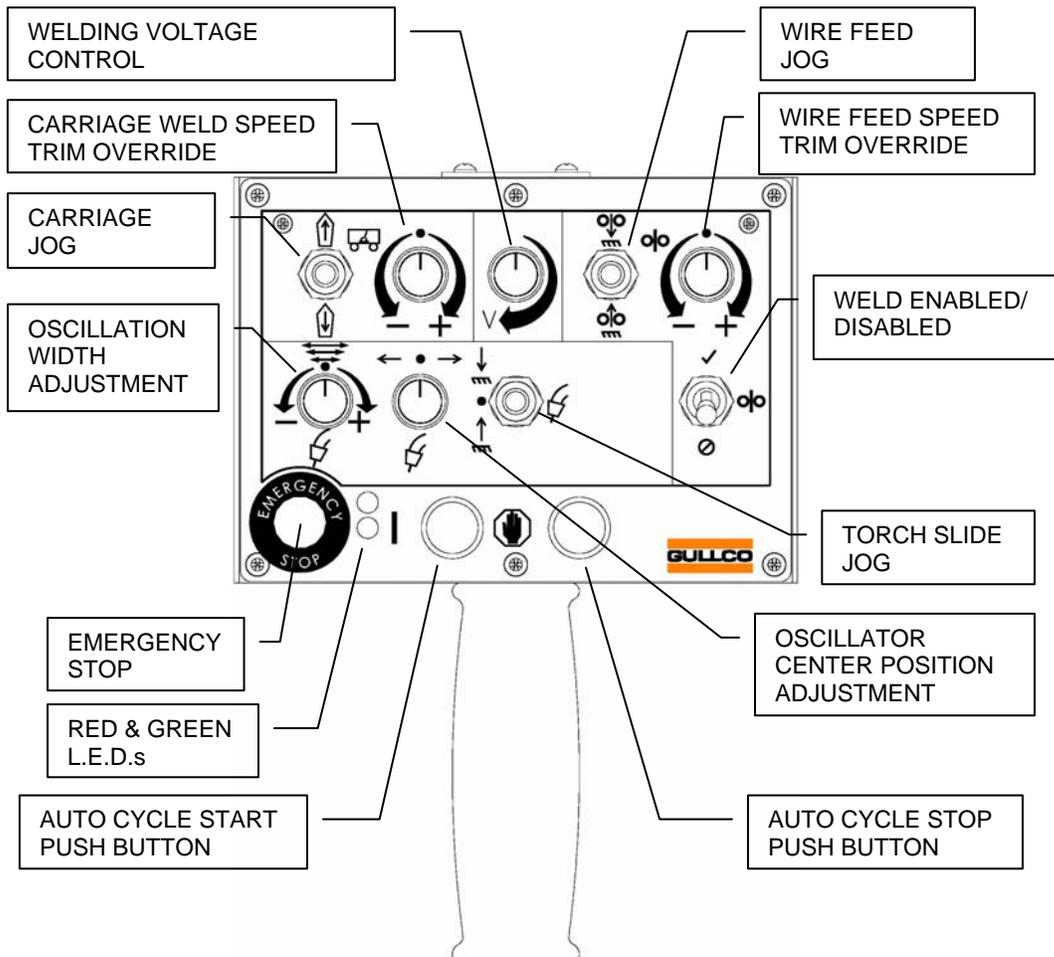
During setup the pendant is used to provide the following:

- Position the carriage to the welding start position
- Adjust oscillator center position
- Adjust torch height in relation to the pipe
- Advance the wire towards and back from the pipe
- Set welding voltage

During the welding operation the pendant can be used to provide the following fine adjustments:

- Carriage speed
- Wire feed speed
- The torch height in relation to the pipe (tip-to-work distance)
- Oscillation center position
- Oscillation width adjustment
- Adjust welding voltage

The remote pendant is supplied with a 35ft communication cable that connects to the right side panel of the PIPE KAT® Main Control. The functions of the Remote Pendant are discussed in detail below.



**RED POWER LED:** The red LED is illuminated to indicate there is power to the pendant. It also flashes whenever there is an error code displayed on the controls.

**WIRE FEED SPEED TRIM OVERRIDE:** This speed adjustment knob allows for fine adjustment in wire feed when the PIPE KAT<sup>®</sup> is in auto cycle mode (welding), this serves as a fine adjustment to control and maintain the quality of the welding process. Adjustment range: +/- 19 inches/minute or +/- 48 cm/minute.

**CARRIAGE WELD SPEED OVERRIDE:** This speed adjustment knob allows for fine adjustment in carriage weld speed when the PIPE KAT<sup>®</sup> is in auto cycle mode (welding), this serves as a fine adjustment to control and maintain the quality of the welding process. Adjustment range: +/- 1.32 inches/minute or +/- 3.36 cm/minute.

**WELDING VOLTAGE CONTROL:** This adjustment knob allows for adjustment of the welding voltage during setup or in auto mode. **Note:** welding voltage control is only available when the PIPE KAT<sup>®</sup> is interfaced with the welding power source; see “Welding power source calibration” on page 37 for more details.

**WIRE FEED JOG:** This 3-position momentary switch (Forward/Auto/Reverse) allows for manual forward and reverse feeding of the welding wire when not in the auto cycle mode. The switch is automatically disabled during the auto cycle.

**CARRIAGE JOG:** This 3-position momentary switch (Forward/Auto/Reverse) allows for manual forward and reverse motion of the carriage when not in the auto cycle mode. Use the carriage jog switch to establish the proper position of the carriage to the work prior to welding. When the forward or reverse jog direction is selected, the carriage will travel at the set carriage (weld) travel speed for three (3) seconds then it will progressively ramp up to maximum travel speed. The switch is automatically disabled during the auto cycle.

**EMERGENCY STOP:** The emergency stop button serves as a safety feature that will terminate all operations and shut down the PIPE KAT<sup>®</sup> unit when pressed. The emergency stop will remain activated until it is reset by turning the button in a clock-wise motion. There are two (2) other such emergency stop buttons; one (1) on the PIPE KAT<sup>®</sup> carriage assembly and one (1) on the Main Control Box. These three (3) Emergency Stop buttons are wired in series, so any one (1) will shut down the PIPE KAT<sup>®</sup> system when activated, and all three have to be released in order for the system to power-up.

**GREEN LED:** The green LED is illuminated when the PIPE KAT<sup>®</sup> is operating in the auto cycle mode.

**AUTO CYCLE START PUSH BUTTON:** This green button is used to initiate the auto cycle mode. The button must be held for a minimum of two (2) seconds to reduce the possibility of accidentally starting an automatic operation.

**AUTO CYCLE STOP PUSH BUTTON:** This red button is used to terminate the auto cycle mode. The button must be held for a minimum of two (2) seconds to reduce the possibility of accidentally aborting the automatic operation.

**OSCILLATION WIDTH ADJUSTMENT:** This adjustment knob allows the operator to adjust the torch oscillation width while in the auto cycle mode (welding). This serves as a fine adjustment

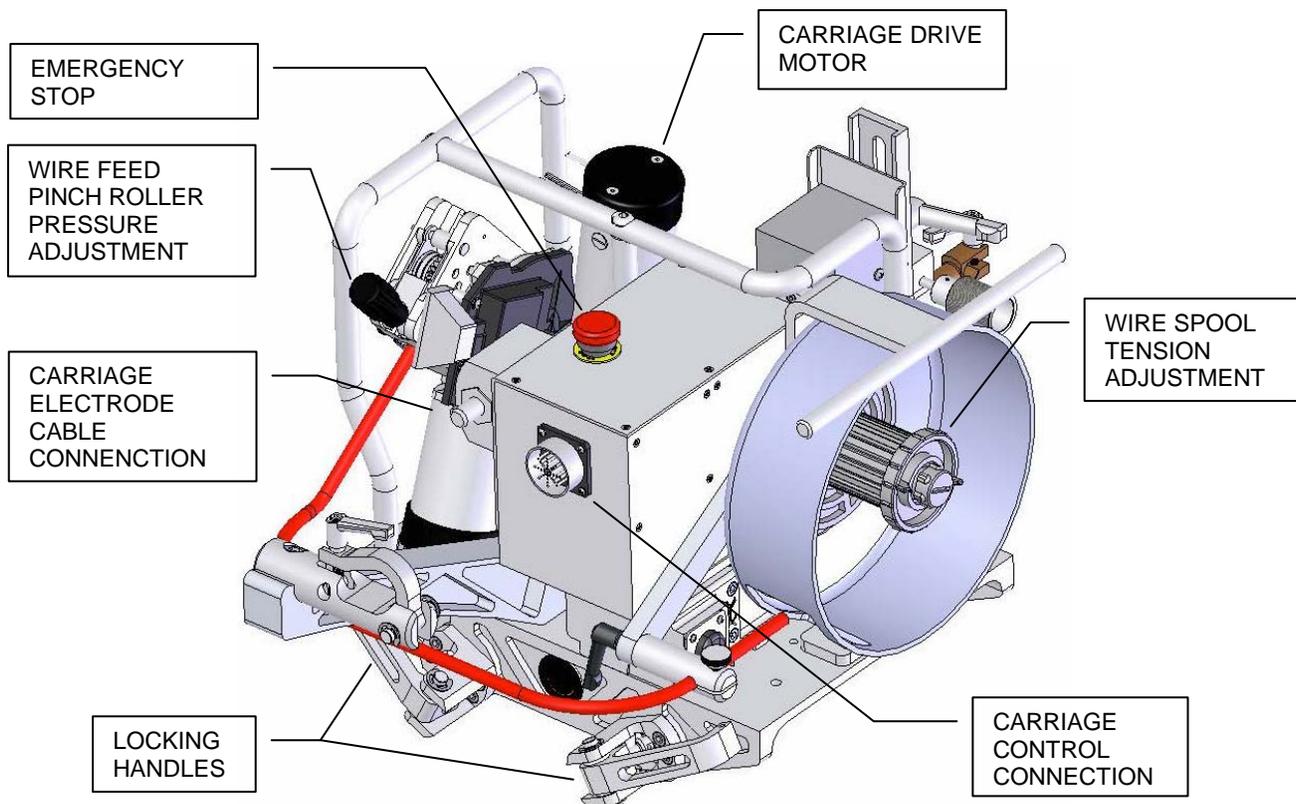
to control and maintain the quality of the welding process. Width is increased or decreased in 0.01 Inch/CM increments.

**OSCILLATION CENTER POSITION ADJUSTMENT:** This adjustment knob allows the operator to adjust the center position of the torch oscillation while in the auto cycle mode (welding) or to jog the torch to the desired position prior to welding. This serves as a fine adjustment to control and maintain the quality of the welding process. To make adjustments (steering) while welding, rotate the knob in the appropriate direction until the center of the oscillation has moved to the desired location. The size of these centre adjustment (steering) increments can be programmed to be as large or small as preferred (see the “2<sup>nd</sup> Field” details on page 25).

**TORCH SLIDE JOG:** This 3-position momentary switch (In/Stop/Out) allows the operator to adjust the In/Out distance of the torch relative to the work. The torch slide provides 2” or [50.8mm] of motorized travel and can be used in both auto and manual modes. This serves as a fine adjustment to control and maintain the tip-to-work distance. The linear speed of the slide can be programmed through the Carriage Control (see page 36).

**WELD ENABLED/DISABLED:** This 2-position maintained switch allows the user to perform simulated auto cycles, without actually welding, when in the Disable (⊘) position (i.e. when an auto cycle is initiated the wire feeder, the welding power source, and the shielding gas flow are disabled). When in the Enabled (✓) position the auto cycle will perform a weld cycle (see page 45).

### PIPE KAT® CARRIAGE



**WIRE FEED PINCH ROLLER PRESSURE ADJUSTMENT:** Allows the operator to adjust and maintain roller pressure on the wire feeder.

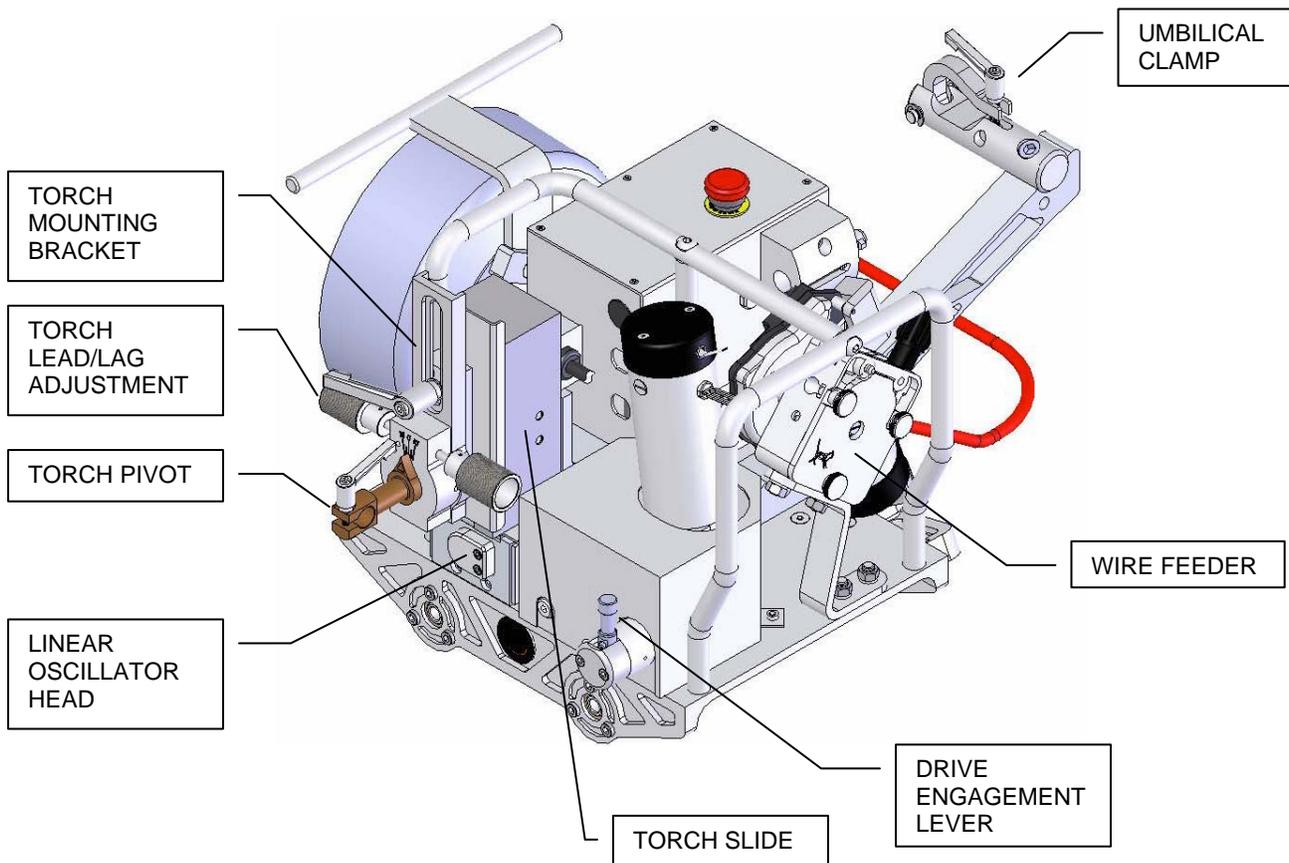
**WIRE SPOOL TENSION ADJUSTMENT:** Allows the operator to adjust and maintain spool tension

**EMERGENCY STOP:** The emergency stop button serves as a safety feature that will terminate all operations and shut down the PIPE KAT® unit when pressed. The emergency stop will remain activated until it is reset by turning the button in a clock-wise motion. There are two (2) other such emergency stop buttons; one (1) on the Remote Pendant and one (1) on the Main Control Box. These three (3) Emergency Stop Buttons are wired in series, so any one (1) will shut down the PIPE KAT® system when activated, and all three have to be released in order for the system to power-up.

**CARRIAGE DRIVE MOTOR:** This DC motor provides the motive propulsion that drives the PIPE KAT® carriage around the Pipe Band/track.

**CARRIAGE CONTROL CONNECTION:** This receptacle corresponds to the large electrical connector on the umbilical.

**CARRIAGE ELECTRODE CABLE CONNECTION:** Connect to the corresponding twist lock electrode cable connection on the umbilical.



**TORCH SLIDE:** The Torch Slide provides 2" or [50.8 mm] of motorized torch tip-to-work vertical adjustment. Adjustment is achieved by using the Torch Slide Jog switch located on the Remote Pendant.

**TORCH PIVOT:** Use the locking handle to adjust the angle of the welding torch to the pipe.

**TORCH MOUNTING BRACKET:** This adjustment bracket mounts the torch to the motorized Torch Slide; it also serves as a manual vertical torch slide allowing movement through the use of a locking handle.

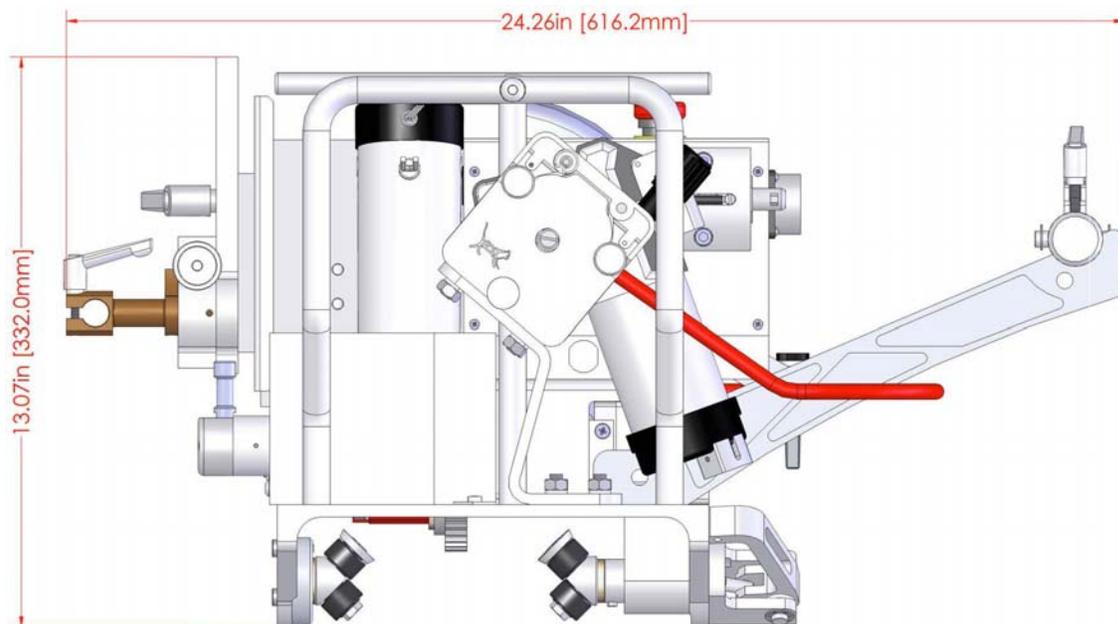
**TORCH LEAD/LAG ADJUSTMENT:** The Torch Lead/Lag Adjustment assembly is attached to the oscillator slide and is used to set the Lead/Lag angle of the welding torch. A range of 10° positive to 10° negative is permitted by rotating the knurled knob.

**LINEAR OSCILLATOR HEAD:** This motorized slide is fully programmable (see page 19) and provides torch positioning and linear oscillation movement of the welding torch.

**WIRE FEEDER:** This compact wire feed unit uses a pair of drive rolls (available in various sizes and types to suit the customers' requirements) to deliver the welding wire through the welding torch.

**UMBILICAL CLAMP:** This clamp provides a strain relief for the umbilical and prevents damage to the electrical connections, welding power cable, and water & shielding gas hoses and ground cable twist connector

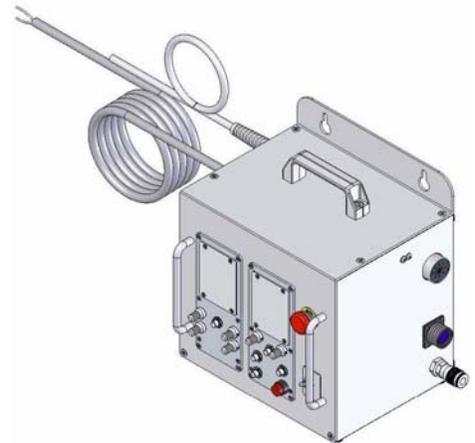
#### General dimensions of the PIPE KAT® carriage



## MAIN CONTROL BOX OPERATION

**NOTE:** Make sure all electrical connections are connected before powering up the PIPE KAT®.

**Do Not** disconnect any electrical connections while the power is ON, always power down the PIPE KAT® before doing so.



### FRONT PANEL

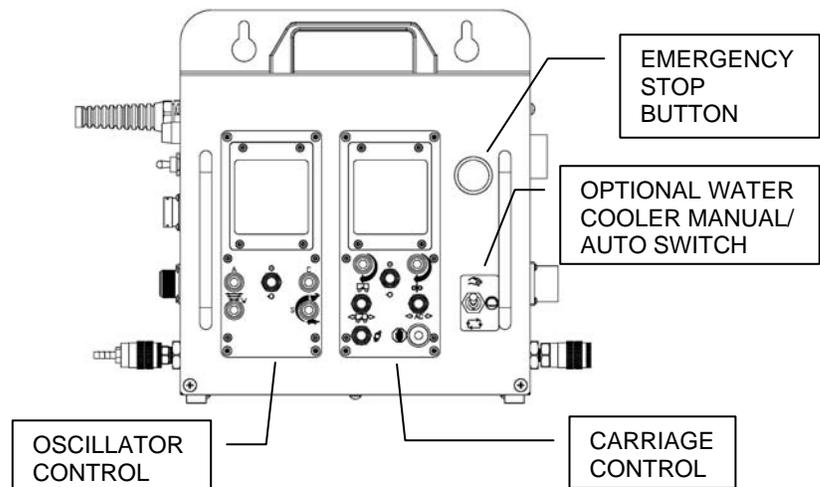
The main control unit houses all standard controls for the carriage. It communicates to the carriage through a cable/hose umbilical assembly.

The control box houses the step down power supply, the shielding gas solenoid valve, the oscillator control and the carriage control (the functions and programming of these controls will be discussed in detail later).

### **EMERGENCY STOP:**

The emergency stop button serves as a safety feature that will terminate all operations and shut down the PIPE KAT® unit when pressed. The emergency stop will remain activated until it is reset by turning the button in a clock-wise motion. There are two (2) other such emergency stop buttons; one (1) on the carriage assembly and one (1) on the remote control pendant. These three (3) Emergency Stop buttons are wired

is series, so any one (1) will shut down the PIPE KAT® system when activated, and all three have to be released in order for the system to power-up.



### **WATER COOLER OVERRIDE (OPTIONAL):**

This switch is part of the optional Water Cooler Power Interface Kit and allows the operator to manually activate the water cooler  or have the water cooler activate automatically whenever a weld cycle is active. 

**NOTE:** Units manufactured without the optional Water Cooler Power Interface Kit will not have the switch.

## **LEFT SIDE PANEL**

The left side panel of the main control contains the following features:

### **MAIN POWER ON/OFF SWITCH:**

This power switch provides power to the main control, carriage and the remote pendant.

### **AC POWER CORD:**

The main control is available with three input voltages options 42V, 115V & 230V.

### **AC POWER FUSE:**

This fuse provides protection to the AC circuitry of the PIPE KAT®. The rating of the fuse depends on the voltage of the unit, 42V unit is supplied with a 10 Amp fuse, 115V unit is supplied with a 5 Amp fuse, and the 230V unit is supplied with a 2.5 Amp fuse.

**WARNING!** Never change the fuse with one of a different rating; this could damage the PIPE KAT® unit.

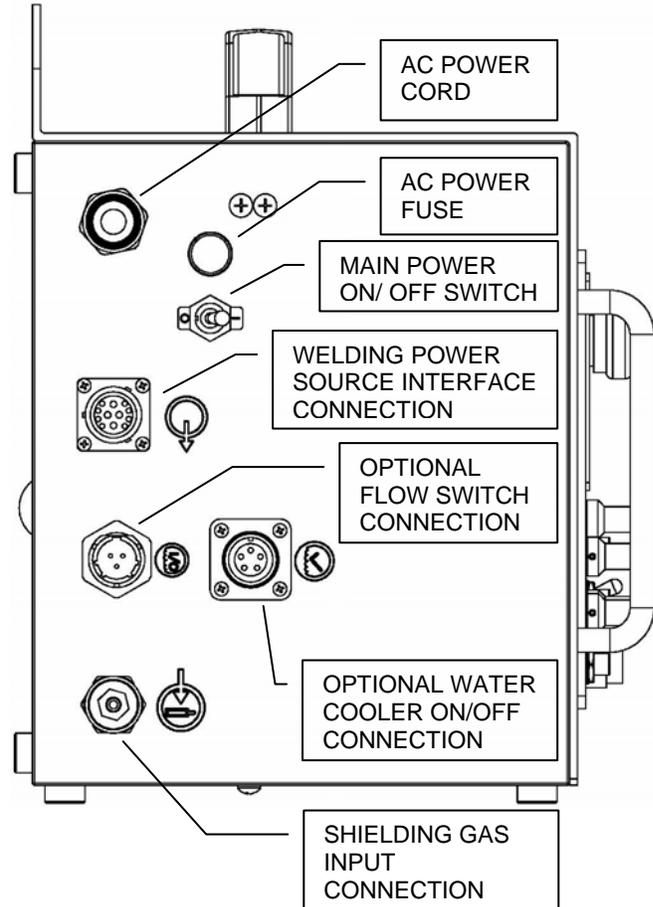
### **WELDING POWER SOURCE INTERFACE CONNECTION:**

This connector is used to communicate to the welding power source. It provides the signal for the arc start when the PIPE KAT® wants the welding power source to weld. In addition there is an analog control signal for remote welding voltage control and wire feed speed communication. Also some advanced welding processes require an “arc sense lead” that provides a feedback welding voltage to the welding power source, this is also included on this connector. The 15ft [4.6m] mating cable assembly is supplied and is intended to connect to the contactor control circuit of the customers’ power source. See page 43 for connection details.

### **REMOTE WATER COOLER START (OPTIONAL):**

This connector is part of the optional Water Cooler Power Interface Kit and uses a 10 amp isolated relay to enable the customers’ water cooler to be turned on during welding operations and off when not welding. 115v or 230v AC power supply to the water cooler (not provided) is fed through the contacts of this normally open relay using the supplied “Y” plug and receptacle cable assembly (not shown), thereby controlling the On/Off state of the water cooler. The Water Cooler Manual/Auto Switch mentioned earlier in this manual, energizes the relay, allowing the water cooler to be powered-up even when the PIPE KAT® is not welding.

**NOTE:** Units manufactured without the optional Water Cooler Power Interface Kit will not have this connector.



### **FLOW SWITCH (OPTIONAL):**

This connector is part of the optional Coolant Flow Switch Kit and is used to transfer a signal from the flow switch (not shown) to the control, indicating whether suitable coolant flow is present or not. The flow switch is mounted in-line with the coolant supply line. When there is sufficient coolant flow through the flow switch (setting adjustable by the operator) a relay closes. The PIPE KAT® control will not allow a weld cycle to start, or continue, unless it sees that relay is closed (or the signal bypassed when this optional kit is not installed).

**NOTE:** the remote flow switch is only available on units that have the remote water cooler start option installed

### **SHIELDING GAS INPUT:**

Shielding gas supply is connected here. The PIPE KAT® Main Control energizes an electric solenoid valve to open the gas flow for pre-flow, welding, post-flow and manual purge operation.

### **RIGHT SIDE PANEL**

The right side panel of the main control contains the following features

### **CARRIAGE CONTROL CONNECTION:**

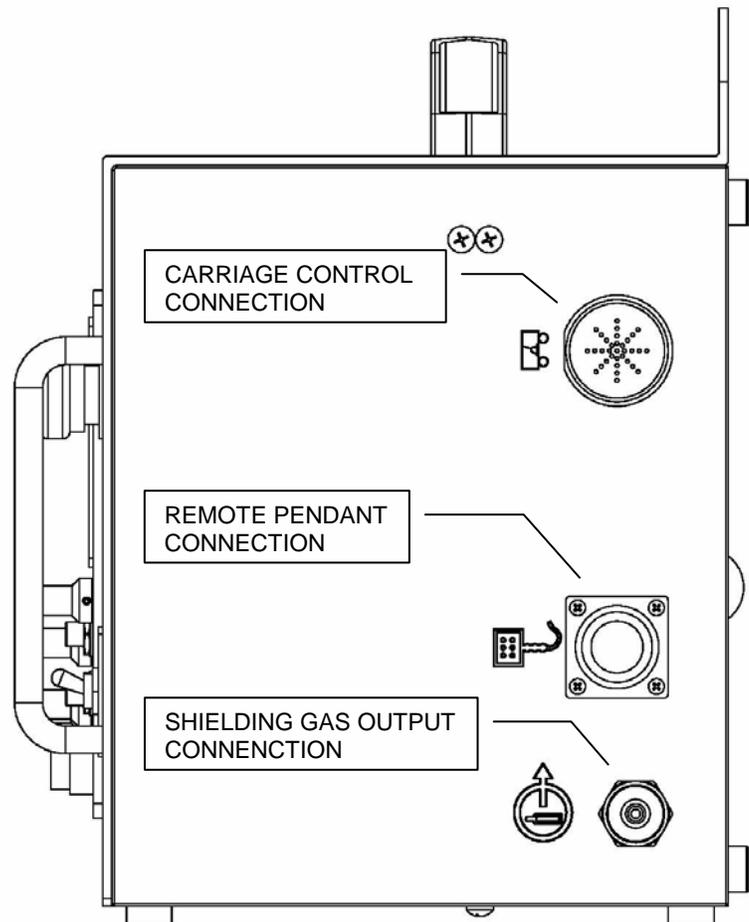
Control communication is delivered to and from the carriage by attaching the corresponding umbilical control connector here.

### **REMOTE PENDANT CONNECTION:**

The Remote pendant is used in conjunction with the main control to provide adjustments during setup, initiate the weld cycle, provide fine adjustment during welding, and to stop the weld cycle.

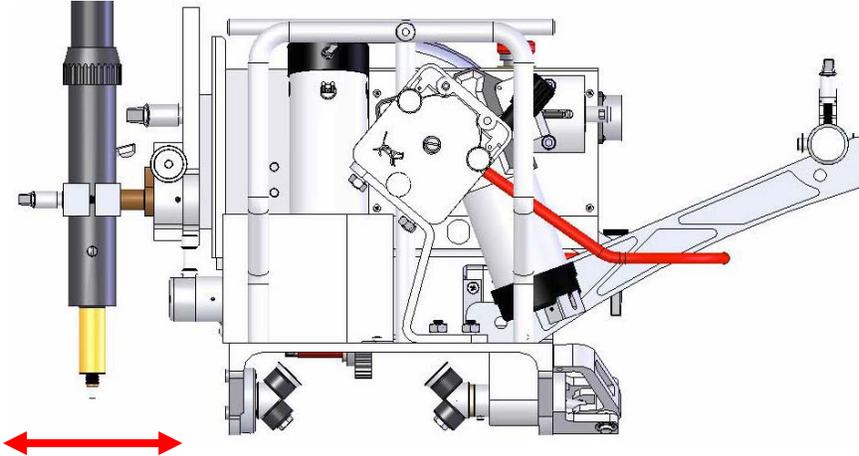
### **SHIELDING GAS OUTPUT CONNECTION:**

Shielding gas is delivered to the welding torch on the carriage, by attaching the corresponding umbilical shielding gas connector here.

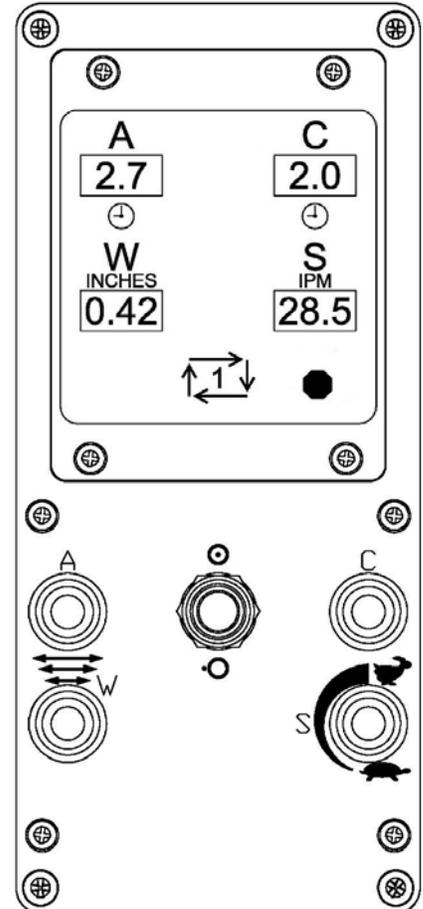


## CARRIAGE OSCILLATOR CONTROL

This control operates the motorized linear oscillator slide that is mounted on the PIPE KAT® carriage, which moves the welding gun laterally across the weld joint, for positioning and for oscillation of the weld. See below.

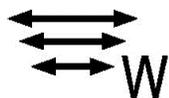


It is a highly sophisticated, yet easy to use, multi-processor based control drives a high torque, high resolution, low vibration stepper motor located in the Oscillator Head, allowing the welding gun to be moved in a precise reciprocative manner. The control interfaces with the main PIPE KAT® control, providing integrated functionality. By controlling the oscillation width, speed, positioning and dwell patterns in conjunction with the timed activation/deactivation of the PIPE KAT® carriage travel and the welding process, the quality and appearance of the weld can be tuned to perfection.

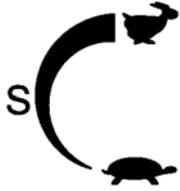


### “A” & “C” ROTARY SWITCHES

The A & C rotary switches will increase (clockwise adjustment) or decrease (counter-clockwise adjustment) the A & C location dwells respectively by 0.1 second increments, from a minimum of zero up to a maximum of 9.9 sec seconds. The current values are displayed on the LCD screen. These adjustments can be changed at any time before, or during, operation and will take effect on the next relevant dwell location. The orientation of the A & C locations of the oscillator can be altered (programmed) to match the orientation of the control. (see the Oscillator Motor Setup Screen later in this manual for details).



The W rotary switch increases (clockwise adjustment) or decreases (counter-clockwise adjustment) the total width of the oscillation stroke (A to C). The increments of adjustment and the minimum and maximum allowable stroke widths are dependent on the preferred units of measurement (see the Oscillator Motor Setup Screen later in this manual for details). The current value is displayed on the LCD screen. Width adjustments can be changed at any time before or during operation and will take effect on the next travel past the centre of stroke location. Note: - there is a width range where the oscillation stroke is too small to permit A & C dwells to work.



The S rotary switch increases (clockwise adjustment) or decreases (counter-clockwise adjustment) the oscillation stroke speed. The increments of adjustment and the minimum and maximum allowable stroke speeds are dependent on the preferred units of measurement (see the Oscillator Motor Setup Screen later in this manual for details). The current value is displayed on the LCD screen. Speed adjustments can be changed at any time before or during operation and will take effect immediately.

### PROGRAMMING BUTTON:

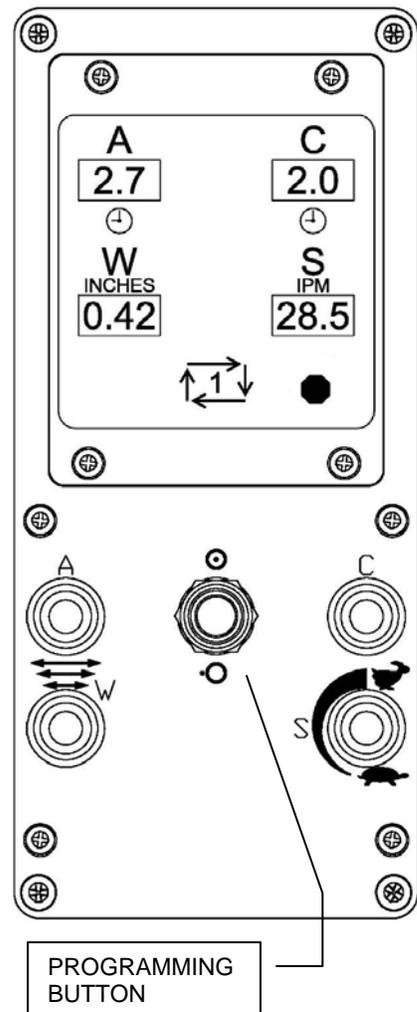
The Program push button changes the control state from running (operational) mode to programming mode, and back to running mode. While-ever the control is in programming mode, the program icon on the lower right corner of the LCD screen will appear as follows: 

**NOTE:** programming can only be accessible while the PIPE KAT<sup>®</sup> is stopped and not welding.

### OSCILLATOR CONTROL PROGRAMMING

There are two levels of programming mode:

- General Programming Mode: To access the General Programming Mode, push the Programming Button for a minimum of two (2) seconds, but no more than ten (10) seconds. The screens that are accessible under this mode are:
  - Feature/Set-up screen and;
  - 10 x Auto cycle storage screens.
- Advanced Programming Mode: this second level of programmable features is meant only to be used by higher level and/or qualified users and requires that the Program push button be pressed for more than ten (10) seconds. The screen that is accessible under this mode is:
  - Motor Setup screen



To change state either from programming mode (any screen) to running (operational) mode, press the Programming Button once (it does not need to be pressed for any specific duration). The various values and settings will be saved.

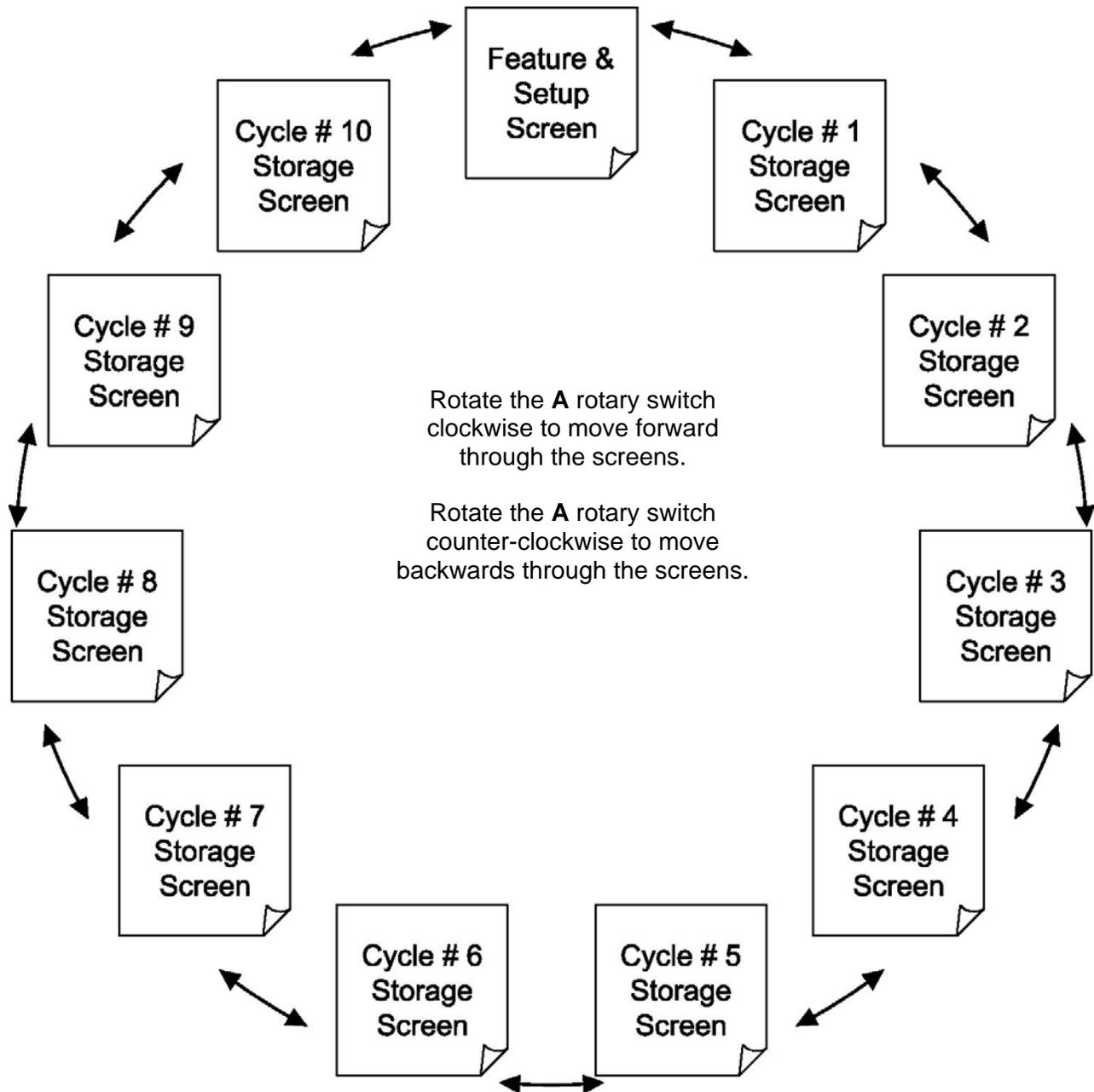
When in the programming mode, only the "A", "C" and the  rotary switches and the Programming Button will be used.

- The "A" rotary switch is used to navigate forward and backward between screens (pages).
- The  rotary switch is used to navigate forward and backward between adjustable fields of the current screen (page). The contents of the selected field will flash to indicate which field is currently selected.
- The "C" rotary switch is used to change the value/setting of the currently selected adjustable field.
- The Programming Button is used to save all values and settings, exit programming mode and return to the running (operational) mode.

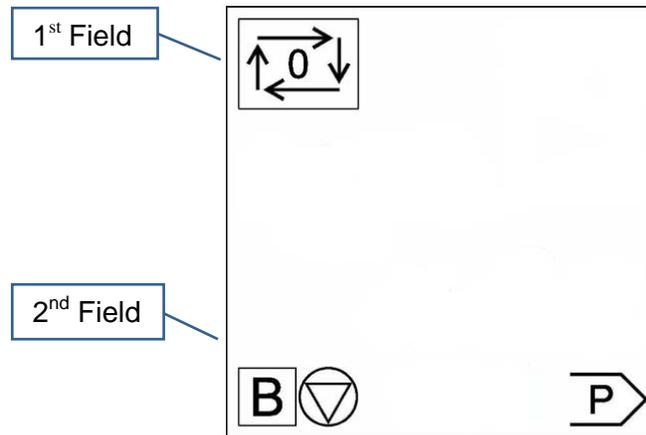
While-ever the control is in programming mode, the program icon is displayed in the lower right hand corner of the LCD screen as follows: 

## GENERAL PROGRAMMING MODE

The sequence of level 1 (General Programming Mode) program screen displays is as follows:



## The Oscillator Control Features & Setup Screen

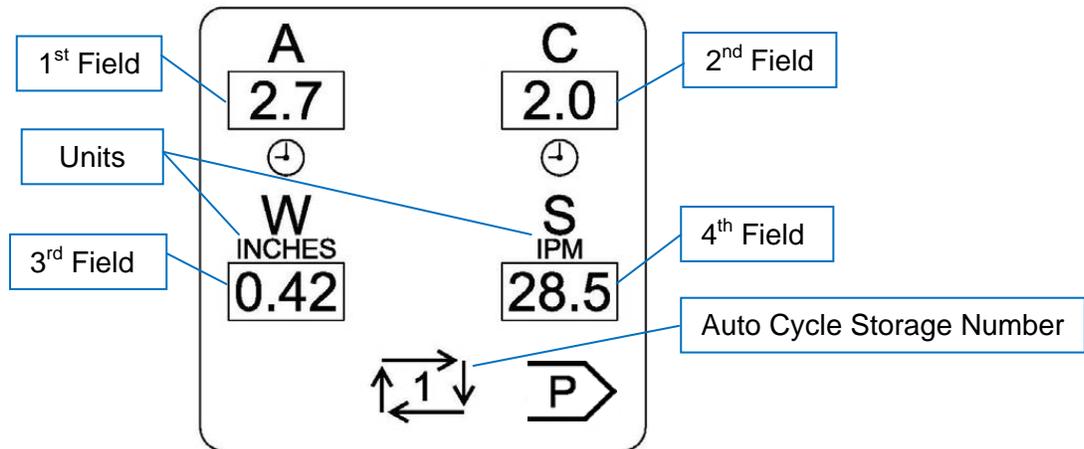


The Features & Setup Screen has the following features:

- 1<sup>st</sup> Field = The Auto Cycle storage number to be recalled. The number shown in this field will be the program that will be copied from storage and applied to the running (operational) mode values when exited from programming mode. The choices are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 (surrounded by the auto cycle symbol). When the value is 0, the existing oscillation values last used will not be over-written. Each time the Features and Setup screen is opened, the value in this field defaults to 0.
- 2<sup>nd</sup> Field = Oscillation Rest Location. This setting dictates where the oscillator stops at the end of an oscillation cycle (and therefore assumed location at the start of an oscillation cycle). The choices are A, B or C. The factory default setting is B (center position of oscillation).

## Oscillator Control Auto Cycle Storage Screens

There are a total of ten (10) Auto Cycle Storage Screens, and each screen is identified by the "Auto Cycle Storage Number" (numbered 1 to 10) as shown in the following image. The units of measure for the oscillation width (W) and the oscillation speed (S) are programmable (level 2 - Advanced Programming Mode). If the units of measure change, all width and speed fields will need to be manually converted. To make changes to these screens/fields use the "A", "C" &  rotary switches. All the Auto Cycle Storage Screens have the following features:



1<sup>st</sup> Field = The A Location Dwell Time. This sets the time duration that the oscillation stroke will dwell (pause) each time the A location is reached. The choices available are from 0.0 to 9.9 seconds in 0.1 second increments.

2<sup>nd</sup> Field = The C Location Dwell Time. This sets the time duration that the oscillation stroke will dwell (pause) each time the C location is reached. The choices available are from 0.0 to 9.9 seconds in 0.1 second increments.

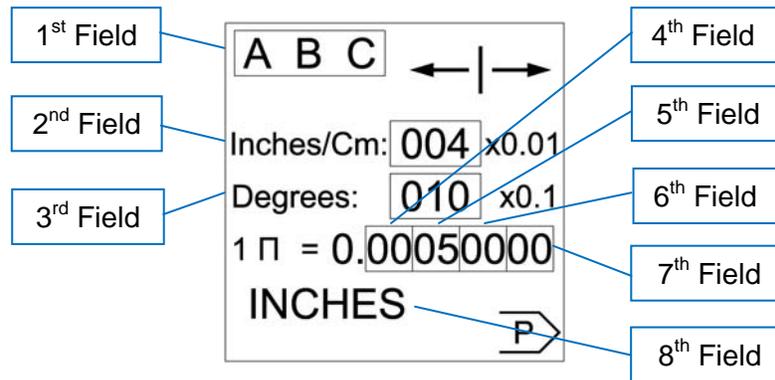
3<sup>rd</sup> Field = the Oscillation Width. The value of this field sets the total width of the oscillation stroke (A to C). The increments of adjustment and the minimum and maximum allowable stroke widths are dependent on the preferred units of measurement (see Oscillator Motor Setup Screen later in this manual for details). Note: - there is a width range where the oscillation stroke is too small to permit A & C dwells to work.

4<sup>th</sup> Field = the Oscillation Speed. The value of this field sets the oscillation stroke speed. The increments of adjustment and the minimum and maximum allowable stroke speeds are dependent on the preferred units of measurement (see the Oscillator Motor Setup Screen later in this manual for details).

## ADVANCED PROGRAMMING MODE

### Oscillator Control Motor Setup Screen

The Motor Setup Screen is only available in the Advanced Programming Mode (requiring the Programming Button to be pressed for more than ten seconds) and has the following features:



- 1<sup>st</sup> Field = the A and C Orientation. Depending on how the Oscillator Head is mounted relative to the control, the A & C dwell locations and manual jog (steering) may be opposite to that expected. This field allows virtual orientation reversal of the oscillator head. The choices available are either "A B C" or "C B A". The control will also reassign limit switch input logic to suit.
- 2<sup>nd</sup> Field = Centre Position Adjustment (Steering) Increments for Linear Oscillator Heads. The value in this field sets the incremental distance of the Centre Position Adjustment (steering). I.e. a large value will result in course steering adjustments, whereas as a small value will provide finer steering. The value is to be multiplied by 0.01 inches, or 0.01 Cm, depending on the Units of Measure (field 8).
- 3<sup>rd</sup> Field = Centre Position Adjustment (Steering) Increments for Radial Oscillator Heads. Not applicable to this model of the PIPE KAT®, therefore do not adjust.
- 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> & 7<sup>th</sup> Fields = Units of Travel Per Motor Step. These numeric fields are used to program how much oscillation travel will be achieved for each step of the oscillator motor. It is broken into four fields to allow the value to be easily entered. Each field has a range of 00 to 99. The control will use this total value to determine the amount of motor motion required to obtain the programmed oscillation. It is important to know the model of oscillator head being used with the control in order to calibrate the control to match the oscillator head. The values entered in these fields must be in units equal to the Units of Measure (field 8).
- 8<sup>th</sup> Field = Units of Measure. This field determines the units of measure (and increments of adjustment) for the oscillator width and speeds. The choices available are "INCHES" or "CM" for the linear heads used on PIPE KAT®'s (the choice of "DEGREES" is for use with radial oscillator heads only and not applicable for this model of PIPE KAT®). See the "Table of Oscillator Head Values" to find the Units of Travel per Step for common Gullco Oscillator Heads.

Table of Oscillator Head Values

Oscillator Head Model	Units Of Measure	Minimum Speed	Maximum Speed	Increments of Speed Adjustment	Width of Oscillation		Increments of Width Adjustment	Units of Travel per Motor Step
					Range Without Dwells	Range With Dwells		
PK-500-012 (Standard Linear)	Inches	0.5 "/min	140 "/min	0.5 "/min	0.09" - 0.18"	0.19" - 2.50"	0.01"	0.00050000
	Cm	1 cm/min	355 cm/min	1 cm/min	0.23 - 0.46 cm	0.47 - 6.35 cm	0.01 cm	0.00127000

**Note:**

**Linear stroke is 4" [10.2cm] on PK-500-012 with 2.5" [6.35cm] maximum oscillation width.**

Oscillator Control Motor (PK-200-300) Board Dip Switch Settings

The Oscillator Control Motor Board is located inside the control box that is mounted on the PIPE KAT® carriage.

Dip Switch S42:

Switch # 1	Switch # 2	Setting
Off	Off	Future use
On	Off	When used on a Gullco Pipe KAT®
Off	On	Future use
On	On	Future use

## **PIPE KAT® OSCILLATOR CONTROL ERROR CODES**

Error codes are displayed on the LCD screen accompanied with the warning buzzer and flashing red L.E.D. on the Remote Pendant.

### **ER.41 (Running condition problem)**

During normal operation of the linear oscillator if the control encounters an issue with controlling the linear slide the control will display ER.41.

### **ER.42: (linear oscillator limit switches)**

When the Oscillator Control is programmed to operate a Linear Oscillator Head (preferred units of measurement are either Inches or CM), the control monitors limit switches located within the Oscillator Head to prevent over-travel. If either, or both, of these limit switches are open circuit, the control will display ER.42 and not permit normal operation. This situation could include the following possibilities:

- Manually jogging the slide too far. To reset, manually jog the slide in the opposite direction.
- The over-travel occurred during Oscillation. This could be due; to the oscillation width being set too large for the stroke of the slide; the starting location of the oscillator slide relative to the oscillation width and direction; or through making center position adjustments (steering), resulting in slide over-travel. To reset, make the necessary manual and/or programming adjustments and restart the automatic cycle. It is recommended that the oscillator be set so that the oscillation occurs in the centre of the slides stroke to permit center position adjustments (steering) without activating the over-travel limit switches.
- Powering up the “PIPE KAT”® Carriage/Compact Oscillator without having a Linear Head connected. To reset, either power down and attach a Linear Oscillator Head or connect a Radial Oscillator Head and reprogram the Oscillator Control accordingly.
  - **WARNING!** Always turn the main power off before connecting/disconnecting the oscillator head cable to/from the “PIPE KAT”® carriage. Failure to comply may result in control damage.

### **ER.43: (PWS main control inactivity)**

During normal operation of the PIPE KAT® the main control communicates with the oscillator control, if for any reason this communication stops ER.43 will be displayed on the control.

**ER.44: (PWS main control communication)**

During normal operation of the PIPE KAT<sup>®</sup> the main control communicates with the oscillator control, if for any reason this communication becomes corrupt ER.44 will be displayed on the control.

**ER.45: (Oscillator control keypad)**

The Oscillator control uses a keypad and a display located in the main control box. For any reason if a malfunction occurs on the keypad board ER.45 will be displayed on the control.

**ER.46: (Oscillator control motor board)**

During normal operation of the PIPE KAT<sup>®</sup> the oscillator control communicates with oscillator control motor board located on the PIPE KAT<sup>®</sup> carriage, if for any reason this communication stops or becomes corrupt ER.46 will be displayed on the control.

**ER.47: (Oscillator control motor board over temp)**

During normal operation of the PIPE KAT<sup>®</sup> if the oscillator motor control board reaches 96°C [205°F] ER.47 will be displayed on the control.

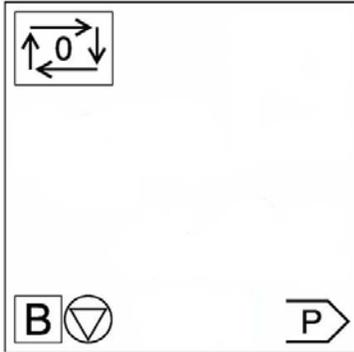
**ER.49: (Oscillator control display)**

During normal operation of the PIPE KAT<sup>®</sup> if the oscillator display encounters a malfunction ER.49 will be displayed on the control.

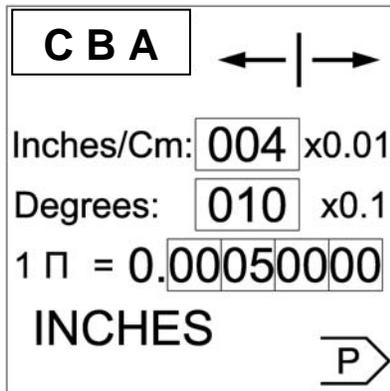
## OSCILLATOR CONTROL FACTORY DEFAULTS

The default factory programming when shipped

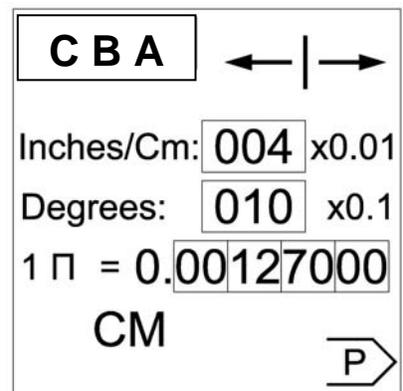
General programming screen



Advanced programming screen (INCHES)

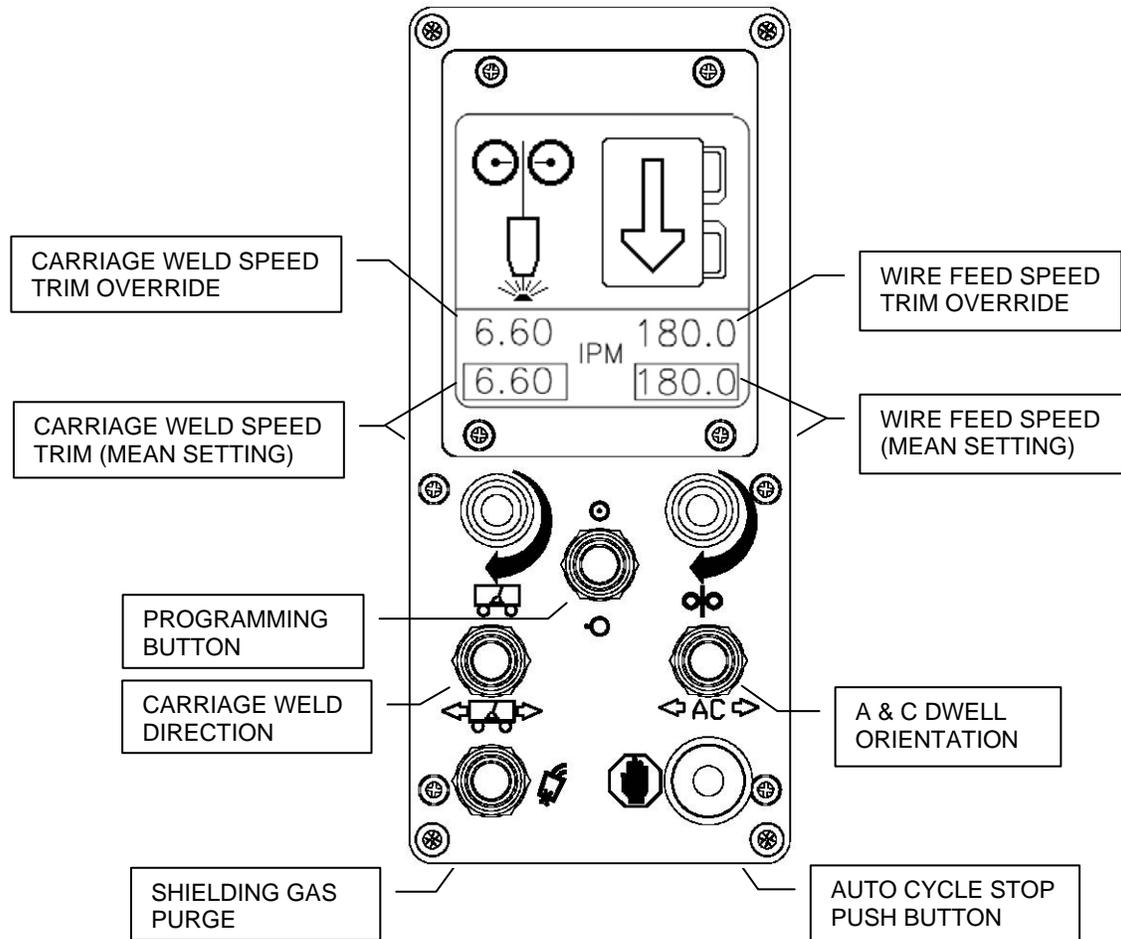


Advanced programming screen (CM)



## CARRIAGE CONTROL

A highly sophisticated, yet easy to use, multi-processor based control that commands the carriage drive motor, the wire feeder, the vertical torch slide, the power source contactor signal, the shielding gas solenoid, the water cooler (optional) and interfaces with the Oscillator Control, and the coolant flow switch to provide a fully automated and programmable welding system.



### **CARRIAGE WELD SPEED (Mean Setting):**

This rotary switch increases (clockwise adjustment) or decreases (counter-clockwise adjustment) the mean setting of the Carriage Weld Speed. This is referred to as the 'mean setting' because there is a trim override adjustment on the remote pendant which allows the operator to fine tune the Actual Carriage Weld Speed to their liking by increasing or decreasing the weld speed by six (6) increments of 0.22 inches/minute [0.56 cm/minute]. The main screen displays both the mean setting of the Carriage Weld Speed and the Actual Carriage Weld Speed (mean setting +/- the trim override setting) in the units of choice (either inches or centimeters per minute). Speed adjustments can be changed at any time before or during operation and will take effect immediately. While in programming mode this switch allows the

operator to navigate through the different fields (indicated by the selected field flashing) by rotating the knob either clockwise or counter-clockwise.

### PROGRAMMING BUTTON:

The Program push button changes the control state from running (operational) mode to programming mode, and back to running mode. While-ever the control is in programming mode, the program icon on the lower right corner of the LCD screen will appear as follows. 

### WIRE FEED SPEED (Mean Setting):

This rotary switch increases (clockwise adjustment) or decreases (counter-clockwise adjustment) the mean setting of the Wire Feed Speed. This is referred to as the 'mean setting' because there is a trim override adjustment on the remote pendant which allows the operator to fine tune the Actual Wire Feed Speed to their liking by increasing or decreasing the wire speed by six (6) increments of 3.2 inches/minute [8 cm/minute]. The main screen displays both the mean setting of the Wire Feed Speed and the Actual Wire Feed Speed (mean setting +/- the trim override setting) in the units of choice (either inches or centimeters per minute). Speed adjustments can be changed at any time before or during operation and will take effect immediately.

While in programming mode this switch allows the operator to increase or decrease values in the selected (flashing) field by rotating the knob clockwise or counter-clockwise.

### SHIELDING GAS PURGE:

This momentary button is used to purge the shielding gas line prior to welding to ensure shielding gas will be present at the torch when welding commences.

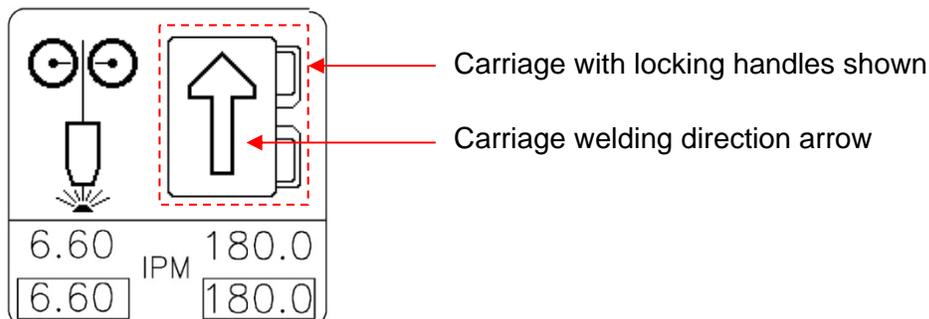
### AUTO CYCLE STOP:

This momentary push button (or the Auto Cycle Stop push button located on the remote pendant) is used to terminate the automatic welding process. When in programming mode this push button is used to navigate from screen to screen (page to page).

### CARRIAGE WELD DIRECTION:

This momentary push button allows the operator to program the travel direction of the carriage during an automatic welding cycle. The direction of travel is indicated on the display by an arrow superimposed on the image that symbolizes the welding carriage. Whenever this button is pushed the arrow on the display will change (flip) to acknowledge the change in will welding direction. See page 33 for the display screens that depict all combinations of carriage direction and torch dwell position.

**Note:** Changes in welding direction can only be made while the carriage is at rest and not in automatic cycle or while being manually jogged.



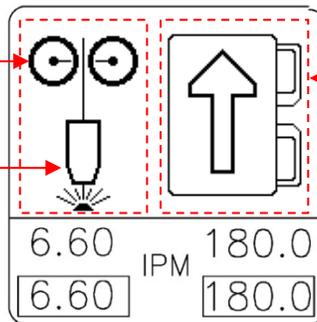
**A & C torch oscillation dwell orientation:**

This momentary push button allows the operator to set the orientation of the A & C dwell positions for the linear torch oscillator. This orientation is indicated on the display by an image of the welding torch shown next to an image that symbolizes the welding carriage. Whenever this button is pushed the image of the torch and welding carriage will change (flip) to acknowledge the change in A & C dwell orientation. Also this push button determines the direction of the oscillator center adjustment / steering direction inputs. For example; if the operator turns the rotary knob for the oscillator center position adjustment / steering (located on the remote pendant) to the left and the corresponding torch movement is to the right, the A & C dwell orientation needs to be changed. See page 33 for the display screens that depict all combinations of carriage direction and torch dwell position.

**Note:** Changes in A & C dwell orientation can only be made while the carriage is at rest and not in automatic cycle or while being manually jogged.

Wire feed drive wheels. Will rotate during welding and whenever the wire feeder is jogged in either forward or reverse

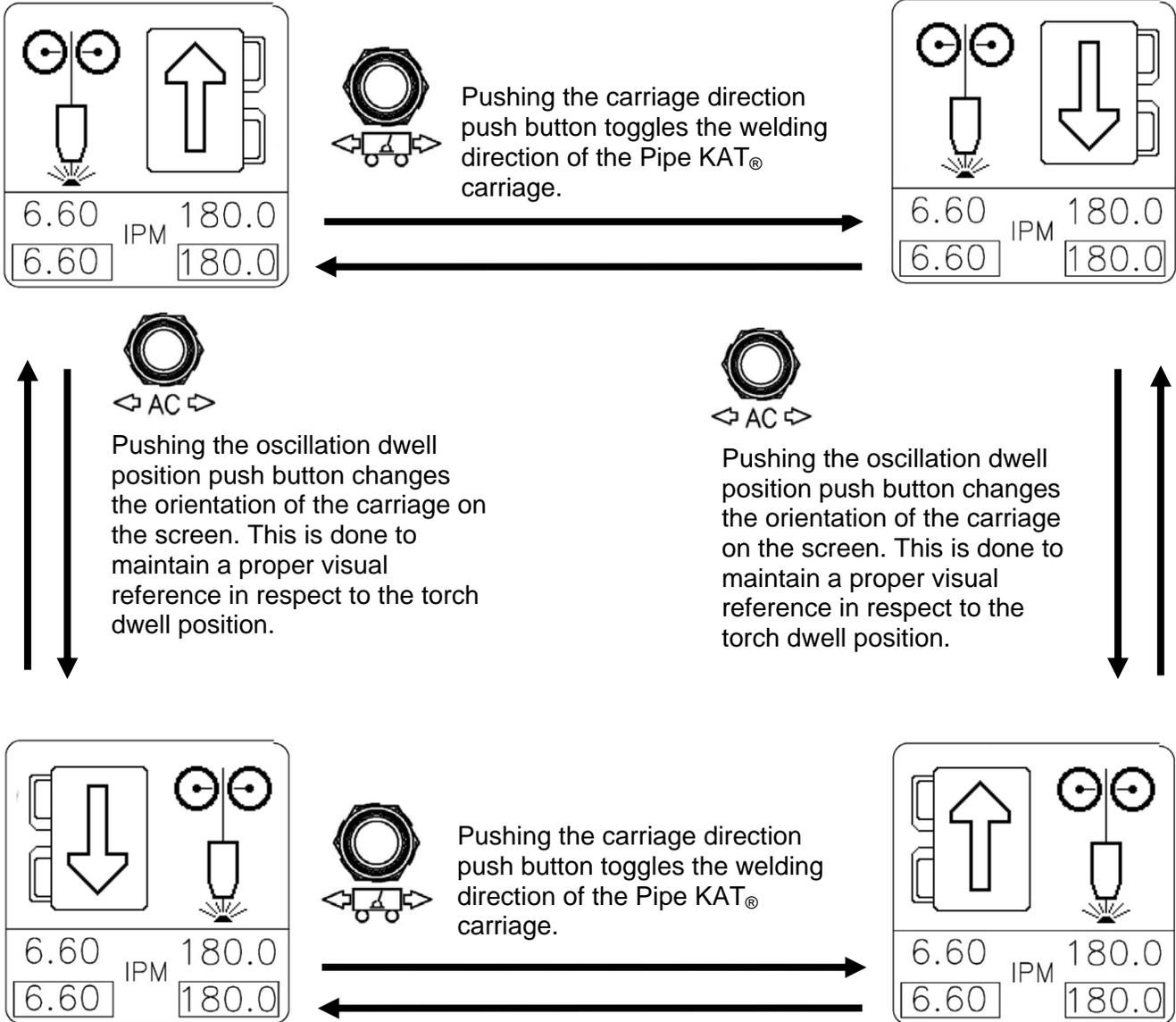
Welding torch shown to the right side of welding carriage



Carriage with locking handles shown

## CARRIAGE WELDING DIRECTION AND TORCH OSCILLATION DWELL POSITION

The four (4) screens shown below depict the display on the Pipe KAT<sup>®</sup> main control and the relationship between the carriage welding direction push button and the oscillation dwell position push button.



**Note:** The carriage direction and torch oscillation dwell position can be toggled independently of one another; the above four (4) screens depict all combinations of carriage direction and torch dwell position.

## **CARRIAGE CONTROL PROGRAMMING**

There are two levels of programming

- General Programming Mode: this first level of programmable features is meant to be easily accessible to the operator and requires that the Program push button be pressed for a minimum of one (1) seconds, but no more than seven (7) seconds. The screens that are accessible under this mode are:
  - Screen 1:- Shielding gas preflow/Wire feed soft start speed.
  - Screen 2:- Travel-Dly/Crater-Fill/Burn-Back/Post-Flow.
- Advanced Programming Mode: this second level of programmable features is meant only to be used by higher level and/or qualified users and requires that the Program push button be pressed for more than ten (10) seconds. The screens that are accessible under this mode are:
  - Screen 1:- Units (inch or Cm)/Vert\_Speed/Buzzer Duration.
  - Screen 2:- Carriage motor parameters.
  - Screen 3:- Wire Feeder motor parameters.
  - Screen 4:- Welding power source calibration.
  - Screen 5:- Error code screen.

To change state from either programming mode (any screen) to running (operational) mode, press the Programming Button for one (1) second or longer. The various values and settings will be saved.

When in programming mode:

- The “Auto Cycle Stop” push button is used to navigate forward and backward between screens (pages)
- The “Carriage Weld Speed” rotary switch is used to navigate forward and backward between adjustable fields of the current screen (page). The contents of the selected field will flash to indicate which field is currently selected.
- The “Wire Feed Speed” rotary switch is used to change the value/setting of the currently selected adjustable field.
- The Programming Button is used to save all values and settings, exit programming mode and return to the running (operational) mode.

While-ever the control is in programming mode, the program icon is displayed in the lower right hand corner of the LCD screen as follows:



## GENERAL PROGRAMMING MODE

While the carriage is stopped, i.e. not in a weld cycle, press the program push button for a minimum of one (1) second but no more than seven (7) seconds to go from the main screen to the General Programming Screen 1.

To navigate between the first and second general programming screens press the Auto Cycle Stop push button. 

### Screen 1:

**Shielding Gas Pre-Flow Duration:** This is a time delay that allows the shielding gas to flow before the wire feeder starts. Adjustable range, 0.0 to 9.9 seconds in 0.1 increments. Factory set at 0.5 seconds

**Wire Feed Soft Start Speed:** This is the initial wire feed speed prior to establishing the arc. Once the arc has been established, the wire feeder runs at the Actual Wire Feed Speed as set by the remote pendant. The adjustable range is 50 to 1200 I.P.M. or 127 to 3048 Cm.P.M. Factory set at 158 I.P.M. or 401 Cm.P.M.

PREFLOW	0.5
SOFT SPEED	158.0
	

### Screen 2:

**Weld Travel Delay:** This is an adjustable time delay for carriage travel. Once the arc has been established the carriage will commence travel after the programmed delay has been reached. Adjustable range 0.0 to 9.9 seconds in 0.1 increments. Factory set at 0.3 seconds

**Crater-Fill Duration:** This is an adjustable time delay that allows the welding to continue after the carriage travel has ceased. Adjustable range 0.0 to 9.9 seconds in 0.1 increments. Factory set at 0.5 seconds

**Burn-Back Duration:** This is a small, adjustable time delay between stopping the wire feed motion and deactivating the weld contactor signal, thereby preventing the wire from solidifying in the weld. Adjustable range 0.00 to 9.99 seconds in 0.01 increments. Factory set at 0.01 seconds

**Shielding Gas Post-Flow Duration:** This time delay allows shielding gas to continue to flow after the burn-back function has completed. Adjustable range 0.0 to 9.9 seconds. Factory set at 0.5 seconds.

TRAVEL-DLY	<input type="text" value="0.3"/>
CRATER-FILL	<input type="text" value="0.5"/>
BURN-BACK	0.01
POST_FLOW	0.5
	

## ADVANCED PROGRAMMING MODE

While the carriage is stopped, i.e. not in a weld cycle, press the program push button for a minimum of eight (8) seconds to go from the main screen to the Advanced Programming Screen1.

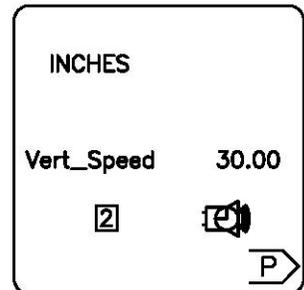
To navigate between the advanced programming screens press the Auto Cycle Stop push button. 

### Screen 1:

**Units:** This field allows the operator to select the desired display units, either INCHES or CM.

**Vertical Slide Speed:** This value allows the operator to set the speed at which the vertical slide (tip-to-work slide) moves. Adjustable range 6% to 100% in increments of 1.0%. Factory set at 30.00%

**Warning Buzzer Duration:** This sets the time between the activation of the auto cycle and the start of the weld cycle, during which time an audible buzzer is activated warning anyone near equipment that a weld cycle is about to commence. Adjustable range 0 to 9 seconds in increments of 1 second. Factory set at 2 seconds.



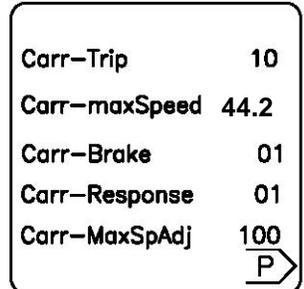
### Screen 2:

**Carriage Over-Current:** This sets the maximum current draw that the carriage drive motor control will allow before activating an error code and ceasing operation. The variable value range is from 0 to 15 amps in increments of 1 amp. Factory set at 10 amps.

**Carriage Maximum Weld Speed:** this variable is used to calibrate the motor control to suit the carriage drive motor used. At this writing there is only one (1) carriage drive motor available which has a maximum weld speed of 44.20 inches per minute [112.0 cm/min] and is factory preset accordingly.

**Carriage Braking:** This sets the level of motor braking from instant braking to a variable degree of pulsed graduated braking. The variable value range is from a reference value of 1 to 10, in increments of 1. A reference value of 0 provides instant braking whereas a reference value of 10 provides the slowest, softest pulse braking. Factory set at 1

**Carriage Response:** This sets the speed correction response (gain) rate. By having the motor speed correction rate at a slow response, the motor takes longer to accelerate to speed and reacts to motor speed variances slower. By having a fast response, the motor will accelerate to speed quickly, sometimes resulting in over shooting of the preset speed, and reacting to motor speed variances instantly, sometimes resulting in slight speed oscillation. The variable value range is from a reference value of 1 to 10, in increments of 1. A reference value of 1 provides the fastest speed correction rate, whereas a reference value of 10 provides the slowest, speed correction response rate. Factory set at 1



**Carriage Maximum Speed Adjustment:** This sets the maximum speed at which the motor control will allow (the speed is capped at this set percentage). The variable value range is from 1 to 100 percent of full speed, in increments of 1%. Factory set at 100.

### Screen 3:

**Wire Feed Over-Current:** This sets the maximum current draw that the wire feed motor control will allow before activating an error code and ceasing operation. The variable value range is from 0 to 10 amps in increments of 1 amp. Factory set at 10 amps.

**Wire Feed Maximum Speed:** this variable is used to calibrate the motor control to suit the wire feed drive motor used. At this writing there is only one (1) wire feed drive motor available which has a maximum weld speed of 633 inches per minute [1607 cm/min] and is factory preset accordingly.

WF-Trip	10
WF-MaxSpeed	633
WF-Brake	01
WF-Response	01
WF-MaxSpdAdj	100
	P

**Wire Feed Braking:** This sets the level of wire feed motor braking from instant braking to a variable degree of pulsed graduated braking. The variable value range is from a reference value of 1 to 10 in increments of 1. A reference value of 0 provides instant braking whereas a reference value of 10 provides the slowest, softest pulse braking. Factory set at 1

**Wire Feed Response:** This sets the speed correction response (gain) rate. By having the wire feed motor speed correction rate at a slow response, the motor takes longer to accelerate to speed and reacts to motor speed variances slower. By having a fast response, the motor will accelerate to speed quickly, sometimes resulting in over shooting of the preset speed, and reacting to motor speed variances instantly, sometimes resulting in slight speed oscillation. The variable value range is from a reference value of 1 to 10 in increments of 1. A reference value of 1 provides the fastest speed correction rate, whereas a reference value of 10 provides the slowest, speed correction response rate. Factory set at 1

**Wire Feed Maximum Speed Adjustment:** This sets the maximum speed at which the wire feed motor control will allow (the speed is capped at this set percentage). The variable value range is from 1 to 100 percent of full speed, in increments of 1%. Factory set at 100.

### Screen 4: Welding Power source Calibration Screen

This screen allows the operator to calibrate the remote welding voltage control and wire feed speed to match the welding power sources welding voltage output and wire feed speed.

**Note:** This screen is only applicable if the welding power source being used can accept analog control signals (0-10VDC) for remote voltage and remote wire feed speed control.

The operator must first determine the welding voltage output range of the power source used and also the wire feed speed range of the wire feed that would normally be used with this power source. This information is normally found in the technical documentation provided with the welding power source.

Example: For the screen shown to the right it was determined the welding power source being used had a welding voltage range of 1- 40 volts, it was also verified that the remote analog control signal for welding voltage was 0-10 VDC.

Information for the wire feed speed showed that the standard wire feeder that is normally used with this power source had a speed range 0 to 1000 IPM (inch per minute), it was also verified that the remote analog control signal wire feed speed was 0-10 VDC.

**Note:** the wire feed speed will be represented in either inch per minute or cm per minute depending on the unit calibration of the control.

Max Weld Volt	40
Max Input Volt	10
Min Weld Volt	01
Min Input Volt	0.0
Max WF Speed	1000
Max Input Volt	10
Min WF Speed	000
Min Input Volt	0.0

**Max Weld Volt:** This allows the operator to set the upper (maximum) welding voltage. The adjustable range is 0 to 99 volts in increments of 1. Factory set at 40 volts.

**Max Input Volt:** This allows the operator to set the upper (maximum) threshold of the 0-10VDC signal to achieve the maximum welding voltage. The adjustable range is 0 to 10 volts in increments of 0.1 Factory set at 10 volts.

**Min Weld Volt:** This allows the operator to set the lower (minimum) welding voltage. The adjustable range is 0 to 99 volts in increments of 1. Factory set at 10 volts.

**Min Input Volt:** This allows the operator to set the lower (minimum) threshold of the 0-10VDC signal to achieve the minimum welding voltage. The adjustable range is 0 to 10 volts in increments of 0.1 Factory set at 0.0 volts.

**Max WF Speed:** This allows the operator to set the upper (maximum) wire feed speed. The adjustable range is 0 to 1000 IPM [2540 cm/min] in increments of 1. Factory set at 1000 IPM [2540cm/min].

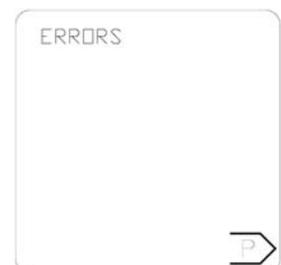
**Max Input Volt (WF):** This allows the operator to set the upper (maximum) threshold of the 0-10VDC signal to achieve the maximum wire feed speed. The adjustable range is 0 to 10 volts in increments of 0.1 Factory set at 10 volts.

**Min WF speed:** This allows the operator to set the lower (minimum) wire feed speed. The adjustable range is 0 to 1000 IPM [2540 cm/min] in increments of 1. Factory set at 0 IPM [0 cm/min].

**Min Input Volt (WF):** This allows the operator to set the lower (minimum) threshold of the 0-10VDC signal to achieve the minimum wire feed speed. The adjustable range is 0 to 10 volts in increments of 0.1 Factory set at 0.0 volts.

### Screen 5:

**Error Code Screen:** Whenever the Pipe KAT encounters a problem that triggers an error code the error will be displayed on the main screen of the display. In addition the errors will be stored on this screen. This screen is useful in the event that more than one (multiple) error codes have been triggered, all errors triggered will be displayed on this screen to allow the operator to trouble shoot the cause(s).



## **PIPE KAT® CARRIAGE CONTROL ERROR CODES**

These codes are displayed on the Carriage Control accompanied with the warning buzzer and flashing red L.E.D. on the Remote Pendant. In addition the codes will be stored on the advanced programming screen (5) for diagnostic purposes.

The codes are cleared by correcting the problem and pressing the Auto Cycle Stop push button after correcting the problem.

**Er.1:** Running conditions – caused by auto start button (located on remote pendant) being depressed while main power is switched on.

**Er.2:** No arc – welding current is not being sensed by the reed switch located in the carriage control box.

**Er.3:** No water flow – flow switch (optional) senses inadequate water flow from water cooler during an auto cycle.

**Er.5:** Power supply – power supply (transformer) has a malfunction possible due to low or high input voltage.

**Er.54:** Remote pendant – remote pendant has malfunctioned.

**Er.71:** Carriage motor control board – the control board has encountered a problem with the carriage drive motor.

**Er.72:** Carriage motor current trip – motor is drawing excessive current.

**Er.73:** Carriage motor feedback – no feedback from motor encoder.

**Er.74:** Carriage motor pulses – loss of motor pulses from the encoder.

**Er.77:** Carriage motor control board high temp – temperature of carriage motor control board has exceeded 96°C [205°F]

**Er.81:** Wire feeder motor control board – the control board has encountered a problem with the wire feeder motor.

**Er.82:** Wire feed motor current trip – motor is drawing excessive current.

**Er.83:** Wire feed motor feedback – no feedback from motor encoder.

**Er.84:** Wire feed motor pulses – loss of motor pulses from the encoder.

**Er.87:** Wire feeder motor control board high temp – temperature of wire feeder motor control board has exceeded 96°C [205°F]

**Er.91:** Vertical torch slide motor control board – the control board has encountered a problem with the vertical torch slide motor.

**Er.92:** Torch slide motor current trip – motor is drawing excessive current.

**Er.95:** Vertical torch slide motor limit switch – no limit switch signal.

**Er.97:** Vertical torch slide motor control board high temp – temperature of torch slide motor control board has exceeded 96°C [205°F].

**Er.51:** Main control box I/O board: the I/O board (PK-200-307) located in the main control box has malfunctioned.

**Er.52:** Carriage control box I/O board: the I/O board (PK-200-308) located in the carriage control box has malfunctioned.

**Er.53:** Main control display: the control display located on the main control box has encountered a problem.

**Er.55:** Hardware compatibility problem – Wrong control hardware or control hardware has not been configured correctly.

**Er.56:** Software compatibility problem – Wrong control software or control software is not compatible with system.

## CARRIAGE CONTROL FACTORY DEFAULTS

The default factory programming when shipped

General programming (INCHES)  
Screen (1)

PREFLOW	0.5
SOFT SPEED	158.0
P >	

General programming (CM)  
Screen (1)

PREFLOW	0.5
SOFT SPEED	401
P >	

Screen (2)

TRAVEL-DLY	<input type="text" value="0.3"/>
CRATER-FILL	<input type="text" value="0.5"/>
BURN-BACK	0.01
POST_FLOW	0.5
P >	

Screen (2)

TRAVEL-DLY	<input type="text" value="0.3"/>
CRATER-FILL	<input type="text" value="0.5"/>
BURN-BACK	0.01
POST_FLOW	0.5
P >	

Advanced programming (INCHES)

Screen (1)

INCHES	
Vert_Speed	30.00
<input type="text" value="2"/>	<input type="text" value="E"/>
P >	

Advanced programming (CM)

Screen (1)

CM	
Vert_Speed	30.00
<input type="text" value="2"/>	<input type="text" value="E"/>
P >	

Screen (2)

<b>Carr-Trip</b>	<b>10</b>
<b>Carr-maxSpeed</b>	<b>44.2</b>
<b>Carr-Brake</b>	<b>01</b>
<b>Carr-Response</b>	<b>01</b>
<b>Carr-MaxSpAdj</b>	<b>100</b>
	

Screen (2)

Carr-Trip	10
Carr-maxSpeed	112
Carr-Brake	01
Carr-Response	01
Carr-MaxSpAdj	100
	

Screen (3)

<b>WF-Trip</b>	<b>10</b>
<b>WF-MaxSpeed</b>	<b>633</b>
<b>WF-Brake</b>	<b>01</b>
<b>WF-Response</b>	<b>01</b>
<b>WF-MaxSpdAdj</b>	<b>100</b>
	

Screen (3)

WF-Trip	10
WF-MaxSpeed	1608
WF-Brake	01
WF-Response	01
WF-MaxSpdAdj	100
	

Screen (4)

Max Weld Volt	40
Max Input Volt	10
Min Weld Volt	01
Min Input Volt	0.0
Max WF Speed	1000
Max Input Volt	10
Min WF Speed	000
Min Input Volt	0.0
	

Screen (4)

Max Weld Volt	40
Max Input Volt	10
Min Weld Volt	01
Min Input Volt	0.0
Max WF Speed	2540
Max Input Volt	10
Min WF Speed	000
Min Input Volt	0.0
	

Screen (5)

ERRORS	
	

Screen (5)

ERRORS	
	

## WELDING POWER SOURCE INTERFACE CONNECTION

The Pipe KAT<sup>®</sup> is supplied with a welding power source interface cable that allows the unit to remotely control the welding contactor circuit, welding voltage, and communicates the wire feed speed and actual torch voltage (electrode sense) to the welding power source .

**Note:** 0-10VDC signals are used to remotely control the welding voltage and communicate the wire feed speed; ensure that the welding power source is compatible before connecting.

The welding power source interface cable assembly is comprised of a 12 circuit connector that mates to left side of the main control box, see page 17, and color coded labelled wires that the user terminates with their choice of preferred welding power source. Welding power sources typically have a circular socket type panel connector or terminal strip that will allow for remote operation, consult the power source manual for detailed hookup instructions. Below is an example of a typical connection to a welding power source using the supplied interface cable assembly.

**“WF SPD - ” (black wire):** terminate this wire to the welding power source remote wire feed speed common connection.

**“WF SPD + ” (brown wire):** terminate this wire to the welding power source remote wire feed speed 0-10VDC analog signal input connection.

Optional signal used to communicate the wire feed speed to the power source. Not required for all processes / power sources.

**“VOLT - ” (red wire):** terminate this wire to the welding power source remote volt control common connection.

**“VOLT + ” (orange wire):** terminate this wire to the welding power source remote volt control 0-10VDC analog signal input connection.

This allows the welding voltage to be adjusted by the GULLCO remote pendant, see page 11

**“CONTACTOR ” (blue wire):** terminate this wire to welding power source contactor control circuit.

**“CONTACTOR ” (white wire):** terminate this wire to welding power source contactor control circuit.

Used to energize / de-energize the welding power source contactor, and in turn the welding current, during weld cycles.

**“ELECTRODE SENSE ” (pink wire):** terminate this wire to welding power source electrode sense connection. May not be necessary / available on some makes and models of power sources.

Used by the welding power source to measure the actual welding voltage.

**“CABLE SHIELD ” (supplied from the factory covered in a light green heat shrink):** Under normal circumstances is not required to be terminated. But in the event that there is the presence of high frequency interference or other RFI causing the PipeKAT<sup>®</sup> to malfunction then it is advised to terminate this wire to the chassis / frame ground of the welding power source.

**IMPORTANT:** If any of the above wires are not used for interfacing with the welding power source then they must be properly terminated and electrically isolated to prevent electrical shorting.

## AUTOMATIC CYCLE OPERATION

### Preparation for an Automatic Weld Cycle:

1. Mount the Pipe Band (track) on the pipe as described on page 7.
2. Mount the carriage to the Pipe Band (track) as described on page 8.
3. Connect the umbilical cable/hose assembly between the PIPE KAT® carriage and the Main Control (see page 9). Also attach the weld power cable from the umbilical assembly to the weld power source; and the water cooler hoses to the water cooler (not required if using air cooled welding torch).
4. Attach the shielding gas supply hose to the Shielding Gas Input Connection of the Main Control Box.
5. Connect the cable from the welding power source interface connection of the Main Control Box to the remote contactor circuit and if equipped the remote control circuit for welding voltage control and wire feed speed on the welding power source (see power source manual for details).
6. Connect the Remote Pendant to its mating connection on the Main Control Box.
7. Connect the optional Water Cooler Power Interface Kit (if applicable).
8. Connect the optional Coolant Flow Switch Kit (if applicable).
9. Once everything is connected, plug the Main Control Box into a suitable power supply (make sure the voltage and amperage match that on the Main Control Box product label).
10. Release (reset) all three (3) Emergency Stop Buttons (located on the Main Control Box, the Remote Pendant and the PIPE KAT® carriage).
11. Turn the Main Power On/Off Switch, located on the left side of Main Control Box, to the On position. The Oscillator and the Main control displays should power-up.
12. If necessary, make any program adjustments to the Oscillator Control as described starting on page 19.
13. If necessary, make any program adjustments to the Carriage Control as described starting on page 30.
14. Set-up the desired oscillation speed, width and dwell patterns, as described on page 19.
15. Set-up the desired Carriage Weld Speed, and Wire Feed Speed using the carriage Control, as described on page 30.
16. Use the controls located on the Remote Pendant to run the wire through to the torch and position the carriage and torch head in the appropriate weld start location.
17. Initially set the Carriage Speed Fine Adjustment and the Wire Feed Speed Fine Adjustment knobs, located on the Remote Pendant, to zero (12 O'clock position).
18. The Shielding Gas Purge push button (  ), located on the Carriage Control can be used to purge the gas lines through to the torch if required.
19. If a test cycle is to be performed (simulated auto cycle, without activation of the: wire feed motor; weld contactor signal; or gas solenoid valve), place the Weld Enabled/Disabled switch in the Disabled (  ) position.

20. When ready, press the Auto Cycle Start push button (  ), located on the Remote pendant, for two (2) seconds or more. (The Automatic Weld Cycle sequence of events is described in the next section).
21. To stop the Automatic Cycle, press either the Auto Cycle Stop push button (  ) located on the Remote Pendant, or on the Carriage Control.

### **AUTOMATIC WELD CYCLE SEQUENCE OF EVENTS**

1. After the Auto Cycle Start push button has been pressed for two (2) seconds, the Auto Cycle Indicator L.E.D. is illuminated, and the relay of the operational Water Cooler Power Interface Kit is energized (if installed). The auto cycle then proceeds as described in the following section.
2. The Main Control looks to see if there is a signal from the optional Coolant Flow Switch Kit indicating sufficient coolant flow through the welding torch. While waiting for this signal, the warning buzzers will emit short tones. The cycle will remain in this state until the cycle is either aborted, or the flow signal is received. Note: if the optional Coolant Flow Switch Kit is not being used, a shunt (jumper) is placed across pins 1 & 2 of the CN51 header, located on the I/O board (PK-200-307) located in the main control box to simulate this signal. Once the signal is received the auto cycle then proceeds as described in the following section.
3. Audible warning buzzers located in the Remote Pendant and on the PIPE KAT<sup>®</sup> will activate for the time period set by the Warning Buzzer Duration (see page 36).
4. Upon completion of the Warning Buzzer Duration, the gas solenoid valve is energized and the Shielding Gas Pre-Flow Duration timing cycle is initiated (see page 35).
5. Upon completion of the Shielding Gas Pre-Flow Duration, the wire feed motor starts feeding the wire through at the Wire Feed Soft Start Speed (see page 35) and the Remote Arc Start Relay is energized (closing the welding power source's remote contactor circuit). This will continue until the reed switch located on the carriage recognizes the presence of welding current, or the cycle is aborted.
6. When the reed switch recognizes the presence of welding current the wire feed motor starts to deliver the welding wire at the Actual Wire Feed Speed and the oscillator head starts to oscillate as per the settings of the Oscillator Control. The Weld Travel Delay is also initiated.
7. Upon completion of the Weld Travel Delay (see page 35) the PIPE KAT<sup>®</sup> carriage will start to travel at the Actual Carriage Weld Speed. The cycle will continue in this state until the cycle is aborted.
8. When the Auto Cycle Stop button is pressed for more than two (2) seconds the auto cycle will start a controlled shut-down as described below.
9. The PIPE KAT<sup>®</sup> carriage will immediately stop, the oscillator head will stop at its Oscillation Rest Location which is typically programmed for the centre of its oscillation width (see page 25), and the Crater-Fill Duration timing cycle is initiated (see page 35).
10. Upon Completion of the Crater-Fill Duration the wire feed will stop and the Burn-Back Duration timing cycle is initiated (see page 35).

11. Upon completion of the Burn-Back Duration the Remote Arc Start Relay is de-energized (opening the welding power source's remote contactor circuit) and the Shielding Gas Post-Flow Duration timing cycle is initiated (see page 35).
12. Upon completion of the Shielding Gas Post-Flow Duration the Auto Cycle Indicator L.E.D. is extinguished, the relay of the optional Water Cooler Power Interface Kit is de-energized (if installed), and the Audible warning buzzers located in the Remote Pendant and on the PIPE KAT<sup>®</sup> will activate indicating the completion of the auto cycle.

Notes:

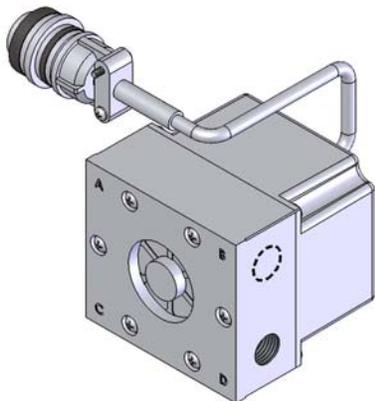
- If the Weld Enable/Disabled switch, located on the Remote Pendant is in the disabled position, section 3 through to 7, and 10 through to 11, above are skipped.
- If the reed switch fails to detect the presence of weld current during an automatic cycle, the cycle will terminate as described in sections 9 through to 12 above and Er.2 will be displayed on the Carriage Control.
- If the signal from the optional Coolant Flow Switch Kit is lost during an automatic cycle, the cycle will terminate as described in sections 9 through to 12 above and Er.3 will be displayed on the Carriage Control.
- If one of the oscillator head stroke limit switches is actuated during an automatic cycle, the cycle will terminate as described in sections 9 through 12 above and Er.2 will be displayed on the Oscillator Control.
- When the oscillation is to start, the oscillator control will always assume that the oscillator head/slide is resting at the "Oscillation Rest Location" (2<sup>nd</sup> Field of the Features & Setup screen, described on page 23) and will travel in the appropriate direction accordingly. I.e. if the "Oscillation Rest Location" field is set to C, the oscillator will start its oscillation cycle by moving in the relevant direction toward the B (center) location by a distance of half the width (W) value.

### GENERAL SPECIFICATIONS

Carriage Weight	48 lbs (21kg)
Control Box Weight	30 lbs (13.6 kg)
Remote Pendant Weight	3 lbs (1.4 kg)
Power Requirements	Either 42, 115 or 230 VAC, single phase, 50/60Hz, 400 watts
AC Fuse	10 Amp (slow blow type) for 42 VAC 5 Amp (slow blow type) for 115 VAC 2.5 Amp (slow blow type) for 230 VAC
Carriage Travel Speed Range	1.35 – 44.2 inch per minute (3.42 -112.27 cm per minute)
Wire Feed Speed Range	19 – 632.8 inch per minute (48.3 – 1607.3 cm per minute)
Linear Oscillator	See page 26 for detailed specifications
Vertical Motorized Torch Slide Stroke	2 Inch [50.8mm]
Welding Spool Size	8"/10 lbs (20.3 cm / 4.5 kg)
Carriage Umbilical Cable Length	25 ft (7.62 meters)
Remote Pendant Cable Length	35 ft ( 10.7 meters)
Welding Power Source Interface Cable Length	15 ft ( 4.6 meters)

## **OPTIONAL EQUIPMENT**

**COOLANT FLOW SWITCH KIT:** With the integration of this coolant flow switch, the PIPE KAT® system will only permit welding when the flow switch detects suitable coolant flow through the torch, preventing welding problems and torch damage due to overheating, P/N PK-500-177.



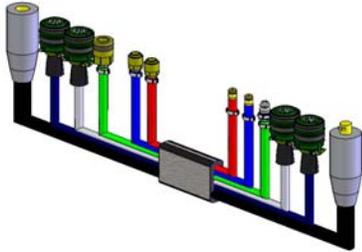
**WATER COOLER POWER INTERFACE KIT:** This interface allows the PIPE KAT® control to automatically activate/de-activate the water cooler during welding cycles, reducing the onus of the operator to remember to switch the cooler on before each weld and also saving energy by automatically turning the cooler off when not welding. Manual override toggle switch also included. P/N PK-200-216-B for 115V coolers or P/N PK-200-216-C for 230V coolers.



**PENDANT EXTENSION CABLE:** Extension Assembly provides an additional 15ft of length to the Remote Pendant P/N PK-200-368. The maximum combined total length of Remote Pendant cable and Extension cable must not exceed 50ft. Distances over 50ft will result in communication signal loss between the Main Control and Remote Pendant causing erratic operation of the PIPE KAT® system.



**CARRIAGE UMBILICAL EXTENSION ASSEMBLY:** Extension Assembly provides an additional 25ft of length to the carriage umbilical assembly P/N PK-500-163-G/N/W. The maximum combined total length of Carriage Umbilical assembly and Extension assembly must not exceed 50ft. Distances over 50ft will result in communication signal loss between the Main Control and Carriage causing erratic operation of the PIPE KAT<sup>®</sup> system.



## REVISION LIST

### July 2012

Manual release

### March 2013

Page 38      Correction, "Screen 5" Error code screen was labeled "Screen 4".  
Page 46      Correction, Coolant flow switch kit PK-500-177 was PK-200-174.

### May 2013

Page 43      Welding power source interface connection instructions added.  
Page 48      General specifications table added.



**GULLCO**



LINEAR or RADIAL  
HIGH DEPOSIT RATE  
QUICK SETUP TIME

## KAT® OSCILLATOR

- Motorized weld center line adjustment
- Motorized stroke width
- Oscillation speed control
- Store up to 10 welding programs



PORTABLE PLATE EDGE  
BEVELLING MACHINE  
QUICK SETUP TIME

## KBM®

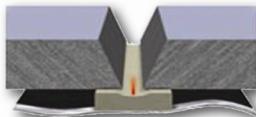
- Produce clean bevels with no thermal distortion
- Bevels angles 22° to 55° (other angles available)
- Hydraulic and Adjustable undercarriages available
- Bevels Mild Steel, Stainless Steel, and Aluminium
- Reduce cost and save time by minimising defects and poor fit up



ONE SIDED WELDING  
X-RAY QUALITY BEADS  
HIGH DEPOSIT RATE

## KATBAK® CERAMIC WELD BACKING

- Eliminate Defects And Rework
- Eliminate Costly Unnecessary Gouging And Grinding
- Sizes 1/4" (6.3 mm) to 2" (51 mm)
- Special Sizes And Configurations Available



PORTABLE AND COMPACT  
INCREASE EFFICIENCY  
MORE ARC ON TIME

## MOGGY® FILLET WELD CARRIAGE

- Single or Dual Torch Models
- Magnet or Non Magnetic Base
- Continuous or Stitch Welding Models
- Fillet, Lap, Butt and Dual Torch Welding

