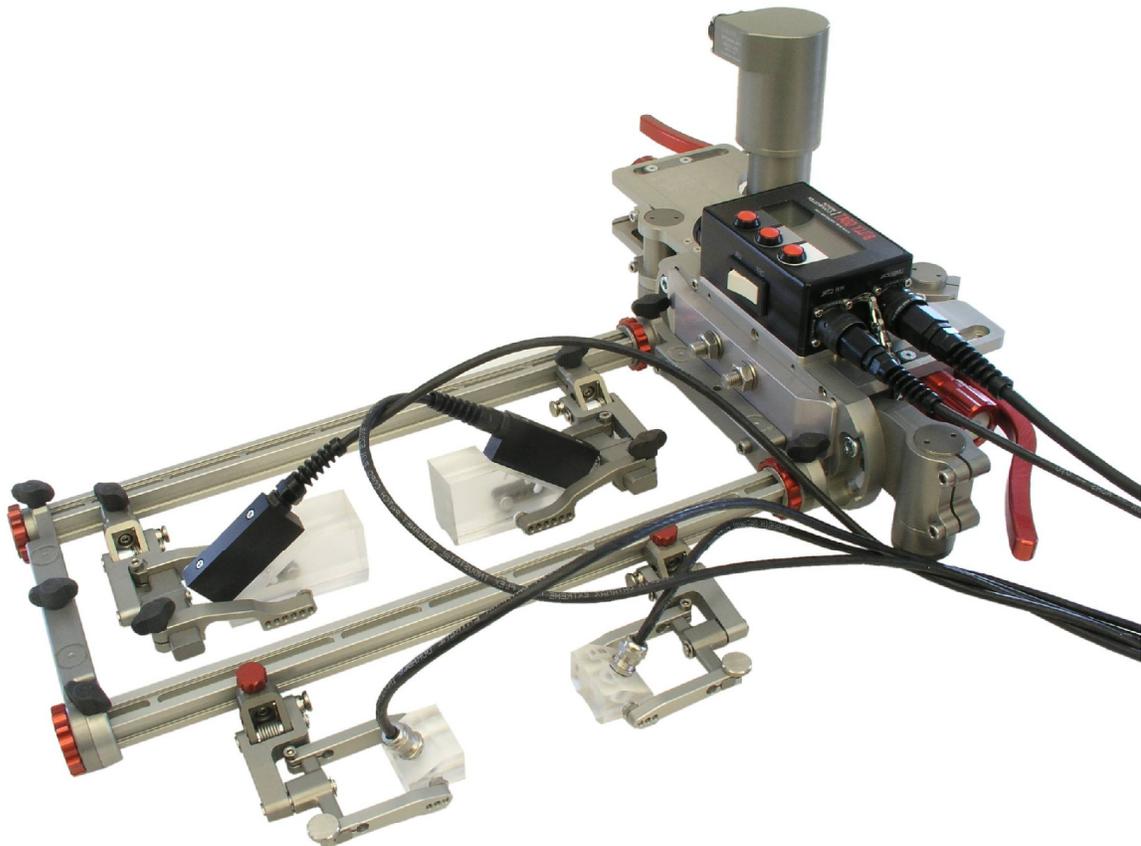


# User Guide

## **BILLY GOAT**

Automated Girth Weld  
Scanning System



## **KEEP THIS MANUAL – DO NOT LOSE**

THIS MANUAL IS PART OF THE BILLY GOAT SYSTEM AND MUST BE KEPT FOR THE LIFE OF THE PRODUCT. PASS ON TO SUBSEQUENT OWNERS.

Ensure any amendments are incorporated with this document.

## **SAFETY WARNINGS / PRECAUTIONS**



**DANGER!** The Billy Goat is designed for a specific use. Using the Billy Goat outside of its intended use is dangerous. Injury could result. Read and understand this manual before using.

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# 1. Billy Goat Specifications

## 1.1 Intended Use

The Billy Goat is a drive platform that is to be used to automatically move a scanning system along a circumferential path of a pipe. The Billy Goat has been designed to be used in conjunction with a suitable pipe band and Jireh Industries' Stix scanning frame (a modular system that is used to hold scanning equipment in various configurations).

The pipe band must be:

- O.D range of: 10" – flat;
- Band width range of: 80mm – 125mm;
- Main band suspended a minimum of 12mm (0.47") above pipe surface;
- Overlap section suspended a minimum of 9mm (0.35") above pipe surface;
- Band clamping buckle/hardware must not exceed 20mm (0.78") above main band;

The Billy Goat is intended to:

- drive on a suitable pipe band;
- be used by trained personnel. See 1.2 "Intended User";
- operate in an environment as described in 1.6 "Operating Environment";

## 1.2 Intended User

The Billy Goat is intended to be used by one or more trained personnel who is without limitations in the physical abilities of the upper and lower limbs, sight, or hearing.

## 1.3 Dimensions and Weight

Scanner Weight*:	7.8 kg	17 lbs
Scanner Dimensions*:	61 x 20.5 x 25cm	24" x 8" x 9.5"

\*excluding case, attachments, umbilical, power supply, and hand held control

NOTE: The Billy Goat requires a minimum radial clearance of 26cm (10") from the pipe band surface.

## 1.4 Performance Specifications

Payload*:	27 kg	60 lbs
Umbilical Length:	15 m**	49 ft**
Hand held control cable length:	6 m**	20 ft**
Scan Speed:	0-4.6 m/min.	0-180 in/min.

\*Attachments and umbilical are considered part of payload

\*\*Standard length. Other lengths available upon request.

## 1.5 Power Requirements

 **WARNING!** A reliable power source must be used for powering the scanner. Connections must be secured to prevent accidental disconnection. Power failure may cause the scanner to freewheel down. Portable generator usage is not recommended unless accompanied by the use of an uninterruptible power supply system.

 **WARNING!** Proper grounding of the power supply is important for safe operation. If a generator is being used to supply power to the system (not recommended), the generator must be properly grounded (see the generator manual).

Power Requirements: 100–240VAC with power supply

NOTE: The Billy Goat power supply automatically adjusts to the supplied voltage.

## 1.6 Operating Environment

The Billy Goat is designed for use in an industrial environment that is:

- dry or wet (the system, excluding the umbilical and power supply, is slash proof).
- between -20°C and 40°C.
- free of explosion or fire hazards.

## 1.7 Unintended Use

 **DANGER!** Using the Billy Goat outside of its intended use is dangerous. Injury could result. Do NOT use the Billy Goat as listed below!

The Billy Goat is NOT intended for:

- operation on pipe band outside the diameter range of: 10" O.D to flat;
- operation on pipe band outside the width range of: 80 to 125mm
- operation on pipe band unsuitable for Idler Shafts (custom Idler Shafts are available upon request)
- lifting or lowering objects or people;
- driving into or over obstructions;
- operation in temperatures below -20°C or above 40°C.

## 2. Preparation for Use

### 2.1 Transportation

**CAUTION!** LIFTING HAZARD. BE CAREFUL when lifting the Billy Goat scanner. Be sure to use proper lifting techniques as to minimize risk of lifting related injury.

### 2.2 Connecting the components

The Billy Goat system consists of the components shown in Figures 1-4.



Figure 1 - The Scanner



Figure 2 - The Power Supply



Figure 3 - The Hand Held Control



Figure 4 - The Umbilical Cable



Figure 5 - Umbilical Bell End Detail

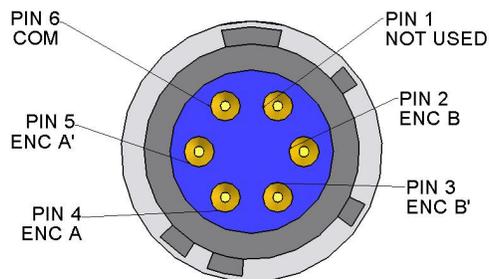


Figure 6 - Encoder Output Pin Detail



Figure 7 - Optional Hand Held Control Cable

Securely connect the components together as follows:

1. Connect the Power Supply / Power Cable to an appropriate power source.
2. Connect the Power Supply / Power Cable to the connector on the Umbilical Cable on the bell end (see figure 5).
3. Connect the Umbilical Cable to the connector on the control box of the Scanner labeled 'UMBILICAL'.
4. Connect the Motor Cable to the motor on the Scanner. Be sure to plug the female end of the cable into the motor (the male end is able to latch onto the connector and may damage pins).
5. Connect the Motor Cable to the control box on the Scanner labeled 'MOTOR'.
6. If using optional Hand held control, connect the Hand held control Cable to the Hand held control and to the connector labeled 'H.H CTRL' on the control box of the Scanner.

Option: For additional distance between the Hand held control and the Scanner, you can substitute the regular Hand held control Cable with the Optional Hand Held Control Cable (see figure 7). To do so, disconnect the regular cable from the Hand held control and the control box. Then, connect the optional cable to the Hand held control and the 'CTRL' connector on the Umbilical Bell End (see figure 5). Note: Using this optional configuration, if the power supply is plugged in, the Hand held control display screen will be always be on but the controller will not be functional unless the control box has been switched on.

7. If using an Auxiliary Encoder, connect the Auxiliary Encoder to the connector labeled 'AUX. ENC' on the control box of the Scanner.

Note: Figure 6 shows the pin detail for the encoder output. Contact Jireh Industries for custom encoder cable information.

## 2.3 Installing Attachments

(Refer to figure 19 for components listed below)  
To install the Stix frame attachments, first ensure that the Adapter Plate #17 is fastened to the Billy Goat using the Studs #24 and M10 Hex Nuts #36. Adjust the height of the adapter appropriately before tightening the M10 Hex Nuts #36. Then using M6 x 30mm Screws, fasten the Stix Side Arm Assembly (BGS021) to the Adapter Plate #17. It is recommended that you build an appropriate Stix configuration that best suits your scanning needs before mounting the Stix Side Arm to the Adapter Plate #17. Please note the adapter plate orientation (see figure 8).

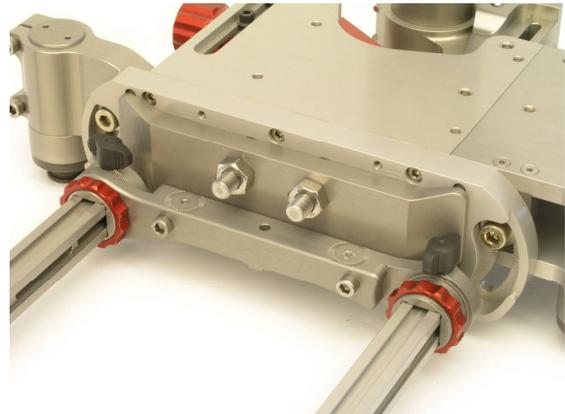


Figure 8 – Mounting Attachments

## 2.4 Preparation of Inspection Surface and Pipe Band

- Ensure there is no damage to the contact edges of the pipe band
- Ensure there are no obstructions in the drive path
- Ensure a minimum clearance of 26cm (10") around the pipe band along the entire drive path.

### 3. Operating Instructions

#### 3.1 Control Box Layout

The Control Box is used to control the operation of the Scanner. It includes the following:

1. Umbilical connector
2. Hand held control connector
3. Push buttons
4. On / off switch
5. Auxiliary encoder connector
6. Motor cable connector

Note: The hand held control operates simultaneously and in the same way as the control box.



Figure 9 - The Control Box

#### 3.2 System Start-up

To start the system, follow these steps:

1. Ensure the system is completely and properly connected (see section 2.2 “Connecting the components”).
2. Move the power switch on the control box to the ON position.
3. After start up, the system must be “zeroed” before the ‘Auto’ mode can be selected.

#### 3.3 Drive Speed Selection

1. Using the control box or hand held control, select ‘Scan Settings’ from the main menu.
2. Scroll down to ‘Scan Speed (%)’ / ‘Return Speed (%)’ / ‘Jog Speed (%)’ / ‘Accel Rate (%)’ and select ‘EDIT’.
  - a. Scan Speed (%): Speed moving in the forward direction in ‘Auto’ mode.
  - b. Return Speed (%): Speed moving in the reverse direction in ‘Auto’ mode.
  - c. Default Jog Speed (%): Speed moving in forward or reverse in ‘Jog’ mode (note: this sets the default for the ‘Jog’ mode speed. Speed can be changed when entering ‘Jog’ mode).
  - d. Accel Rate (%): Rate of acceleration and deceleration of the motor.
4. Change speed to desired setting and press ‘ENTER’.
5. Scroll down to ‘Exit’ and press ‘EXIT’ to return to the main menu.

#### 3.4 Placement of Scanner on Inspection Surface

**⚠ DANGER!** If the scanner is not plugged into the power supply OR the scanner is not powered on, the scanner is able to freewheel around the pipe band. This could result in the scanner running around the pipe band uncontrollably and striking a person. Ensure that the motor drive wheel is engaged and power is turned on to the motor before releasing your hold of the scanner

**⚠ CAUTION!** Do NOT handle the scanner using the umbilical cable.

Use the following instructions to properly setup the Billy Goat for mounting on a pipe band.

### 3.4.1 Angle Adjustment

- Loosen all (4) angle adjustment bolts (see figure 10,11).
- Sight the approximate angle by placing the Billy Goat on the pipe band. Each Idler Shaft #22 (see fig. 18) should look symmetrical with the pipe band about the center axis of the Idler Shaft.
- Make final adjustment by ensuring that the angles of both adjustment joints are equal (use the graduations located in the slot to obtain equal angles; see figure 12).
- Tighten all (4) angle adjustment bolts.

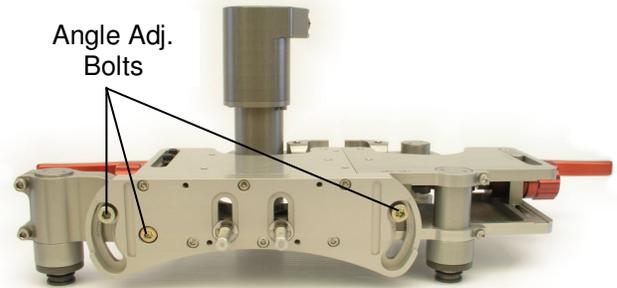


Figure 10 – Angle Adjustment Bolts



Figure 12 - Graduations

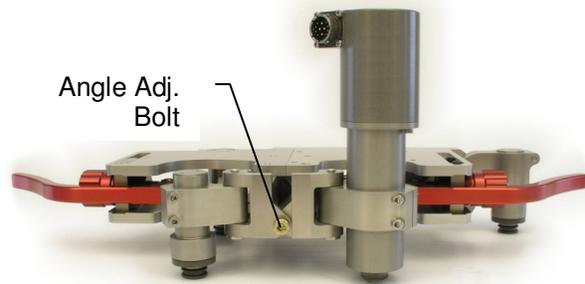


Figure 11 – Angle Adjustment Bolts

### 3.4.2 Width Adjustment

- Loosen all width adjustment bolts (see figure 13, 14, 19).
- Ensure the Adjustable Knob #21 is approximately in the middle of its travel (see figure 15).
- With Handles #7 in the open position, adjust the width so that there is an approximate gap of 0.25" (6mm) between the motor drive wheel and the edge of the band (see figure 16).
- Tighten all bolts ensuring that the scanner width adjustment sections are equal using the engraved graduations (count graduations starting at the mark closest to the front mounting plate #13; each adjustment section should be located at the same graduation mark).

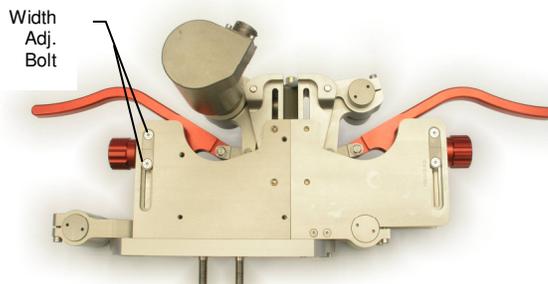


Figure 13 – Width Adjustment Bolts

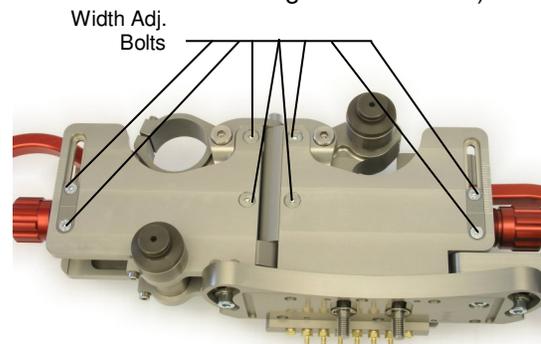


Figure 14 – Width Adjustment Bolts

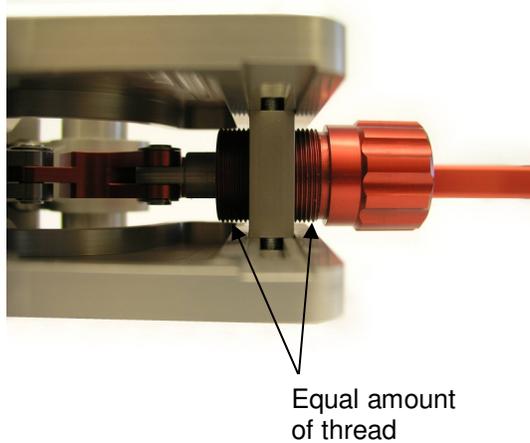


Figure 15 – Knob Position

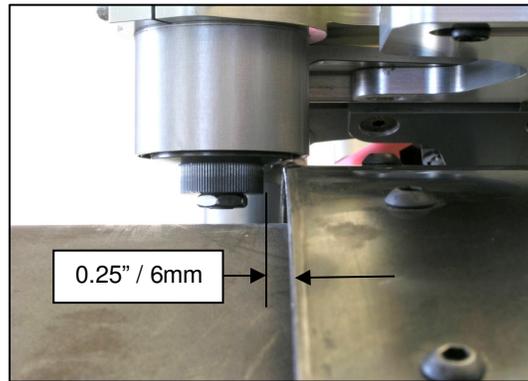


Figure 16 – Motor Gap

### 3.4.3 Mounting

- Mount the Billy Goat on the pipe band by placing the band in the upper grooves of the Idler Shaft #22.
- Turn the Adjustable Knobs #21 for desired clamping force.
- Move both handles into the closed position.
- Check to make sure all contact points of the scanner are properly located on the pipe band.

## 3.5 Operating Modes

### 3.5.1 Auto Mode

Auto mode will drive the scanner between two set points. To operate in this mode:

1. Power up the Billy Goat, if not already on (see 3.2 “System Start-Up”).
2. Jog the scanner to the preferred zero point. From the main menu, select ‘Zero and Go Auto’ and press ‘SELECT’. This sets the scanner’s zero point and jumps to ‘Auto’ mode.
3. Under ‘Scan Settings’ set the drive distance parameters. This can be done using two different methods:
  - a. Teach: Under ‘Scan Settings’ select ‘Teach’ and press ‘EDIT’. Then select a desired jog speed and press ‘ENTER’. Jog the scanner to a desired stop location and press ‘EXIT’. Press ‘YES’ to save this position. Scroll down to ‘Exit’ and press ‘EXIT’. The scanner is now set to drive between your zero point and stop location when in ‘Auto’ mode.
  - b. Target Position: Under ‘Scan Settings’ select ‘Target Position’ and press ‘EDIT’. Select a specified distance from the zero point that the scanner is to stop and press ‘ENTER’. Scroll down to ‘Exit’ and press ‘EXIT’. The scanner is now set to drive between your zero point and stop location when in ‘Auto’ mode.
4. In the main menu, scroll to ‘Auto’ and press select. Press ‘SCAN’ to drive the scanner forward to the stop position. The scanner will automatically stop at the preset setting. To stop the scanner in mid travel, press any of the three buttons on the control box / hand held control. To return to zero position, press ‘RETURN’.

NOTE: The Scan Settings will remain in memory even after the power has been turned off. If the scan settings can remain the same, it is not necessary to repeat step 3, even if the power has been interrupted or the scanner has been moved to a different band.

### 3.5.2 Jog Mode

Operating in Jog Mode causes the Forward and Reverse Pushbuttons to operate as momentary controls (i.e. the scanner will stop driving when the Forward or Reverse Pushbutton is released). To operate in this mode:

1. Power up the Billy Goat, if not already on (see 3.2 “System Start-Up”).
2. From the main menu, scroll to ‘Jog’ and press ‘SELECT’
3. Set the desired drive speed and press ‘ENTER’
4. Press and hold ‘FWD’ or ‘REV’ to drive the scanner in the commanded direction. Release the button to stop the scanner.

### 3.5.3 Diagnostics Mode

Diagnostics mode provides information regarding the setup of the scanner. To access, scroll to ‘Utilities’ and press ‘SELECT’, then scroll to ‘Diagnostics’ and press ‘SELECT’. The following is a brief description of the available diagnostic information:

- Motor Position: A direct read out of the motor encoder counts.
- Encoder Position: A direct read out of the auxiliary encoder counts.
- Position Error: A value (in encoder counts) of error between the actual and desired position.
- Output Command: The torque applied to the motor.
- Software Version: Software version used by the scanner.

### 3.5.4 User Settings

User Settings is accessed by selecting ‘Utilities’ then selecting ‘User Settings’. Through User settings, the user is able to make the following changes:

- ‘Units In=0/MM=1’: this allows the user to choose between metric and imperial units
- ‘UmbilEnc 0=Mot 1=Aux’: this allows the user to choose which encoder signal is output through the umbilical.

## 3.6 Removal of Scanner from Inspected Surface



**DANGER!** If the scanner is not plugged into the power supply OR the scanner is not powered on, the scanner is able to freewheel around the pipe band. This could result in the scanner running around the pipe band uncontrollably and striking a person. Ensure that the motor drive wheel is engaged and power is turned on to the motor before releasing your hold of the scanner



**CAUTION!** Do NOT handle the scanner using the umbilical cable.

To remove the scanner, move both Handles #7 into the open position, then lift the scanner off. Be sure to have a firm grip on the Billy Goat while releasing the Handles #7.

## 4. Maintenance

### 4.1 Safety Precautions before Maintenance

 **WARNING!** ELECTRICAL SHOCK HAZARD. Disconnect the Power Supply when servicing the equipment.

### 4.2 Maintenance Schedule

The Billy Goat system must be maintained according to the following schedule:

MAINTENANCE ITEM	FREQUENCY
<p><b><u>Idler Shafts</u></b> The Idler Shafts are made from a hardened material and therefore may become cracked. Inspect all Idler Shafts #22 to make sure that they are not cracked or severely worn.</p>	Daily
<p><b><u>Inspect Cables and Connectors</u></b> Inspect the Umbilical Cable, the Hand held control Cable, and the Power Supply Cable for damage. Repair by a qualified person or replace the cable assembly as necessary. Inspect all connectors for damage or moisture. Straighten bent pins. Dry connectors before using.</p>	
<p><b><u>Linkages</u></b> Check to see that there is no excessive play in the clamp handle linkage. This includes all pinned connections from the Handle #7 to the Adjustable Knob #21 and to the Idler Shaft Pivot Arm #11 / Motor Pivot Arm (see figure 19).</p>	Every 40 hours

## 5. Troubleshooting

Problem	Possible Cause	Solution
1. Control Box display does not turn on	Input power requirements not met.	Ensure input power meets requirements (see 1.5 “Power Requirements”).
	Control Box not plugged into Power Supply.	See Section 2.2 – Connecting Components.
	Umbilical Cable not properly connected.	Check Umbilical Cable connections at both ends. Ensure connectors are dry and clean and pins in connectors are not bent.
	Switch is in OFF position	Start the Billy Goat system (see 3.2 “System Start Up”)
	Damaged components in Control Box, Scanner, Power Supply, or cabling.	Call manufacturer (see page 3).
2. Control Box display is on but scanner doesn't drive.	Damaged components in Control Box, Motor, or cabling.	Call manufacturer (see page 3).
3. The Hand Held Controller screen is on, but the buttons do not work	Control box is not switched on.	Turn on the Control Box (see page 8).
4. Scanner does not stop at desired location.	Encoder failure.	Call manufacturer (see page 3).
	Improper setup of stop location.	See section 3.5.1 – Auto mode.

For technical assistance, see 6.3 “Technical Support”.

## 6. Service and Repair



**WARNING!** ELECTRICAL SHOCK HAZARD. Disconnect the Power Supply when servicing the equipment.

### 6.1 Idler Shaft Removal / Installation

1. Remove scanner from pipe band and place on an appropriate surface to begin servicing.
2. Loosen the (2) screws on the Idler Shaft clamp.
3. Slide Idler Shaft out.
4. To re-install, reverse the process described above.

Note: For the Idler Shaft on the motor side only, re-insert to the scribed line on the shaft casing (do not bottom out on the step).



Figure 17 – Idler Shaft Clamp Bolts

### 6.2 Motor Removal / Installation

1. Remove scanner from pipe band and place on an appropriate surface to begin servicing.
2. Loosen the (2) screws on the Motor clamp
3. Slide Motor out
4. To re-install, reverse the process described above.



Figure 18 – Motor Clamp Bolts

### 6.3 Technical Support

For technical support contact Jireh Industries (see page 3).

# 7. Spare Parts

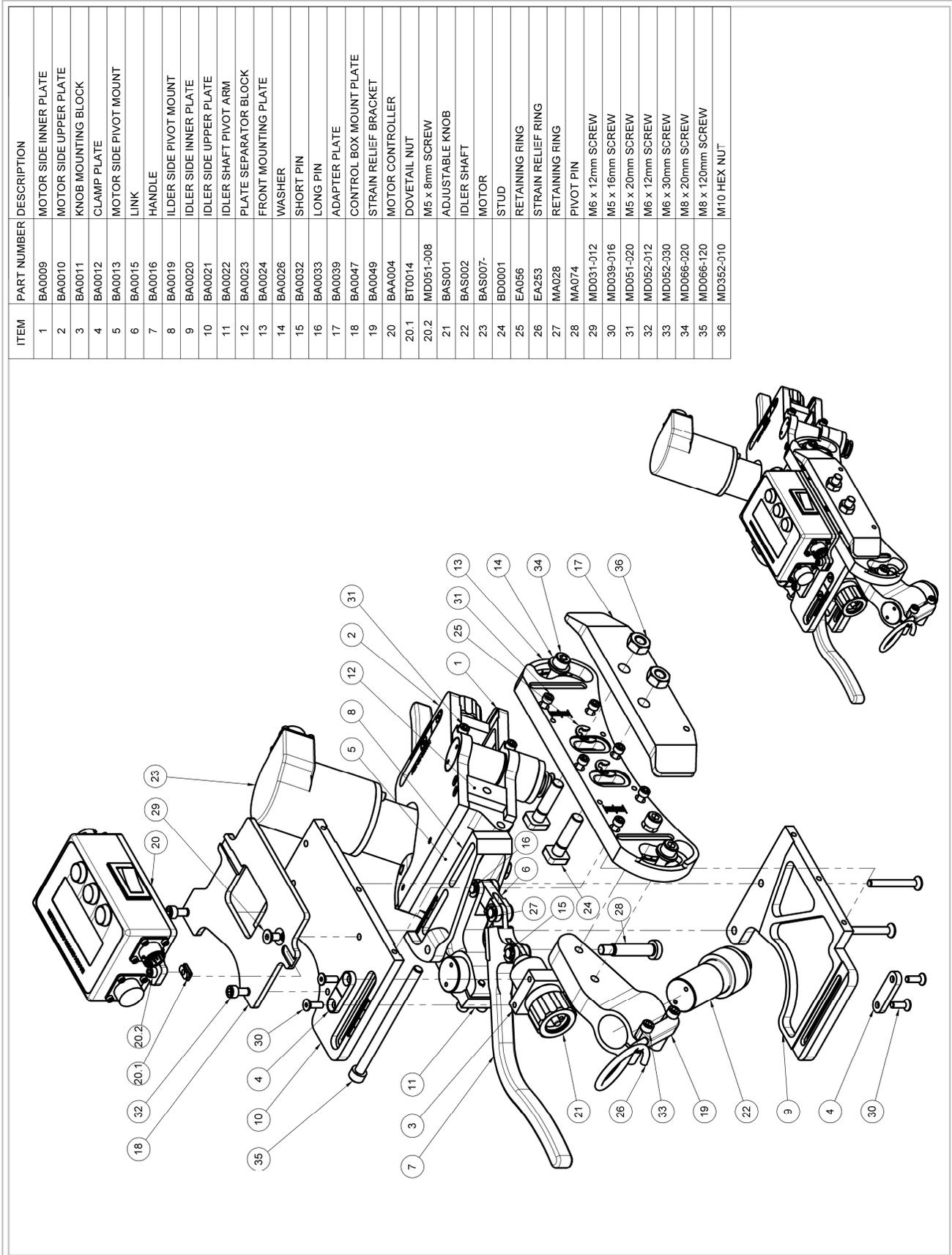


Figure 19 - Spare Parts