BenchMark Wireline Products
36220 FM 1093
P. O. BOX 850
Simonton,Texas 77476
Phone: 281.346.4300
Fax: 281.346.4301
benchmarkwireline.com

AMSLA490C – DOLPHIN

COMBINED DEPTH/TENSION HEAVY DUTY SLICKLINE MEASUREMENT DEVICE

ATEX Zone 2

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SAFETY WARNINGS

This apparatus is suitable for use in ATEX Zone 2 Locations.

WARNING – EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR ATEX Zone 2 LOCATIONS.

AVERTISSEMENT – RISQUE D'EXPLOSION – LA SUBSTITUTION DE COMPOSANT PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES ATEX Zone 2 LOCALES.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOW TO BE NON-HAZAROUS;

AVERTISSEMENT – RISQUE D'EXPLOSION – AVANT DE DECONNECTER L'EQUIPMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNE NON DANGEREUX.

BenchMark measuring equipment will be frequently operated in hazardous environments. Appropriate safety precautions need to be taken.

Training - Operators shall be trained in the proper and safe use of the device.

Do not exceed the tension limit specified for this device in this manual.

Flammable Substances - Flammable and explosive substances are often found in the proximity of the equipment operations. Proper venting should take place where practicable. Avoid open flames, sparks and other ignition sources.

Electric Shock – Depending on the equipment being used, both AC and DC current may be present. Frequently in wellsite operations conductive fluids and chemicals are used. Use extra caution when working with BenchMark equipment and follow manufacturer warnings to avoid electric shock.

Do not separate any electrical connector, while powered, in a hazardous area. Separate only when power is removed, and/or in a safe area.

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SAFETY WARNINGS continued

Safe Operating Temperatures – BenchMark Wireline equipment is designed to operate safely within these temperature ranges. Do not try to operate this equipment in conditions that outside these temperature limits.

Recommended equipment safe operating temperature range -40*C to +60*C

Hazardous Equipment Marking - See General Assembly drawings for hazardous equipment marking.

ALL WARNING LABELS ON THE EQUIPMENT MUST BE OBSERVED AND FOLLOWED.

Installation Instructions - Install measuring device onto the spooling mechanism per the unit manufacturer instructions. Take care to avoid pinching or cutting of electrical cables when the measuring device moves during the spooling operation.

Take care to thread the wire through the device properly to prevent the wire from rubbing the frame during operation. The Table of Contents of this manual will list where the threading procedure is located.

Rotating Equipment – BenchMark Wireline measuring equipment is often attached to rotating industrial machinery. This may include winches, pulleys, rigging, rotating drums plus moving cable and wire. Though BenchMark's measuring equipment does not normally present a safety hazard when in operation provided it is used within the design parameters of the equipment, the heavy equipment used in this type of work in proximity to BenchMark's equipment may. Never attempt to use BenchMark equipment in any way or for any other purpose than for which it was designed.

Use every precaution to keep a safe distance from dangerous equipment when it is in operation. Never approach the measuring device while the cable drum is turning.

CONTENTS

1.0 GENERAL DESCRIPTION & FEATURES

1.1 PRODUCT DESCRIPTION & INTENDED USE OF EQUIPMENT

The "DOLPHIN" Slickline Measuring Device is a heavy duty two wheeled device which accurately measures both wireline depth and tension. It minimizes wire abrasion and fatigue by using a non reverse bend configuration.

The device is designed to be mounted in front of the wireline drum on a spooling mechanism. Linear bearings in the mount allow it to slide back and forth in front of the drum so the wire can be spooled evenly. The bracket on the back of the measuring head is used to mount it to the wireline unit. Spooling rollers and pressure wheels are provided to keep the wire in the wheels at low or no tension.

This measuring head is different from previous versions in that the wireline can be removed from the measuring head without cutting off the re-head. The wireline can be removed from the side. The guide rollers are slotted so they can be slid out of the way to remove the wireline.

Tension is measured from a load pin which also serves as the axle for the tension wheel. Since the two wheels are opposite each other, the wire completely wraps around both wheels. This creates a relatively high signal at the load pin which provides a very accurate tension measurement.

With the BenchMark Winchman's Panel, depth can be accurately measured on different sized lines without changing wheels. This is done electronically by the panel using the depth information provided by an encoder. Changes in wire size are accounted for by the panel software. Wire stretch can also be automatically calculated by the panel. An adapter is provided to drive a standard mechanical counter.

1.2 CERTIFICATES

1.2.1 RESERVED FOR SAFETY STANDARDS & ATEX REQUIREMENTS

NOTE – this information will be added after certificates are issued.

1.2.2 RESERVED FOR CLASS 1 DIVISION 2 CERTIFICATE

NOTE – this information will be added after certificates are issued.

1.3 TYPE EXAMINATION CERTIFICATES AND LABELS

CONFORMS TO ANSI/UL STD 61010-1-2008
CERTIFIED TO CAN/CSA STD C22.2 61010-1-04

T6, Tamb = -20°C TO +40°C
CLASS I DIV 2, GROUPS A B C D

MEASURING DEVICE ASSY
Part Number: XXXXXXXX
Serial Number: YRXXX

Intertek
XXXXXX

BenchMark
Wireline Products
Simonton, TX USA

Class 1 Division 2, Groups A, B, C, D
PRODUCT: Load Pin
VOLTS: +/-15DC AMPS: 0.050

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS

ADVERTISSEMENT - RISQUE D'EXPLOSION. NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.

Class 1 Division 2, Groups A, B, C, D
PRODUCT: Load Pin
VOLTS: 24DC AMPS: 0.050

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS

ADVERTISSEMENT - RISQUE D'EXPLOSION. NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.

Class 1 Division 2, Groups A, B, C, D
PRODUCT: Load Pin
VOLTS: 12DC AMPS: 0.050

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS

ADVERTISSEMENT - RISQUE D'EXPLOSION. NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.

Class 1 Division 2, Groups A, B, C, D
PRODUCT: Optical Encoder
VOLTS: 5-15DC AMPS: 0.100

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS

ADVERTISSEMENT - RISQUE D'EXPLOSION. NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.

Class 1 Division 2, Groups A, B, C, D
PRODUCT: Magnetic Backup Encoder
VOLTS: 5DC AMPS: 0.050

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS

ADVERTISSEMENT - RISQUE D'EXPLOSION. NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.

1.4 TECHNICAL SPECIFICATIONS

1.4.1 WIRE PATH

The wire runs from the drum around the idler wheel then around the tension wheel and back across the top of the measuring wheel to the well. Guide rollers are aligned to assist in keeping the wire on the proper side of the groove.

The wire runs through a non reversed bend configuration (i.e. the wire is always bent in the same direction). This minimizes wire fatigue due to bending the wire in opposite directions each time it passes through the measuring head. The large wheel radius minimizes the effects of fatigue and promotes longer wire life, especially with larger diameter wirelines.

Guide rollers are installed on the tension wheel to keep the wire in the groove. A spring mounted pressure wheel is used on the measure wheel to ensure the wire is always pressed tightly against the measure wheel to prevent wire slippage at low tension to minimize measurement error. The spring tightly presses the wire against the wheel regardless of wire size. The spring force keeps the wire turning the wheel even with sudden changes of direction during jarring action. A keeper roller is mounted above the measure wheel to keep the wire in the groove when wireline tension is relaxed such as during transport and rigup.

1.4.2 DEPTH MEASUREMENT

Depth measurement is made by wrapping the wire around the measuring wheel which has a precision machined groove. The wheel groove has a circumference of 4 feet with .125 wire installed. The wheel is hardened to greater than Rockwell 58 by using a special heat treat process. This minimizes wheel wear to maximize wheel life.

This measuring head is capable of providing three completely independent depth measurements, an optical encoder, and a magnetic pickup.

The optical encoder provides a high resolution measurement to the BenchMark Wireline Products hoistman's panel. With this panel depth and line speed can be accurately measured on different sized lines without changing wheels. This is done electronically by the panel. Changes in wire size are accounted for by the panel software. Wire stretch can also be automatically calculated by the panel. The panel operates on 12v and supplies the necessary power to the encoder and load pin.

A backup depth system is available to provide another independent depth measurement. Depth is measured by a frictionless magnetic pickup mounted in the measuring head. The pickup consists of magnets imbedded in the measure wheel coupling and two hall affect devices mounted next to the shaft. This provides a quadarature type measurement. A small display panel is mounted inside a wireline unit. The panel is designed to be connected to an external AC or DC supply or operate off internal batteries for up to 15 hours between charges. In the event of an external power interruption, the unit automatically switches to battery power. The system is designed to operate without intervention from the user. When external power fails, the depth display is maintained by the batteries. A switch on the front of the panel allows different sizes of wire to be measured accurately without changing the measuring wheels.

The mechanical measurement is made by connecting a "speedometer" cable to the hub of the measuring wheel. A "Veedor Root" type counter can be used. Step down adapters are available to convert from a 1:4 to a 1:1 measurement (adapters on the wheel and in the counter). The mechanical system cannot be adjusted for different wire sizes so a wheel with a different sized groove must be installed to make the mechanical measurement correct.

1.4.3 ELECTRONIC TENSION SPECIFICATIONS

The wheel nearest the well rotates on an axle pin that is instrumented with strain gauges. These strain gauges produce an electrical signal proportional to the magnitude of line tension. The wire always makes a complete 180 degree wrap around the tension wheel so rigup angle does not affect the tension measurement.

The tension wheel is mounted on a self aligning bearing which allows the wheel to properly align itself. This reduces any side forces that may be present which increases the tension measurement accuracy.

1. PASSIVE LOW VOLTAGE

Power Requirement - 12 vdc excitation

Interface – None – passive bridge only

2. DIFFERENTIAL VOLTAGE

Power Requirements - +/– 15 vdc input power

Interface - Proprietary circuit board which amplifies the load pin signals and provides a 1.5v differential output.

0 vdc = 0 lbs (0 kg)
.75 vdc = 5,000 lbs (2,268 kg) - shunt cal
1.5 vdc = 10,000 lbs (4,536 kg)

1.4.3 ELECTRONIC TENSION SPECIFICATIONS continued

3. 4-20MA CURRENT LOOP

Power Requirements - +24vdc input power

Interface - Proprietary circuit board which amplifies the load pin signals and provides a 4-20ma current loop output.

4 ma = 0 lbs (0 kg)
12 ma = 5,000 lbs (2,268 kg) - shunt cal
20ma = 10,000 lbs (4,536 kg)

COMMON SPECIFICATIONS

Temperature Stability
<= .015% full scale / deg F on zero
<= .02% full scale / deg F on output

Accuracy 1% full scale nominal
Maximum Rated Load 9,000 lbs (4,082 kg)

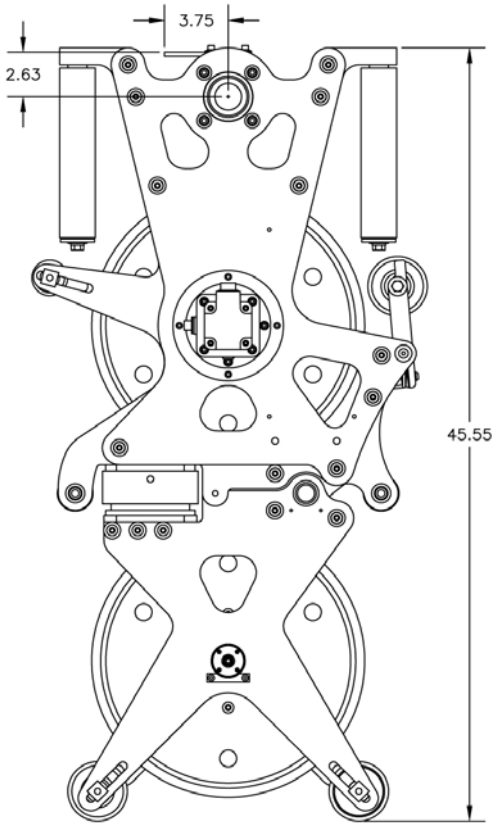
1.4.3.1 HYDRAULIC TENSION SPECIFICATIONS

A hydraulic load cell is included which measures wireline tension independently of the electronic load pin. It is mounted in the frame and measures the tension differential between the top measure wheel and the bottom tension wheel. A second depth idler wheel is provided to eliminate cable rub against a single wheel with the movement of the hydraulic load cell.

Different scales are available.

1.4.4 GENERAL SPECIFICATIONS

Height:	45.55“ 1.15 m	
Width:	23.27” .591 m	
Depth:	11.08" .281 m	
Weight:	132 lbs	59.87 kg
Maximum Tension:	9,000 lbs	4,082 kg
Line Sizes:	.092" – 1/4”	2.3 mm – 6.35 mm
Encoder:	1,200 PPR , others available	
Backup Counter:	4 PPR Quadarature	
Load Pin:	Passive low voltage, Differential voltage, 4-20ma current loop	

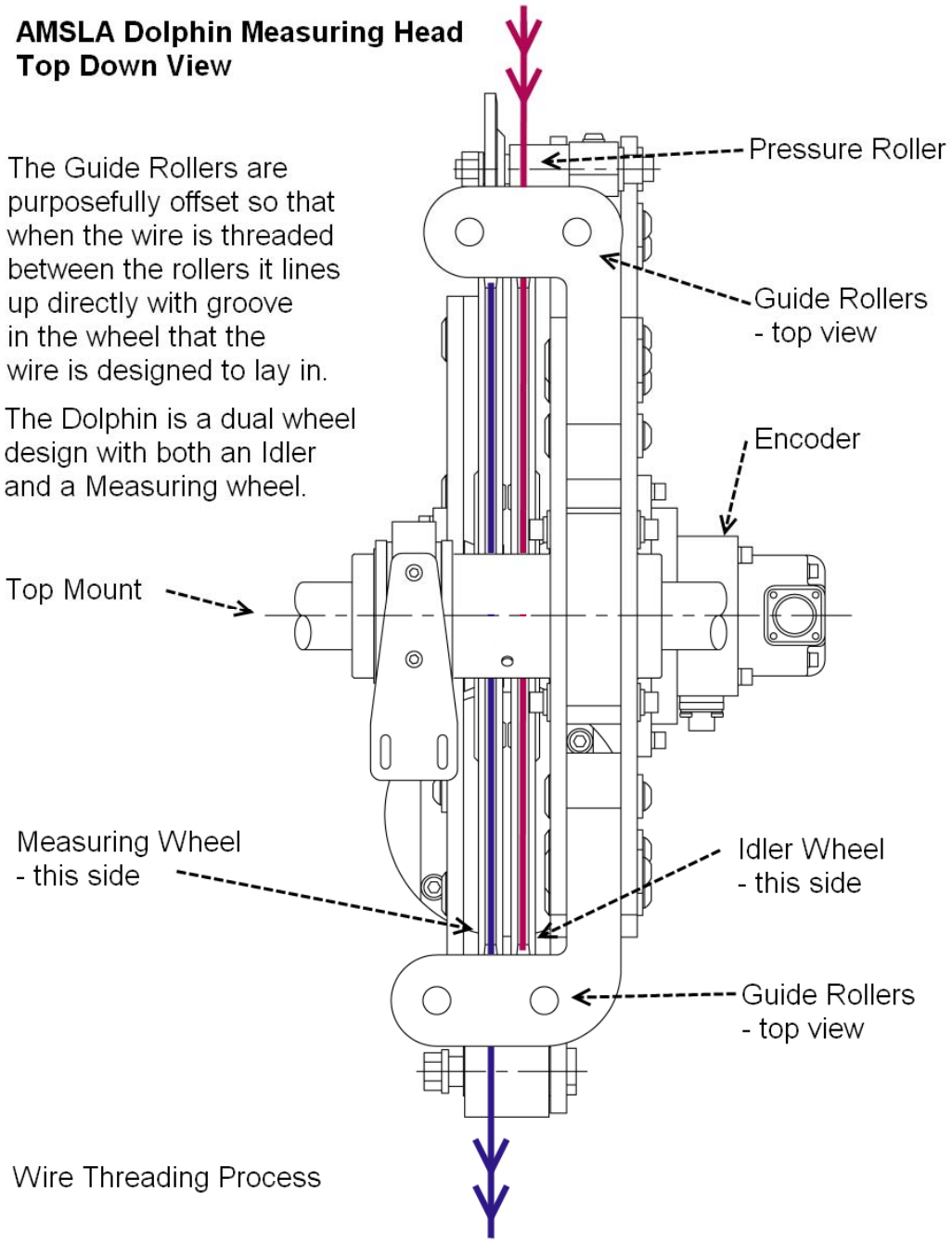


1.5 HARDWARE FEATURES

- **Cable sizes .**092 to .125 slickline & 3/16" to 1/4 e-line/braided line
- **Tension load axle** & amplifier can be configured to different outputs
- Can measure **wireline tensions** up to 9,000 pounds – 4,082 kg)
- **Includes both hydraulic load cell and electronic tension load pins**. These tension devices are completely independent of each other.
- **2 fully independent depth measurements** - optical encoder and magnetic pickup
- **Backup depth system** -reduces drag on measuring wheel by eliminating mechanical drive cable
- **Line removal from the side** without cutting off Cable Head
- **Minimizes wire abrasion & fatigue** by using non-reverse bend configuration
- **Wires run side-by-side** across top of measuring wheel to prevent wire rub
- **Large diameter wheel** radius minimize wire fatigue
- **Spooling rollers** and pressure wheels keep wire in wheel at low/no tension
- **Spring pressure wheel** keeps wire turning with wheel even with sudden direction change or jarring action
- Mounts on an **ASEP style overhead bar**
- **Encoder & tension amplifier certified** for Zone II area use available
- **Anodized aluminum** frame

1.6 USER INTERFACE FEATURES

1.6.1 WIRE THREAD PATH

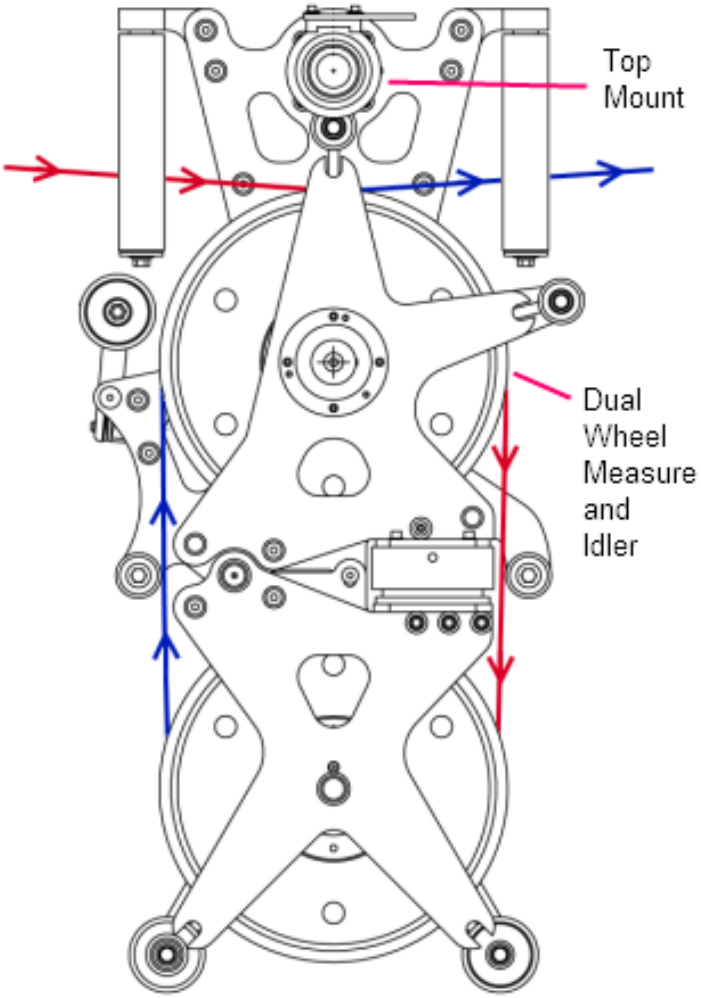


1.6.2 SLICKLINE WIRE THREADING – FINAL RESULT

This is what an AMSLA Dolphin measuring head should look like with the wire properly threaded.

Final Thread Path is the same whether threaded with or without cable head attached.

AMSLA DOLPHIN WIRE PATH



1.7 HAZARDOUS AREA INSTALLATION STANDARDS & REQUIREMENTS

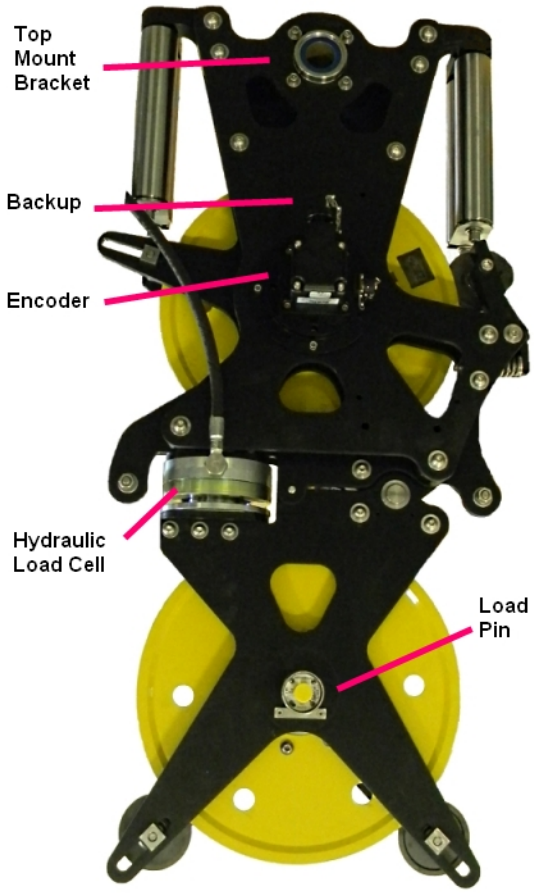
This equipment is to be installed only by personnel who are suitably trained and qualified to local/national codes.

1. Install the measuring head on the wireline equipment.
   Bolt the mounting bracket to the wireline equipment.
   Connect the measuring head to the mounting bracket.

2. Connect the cables from the panel to the encoder, backup and load pin on the measuring head.

Make sure you use the correct cable for each connection as described in this manual.

BenchMark Wireline - AMSLA490 - Dolphin



1.8 OBTAINING TECHNICAL ASSISTANCE

Call BenchMark Wireline Products Inc. at +1 281 346 4300
Or contact by email mail@benchmarkwireline.com
Or fax in request at +1 281 346 4301

Information is also available on website www.benchmarkwireline.com

Parts can be ordered by email, phone, or fax.

Equipment can be returned for repair and maintenance.
Please notify us by Phone, email, or fax before sending any equipment.

To return equipment to BenchMark, ship it to:
BenchMark Wireline Products
36220 FM 1093
Simonton, Texas 77476
U.S.A.

Note – For better response, please have the Part Number available.

2.0 WELLSITE OPERATING SUMMARY

2.1 WELLSITE OPERATION

Power up the panel connected to the measuring head and verify it is working properly.

Verify the panel is configured to match the system
- Line size
- Measurement units
- Encoder settings

Install the line in measuring head and set the line size parameter on the panel.

Set Tension Alarm value.

Set depth adjust value if necessary.

Ensure that memory card is installed in data recorder.
Turn power to panel off then on again.
This will write the operating parameters to the memory card.

Rig up through sheaves, install tool, and slack off weight.

Set depth to zero.

Press T-Zero to set tension to zero.

Press T-CAL and verify that panel tension reads 4,000 or 5,000 lbs (depending on type of measuring head selected)

Pull tool to depth 0 position.
Press D-Zero to reset the panel depth to 0.

2.1 WELLSITE OPERATIONS continued

Determine wireline size to be used – .092" to 1/4”

Since the wireline wraps around the depth wheel, the circumference of the depth wheel will change with a change in wire size. The wheel size needs to be corrected for wireline size in order to accurately measure depth.

These corrections are automatically made in the BenchMark hoistman's panel by selecting the proper cable size using the menu. If a different panel is used, the wheel size will need to be entered at this time.

3.0 SOFTWARE OPERATING INSTRUCTIONS

NOTE - The measuring heads do not contain any software. The software is in the display panel. A variety of display panels can be used with this measuring head.

To view the Software Operating Instruction, refer to the manual for the Display Panel being used with this head.

4.0 SOFTWARE UPDATE PROCEDURES

NOTE - The measuring heads do not contain any software. The software is in the display panel. A variety of display panels can be used with this measuring head.

To view the Software Update Procedures, refer to the manual for the Display Panel being used with this head.

5.0 MAINTENANCE, ASSEMBLY DRAWINGS & PARTS LIST

5.1.1 PRE AND POST JOB CHECKS

Between jobs, check the measuring and guide wheels for looseness, play, out-of-roundness, worn or rough sounding bearings, or other mechanical conditions that could affect measurement accuracy.

Visually inspect the interiors of the electrical connectors for the encoders and electronic load axle for dirt and evidence of insulation breakdown. Clean or replace as necessary. Install dust caps on the connectors if the cables are removed.

Manually rotate each wheel by hand to verify its condition. Inspect the depth measuring wheel for signs of abnormal wear diameter changes, or shaft play that can affect measurement accuracy. The wheel should be replaced if it is grooved more than .005".

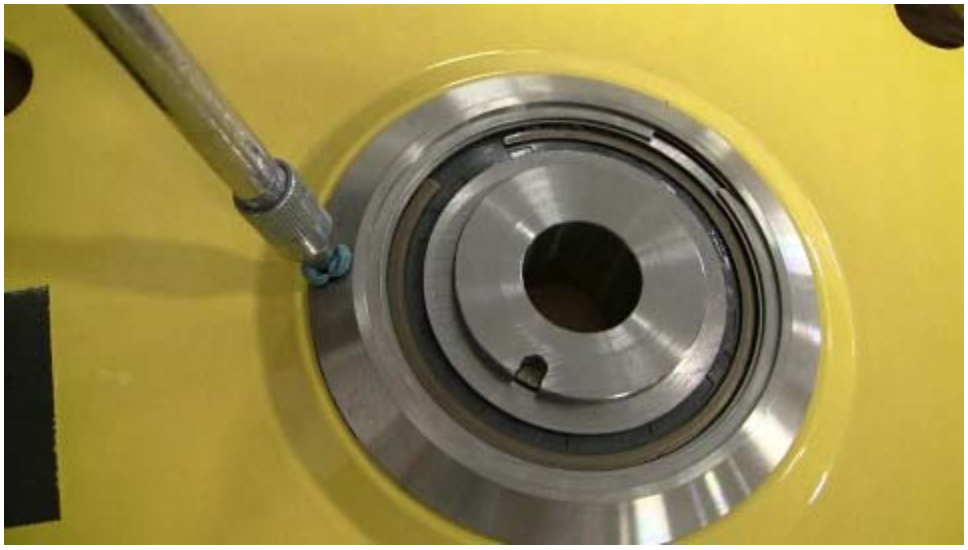
Inspect the tension wheels for signs of abnormal wear, diameter changes, or shaft and bearing play that could affect measurement accuracy. It should also be replaced if it is grooved more than .005".

Do not pressure wash bearings or electrical parts

5.1.2 LUBRICATION

Lubrication – use waterproof marine grease and a straight necked grease gun. Use the grease nozzle that comes with the measuring head (in the small plastic bag zip-tied to the frame).

Press the nozzle into the fitting and apply 3 squirts. Repeat same lubrication schedule each month.



DO NOT pressure wash the machine as it will force the grease out of the bearings and they will fail.

5.2 FIELD MAINTENANCE PROCEDURES

TENSION WHEEL MAINTENANCE

There are 4 field maintenance procedures for the Tension Wheel and Load Cell.

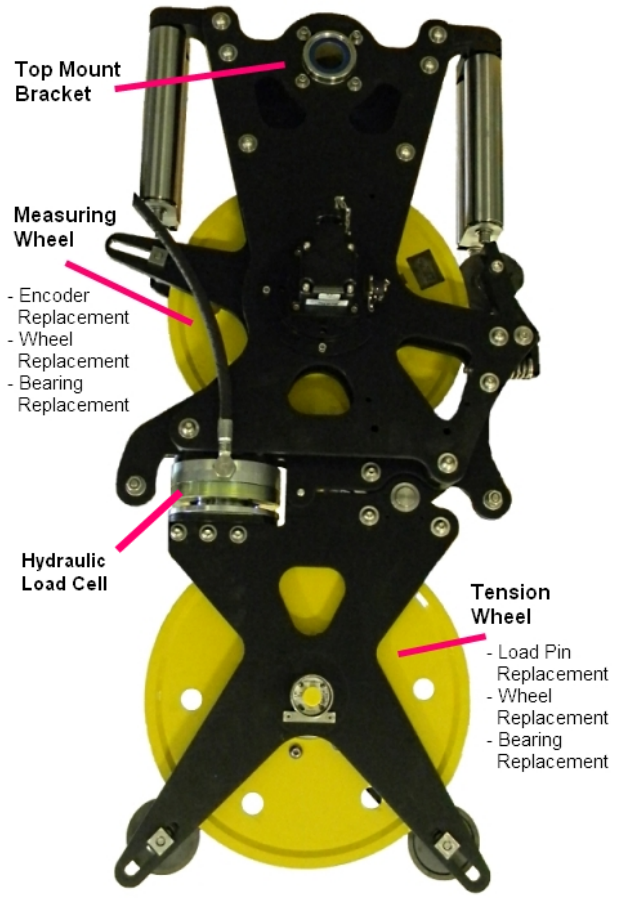
- Load Pin Replacement – 5.2.1
- Wheel Replacement – 5.2.2
- Wheel Bearing Replacement – 5.2.3
- Load Cell Replacement – 5.2.4

MEASURING WHEEL MAINTENANCE

There are 3 field maintenance procedures for the Measuring Wheel.

- Encoder Replacement – 5.3.1
- Wheel Replacement – 5.3.2
- Wheel Bearing Replacement – 5.3.3

BenchMark Wireline - AMSLA490 - Dolphin



5.2 FIELD MAINTENANCE PROCEDURES

Many of the operations shown in this manual assume that the Dolphin is dismounted, inverted and clamped to a heavy work bench as seen here or laid down.

5.2.1 TENSION WHEEL - LOAD PIN REPLACEMENT

***NOTE** – maintenance on the Dolphin may be performed with the device attached to its top mount, with it inverted as shown above or laid horizontally on blocks. Replacing the load pin is a simple procedure that can be performed with the Dolphin in a variety of positions.

The 1st step is to remove the spiral lock from the load pin shaft.
If the lock has not been damaged it can be used again on reassembly.

Hold the tension wheel with one hand.

5.2.1 TENSION WHEEL - LOAD PIN REPLACEMENT continued

Gently remove the load pin from the wheel hub.
The load pin shaft holds the tension wheel in place.

With the load pin removed gently let the tension wheel rest in the frame.

Put anti-seize compound on shaft of the new load pin.

5.2.1 TENSION WHEEL - LOAD PIN REPLACEMENT continued

Position the tension wheel so that the load pin can be placed through the wheel hub.

Note that the load pin has a flat notch on one side.

5.2.1 TENSION WHEEL - LOAD PIN REPLACEMENT continued

The flat side of the load pin will flange up to the guide plate on the frame.

Insert the load pin and rotate it so that the flat side of the pin butts up to the guide plate.

5.2.1 TENSION WHEEL - LOAD PIN REPLACEMENT continued

The bearing in the tension wheel has a slot for an anti rotation screw.

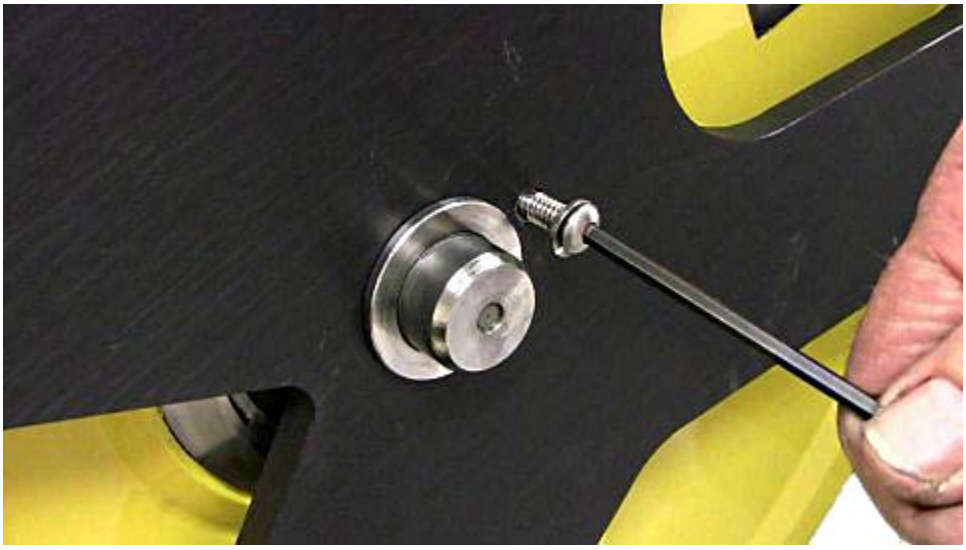
*Note - depending on position of the wheel, if during this procedure the tension wheel stays in place, there is no need to remove the anti rotation screw.

If the wheel moves too much, the bearing may slide off the anti-rotation screw. In that case you must remove the anti-rotation screw for proper reinstallation.

5.2.1 TENSION WHEEL - LOAD PIN REPLACEMENT continued

Spin the wheel until the anti rotation slot on the bearing can be seen through the anti rotation screw hole.

Replace the anti rotation screw and tighten it firmly.



5.2.1 TENSION WHEEL - LOAD PIN REPLACEMENT continued

Replace the spiral lock.

5.2.2 TENSION WHEEL REPLACEMENT

***NOTE** – maintenance on the Dolphin may be performed with the device attached to its top mount, with it inverted and clamped to a heavy work bench or laid horizontally on blocks. Replacing the tension wheel is a simple procedure that can be performed with the Dolphin in a variety of positions.

For this maintenance, we assume that the load pin has been removed. 5.2.1

Loosen and completely move the pressure roller to the end of its slot and retighten. Unscrew and completely remove the other pressure rollers.

Pull the wheel up and out of the frame.

If bearing replacement is needed see 5.2.3

Reposition the wheel back in the frame and follow the load pin installation instructions in 5.2.1.

Then replace and adjust the pressure rollers so that the rollers fit inside the groove of the tension wheel.

5.2.3 TENSION WHEEL - BEARING REPLACEMENT

For this maintenance, it is assumed that both the wheel and the bearing have already been removed. The bearing is held in the wheel hub by 2 snap rings.

An Arbor press is being used to demonstrate this replacement.

The anti-rotation bushing will be pressed into the bearing. Place the new bearing on the press.

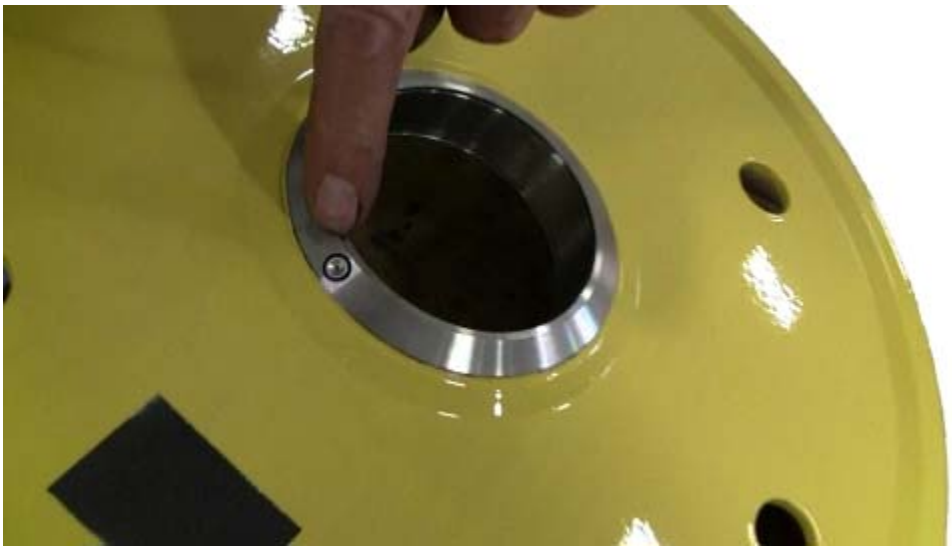
5.2.3 TENSION WHEEL - BEARING REPLACEMENT continued

On the first stroke, the bushing may not go all the way into the bearing. Add a spacer on the bottom of the bearing as the bushing will protrude below the bottom bearing.

The bushing is properly installed when approximately equal amounts stick out both above and below the bearing assembly.

5.2.3 TENSION WHEEL - BEARING REPLACEMENT continued

Take the Tension Wheel. 2 snap rings will hold the bearing assembly in place. The front of the wheel is the side with the grease fitting.



5.2.3 TENSION WHEEL - BEARING REPLACEMENT continued

On the BACK of the wheel, install the 1st snap ring.

Then turn the wheel over. You should be able to simply insert the bearing assembly into the center hub. **NOTE make sure the small grease hole on the outside of the bearing assembly is placed directly in front of the grease fitting of the bearing or it will not be properly lubricated and the bearing will fail.

5.2.3 TENSION WHEEL - BEARING REPLACEMENT continued

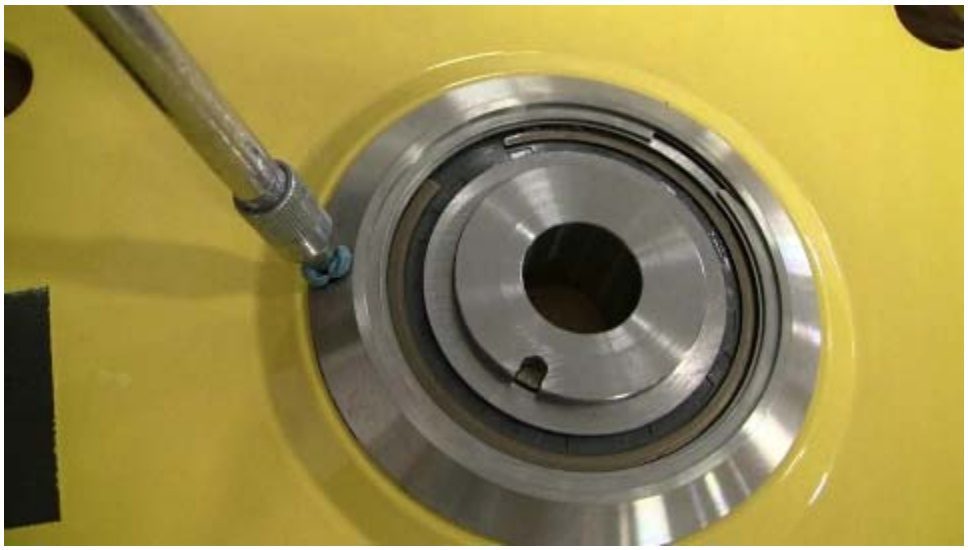
Install the 2nd snap ring to hold the bearing in place.

Manually tug on the bearing assembly to make sure it is firmly in place.

5.2.3 TENSION WHEEL - BEARING REPLACEMENT continued

Lubrication – use waterproof marine grease and a straight necked grease gun. Use the grease nozzle that comes with the measuring head (in the small plastic bag zip-tied to the frame).

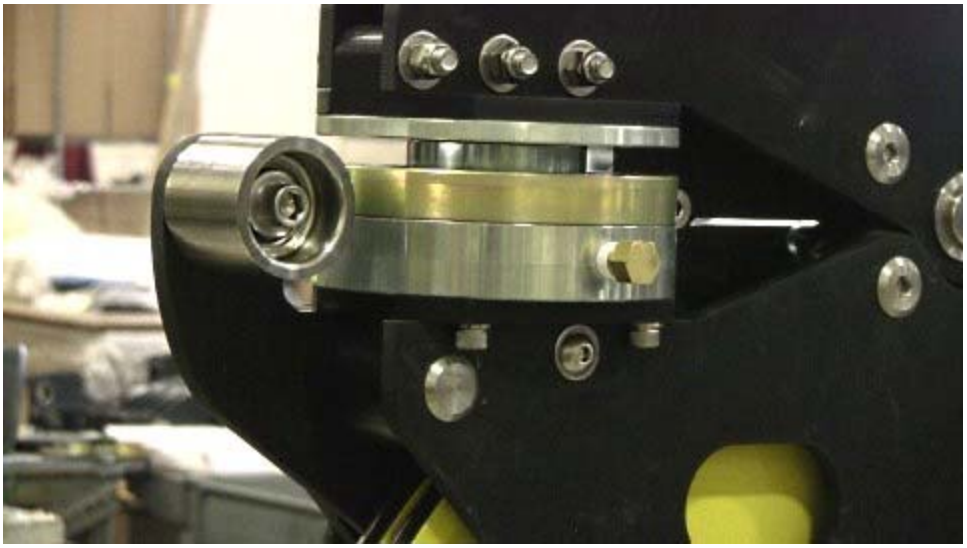
Press the nozzle into the fitting and apply 3 squirts. Repeat same lubrication schedule each month.



DO NOT pressure wash the machine as it will force the grease out of the bearings and they will fail.

5.2.4 LOAD CELL REPLACEMENT

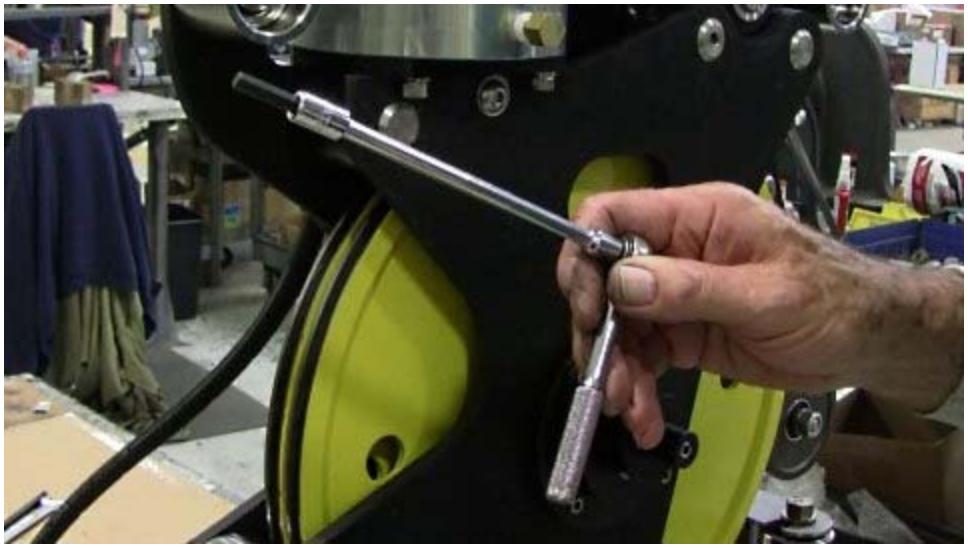
The Hydraulic Load Cell is backup device that measures tension independent of the load pin.



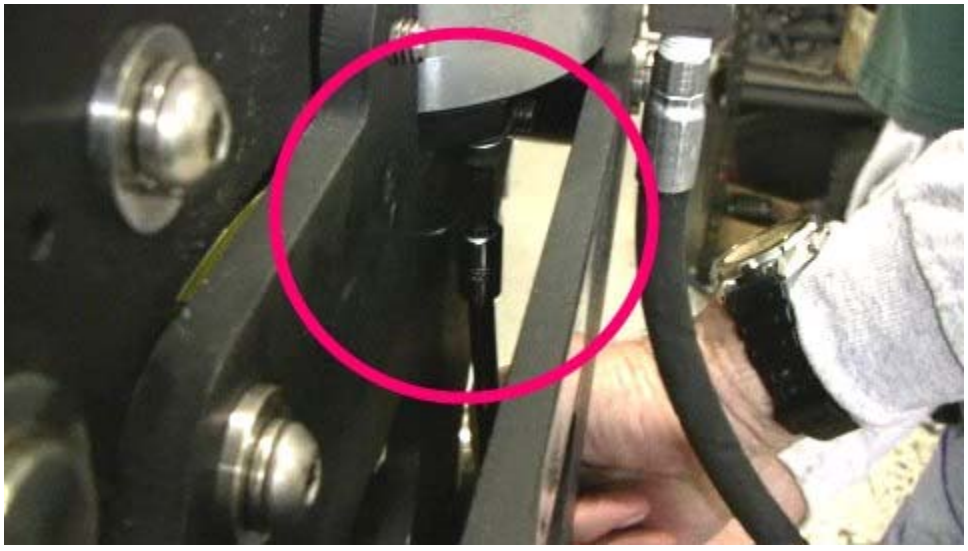
To replace the load cell, these screws which run through the mounting plate up into the bottom of the load cell, a deeply recessed screw and a shoulder bolt need to be removed.

5.2.4 LOAD CELL REPLACEMENT continued

First remove the recessed screw. For this task a ¼ inch drive with an 8 to 10 inch extension will work the best and a flexible connection on the extension is also helpful.

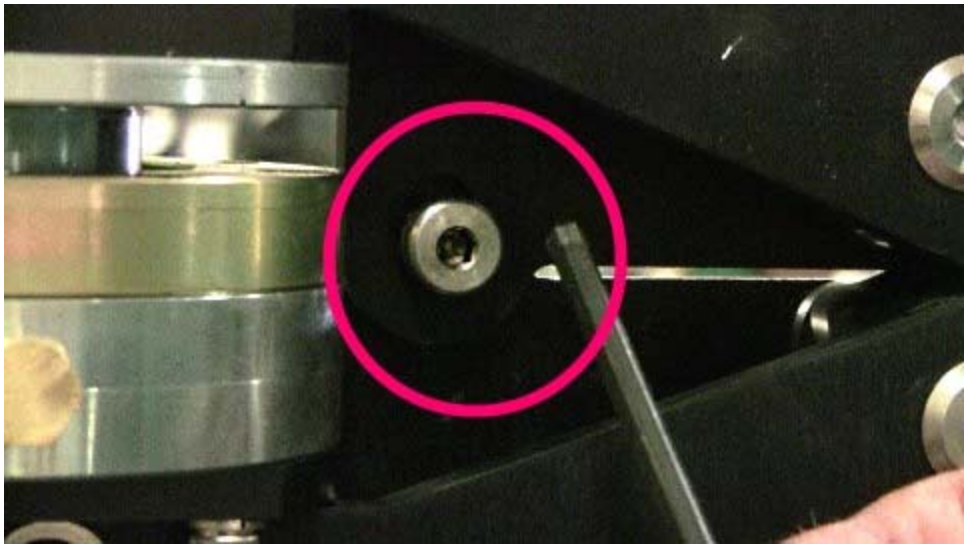


The recessed screw is on the back of the load cell and is removed from the bottom as shown.



5.2.4 LOAD CELL REPLACEMENT continued

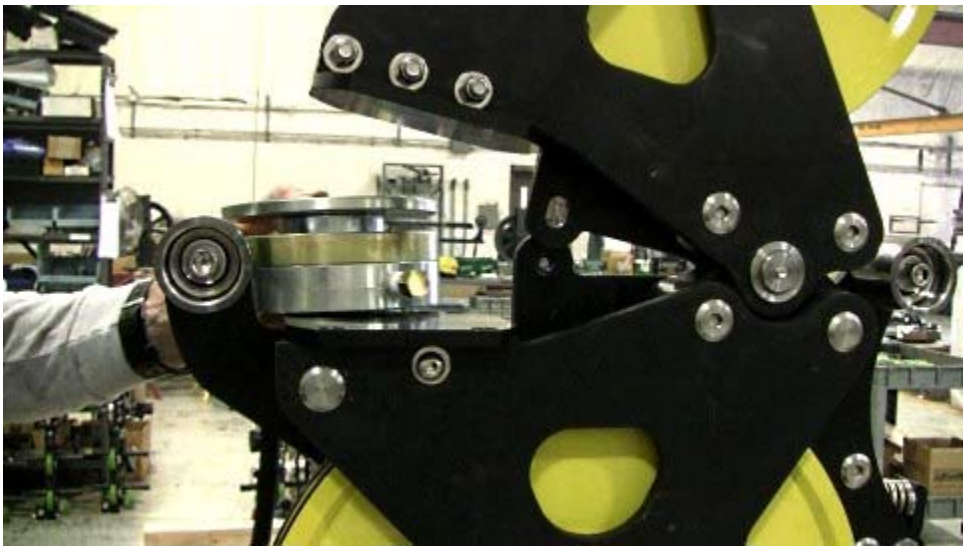
Now remove the shoulder bolt located next to the load cell. This allows the frame to pivot facilitating the replacement of the load cell.



Next remove the screws that hold the load cell in place.

5.2.4 LOAD CELL REPLACEMENT continued

Swing the frame away and slide the load cell out from the back.

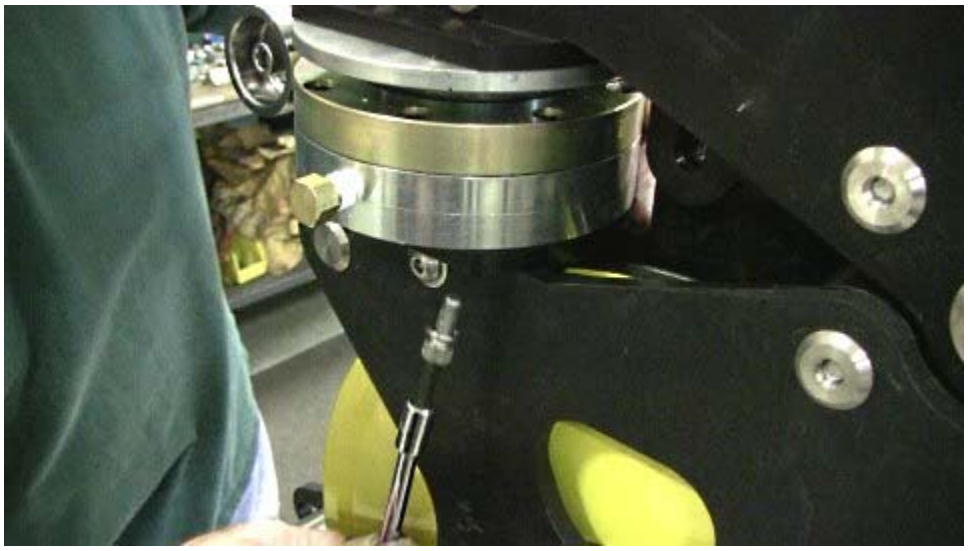


The load cell is an independent self contained tension measuring device.

5.2.4 LOAD CELL REPLACEMENT continued

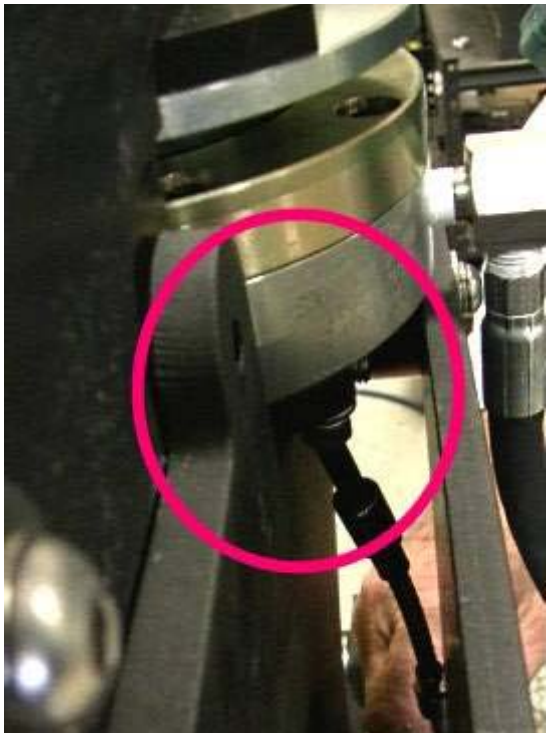
Place the new load cell on the mounting plate.

Position the load cell in the middle of the plate with the rounded corners of the plate flush with the side of the load cell. Insert the screws but do not fully tighten them.



5.2.4 LOAD CELL REPLACEMENT continued

Reinstall the recessed screw and tighten it. Now go back and tighten the 2 screws holding the load cell to the mounting plate.



Reinstall the shoulder bolt after putting Locktite or an equivalent product on it.

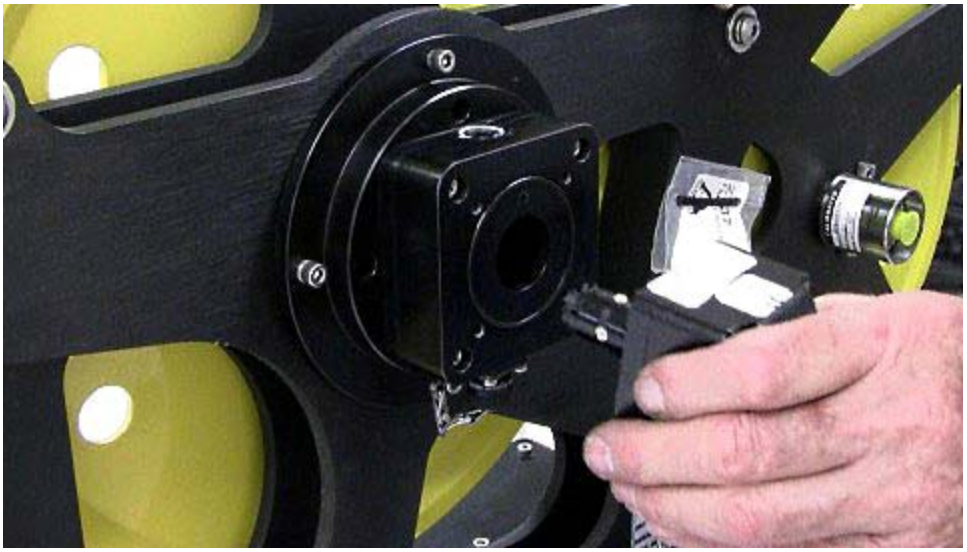
5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT

The first step is to remove the Plug.
The plug covers an access hole used to maintain the equipment.

Next remove the 4 encoder screws.
Hold the encoder as the last screw is removed or it will fall from the adapter body.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Carefully pull the encoder straight out avoiding contact between the couplings and the adapter.



If the plastic coupling is attached to the coupling stack, remove it.
If it is still inside the adapter body, with a pair of needle nose pliers, reach in and extract it.

*Note - If you drop the plastic coupling inside the adapter, you may have to remove the adapter to retrieve it.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Carefully remove the O Ring.

Note the size of the gap between the coupling and the encoder body.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

With the small Allen wrench, loosen the 2 set screws that hold the coupling on the shaft of the encoder.

Remove the coupling stack from the shaft.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Replace the existing coupling stack on the shaft of the new encoder.
Note that the shaft has a flat side. Place the coupling on the shaft so that the tangs on the coupling and one set screw are aligned to the flat side of the shaft.

When tightening, leave the same gap on the shaft between the coupling and the encoder. Snug up but DO NOT fully tighten the set screw on the flat side of the shaft.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Use DC111 or equivalent and apply a thin layer to the plastic coupling.
Press the plastic on top of the coupling stack. The DC111 will temporarily hold it in place.

The top of the encoder has the OEM labels. Rotate the coupling stack so that the slot on the top of the plastic coupling is oriented vertically.

Look though the hole in the adapter body and you will see the coupling half.
Rotate the measuring wheel so that the tang on the coupling half is vertical.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Carefully replace the encoder watching to not jar the coupling stack.
Hold it against the adapter body.

Using a flashlight look in the hole to verify that the plastic coupling has engaged the tang on the measuring wheel.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Temporarily replace the 2 screws to hold the encoder and coupling in place.

Place the Allen wrench in a set screw hole and exerting force, lever the encoder stack away from you towards the measuring wheel, snug up the set screw.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Remove the temporary screws remembering to hold on to the encoder. Carefully remove the encoder taking care to not jar the encoder stack.

Firmly tighten the 2 set crews on the coupling.

Lubricate the O ring using the DC111 and carefully replace the O ring in the adapter body.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Position the coupling on the encoder so that the slot is vertical.

Carefully position the encoder in the adapter body.

Holding the encoder firmly in place, Rotate the measuring wheel and if properly engaged, as you look down through the plug hole, you should see the white dots on the coupling stack move as the coupling spins.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Replace the 4 screws and tighten them firmly.

The last step in the process is to replace the plug.
Put a half a bead of Teflon sealant on the leading threads of the plug.

5.3.1 MEASURING WHEEL - ENCODER REPLACEMENT continued

Replace the plug and tighten it firmly.

5.3.2 MEASURING WHEEL REPLACEMENT

*** NOTE** – The Dolphin measuring head has both a Measuring Wheel and an Idler Wheel connected to the same shaft. Both wheels will need to be removed and reinstalled.

Remove the encoder - carefully remove the 4 screws holding it in place. When removing the last screw, make sure to hold the encoder to avoid it falling and possibly being damaged.

Remove the adapter and remove the 4 screws which attach it to the hub. If handled carefully, there is no need to remove the rubber seal. Carefully remove the adapter by pulling it straight back trying not to impact the encoder stack.

5.3.2 MEASURING WHEEL REPLACEMENT continued

The plastic coupling can be found either on the removed encoder or on the end of the shaft. If the plastic coupling is still on the shaft, remove it.

Loosen the 2 set screws then slide the coupling off the shaft.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Place the ¾ inch wooden dowel through the holes on both the measuring and the idler wheels. Remove the large nut which holds the wheels in place. It should take considerable force to loosen this nut.

After the nut is off, remove the spacer from off the shaft.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Now remove the socket head screws that hold the hub in place. Remove the 4 longer screws in the center first, then the 4 shorter ones on the outside ring next.

Slowly pull the hub off the shaft and out of the frame.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Remove the pressure wheel. Remove the nut, spring the tension wheel arm back and remove the wheel, spacer and the screw.

Loosen and move the keeper roller to the end of its slot out of the way.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Completely remove this upper keeper roller.

In order to remove the wheels, this guide roller must be swung out of the way. Loosen the frame bushings that hold the roller in place. Unscrew them from behind.

5.3.2 MEASURING WHEEL REPLACEMENT continued

You will now have to lay the dolphin measuring head down on its side with the encoder side down.

Simple wooden blocks like these made from 2x4 will hold the dolphin in place for bench maintenance.

Unclamp the Dolphin from the work bench and lay the device down. Position the wood blocks to make it steady. **Safety precautions** need to be taken as the Dolphin is a large and heavy piece of equipment.

5.3.2 MEASURING WHEEL REPLACEMENT continued

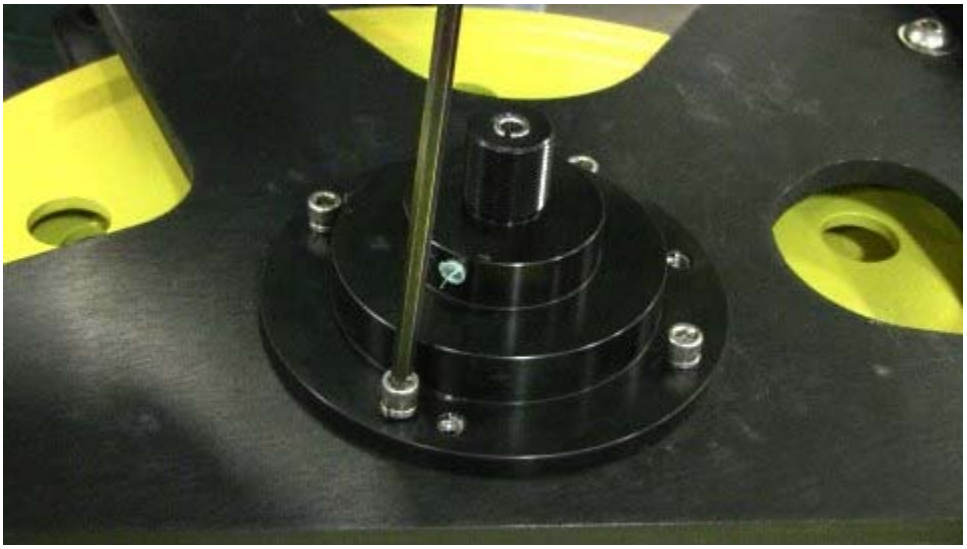
The guide roller must be swung out of the way. The upper frame bushing must be removed. Remove the 2 pieces of the frame bushing, spacer and washer by unscrewing it from below.

If the bushing is difficult to remove, screw the treaded bushing into the top of the tapped bushing and pull it out.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Now swing the guide roller arm out of the way.

Now remove the 4 screws that hold the adapter hub in place. This hub contains the shaft that holds the measuring and the idler wheels in place.



5.3.2 MEASURING WHEEL REPLACEMENT continued

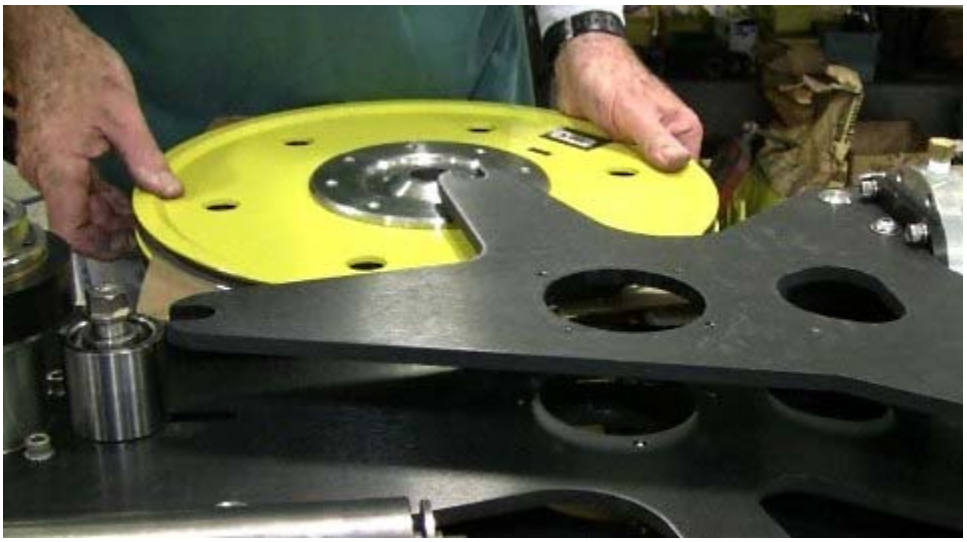
Slide 2 pieces of cardboard between the measuring and idler wheels to protect them and to reduce some of the sliding.

Now remove the hub and shaft.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Notice the position of the key and keyway.

Now hold both wheels together and pull them out of the frame on the open side.



5.3.2 MEASURING WHEEL REPLACEMENT continued

Place the wheels on a work surface together and then separate them. Note that the wheels are positioned with the screw heads on each hub facing each other.

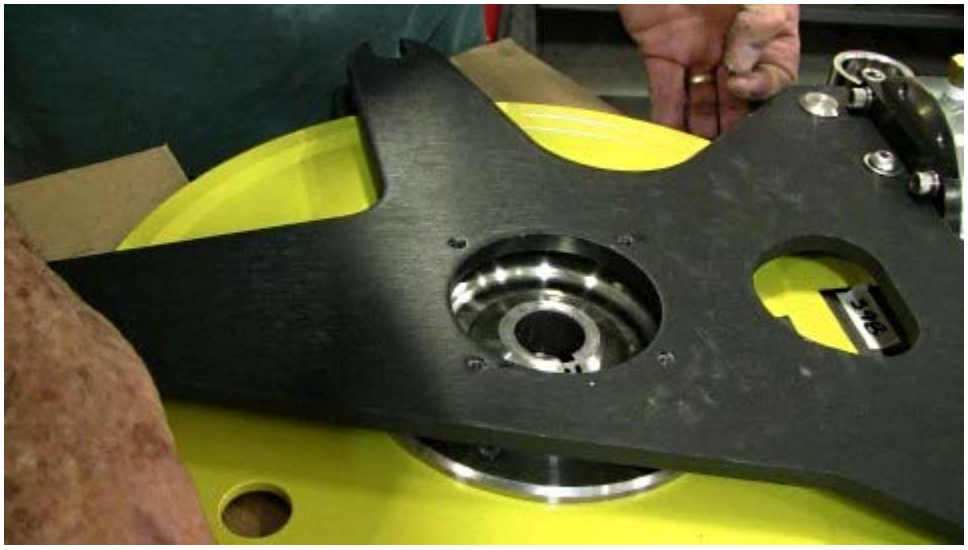
****NOTE** – if you are also replacing the **Idler Wheel bearing** as part of this maintenance, see 5.3.4 for instructions. If you are replacing the bearing in the **Hub**, see 5.3.3.

The shaft adapter must be repositioned inside the bearing on this side of the wheel (see picture). This can be reinstalled by hand or with gentle taps of a rubber mallet on the opposite side of the wheel from the screw heads.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Lay the idler wheel with the shaft adapter side down. Replace the cardboard strips and lay the measure wheel on top. Make sure that wheels are screw head to screw head and line up the holes in the wheels

Slide the wheels back in the frame. Try to center the wheels in the frame as the shaft needs to be reinserted through the frame and the wheels.



5.3.2 MEASURING WHEEL REPLACEMENT continued

Put anti-seize compound on the shaft and keyway.

Reinsert the shaft. Make sure the key and the keyway are aligned. If necessary, use a flat screwdriver to rotate the shaft end in the top of the hub to align it. Then insert the hub and shaft into the frame.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Rotate the hub to position the grease fitting as shown and to align with the screw holes on the frame. Replace the 4 screws. They should NOT be tight. Make contact and loosen them slightly. The hub and shaft need to be held in place yet have some play so that the shaft can be aligned with the hub on the other side of the frame

Swing the guide roller back in place. Align the hole in the frame and insert the top frame bushing. Reinstall the bottom frame bushing and spacer on the underside of the frame and finger tighten.

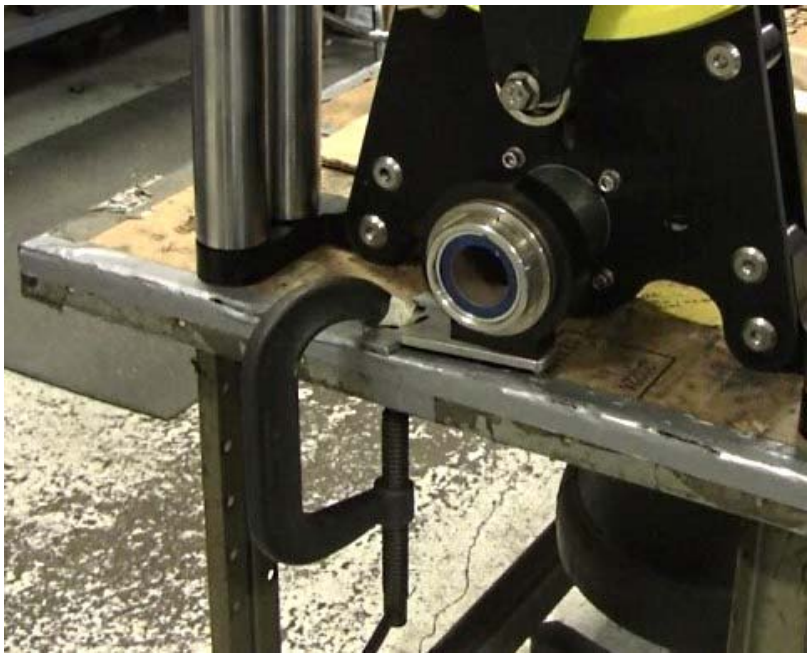
5.3.2 MEASURING WHEEL REPLACEMENT continued

Slide the keeper roller to almost touching the wheel and install and snug up the screw. This roller will help support the wheels.

Stand the Dolphin up on it end again. **Safety precautions** need to be taken as the Dolphin is a large and heavy piece of equipment.

5.3.2 MEASURING WHEEL REPLACEMENT continued

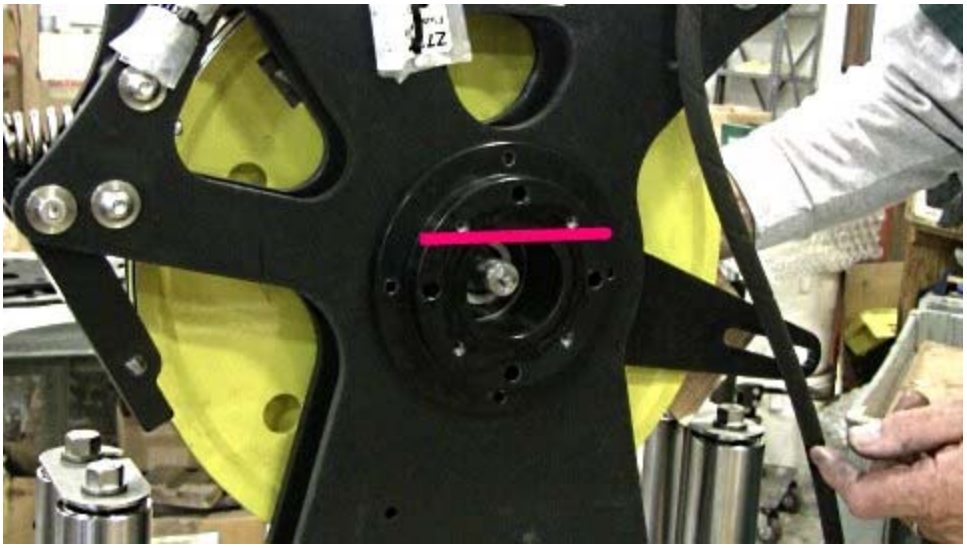
Now clamp the Dolphin measuring head to the work table with a heavy duty C clamp.



If while standing the dolphin up the shaft adapter falls out, which it may do, it needs to be replaced. This may take 2 people. The adapter will be placed on the shaft and then both wheels need to be held and positioned with the center of the wheels exactly in the center of the frame. The adapter will keep the shaft and the frame perfectly aligned.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Reinstall the hub on the shaft. Rotate the screw holes to horizontal as shown so that the when the encoder is replaced, it will be positioned properly.



The 4 short screws are installed on the outer hub first, snugged not tightened and then the longer 2 inch screws are installed and tightened. Next the short screws are tightened.

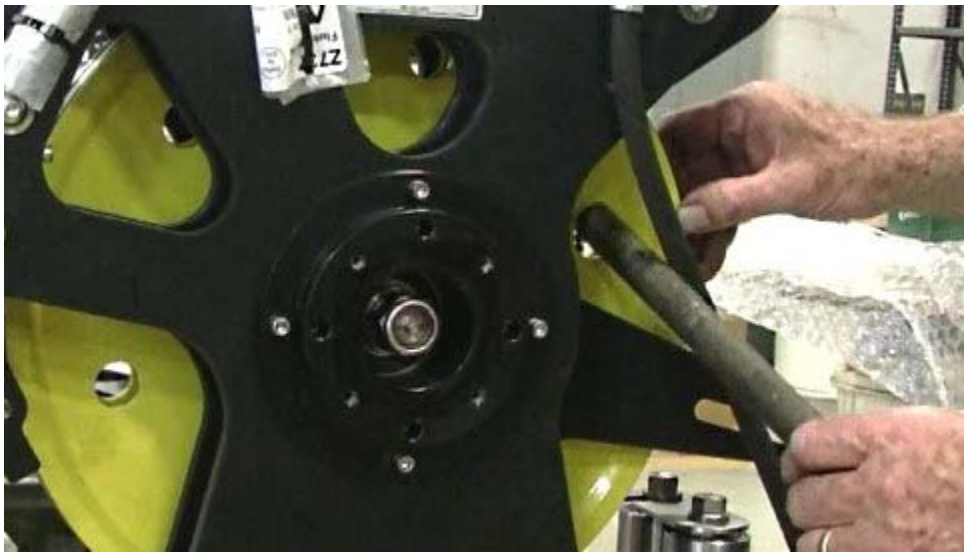
5.3.2 MEASURING WHEEL REPLACEMENT continued

On the other side of the measuring head, snug then tighten the 4 screws on that hub. This assures that components stay perfectly aligned.

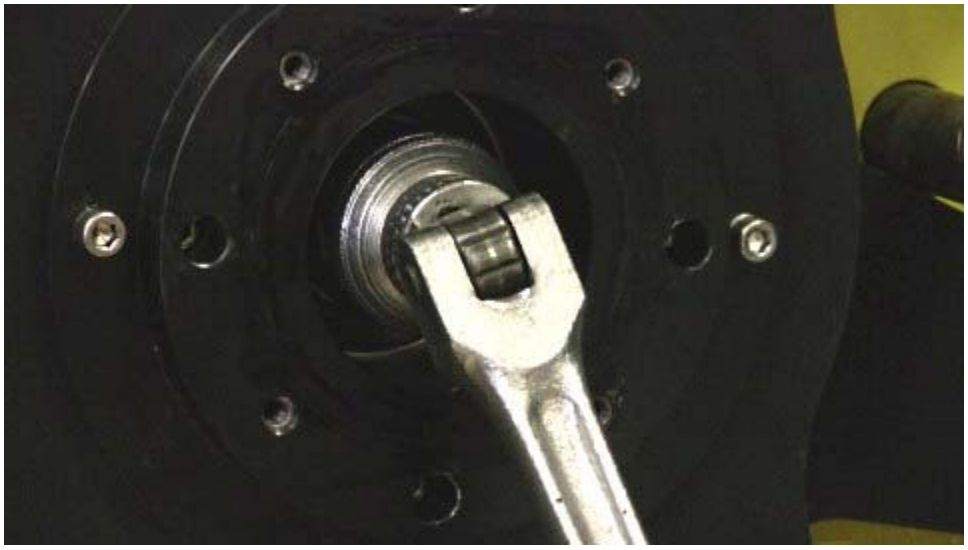
Next place the spacer on the shaft, then hand tighten the nut on the shaft.

5.3.2 MEASURING WHEEL REPLACEMENT continued

Pull the cardboards out from between the wheels. Rotate the wheels so that the holes are lined up. Place the wooden dowel through the holes on both wheels.



Now firmly tighten the nut on the shaft and remove the dowel.



5.3.2 MEASURING WHEEL REPLACEMENT continued

Reinstall the lower keeper roller and tighten the screw.

Tighten the screws on the guide rollers.

5.3.3 MEASURING WHEEL – HUB BEARING REPLACEMENT

There are 2 bearings in the measuring wheel. 1 is on the shaft and the other is inside this hub. Both will need to be replaced.

Remove the retainer clip that holds the bearing in place in the hub.
It can normally be removed and replaced with no special equipment.
Install the new bearing and the retainer clip.

NOTE – make sure that the small lubrication hole on the outside bearing race is lined up with the grease fitting on the hub or the bearing won't be lubricated and will fail.

5.3.3 MEASURING WHEEL – HUB BEARING REPLACEMENT continued

The other bearing is on the shaft.
First remove the key from the shaft.

Now remove the retainer clip for this bearing.

5.3.3 MEASURING WHEEL – HUB BEARING REPLACEMENT continued

You now need to press the shaft and the bearing out of the hub.
You will usually need a press to both remove and reinstall the bearing and shaft.
Set up your press to allow pressing the shaft and bearing out through the bottom of the hub.

Get a punch of smaller diameter than the shaft and press out the shaft.

5.3.3 MEASURING WHEEL – HUB BEARING REPLACEMENT continued

Be sure to catch the shaft – clean off any lubricant on the bearing and shaft.

Protect the small threaded end of the shaft by putting a nut over it to press on. Press the shaft out of the bearing.

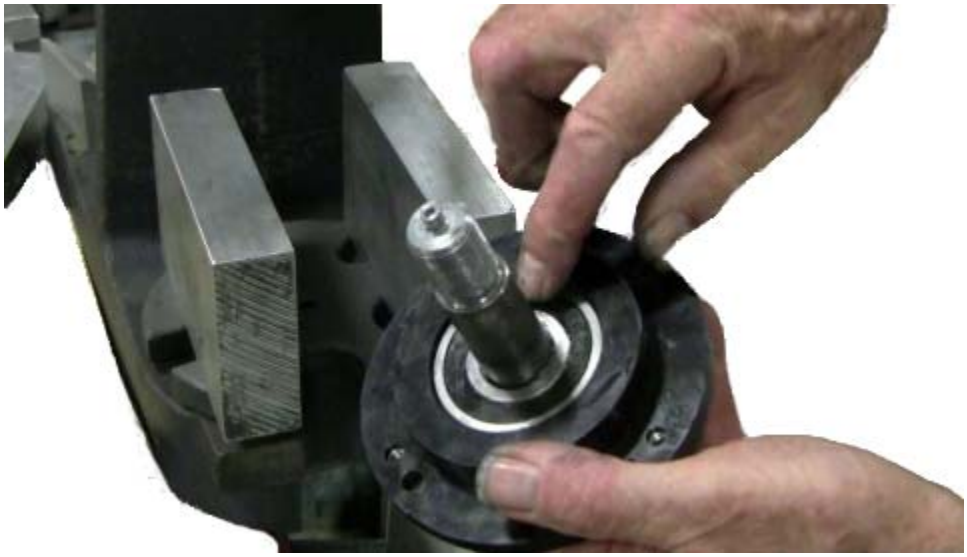
Place the new bearing on the shaft and snug as much as possible manually.

5.3.3 MEASURING WHEEL – HUB BEARING REPLACEMENT continued

NOTE – make sure that the small lubrication hole on the outside bearing race is lined up with the grease fitting on the hub or the bearing won't be lubricated and will fail.

Place the shaft and bearing in the hub so that you can see the small end of the shaft protruding out of the hub…this will indicate that the shaft is properly aligned in the hub.

You will now press the bearing with the shaft in it, into the hub.



5.3.3 MEASURING WHEEL – HUB BEARING REPLACEMENT continued

Verify that the shaft is properly aligned in the hub.
If the shaft spins easily, then it is properly installed.

Now replace the key in the shaft.
The shaft is ready to be inserted in the wheel hub.

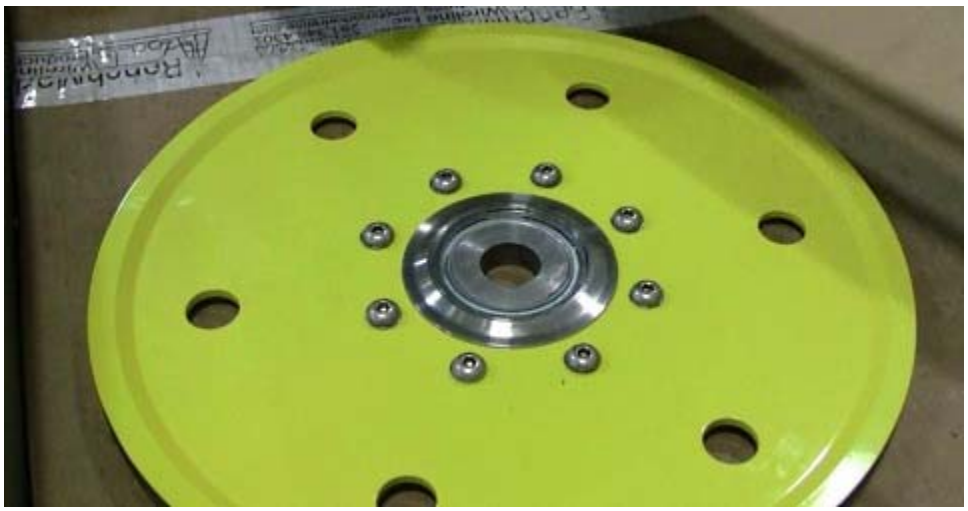
For instructions on reinstalling the shaft in the wheel, go to 5.3.2

5.3.4 IDLER WHEEL BEARING REPLACEMENT

The Dolphin measuring head has a bearing in the hub of the shaft that supports both the Measuring Wheel and the Idler Wheel. There is also a bearing in the Idler Wheel itself. This will show how to replace the Idler Wheel Bearing.

The top wheel is the measuring wheel. Notice that it has a solid hub and no bearings.

We will now replace the bearing in the center of the idler wheel.



5.3.4 IDLER WHEEL BEARING REPLACEMENT continued

There is a shaft adapter inside the bearing. It needs to be removed.

The adapter will be pushed out from the back and it should come out very easily by either pressing directly on it or by tapping it with a rubber hammer.

5.3.4 IDLER WHEEL BEARING REPLACEMENT continued

There are retainers on each side of the bearing that need to be removed.

Remove the old bearing.

The new bearing must be reinstalled with care. You cannot press on the inner race of the bearing as it will likely bend and not work properly. You must press on the thin outer race only.

5.3.4 IDLER WHEEL BEARING REPLACEMENT continued

Benchmark Wireline has developed this precision reinstallation tool that presses only on the outer race of the bearing and seats it to the proper depth.

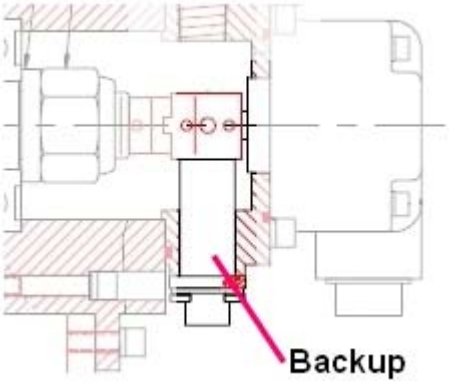
5.3.4 IDLER WHEEL BEARING REPLACEMENT continued

Replace the retainer clips that hold the bearing in place.

5.3.4 BACKUP DEPTH MAGNETIC PICKUP REMOVAL AND INSTALLATION

The backup depth magnetic pickup is mounted to the encoder adapter. It is held in place by four screws. Remove the screws and the pickup can then be removed. The pickup must be properly oriented to work correctly. The slot should be oriented to the top. The top side is the encoder side. Ensure that an o-ring is inserted between the plastic housing and the mount. An additional o-ring is used between the connector and the housing to keep moisture out.

If the backup display is counting backward (i.e. counting negative when going down hole), simply rotate the pickup 180 degrees to change the direction.

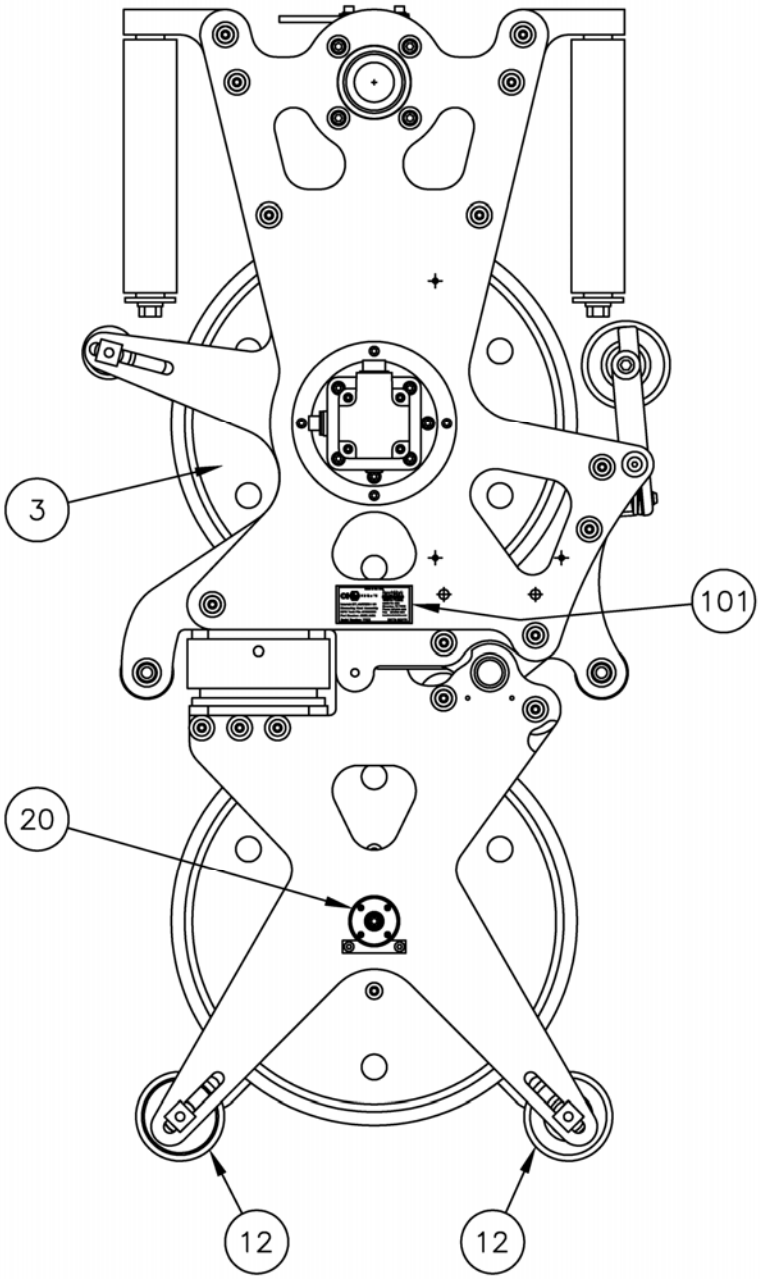


5.4.1 GENERAL ARRANGEMENT PARTS LIST – AMSLA DOLPHIN

ITEM	P/N	DESCRIPTION	QTY	REF
0	AMSLA490	COUNTER ASSY 2 WHL 4 FT DOLPHN E/H OH 40MM BASE MODEL	0	
1	AMSLA459	WHEEL ASSY MEAS 4FT 1/4 BR LIN DOLPHIN	1	
2	AMSLA460	WHEEL ASSY TENS 4FT 1/4 BR LIN DOLPHIN	1	
3	AMSLA461	WHEEL ASSY IDLER 4FT 1/4 DOLPHIN	1	
4	AM3KM040	ADAPTER ENCODER H25D/H20 MAG BACKUP	0	OPTION
4	AM5KM057	ADAPTER ENCODER H37C/H25D	0	OPTION
5	AMSLA464	KIT 2ND ENCDR MOUNT DOLPHIN	0	OPTION
5	AMSLM122	ADAPTER COUNTER HD RT ANGL DRV 1/4 2 WHL COUNTER	1	OPTION
11	AMSLM433	ROLLER KEEPER MEGAMOUTH	1	
12	AMSLA162	WHEEL ASSY PRESS RLR 1/4 TENSN W/BEARING	2	OPTION
20	AMSLA110B	ASSY LOAD AXLE 0-1.5V 1 IN DIA 0-9000# KPT 16 8 PIN Exn	0	REMOTE
20	AMSLA115B	ASSY LOAD AXLE 4-20mA 1 IN DIA 9K# LINE PULL 2WIR Exn	0	REMOTE
20	AMSLA132A	ASSY LOAD AXLE 2MV/V 1"DIA Z2 KP16-8P PASSIVE 09ATEX41118	0	REMOTE
20	AMSLA133A	ASSY LOAD AXLE 2MV/V 1" DIA Z2 P10-6P PASSIVE 09ATEX41118	0	REMOTE
20	AMSLA134A	ASSY LOAD AXLE 2MV/V 1" DIA Z2 P10-6P DUAL PASSIV 09ATEX41118	0	REMOTE
20	AMSLA137B	ASSY LOAD AXLE 2MV/V 1"DIA Z2 MS14S 6P PASSIVE 09ATEX41118	0	REMOTE
20	AMSLA138A	ASSY LOAD AXLE 2MV/V 1"DIA Z2 CWL18 10P PASSIVE 09ATEX41118	0	REMOTE
20	AMSLA187B	ASSY LOAD AXLE 2MV/V 1"DIA Z2 CWL18 10P PASSIVE 09ATEX41118	0	REMOTE
29	AMSLM219	ROLLER GUIDE VERT LEVELWIND	4	
49	AM5KA058	ASSY ENCDR BACKUP MAG EEx nA	0	REMOTE
50	AM5KA068B	ASSY ENCDR 1200 PPR OPTICAL MS16 HES Ex nA ETL09ATEX41123	0	REMOTE
50	AM5KA070B	ASSY ENCDR 512/780 PPR OPTICAL KP14 Ex nA ETL09ATEX41123	0	REMOTE
50	AM5KA074B	ASSY ENCDR 1200 PPR OPTICAL MS18 Ex nA ETL09ATEX41123	0	REMOTE
50	AM5KA079B	ASSY ENCDR 1200 PPR OPTICAL MS16 STD Ex nA ETL09ATEX41123	0	REMOTE
50	AM5KA080B	ASSY ENCDR 1200 PPR OPTICAL MS16 BLUE Ex nA ETL09ATEX41123	0	REMOTE
60	AMSLP149	CELL LOAD M/D TOTCO 10K# STL 8 SQ IN COMP CELL E360-2	1	
101	AMSLM640	LABEL MSR HD SLICKLINE Ex Na ETL10ATEX11131	1	

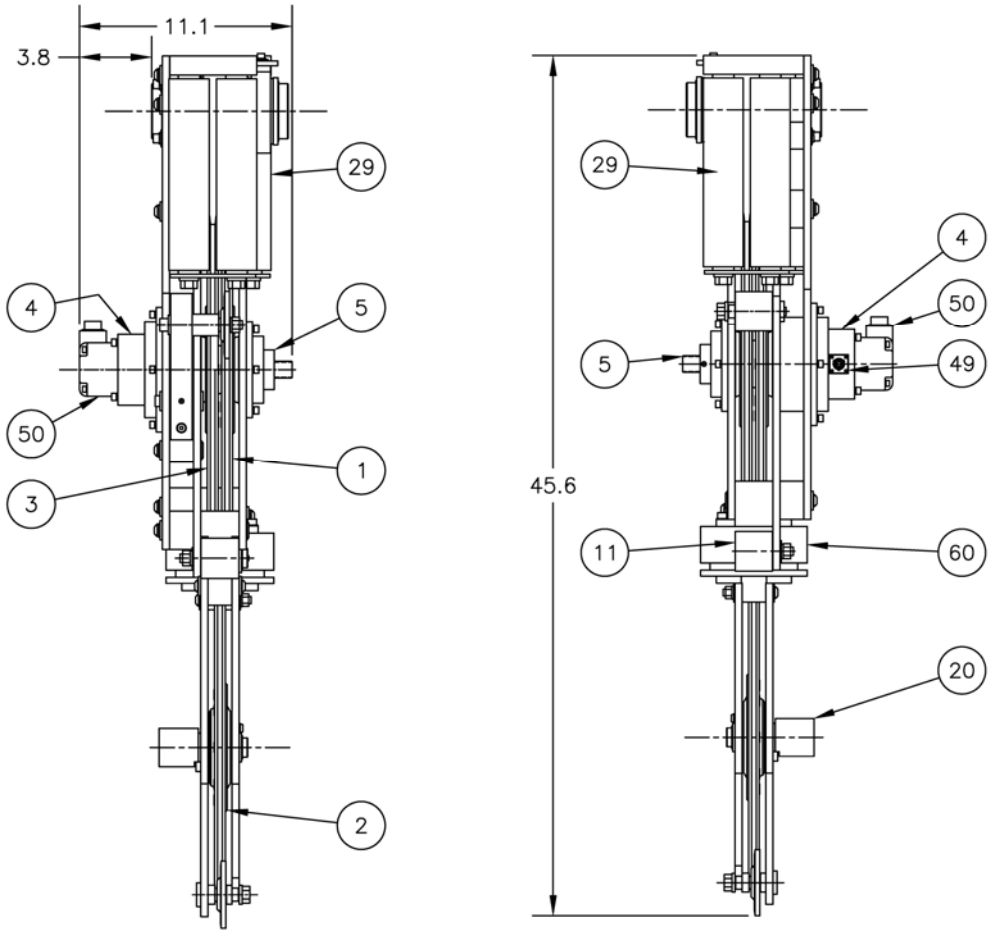
5.4.2 GENERAL ARRANGEMENT DRAWINGS - MEASURING HEAD

AMSLA DOLPIN – ENCODER SIDE VIEW



5.4.2 GENERAL ARRANGEMENT DRAWINGS - MEASURING HEAD

AMSLA DOLPIN – END VIEWS



5.4.3 ASSEMBLY DRAWING BILL OF MATERIALS – AMSLA DOLPHIN

ITEM	P/N	DECSRIPTION	QTY	REF
1	AMSLA459	WHEEL ASSY MEAS 4FT 1/4 BR LIN DOLPHIN	1	
2	AMSLA460	WHEEL ASSY TENS 4FT 1/4 BR LIN DOLPHIN	1	
3	AMSLA461	WHEEL ASSY IDLER 4FT 1/4 DOLPHIN	1	
4	AM3KM040	ADAPTER ENCODER H25D/H20 MAG BACKUP	0	OPTION
4	AM5KM057	ADAPTER ENCODER H37C/H25D	0	OPTION
5	AMSLA464	KIT 2ND ENCDR MOUNT DOLPHIN	0	OPTION
5	AMSLM122	ADAPTER COUNTER HD RT ANGL DRV 1/4 2 WHL COUNTER	1	OPTION
6	AMSLM468	MOUNT GUIDE ROLR FRONT DOLPHIN DRUM SIDE THREAD	1	
8	AMSLM221	PLATE SPACER GUIDE ROLLER VERT LEVELWIND SLOTTED	2	
11	AMSLA437	ROLLER ASSY PRS 2.10OD 12MM SS	4	
12	AMSLA162	WHEEL ASSY PRESS RLR 1/4 TENSN W/BEARING	3	
14	AMSLM228	NUT 7/16-14 TEE SLOT SST	4	
15	AMSLM449	GUIDE SPRING PRESS WHL 2WC MEGAMOUTH	2	
16	AMSLM467	MOUNT GUIDE ROLR REAR DOLPHIN DRUM SIDE THREAD	1	
17	AMSLM257	MOUNT PIVOT PRESS WHL ORCA 3/4 WRENCH	1	
18	AMSLM416	SHAFT MEAS WHL 30MM ENCDR/RT ANGLE DR 1/4 DOLPHIN DS THD	1	
19	AMSLM085	PLATE ORIENTATION LOAD PIN	1	
20	AMSLA110B	ASSY LOAD AXLE 0-1.5V 1 IN DIA 0-9000# KPT 16 8 PIN Exn	0	OPTION
20	AMSLA115B	ASSY LOAD AXLE 4-20mA 1 IN DIA 9K# LINE PULL 2WIR Exn	0	OPTION
20	AMSLA132A	ASSY LOAD AXLE 2MV/V 1"DIA Z2 KP16-8P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA133A	ASSY LOAD AXLE 2MV/V 1" DIA Z2 P10-6P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA134A	ASSY LOAD AXLE 2MV/V 1" DIA Z2 P10-6P DUAL PASSIV 09ATEX41118	0	OPTION
20	AMSLA137B	ASSY LOAD AXLE 2MV/V 1"DIA Z2 MS14S 6P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA138A	ASSY LOAD AXLE 2MV/V 1"DIA Z2 CWL18 10P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA187B	ASSY LOAD AXLE 2MV/V 1"DIA Z2 CWL18 10P PASSIVE 09ATEX41118	0	OPTION
20	AMSLM113	SHAFT LOAD PIN REPL 1"OD 2 WH	1	
21	AM3KM050	COUPLING ENCDR W/BKUP MAGNETS	0	OPTION
22	AMSLM030	BUSHING FRAME 2 WHEEL COUNTER	13	
23	AMSLM131	BUSHING TENSION WHEEL 1 IN L/P	4	
24	AMSLM065	BUSHING L/P 1IN W/ANTI-ROTATN 1/4 BRAIDED LINE	1	
25	AMSLM114	SPACER .90ID X 1.50D X .250W M WHL SHAFT SST	1	
26	AMSLM230	BUSHING FRAME 3/8-16 SHARK	11	
27	AMSLM418	SHAFT GUIDE ROLLER VERT LVLWND ORCA	4	
28	AMSLM218	TBG SPACER GUIDE ROLLER LVLWND	4	
29	AMSLM219	ROLLER GUIDE VERT LEVELWIND	4	
30	AMSLM084	SCREW ANTI-ROTATION TENS WHEEL	1	
31	AMSLM053	BUSHING FLANGE PRESS WHEL 3/8 ID X 3/4 OD SST	1	
32	AMSLM055	BUSHING FLANGE PRESS WHEL 5/16 -18 THD X 3/4 OD SST	1	
33	AMS1P072	PLUG 3/8 NPT SS	1	

5.4.3 ASSEMBLY DRAWING BILL OF MATERIALS – AMSLA DOLPHIN continued

BenchMark Wireline Products
36220 FM 1093
P. O. BOX 850
Simonton,Texas 77476
Phone: 281.346.4300
Fax: 281.346.4301
benchmarkwireline.com

ITEM	P/N	DECSRIPTION	QTY	REF
34	AMSLM453	SPACER KEEPER ROLLER 0.70 THK 1-1/8 OD 7/16ID SST	6	
35	AMSLM040	SPACER FRAME 2 WHEEL COUNTER	6	
36	AMSLM463	SPACER PRESSURE WHEEL 0.36 THK 1-1/8 OD 7/16 ID M WHL SST	2	
37	AMSLM462	SPACER PRESSURE WHEEL 0.28 THK 1-1/8 OD 7/16 ID M WHL SST	2	
38	AMSLM530	BUSHING FRAME 3/8-16 MAKO	2	
39	AMSLM283	SPACER KEEPER ROLLER 0.34 THK 0.69 OD SST	4	
40	AMSLM466	SPACER PRESSURE WHEEL 1.38 THK 1-1/8 OD M WHL SST	1	
41	AMSLM430	PIVOT HINGE DOLPHIN	1	
42	AMSLM441	ANCHOR SPRING PRES WHL DOLPHIN	1	
43	AMSLM428	PLATE FRAME OPEN LWR DOLPHIN	1	
44	AMSLM429	PLATE FRAME MID LWR DOLPHIN	1	
45	AMSLM425	PLATE FRAME OPEN UPR DOLPHIN	1	
46	AMSLM426	PLATE FRAME MID UPR DOLPHIN	1	
47	AMSLM427	PLATE FRAME OUTER UPR DOLPHIN	1	
48	AMSLM216	ADAPTER MEASURING WHL SHAFT 30MM ENCODER SIDE MEGAMOUTH	1	
49	AM5KA055	ASSY ENCODER BACKUP MAGNETIC	0	OPTION
49	AM5KA058	ASSY ENCDR BACKUP MAG EEx nA	0	OPTION
49	AM5KP046	PLUG FREEZE 3/4 DIA BRASS	0	OPTION
50	AM5KA068B	ASSY ENCDR 1200 PPR OPTICAL MS16 HES Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA070B	ASSY ENCDR 512/780 PPR OPTICAL KP14 Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA074B	ASSY ENCDR 1200 PPR OPTICAL MS18 Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA079B	ASSY ENCDR 1200 PPR OPTICAL MS16 STD Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA080B	ASSY ENCDR 1200 PPR OPTICAL MS16 BLUE Ex nA ETL09ATEX41123	0	OPTION
51	AM5KM073	COUPLING MOD ENCDR 0.250/0.375	0	OPTION
51	AMS1P090	COUPLING OLDHAM ENCODER *C123 10/26/++15	0	OPTION
52	AMSLP040	BEARING SPHERE-ROL 50MM ID MCGILL W/SEALS	1	
53	AMSLP030	BEARING BALL 30MM 2-ROW SST	2	
54	AM3KP204	BEARING BALL 20MM SST ABEC-1 REPLACES C276P002	8	
55	AMSLP240	BEARING LINEAR 40MMID X 62MMOD X 80MM LG SELF-ALIGN COMPNSTD	2	
56	AMSLP009	BEARING BRZ FLANGED 3/8" ID X 1/4L OIL IMPREGNATED	2	
57	AMSLP112	BEARING BALL 12MM SST 2X EXTENDED INNER RING	7	
58	AMSLP231	BEARING BALL 2-5/16 BORE X 3-1/16 OD X 7/16 W	1	
59	AMSLP432	BEARING BRZ 1.00ID X 1.25OD X 1.25 LG SAE 660	1	
60	AMSLP149	CELL LOAD M/D TOTCO 10K# STL 8 SQ IN COMP CELL E360-2	1	
61	AMSLM435	MOUNT HYD L/C UPR DOLPHIN	1	
62	AMSLM436	MOUNT HYD L/C LWR DOLPHIN	1	
63	AMSLM459	WHEEL MEASURING 4FT 0.092-1/4 BOLT ON	3	

5.4.3 ASSEMBLY DRAWING BILL OF MATERIALS – AMSLA DOLPHIN continued

ITEM	P/N	DECSRIPTION	QTY	REF
64	AMSLM460	HUB TENSION WHL 4FT 1/4 DOLPHN BOLT ON	1	
65	AMSLM469	HUB MSRNG WHL 4FT 1/4 DOLPHN BOLT ON	1	
66	AMSLM461	HUB IDLER WHL 4FT 1/4 DOLPHN BOLT ON	1	
67	AMSLM465	BUSHING IDLER WHL 30MM SST	1	
68	AMSLM454	HOUSING LINEAR BRG 40MM OH BAR HYBRID DOLPHIN SST	1	
69	AMSLM440	SPACER GUIDE OH BAR	1	
70	AMSLM438	HUB GUIDE OH BAR	1	
71	AMSLM444	BEARING FLANGE 2-7/8 IN ID BRZ	2	
72	AMSLM241	PLATE CHAIN GUIDE ASEP OH ARM DOLPHIN	1	
73	AMSLM455	SPACER GUIDE 2-7/8ID OH SPLR	2	
74	AMSLM432	PIN HINGE 1IN DOLPHIN SST	1	
99	AM5KP129	FITTING GREASE FLUSH STRAIGHT STL	6	
101	AMSLM640	LABEL MSR HD SLICKLINE Ex Na ETL10ATEX11131	1	
111	AM5KP130	NOZZLE GREASE FITTNG FLUSH	1	NOT SHOWN
133	AMSLP243	SCREW 7/16-14 X 3-3/4 SOC HD CAP SST	1	
134	C276P031	SCREW 1/4-20 X 1-1/4 SOC HD SS	2	
135	AMSLP142	SCREW 3/8-16 X 3 BUT HD SS	1	
136	AMSLP146	SCREW 3/8-16 X 3-1/2 BUT HD SS	1	
137	AMSLP145	SCREW 3/8-16 X 2-3/4 BUT HD SS	3	
138	AMS1P047	WASHER 5/16 LOCK SS	11	
139	C276P039	WASHER 5/16 FLAT SST	8	
140	AMSLP438	WASHER 3/8 LOCK INT STAR SST 0.7 OD X .03 THK	24	
141	AM5KP011	WASHER M20 FLAT SST 37MM OD 3MM THK	4	
147	AMSLP412	RING RETNG INT 1.250 SHAFT SST	0	REF
148	AMSLP022	RING RETNG INT 3.562 LT DUTY .039 THICK SST	2	
154	AMSLP306	RING RETNG INT 3.062 LT DUTY .039 THICK SST	2	
155	AMSLP021	RING RETNG INT 2.440 MED DUTY .049 THICK SST	2	
156	AMSLP287	RING RETNG EXT 2.875 SHAFT SST	2	
157	AMSLP100	RING RETNG EXT 1.000 SHAFT SST	5	
158	AM5KP168	RING RETNG INT 2.875 LT DUTY .039 THICK SST	2	
159	AMSLP278	SPRING COMP 2.00 OAL 1.218 OD GROUND ENDS SST	1	
160	AMSLP015	KEY 1/4 X 7/8 WOODRUFF SST 807	1	
161	AM5KP250	INSERT 1/4-20 HELI-COIL #R1185 -254	3	
162	C276P014	INSERT 1/4-20 HELI-COIL #R1185 -379	20	
163	C276P046	WASHER #6 LOCK SS	4	
164	C276P035	WASHER #10 LOCK SS	4	
165	AMS1P058	WASHER 3/8 LOCK SS	8	
166	C276P513	WASHER 3/8 FLAT SST	10	
167	C276P036	WASHER 1/4 LOCK SS	15	
168	AM5KP144	WASHER 1/4 LOCK SS HIGH COLLAR 0.363 OD X .093 THK	22	
169	AMSLP047	WASHER 7/16 LOCK SST	8	
170	AMSLP247	WASHER 7/16 HEAVY FLAT SST	17	
171	AMS1P014	O-RING 2-152 BUNA N ENC ADPTR 3-1/4 X 3-7/16 X 3/32	1	ENCODER ADAPTER
172	AM5KP071	O-RING 2-141 BUNA N H25 ENCDR 2 5/16 x 2 1/2 x 3/32	1	ENCODER

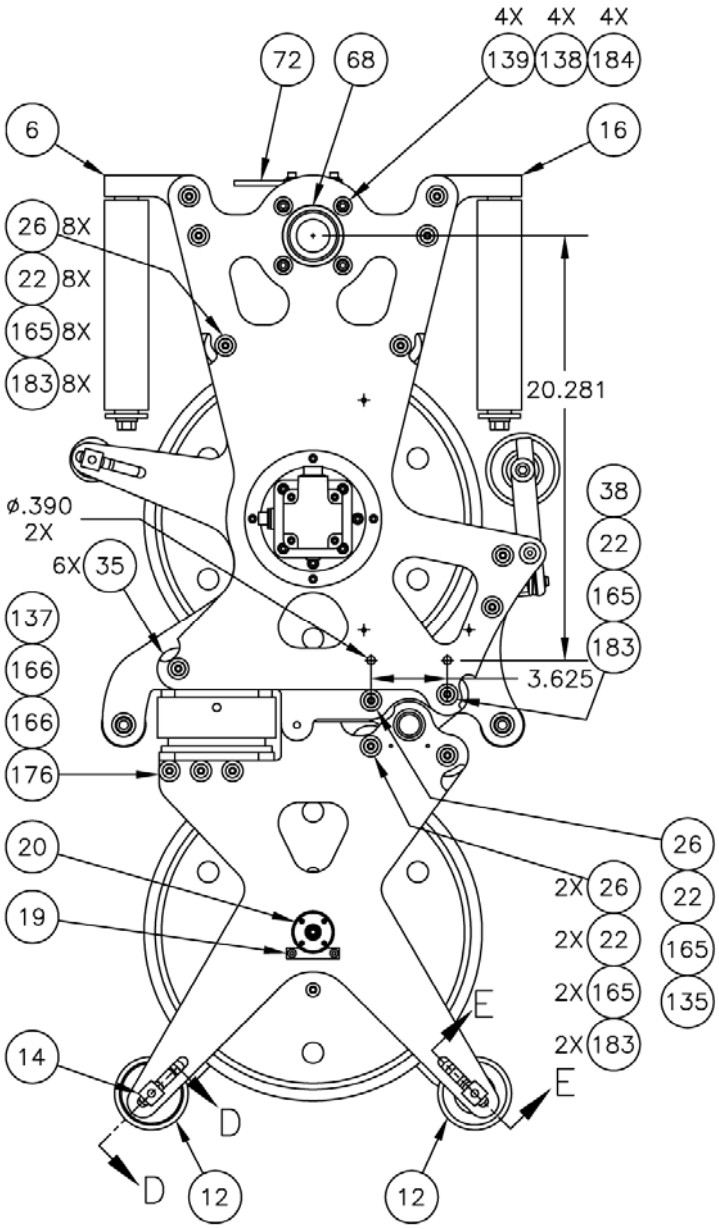
5.4.3 ASSEMBLY DRAWING BILL OF MATERIALS – AMSLA DOLPHIN continued

BenchMark Wireline Products
36220 FM 1093
P. O. BOX 850
Simonton,Texas 77476
Phone: 281.346.4300
Fax: 281.346.4301
benchmarkwireline.com

ITEM	P/N	DECSRIPTION	QTY	REF
173	C276P042	O-RING 2-016 BUNA N 5/8 X 3/4 X 1/16	0	BACKUP CONNECTOR
174	C276P041	O-RING 2-017 BUNA N 11/16 X 13/16 X 1/16	0	BACKUP HOUSING
176	AMS8P024	NUT 3/8-16 ELASTIC STOP SST	4	
177	AMSLP059	NUT 7/16-14 SST	3	
178	C276P021	NUT 7/8-14 ELASTIC STOP SST 1-1/4 HEX 63/64 HIGH	1	
179	AMSLM207-300	SCREW 7/16-14 X 3 FLG HD SST	2	
180	AMSLP097	SCREW 7/16-14 X 2-1/4 SOC HD CAP SST	2	
181	AMSLM207-075	SCREW 7/16-14 X 3/4 FLG HD SST	4	
182	AMSLM207-225	SCREW 7/16-14 X 2.25 FLGHD SST	2	
183	AMSLP067	SCREW 3/8-16 X 2-1/4 BUT HD SS	6	
184	AMS1P046	SCREW 5/16-18 X 1 SHCS SST	11	
186	AM5KP043	SCREW 3/8-16 X 1/2 BUTTON HD sst	24	
187	AMS1P048	SCREW 1/4-20 X 3/4 SOC HD SST	8	
188	AM3KP027	SCREW 1/4-20 X 1-1/2 SOC HD SS	5	
190	AM3KP026	SCREW 1/4-20 X 2 SOC HD CAP SS	4	
191	ACMU2P31	WASHER 1/4 FLAT 5/8OD SST	1	
193	AMS4P870	SCREW 1/4-20 X 3/4 BTN HD SST	1	
194	AMS1P053	SCREW 10-24 X 2 SHCS SST -0.5102	4	
195	AM5KP045	SCREW 10-24 X 1/2 FH SOC SST	2	
197	C276P331	SCREW 6-32 X 1/2 PHIL PAN SST	4	
198	AMSLP023	BOLT SHOULDER 3/8 X 1-3/4 SST 5/16-18 THD	1	
199	AMS3P001	BOLT SHOULDER 1/2 X 1/2 316SST	1	

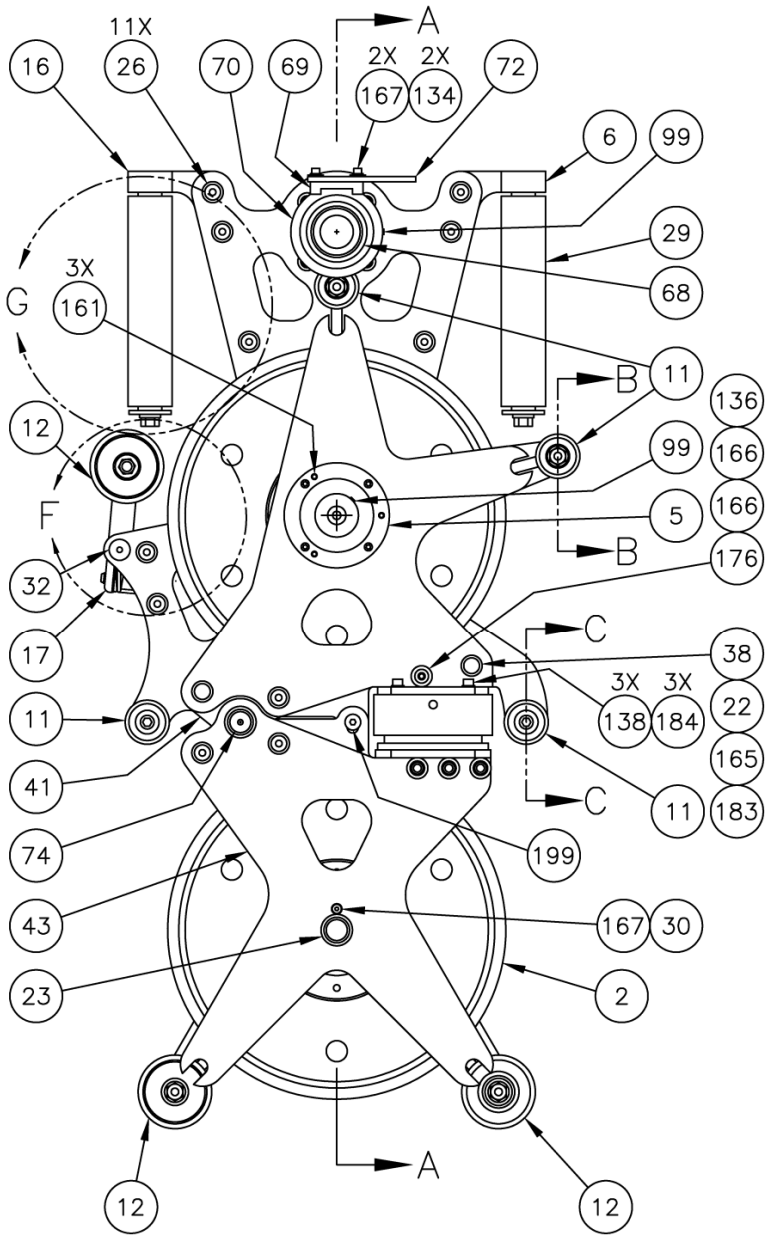
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD

AMSLA DOLPHIN – SIDE 1 VIEW



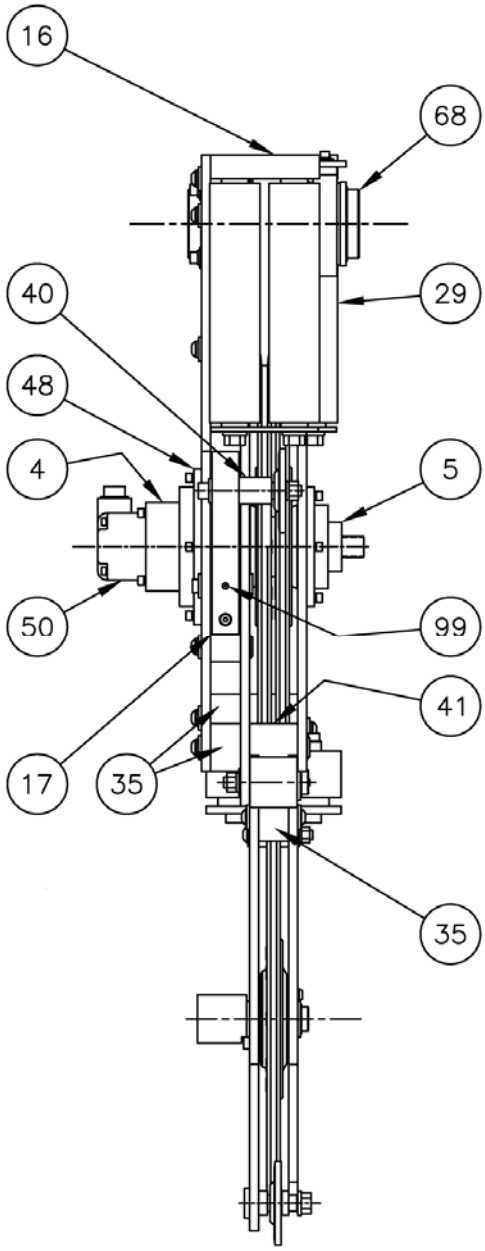
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – SIDE 2 VIEW



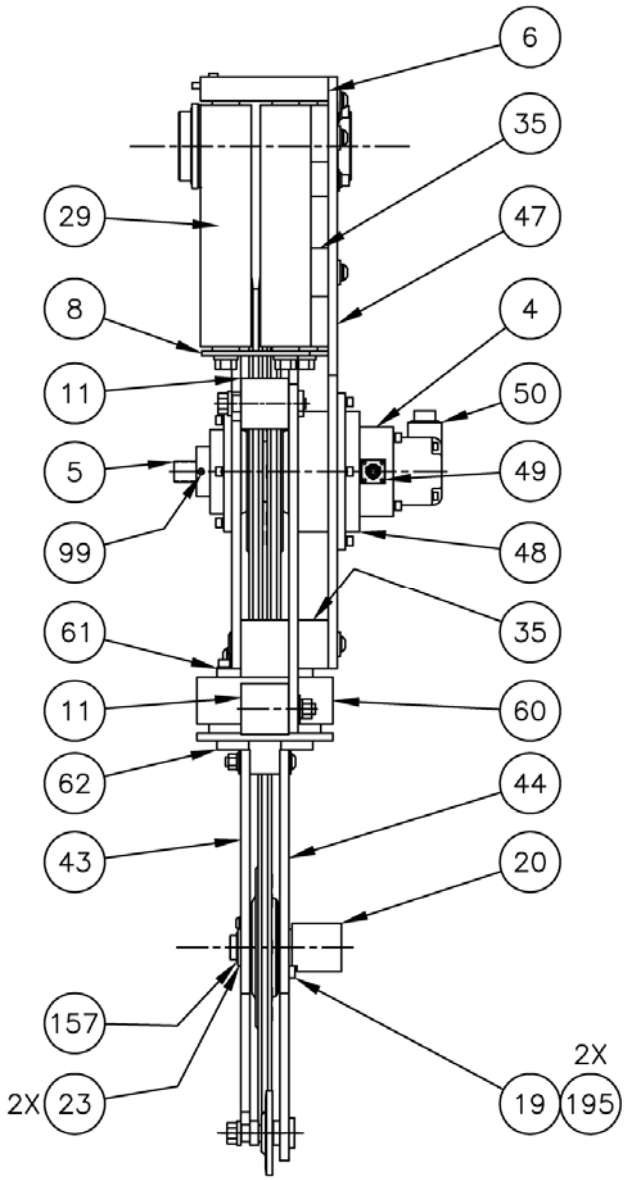
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – FRONT VIEW



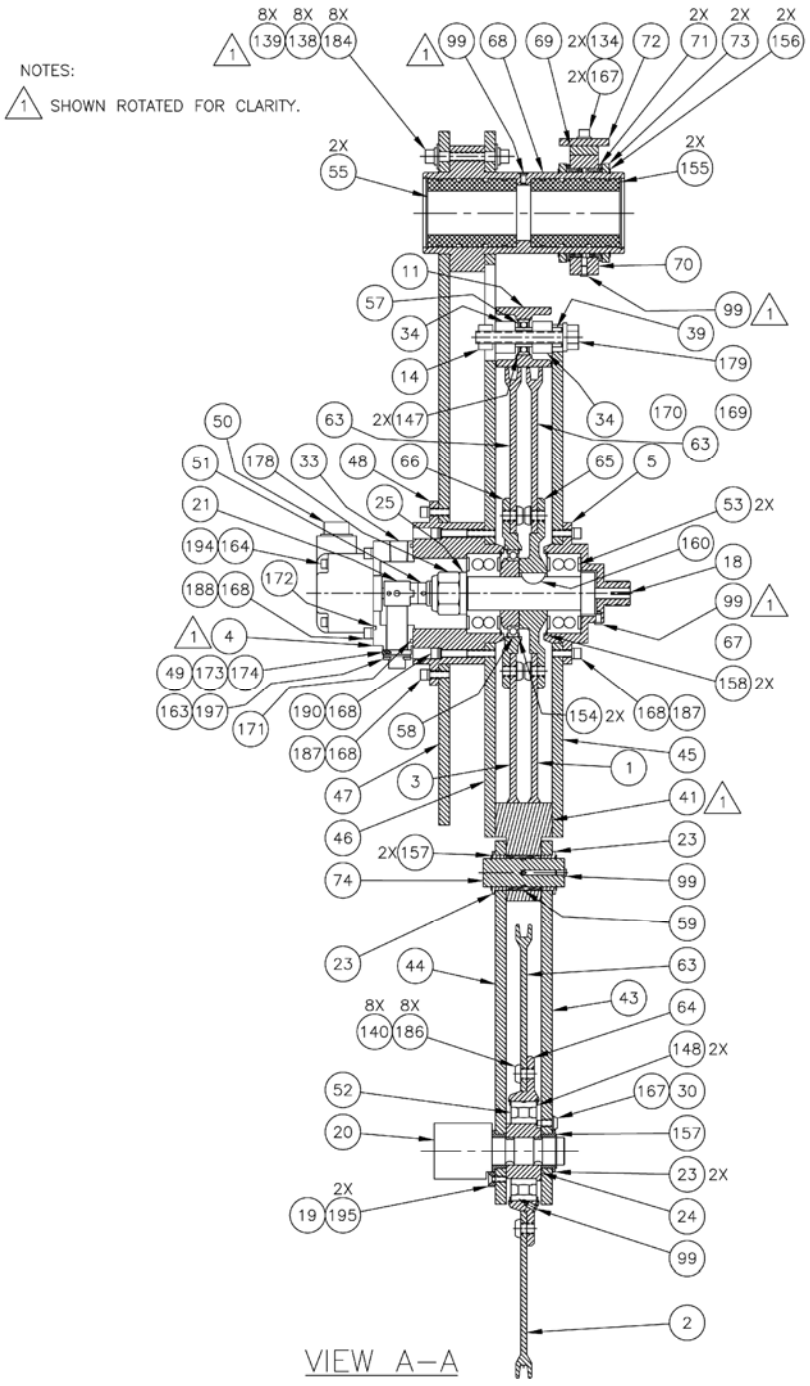
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – REAR VIEW



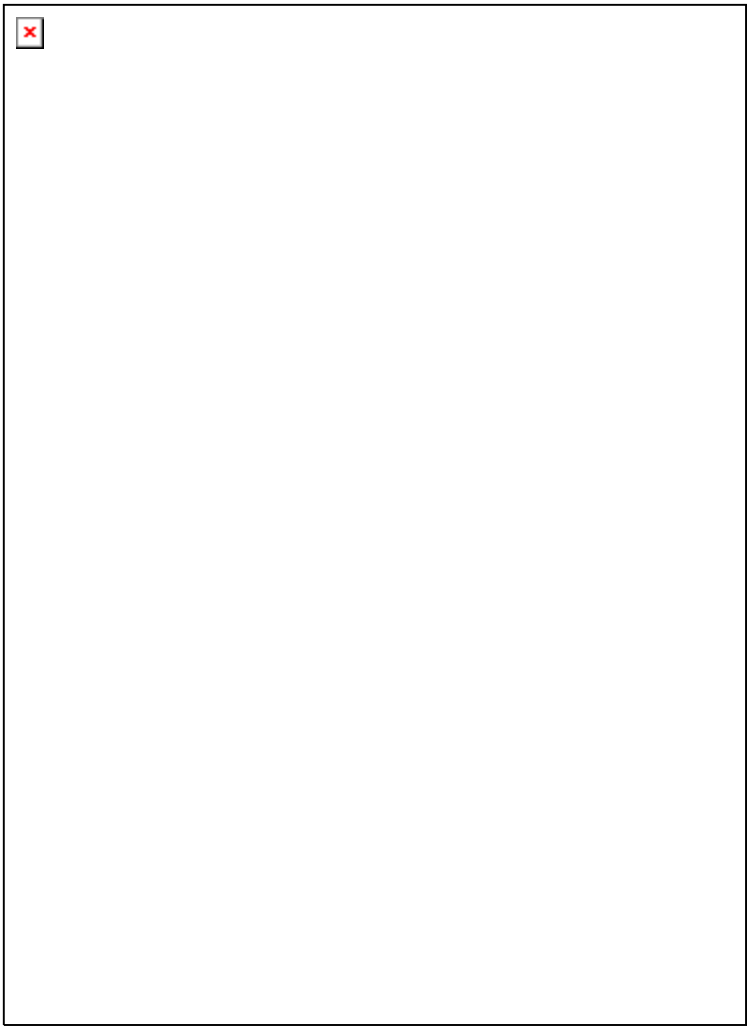
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – MEASURING WHEEL



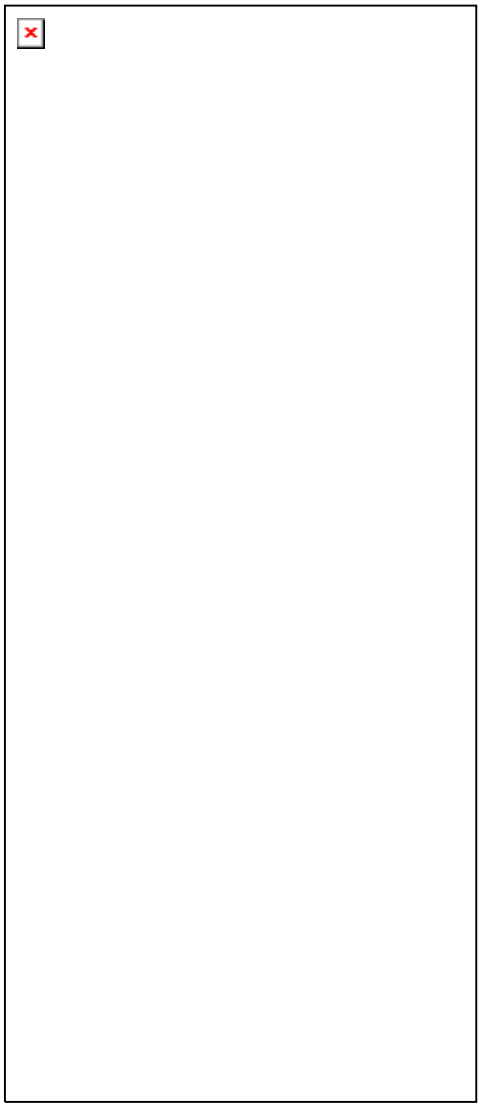
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – PRESSURE WHEEL – DETAIL F



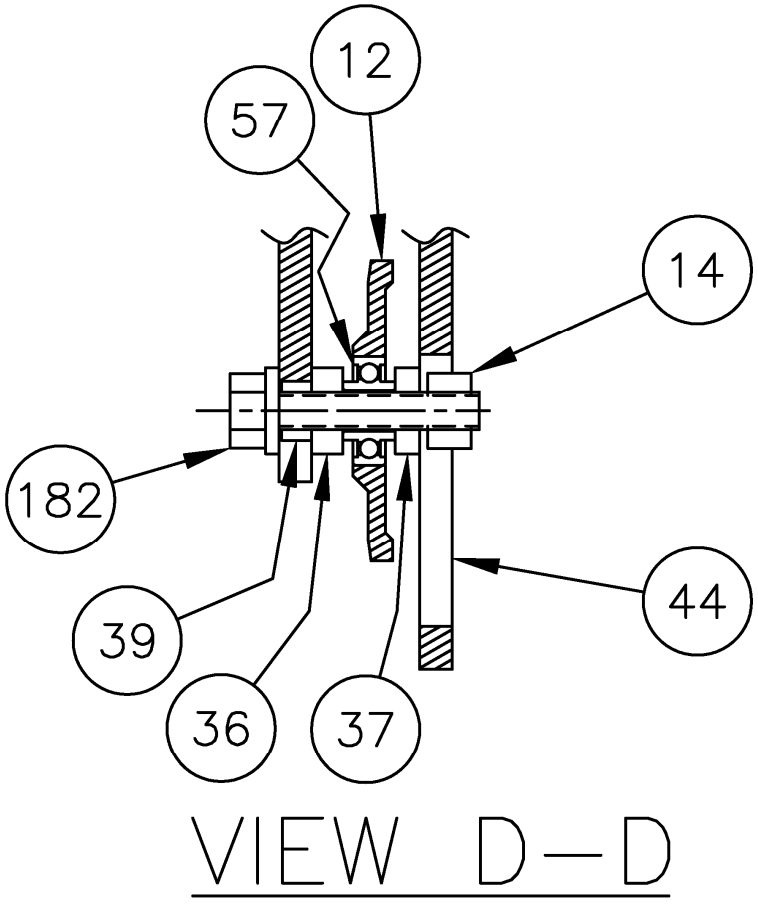
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – GUIDE ROLLER – DETAIL G



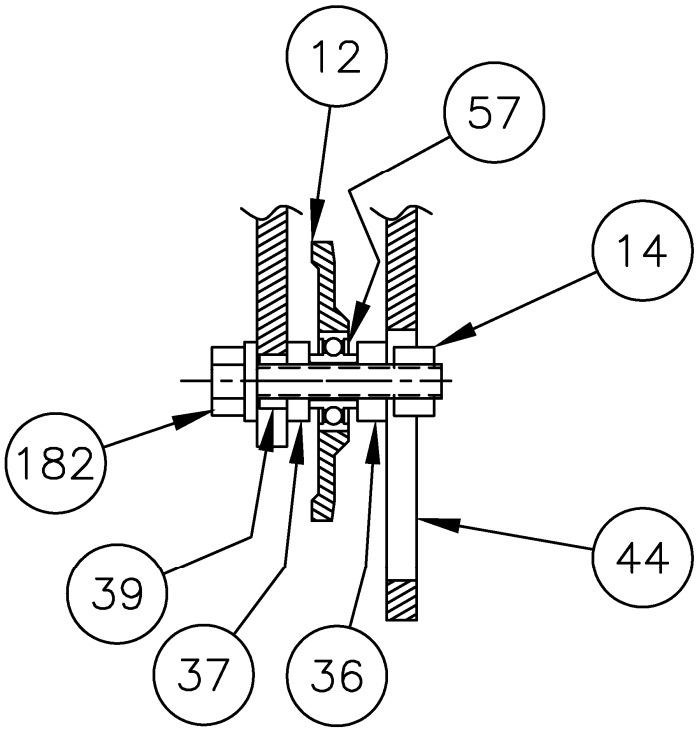
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – KEEPER ROLLER – DETAIL D



5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

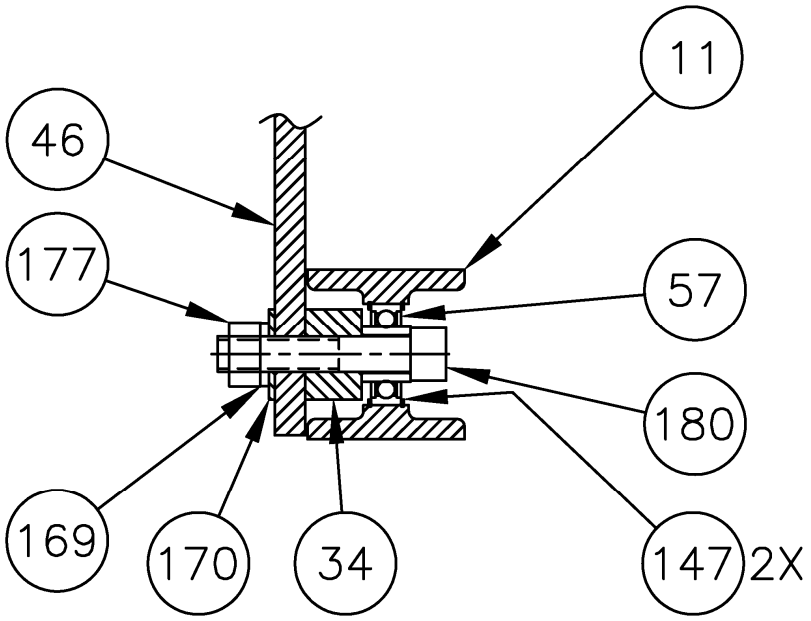
AMSLA DOLPHIN – KEEPER ROLLER – DETAIL E



VIEW E–E

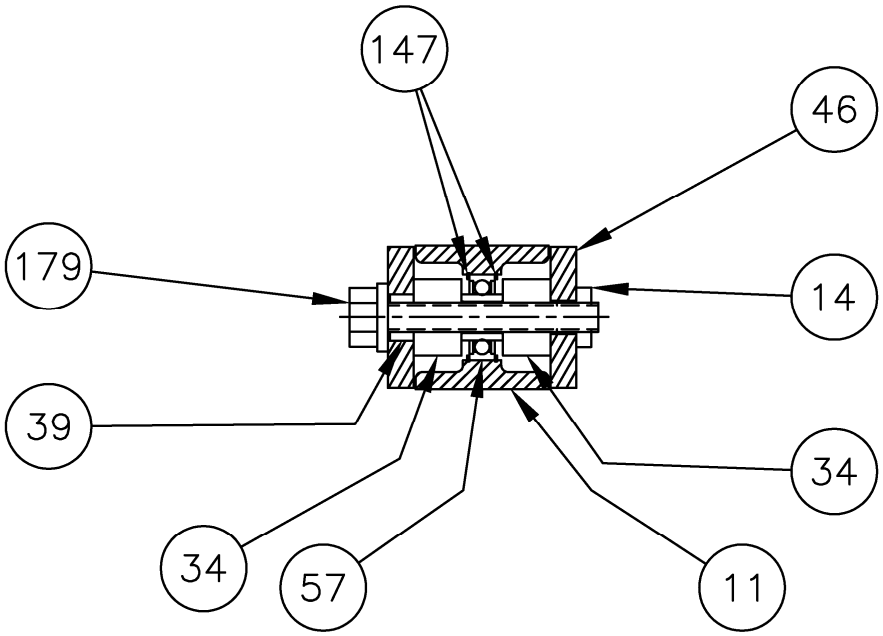
5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – KEEPER ROLLER – DETAIL C



5.4.4 ASSEMBLY DRAWINGS - MEASURING HEAD continued

AMSLA DOLPHIN – KEEPER ROLLER – DETAIL B



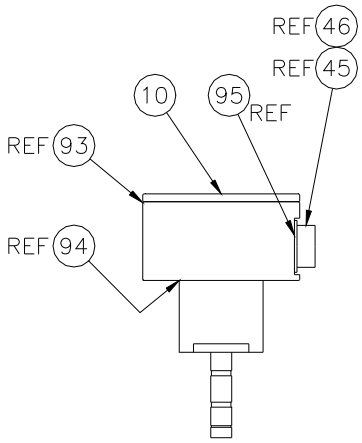
VIEW B–B

5.4.5 RECOMMENDED SPARE PARTS – AMSLA DOLPHIN

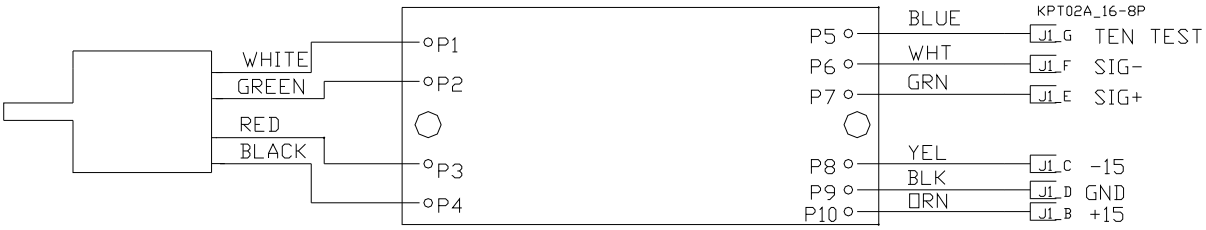
Following is a list of recommend spare parts. Stocking parts designated as REMOTE is recommended only for areas that have a very difficult time getting parts shipped to. For all other areas, it should not be necessary to stock the REMOTE parts locally.

ITEM	P/N	DECSRIPTION	QTY	REF
1	AMSLA459	WHEEL ASSY MEAS 4FT 1/4 BR LIN DOLPHIN	1	
2	AMSLA460	WHEEL ASSY TENS 4FT 1/4 BR LIN DOLPHIN	1	
4	AM3KM040	ADAPTER ENCODER H25D/H20 MAG BACKUP	0	OPTION
4	AM5KM057	ADAPTER ENCODER H37C/H25D	0	OPTION
12	AMSLA162	WHEEL ASSY PRESS RLR 1/4 TENSN W/BEARING	3	
20	AMSLA110B	ASSY LOAD AXLE 0-1.5V 1 IN DIA 0-9000# KPT 16 8 PIN Exn	0	OPTION
20	AMSLA115B	ASSY LOAD AXLE 4-20mA 1 IN DIA 9K# LINE PULL 2WIR Exn	0	OPTION
20	AMSLA132A	ASSY LOAD AXLE 2MV/V 1"DIA Z2 KP16-8P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA133A	ASSY LOAD AXLE 2MV/V 1" DIA Z2 P10-6P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA134A	ASSY LOAD AXLE 2MV/V 1" DIA Z2 P10-6P DUAL PASSIV 09ATEX41118	0	OPTION
20	AMSLA137B	ASSY LOAD AXLE 2MV/V 1"DIA Z2 MS14S 6P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA138A	ASSY LOAD AXLE 2MV/V 1"DIA Z2 CWL18 10P PASSIVE 09ATEX41118	0	OPTION
20	AMSLA187B	ASSY LOAD AXLE 2MV/V 1"DIA Z2 CWL18 10P PASSIVE 09ATEX41118	0	OPTION
20	AMSLM113	SHAFT LOAD PIN REPL 1"OD 2 WH	1	
21	AM3KM050	COUPLING ENCDR W/BKUP MAGNETS	0	OPTION
49	AM5KA055	ASSY ENCODER BACKUP MAGNETIC	0	OPTION
49	AM5KA058	ASSY ENCDR BACKUP MAG EEx nA	0	OPTION
49	AM5KP046	PLUG FREEZE 3/4 DIA BRASS	0	OPTION
50	AM5KA068B	ASSY ENCDR 1200 PPR OPTICAL MS16 HES Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA070B	ASSY ENCDR 512/780 PPR OPTICAL KP14 Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA074B	ASSY ENCDR 1200 PPR OPTICAL MS18 Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA079B	ASSY ENCDR 1200 PPR OPTICAL MS16 STD Ex nA ETL09ATEX41123	0	OPTION
50	AM5KA080B	ASSY ENCDR 1200 PPR OPTICAL MS16 BLUE Ex nA ETL09ATEX41123	0	OPTION
51	AM5KM073	COUPLING MOD ENCDR 0.250/0.375	0	OPTION
51	AMS1P090	COUPLING OLDHAM ENCODER *C123 10/26/++15	0	OPTION

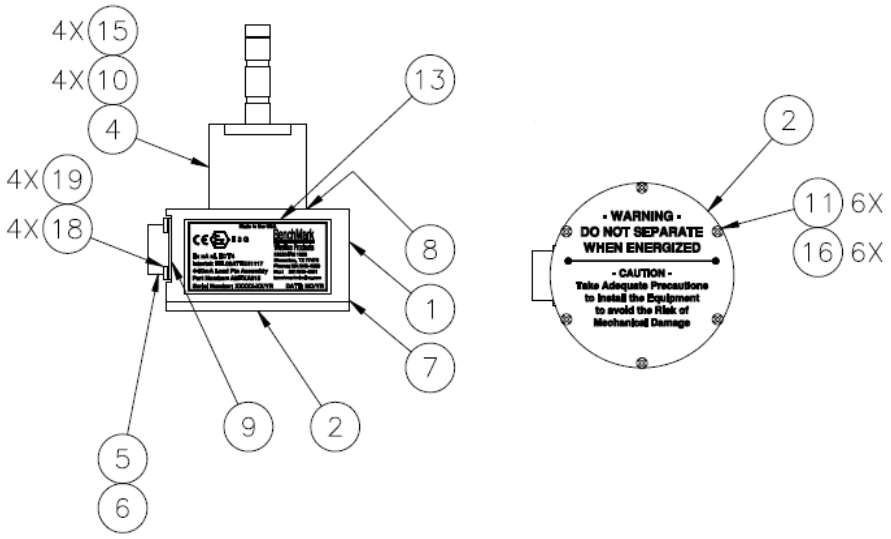
5.5.1 LOAD PIN - DIFFERENTIAL - AMSLA110



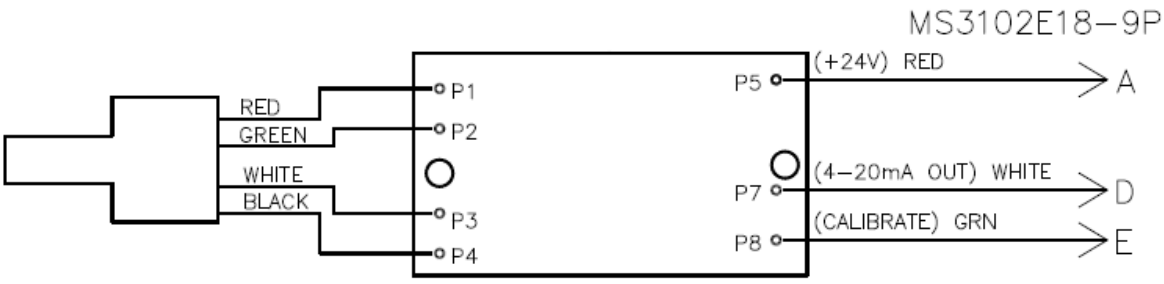
ITEM	P/N	DESCRIPTION	QTY	UM
45	AMS8P055	CONN KPT 02A16-8P	1	EA
46	AMS8P056	DUST CAP KPT81-16C	1	EA
93	C276P040	O-RING 2-235 BUNA N L/P LID 3-1/8 X 3-3/8 X 1/8	1	EA
94	AMS8P066	O-RING 2-136 BUNA N L/P HSG 1.98ID X 2.19OD X 0.103W	1	EA
95	AM5KP118	O-RING 2-023 BUNA N L/P CONN 1-1/16 X 1-3/16 X 1/16	1	EA



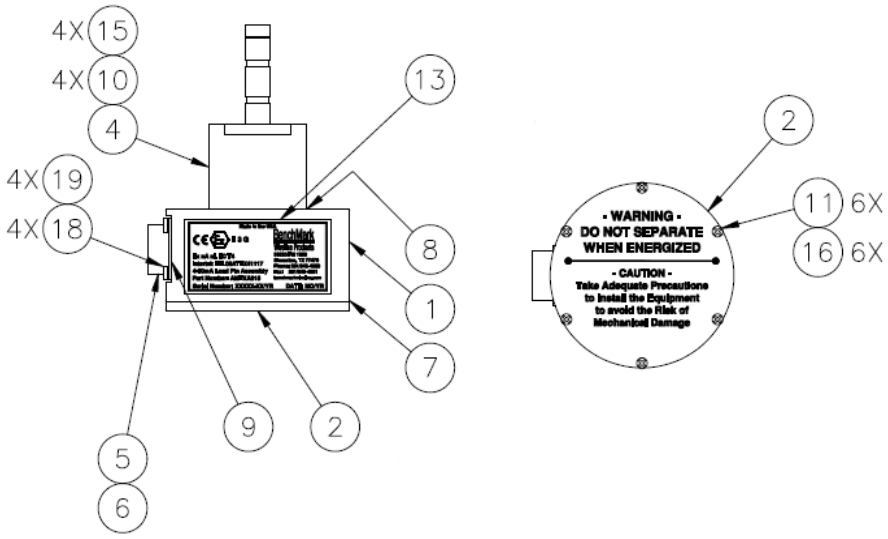
5.5.2 LOAD PIN - 4-20MA CURRENT LOOP - AMSLA115



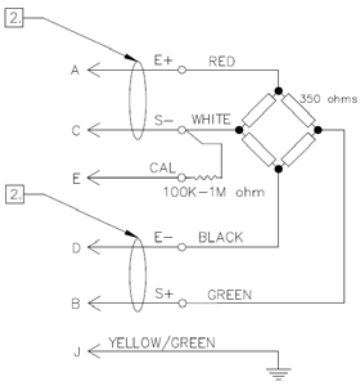
ITEM	P/N	DESCRIPTION	QTY	UNIT
1	AMS8M010	HOUSING LOAD PIN AMS80	1	EA
2	AM5KM262	LID LOAD PIN HSG BLACK WARNING	1	EA
4	AMSLP101	PIN LOAD 12,500# 1"OD 2.0 MV/V 350 OHM 10VDC EXC HEADER	1	EA
5	AMS7P013	CONN MS3102E-18-9P LOAD CELL 7 PIN	1	EA
6	ACMU2P09	DUST CAP MS25043-18DA RECEPT	1	EA
7	C276P040	O-RING 2-235 BUNA N L/P LID 3-1/8 X 3-3/8 X 1/8	1	EA
8	AMS8P066	O-RING 2-136 BUNA N L/P HSG 1.98ID X 2.19OD X 0.103W	1	EA
9	AM5KP118	O-RING 2-023 BUNA N L/P CONN 1-1/16 X 1-3/16 X 1/16	1	EA
10	AM5KP041	SCREW 10-24 X 1-1/4 PHIL PAN	4	EA
11	AMS8P034	SCREW 4-40 X 3/8 SOC HD SST	6	EA
13	AM5KM647	LABEL LOAD PIN Ex nA 4-20mA 09ATEX41117	1	EA
15	C276P035	WASHER #10 LOCK SS	4	EA
16	AMS8P036	WASHER #4 LOCK SST	6	EA
17	AMS8P090	WASHER #4 FLAT SST	6	EA
18	AMS1P040	SCREW 6-32 X 3/8 PHIL PAN SST	4	EA
19	C276P046	WASHER #6 LOCK SS	4	EA



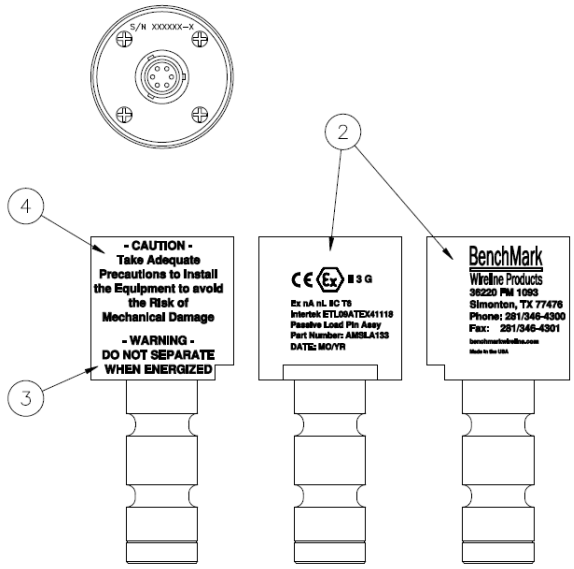
5.5.3 LOAD PIN – PASSIVE – AMSLA132



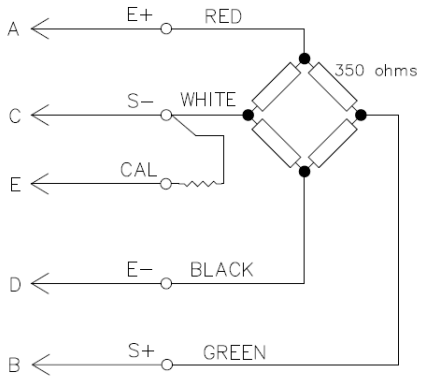
ITEM	P/N	DESCRIPTION	QTY	UNIT
1	AMS8M010	HOUSING LOAD PIN AMS80	1	EA
2	AM5KM262	LID LOAD PIN HSG BLACK WARNING	1	EA
4	AMSLP101	PIN LOAD 12,500# 1"OD 2.0 MV/350 OHM 10VDC EXC HEADER	1	EA
5	AMS8P055	CONN KPT02A16-8P	1	EA
6	AMS8P056	DUST CAP KPT8116C RECEPT	1	EA
7	C276P040	O-RING 2-235 BUNA N L/P LID 3-1/8 X 3-3/8 X 1/8	1	EA
8	AMS8P066	O-RING 2-136 BUNA N L/P HSG 1.98ID X 2.19OD X 0.103W	1	EA
9	AM5KP118	O-RING 2-023 BUNA N L/P CONN 1-1/16 X 1-3/16 X 1/16	1	EA
10	AM5KP041	SCREW 10-24 X 1-1/4 PHIL PAN	4	EA
11	AMS8P034	SCREW 4-40 X 3/8 SOC HD SST	6	EA
12	AM5KP228	STANDOFF 4-40 X 1/2 M/F HEX	2	EA
13	AM5KM648	LABEL LOAD PIN Ex nA PASSIVE 09ATEX41118	1	EA
15	C276P035	WASHER #10 LOCK SS	4	EA
16	AMS8P036	WASHER #4 LOCK SST	6	EA
17	AMS8P090	WASHER #4 FLAT SST	6	EA



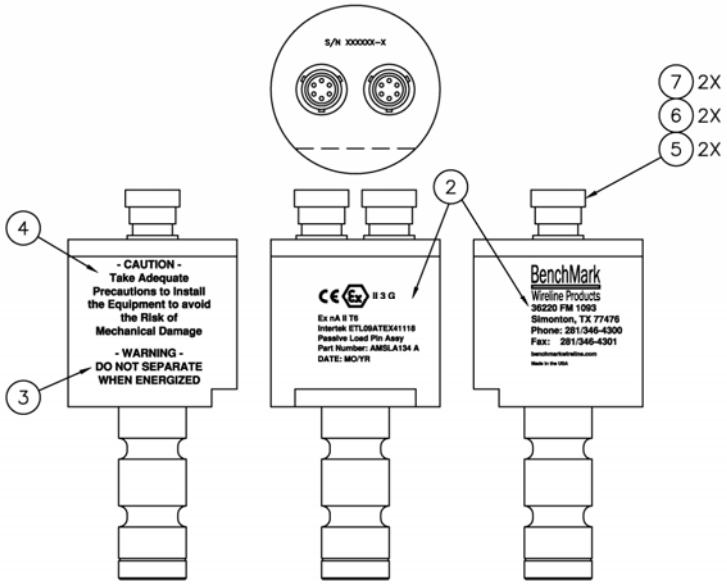
5.5.4 LOAD PIN - PASSIVE - AMSLA133 / AMSLP103



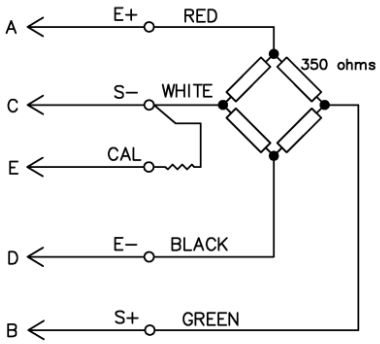
ITEM	P/N	DESCRIPTION	QTY	UNIT
1	AMSLP103	PIN LOAD 12,500# 1"OD 2.0mV/V	1	EA
2	AM5KM648	LABEL LOAD PIN Ex nA PASSIVE 09ATEX41118	1	EA
3	AM5KM650	LABEL WARNING LOAD PIN ENCDR DO NOT SEPARATE WHEN ENERGIZED	1	EA
4	AM5KM645	LABEL LOAD PIN CAUTION AVOID MECHANICAL DAMAGE	1	EA

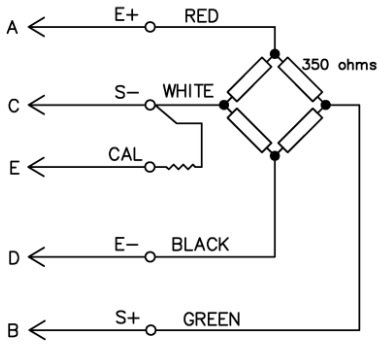


5.5.5 LOAD PIN – DUAL PASSIVE - AMSLA134A

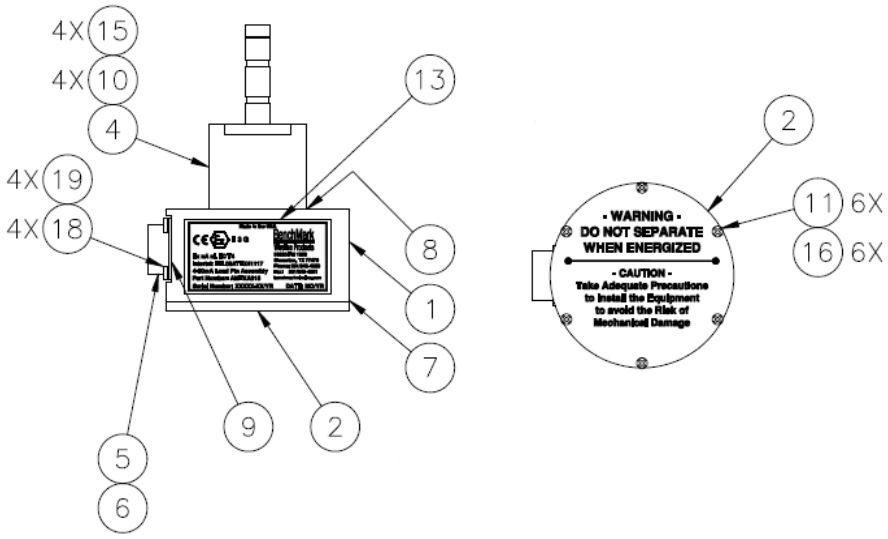


ITEM	P/N	DESCRIPTION	QTY	UNIT
1	AMSLP120	PIN LOAD 12,500# 1"OD 2.0mV/V	1	EA
2	AM5KM648	LABEL LOAD PIN Ex nA PASSIVE 09ATEX41118	1	EA
3	AM5KM650	LABEL WARNING LOAD PIN ENCDR DO NOT SEPARATE WHEN ENERGIZED	1	EA
4	AM5KM645	LABEL LOAD PIN CAUTION AVOID MECHANICAL DAMAGE	1	EA
5	AM5KP059	DUST CAP KPT8010C CANNON MS3180-10CA	2	EA
6	ALS4P007	SCREW 4-40 X 3/4 PHIL PAN SST	2	EA
7	AMS8P036	WASHER #4 LOCK SST	2	EA

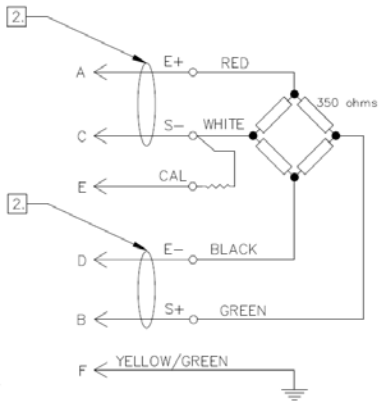




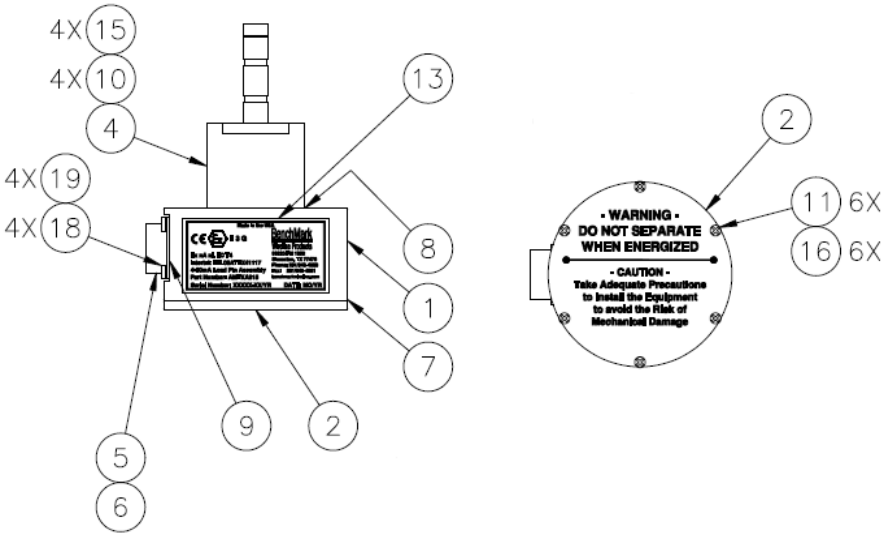
5.5.6 LOAD PIN - PASSIVE - AMSLA137



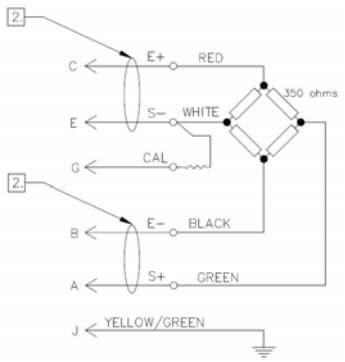
ITEM	P/N	DESCRIPTION	QTY	UNIT
1	AMS8M010	HOUSING LOAD PIN AMS80	1	EA
2	AM5KM262	LID LOAD PIN HSG BLACK WARNING	1	EA
4	AMSLP101	PIN LOAD 12,500# 1"OD 2.0 MV/V 350 OHM 10VDC EXC HEADER	1	EA
5	C276P043	CONN MS3102E-14S-6P LOAD AXLE	1	EA
6	AMS7P041	DUST CAP MS25043-14DA RECEPT POWER IN	1	EA
7	C276P040	O-RING 2-235 BUNA N L/P LID 3-1/8 X 3-3/8 X 1/8	1	EA
8	AMS8P066	O-RING 2-136 BUNA N L/P HSG 1.98ID X 2.19OD X 0.103W	1	EA
9	AM5KP219	O-RING 2-019 BUNA N 70D	1	EA
10	AM5KP041	SCREW 10-24 X 1-1/4 PHIL PAN	4	EA
11	C276P047	SCREW 4-40 X 1/2 PHIL PAN SST	6	EA
13	AM5KM648	LABEL LOAD PIN Ex nA PASSIVE 09ATEX41118	1	EA
15	C276P035	WASHER #10 LOCK SS	4	EA
16	AMS8P036	WASHER #4 LOCK SST	10	EA
18	C276P143	SCREW 4-40 X 3/8 PHIL PAN SST	4	EA



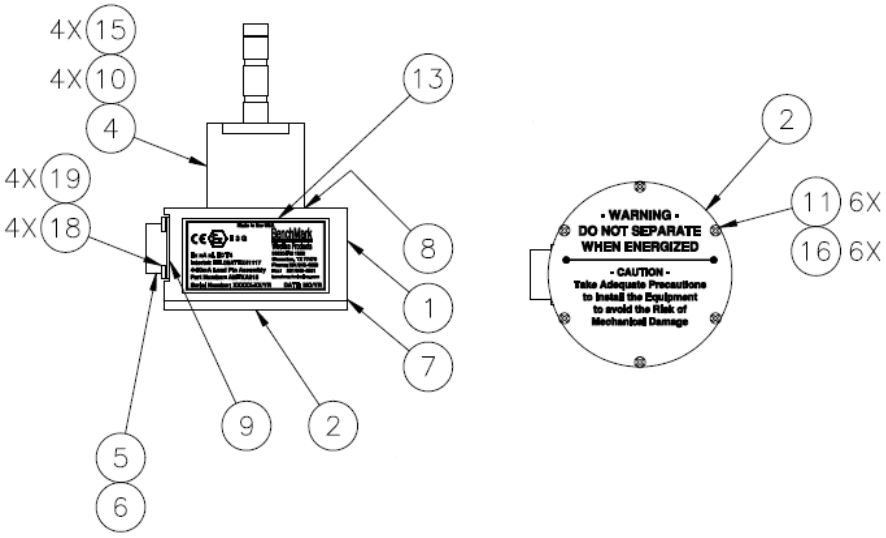
5.5.7 LOAD PIN - PASSIVE - AMSLA138



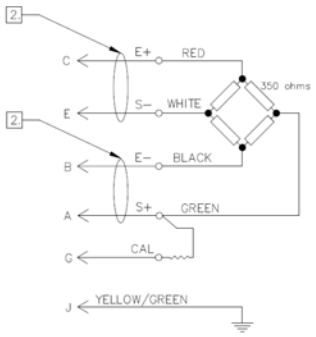
ITEM	P/N	DESCRIPTION	QTY	UNIT
1	AMS8M010	HOUSING LOAD PIN AMS80	1	EA
2	AM5KM262	LID LOAD PIN HSG BLACK WARNING	1	EA
4	AMSLP101	PIN LOAD 12,500# 1"OD 2.0 MV/V 350 OHM 10VDC EXC HEADER	1	EA
5	AM5KP068	CONN 10-107218-1P BENDIX QWL COURSE THREAD 10 PIN	1	EA
6	AM5KP067	DUST CAP KPT8116C RECEPT	1	EA
7	C276P040	O-RING 2-235 BUNA N L/P LID 3-1/8 X 3-3/8 X 1/8	1	EA
8	AMS8P066	O-RING 2-136 BUNA N L/P HSG 1.98ID X 2.19OD X 0.103W	1	EA
9	AM5KP118	O-RING 2-023 BUNA N L/P CONN 1-1/16 X 1-3/16 X 1/16	1	EA
10	AM5KP041	SCREW 10-24 X 1-1/4 PHIL PAN	4	EA
11	C276P047	SCREW 4-40 X 1/2 PHIL PAN SST	6	EA
13	AM5KM648	LABEL LOAD PIN Ex nA PASSIVE 09ATEX41118	1	EA
15	C276P035	WASHER #10 LOCK SS	4	EA
16	AMS8P036	WASHER #4 LOCK SST	6	EA
18	AM5KP184	SCREW 8-32 X 3/8 PHIL PAN SST	4	EA
19	AMS1P056	WASHER #8 LOCK SST	4	EA



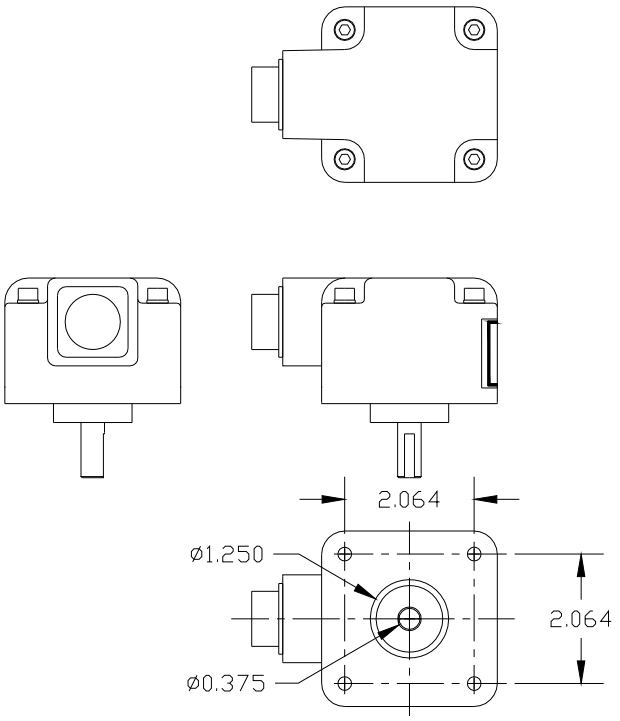
5.5.8 LOAD PIN - PASSIVE - AMSLA187



ITEM	P/N	DESCRIPTION	QTY	UNIT
1	AMS8M010	HOUSING LOAD PIN AMS80	1	EA
2	AM5KM262	LID LOAD PIN HSG BLACK WARNING	1	EA
4	AMSLP101	PIN LOAD 12,500# 1"OD 2.0 MV/V 350 OHM 10VDC EXC HEADER	1	EA
5	AM5KP068	CONN 10-107218-1P BENDIX QWL COURSE THREAD 10 PIN	1	EA
6	AM5KP067	DUST CAP KPT8116C RECEPT	1	EA
7	C276P040	O-RING 2-235 BUNA N L/P LID 3-1/8 X 3-3/8 X 1/8	1	EA
8	AMS8P066	O-RING 2-136 BUNA N L/P HSG 1.98ID X 2.19OD X 0.103W	1	EA
9	AM5KP118	O-RING 2-023 BUNA N L/P CONN 1-1/16 X 1-3/16 X 1/16	1	EA
10	AM5KP041	SCREW 10-24 X 1-1/4 PHIL PAN	4	EA
11	C276P047	SCREW 4-40 X 1/2 PHIL PAN SST	6	EA
13	AM5KM648	LABEL LOAD PIN Ex nA PASSIVE 09ATEX41118	1	EA
15	C276P035	WASHER #10 LOCK SS	4	EA
16	AMS8P036	WASHER #4 LOCK SST	6	EA
18	AM5KP184	SCREW 8-32 X 3/8 PHIL PAN SST	4	EA
19	AMS1P056	WASHER #8 LOCK SST	4	EA



5.6.1 ENCODER - HI RESOLUTION - AM5KA068



P/N	DESCRIPTION	QTY	UNIT
AM5KP161	ENCODER H25D-SS-1200-ABC-4469 EEx nA	2	EA
AM5KM073	COUPLING MOD ENCDR 0.250/0.375 BORE	2	EA
AMS1P071	DUST CAP MS25043-16DA	2	EA

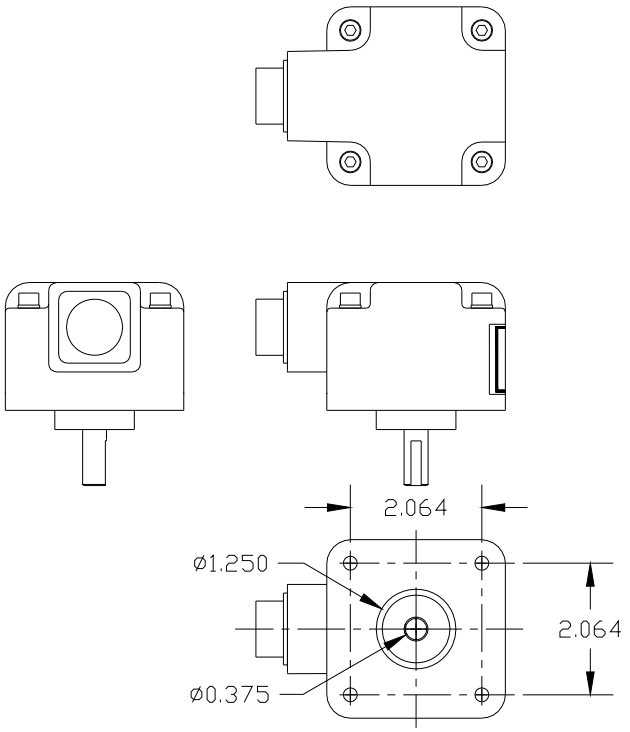
Specifications

1200 Pulses per revolution
+5 to +15 vdc power
Differential Quadrature output (A – A not, B – B not)

Pin Out

E - A
C - A
G - B
D - B
A - +5 to +15 vdc
B - Gnd
F - Case

5.6.2 ENCODER - HI RESOLUTION - AM5KA070



ITEM	P/N	DESCRIPTION	QTY	UNIT
13	AM5KP163	ENCODER H25D-SS-1200-ABC-4469 EEx nA	2	EA
36	AM5KM073	COUPLING MOD ENCDR 0.250/0.375 BORE	2	EA
44	AMS1P071	DUST CAP MS25043-16DA (HES)	2	EA

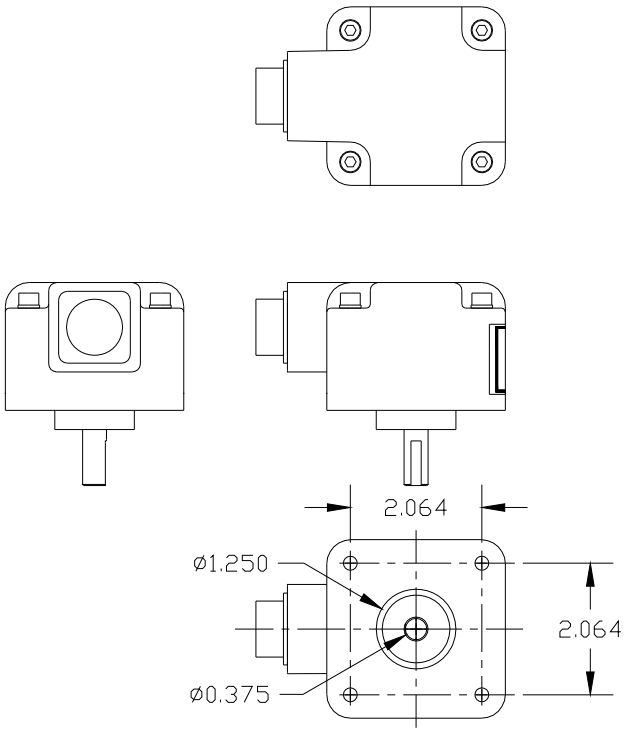
Specifications

1200 Pulses per revolution
+5 to +15 vdc power
Differential Quadrature output (A – A not, B – B not)

Pin Out

A - A
C - A
B - B
E - B
D - +5 to +15 vdc
F - Gnd
G - Case

5.6.3 ENCODER - HI RESOLUTION - AM5KA074



P/N	DESCRIPTION	QTY	UNIT
AMSLP061	ENCODER H25D-SS-1200-ABC-4469	2	EA
AM5KM073	COUPLING MOD ENCDR 0.250/0.375 BORE	2	EA
AMS1P071	DUST CAP MS25043-16DA	2	EA

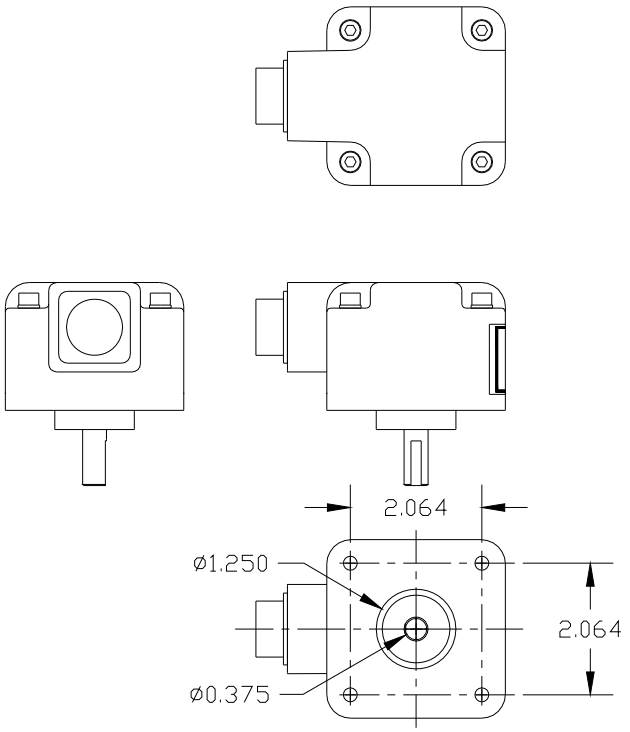
Specifications

1200 Pulses per revolution
+5 to +15 vdc power
Differential Quadrature output (A – A not, B – B not)

Pin Out

A - A
H - A
B - B
I - B
D - +5 to +15 vdc
F - Gnd
G - Case

5.6.4 ENCODER - HI RESOLUTION - AM5KA079



P/N	DESCRIPTION	QTY	UNIT
AM5KP188	ENCODER H25D-SS-1200-ABC-4469	2	EA
AM5KM073	COUPLING MOD ENCDR 0.250/0.375 BORE	2	EA
AMS1P071	DUST CAP MS25043-16DA	2	EA

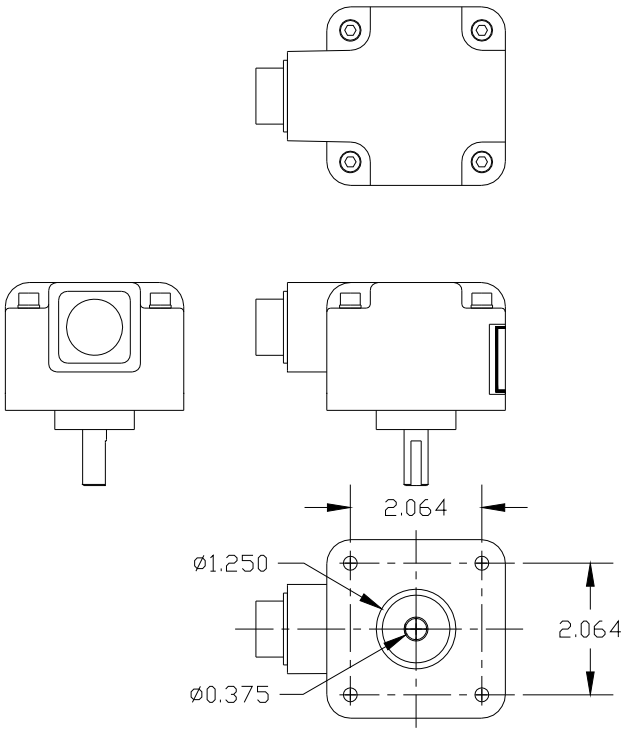
Specifications

1200 Pulses per revolution
+5 to +15 vdc power
Differential Quadrature output (A – A not, B – B not)

Pin Out

E - A
C - A
G - B
D - B
A - +5 to +15 vdc
B - Gnd
F - Case

5.6.5 ENCODER - HI RESOLUTION - AM5KA080



P/N	DESCRIPTION	QTY	UNIT
AM5KP192	ENCODER H25D-SS-1200-ABC-4469	2	EA
AM5KM073	COUPLING MOD ENCDR 0.250/0.375 BORE	2	EA
AMS1P071	DUST CAP MS25043-16DA	2	EA

Specifications

1200 Pulses per revolution
+5 to +15 vdc power
Differential Quadrature output (A – A not, B – B not)

Pin Out

A - A
C - A
B - B
E - B
D - +5 to +15 vdc
F - Gnd
G - Case

5.7 OPTIONAL ACCESSORIES

5.7.1 DRIP LINE OILER - FSU1A013

This oiler features a Lexan reservoir with self closing filler cap. The flow is regulated by adjusting the valve at the base of the reservoir. A mount is provided on the measuring head. A copper tube channels the fluid to the wireline where it first enters the measuring head.

P/N	DESCRIPTION	QTY	UM
FSU1P051	RESERVOIR DROP FEED 1/2 NPT	1	EA
AMSLM005	MOUNT LINE OILER DRIP TANK	1	EA
FSU1P050	ADPTR 1/4COMP X 1/2MPT 90 BRS	1	EA
FSU1P011	COPPER TBG 1/4 OD	2	FT

6.0 SCHEMATICS, WIRELISTS & SETUP PROCEDURES

6.1 SCHEMATICS

Schematic drawings for load pins and encoders are not provided.
They contain either proprietary information and/or are purchased from 3rd party suppliers.

Additionally, load pins and encoders are not field reparable.

6.2 WIRELISTS

Wirelists do not pertain to this type of equipment.

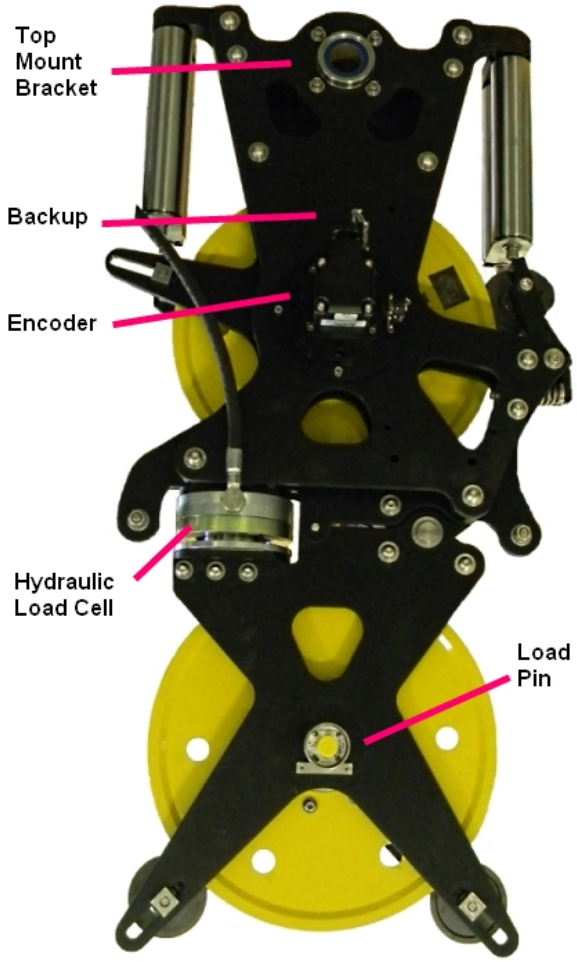
6.3 SETUP PROCEDURES

This equipment is to be installed only by personnel who are suitably trained and qualified to local/national codes.

1. Install the measuring head on the wireline equipment.
   Bolt the mounting bracket to the wireline equipment
   Connect the measuring head to the mounting bracket

2. Connect the cables for to the encoder, backup and load pin to the measuring head.

BenchMark Wireline - AMSLA490 - Dolphin



6.3 SETUP PROCEDURE continued

Power up the panel connected to the measuring head and verify it is working properly.

Verify the panel is configured to match the system
- Line size
- Measurement units
- Encoder settings

Install the line in measuring head and set the line size parameter on the panel.

Set Tension Alarm value.

Set depth adjust value if necessary.

Ensure that memory card is installed in data recorder.
Turn power to panel off then on again.
This will write the operating parameters to the memory card.

Rig up through sheaves, install tool, and slack off weight.

Set depth to zero.

Press T-Zero to set tension to zero.

Press T-CAL and verify that panel tension reads 4000 or 5000 lbs (depending on type of measuring head selected)

Pull tool to depth 0 position.
Press D-Zero to reset the panel depth to 0.

7.0 CABLE DRAWINGS

NOTE - All Cable Drawings are included in the respective panel manuals.