

**KRÜGER
HAP/HLAP SYSTEM**

A-2-B With Angle and Angle Presets

A-2-B with Length, Angle, and Angle Presets

BODE
TECHNICAL SERVICES



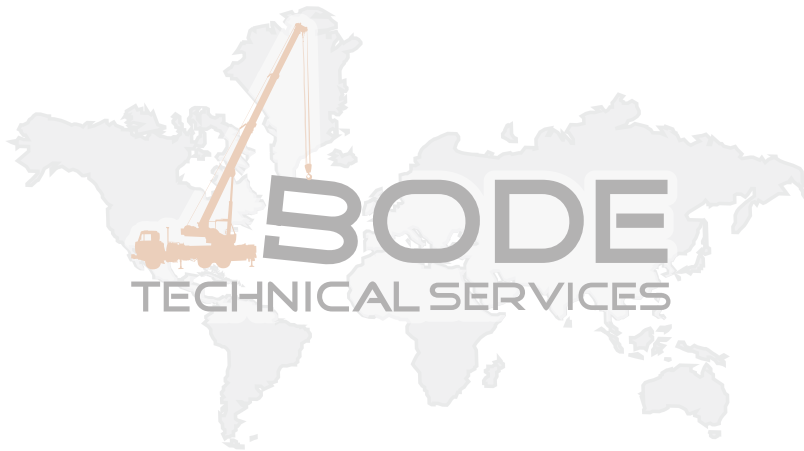
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FOREWORD

The purpose of this manual is to provide the installer and technician with information on the proper installation and set-up of the KRÜGER "H(L)AP" family of Indicator Systems.

The H(L)AP family of Indicating Systems is designed to provide an audible and visual warning of an IMMINENT TWO-BLOCK condition with an analog display of MAIN BOOM LENGTH and MAIN BOOM ANGLE. The H(L)AP family of Indicating Systems can actuate an optional crane function shut off system.

WARNING

DO NOT CONSIDER THIS SYSTEM A SUBSTITUTE FOR GOOD JUDGEMENT, EXPERIENCE AND ACCEPTED SAFE CRANE OPERATIONAL PRACTICES.

THE CONTENTS OF THIS HANDBOOK AND THE CRANE MANUFACTURERS HANDBOOKS SHOULD BE READ AND UNDERSTOOD BEFORE ATTEMPTING TO OPERATE THE CRANE.

NOTE

This system utilizes a series of electrical and mechanical components and cannot be 100% fail safe.

This system should only be serviced by qualified individuals, either PAT-KRUEGER Corporation, Inc. service technicians or those who have received special training from Krüger GmbH & Co. KG. or their authorized representatives.

To avoid damage and loss of warranty consideration, we recommend repair only be attempted by individuals with a strong electrical/electronic background.

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INTRODUCTION

The KRÜGER “H(L)AP” family of Indicating Systems are designed to provide an audible and visual indication of imminent TWO-BLOCK and analog display of BOOM LENGTH and/or BOOM ANGLE with ANGLE PRE-SET capabilities.

When installed in conjunction with a crane function shut off system, this system prevents the hook block of a crane from coming into physical contact with the sheaves in the boom head.

The complete system consists of:

- * The Indicator Panel
- * A Cable Reel with Length and/or Angle sensors
- * An Anti-Two-Block switch with counterweight

SPECIFICATIONS

Power Supply:	12VDC +/- 20% (24VDC +/- 20% Optional)
Current Draw:	Ca. 60mA.
Working Temperature:	-22°F to 160°F (-30°C to +70°C)
Relative Humidity:	95%/40°C not condensing
Enclosure:	IP 65 (NEMA 4)
Display:	Analog meter with 105° illuminated scale
Accuracy of Display:	Angle: -2° to 0° of actual angle, 1.0° increments Length: +/-2%, 1.0 Ft. increments



WARRANTY

THERE ARE NO WARRANTIES EXPRESS OR IMPLIED, MADE BY EITHER THE DISTRIBUTOR OR THE MANUFACTURER ON KRÜGER EQUIPMENT, EXCEPT THE MANUFACTURER'S WARRANTY AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP SET OUT BELOW.

NEW EQUIPMENT WARRANTY

The manufacturer warrants each new product made by the manufacturer to be free from defects in material and workmanship. At its option, all obligation and liability under this warranty is limited to free of charge replacement, repair or reconditioning, at its factory, of any part proven defective under normal use and service within twelve (12) months from date of delivery. The system or component must be on record with the manufacturer as being delivered by the distributor. If the system or component is not on record as being delivered by the distributor, the warranty period will commence on the date of shipment from the factory. This warranty shall not include any transportation, customs or other charges or the cost of installation or any liability for the cost of installation or any other liability for direct, indirect or consequential damage or delay resulting from the defect. The manufacturer is not responsible for, and makes no warranties in connection with, the installation or servicing, use or operation of the product. Any repair, alteration or adjustment of the product or any substitution of parts without the express written consent of the manufacturer shall void this warranty. This warranty covers only the products of KRÜGER including products replaced, repaired or reconditioned by KRÜGER. The products of other manufacturers are covered by such warranties as are made by their manufacturers.

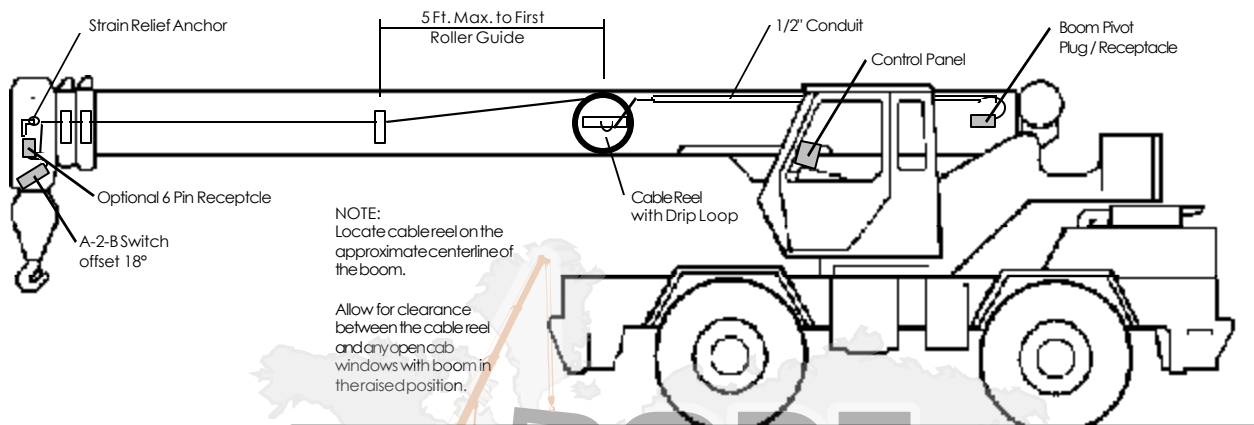
THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF THE OBLIGATIONS OR LIABILITY ON THE PART OF THE MANUFACTURER, AND KRÜGER NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH SUCH EQUIPMENT!



INSTALLATION PROCEDURE - MAIN BOOM

COMPONENT LOCATION

Install all the system components according to manufacturer installation drawings. If not available, use the following as a basic guide for component location.



CAUTION

USE ACCEPTED WELD PRACTICE WHEN WELDING COMPONENT MOUNTING BRACKETS TO THE STRUCTURES.

NOTE

Do not install cable reel into mounting bracket at this time.

MAIN BOOM WIRING

1. For an HLAP System install a piece of 10 conductor cable between the cable reel mounting bracket and the 10 pin receptacle mounted at the boom pivot.

For an HAP System install a piece of 5 conductor cable between the cable reel mounting bracket and the 6 pin receptacle mounted at the boom pivot.

Leave approximately 2 feet of excess cable at each end.

It is recommended, but not essential, that a piece of 1/2' conduit be mounted to the boom

base section to protect the cable.

If conduit is not used, secure the cable to the boom structure using stand offs and tie wraps.

CAUTION

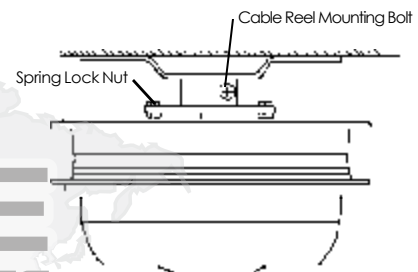
INSTALL THE CABLE INTO THE RECEPTACLE WITH THE CABLE ENTERING FROM THE LOWEST POINT OF THE RECEPTACLE WITH THE BOOM IN ITS NORMAL OPERATING POSITION.

2. Remove the cable reel cover. Remove the nut and rubber grommet from the center shaft. Route cable through the mounting bracket and into hole in the cable reel center shaft. Replace the rubber grommet and nut, tighten nut. Install the cable reel into the mounting bracket and tighten the bolt in the mounting bracket to lock the cable reel in place.

CAUTION

DO NOT LOOSEN SPRING LOCK NUTS, AS CABLE REEL SPRING IS UNDER TENSION, WHEN SHIPPED.

INSTALL EITHER THE 5 CONDUCTOR CABLE OR 10 CONDUCTOR CABLE WITH A DRIP LOOP TO REDUCE THE POSSIBILITY OF WATER ENTERING THE CABLE REEL HOUSING.



3. Unwrap sufficient cable from the cable reel to reach the strain relief anchor on the boom head.

NOTE

Take care to keep any twists out of the cable reel cable.

4. Route the cable through the roller guides and attach the strain relief assembly to the anchor bracket on the boom head.

NOTE

Do not put a twist in the cable reel cable between the reel and strain relief anchor. Twisted cable will result in accelerated wear.

5. If a 6 Pin Receptacle is installed at the boom head, pull the cable reel cable through the P clamps on the receptacle and into the bottom of the receptacle. Wire as shown on the Wiring diagram included with this publication.



NOTE

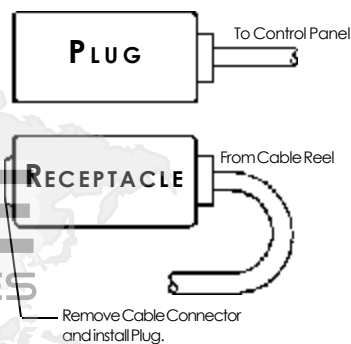
Wire the cable reel cable directly to the A-2-B switch, if a 6 Pin Receptacle is not used.

- Using 2 conductor Olflex cable wire from the bottom of the receptacle to the A-2-B switch.

Refer to wiring diagram included with this publication. The wiring shown is for a Main Boom installation only.

- DO NOT loosen the cable reel lock nuts. Leave slack in the cable from the Boom head.
- Move to the cable reel and complete the wiring for the A-2-B, Angle transducer and Length transducer, if this is an HLAP installation. Refer to the Wiring diagrams included with this publication.
- Install either the 5 conductor or 10 conductor cable in the Boom Pivot receptacle. Wire as described in the wiring diagram included with this publication.

- Make up either a 6 Pin or 10 Pin Plug with either 5 conductor or 10 conductor cable. The cable should be long enough to be routed along the machine structure to the Control Panel mounted in the crane cab.



NOTE

Route cable to ensure that cable is not crimped or can be stepped on in the normal course of machine operation.

- Secure the cable in position with stand offs and tie wraps, as needed.
- Install cable in panel and wire to terminal strips in the panel. Refer to the wiring diagram included with this publication.
- Install a piece of 2 conductor Olflex cable from panel to the power source of the crane. Connect the power side to the power source. The preferred connection is the run side of the ignition key switch. Connect the ground wire to a cleaned ground lug on the machine structure.

CAUTION

DO NOT APPLY POWER TO THE SYSTEM AT THIS TIME. POWER WILL BE APPLIED AS PART OF THE CHECK OUT AND CALIBRATION PROCEDURE. THIS WILL ENSURE THAT THE PANEL VOLTAGE AND CRANE SYSTEM VOLTAGE ARE IDENTICAL.

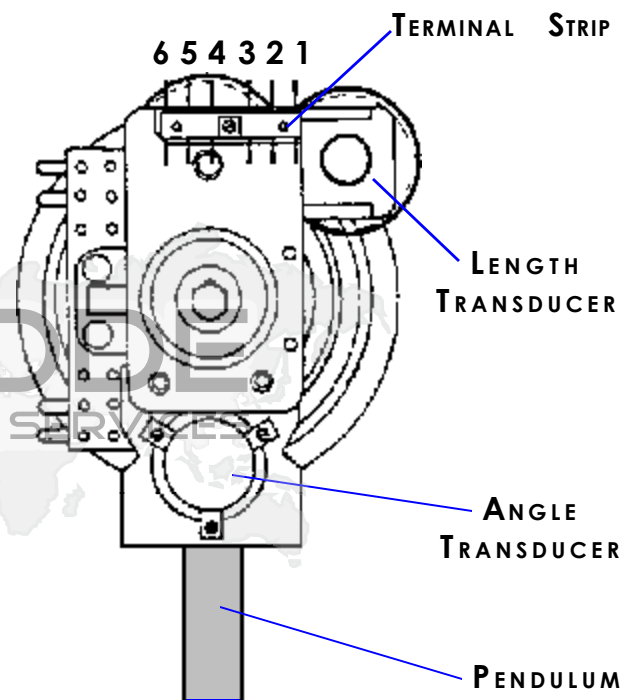
ADJUSTMENT PROCEDURES

Tools required:

Magnetic base Angle protractor
Small flat blade screwdriver
Medium flat blade screwdriver
1.5mm Allen wrench
13mm Open end wrench

Needle nose pliers
Digital Volt-Ohm meter
1/2" ratchet driver
8" extension
17mm socket

1. Bring the boom down to zero degrees (level). Measure with an angle finder to insure that the boom is at zero degrees.
2. Loosen the cable reel mounting bolt and gently turn the reel until the angle transducer pendulum just begins to come off the stop (see diagram).
3. Apply power to the system and select the angle indication (HLAP ONLY). The meter should indicate zero degrees on the panel in the cab.
4. If the indication is not correct, gently rotate the cable reel until the reading is correct and tighten the cable reel mounting bolt.



The angle voltage should be measured at this time. Using a volt meter place the positive lead on terminal #5 on the 6 pin terminal strip in the cable reel and the negative lead on terminal #4. The voltage should be in a range of 0.995 to 1.005 volts DC.

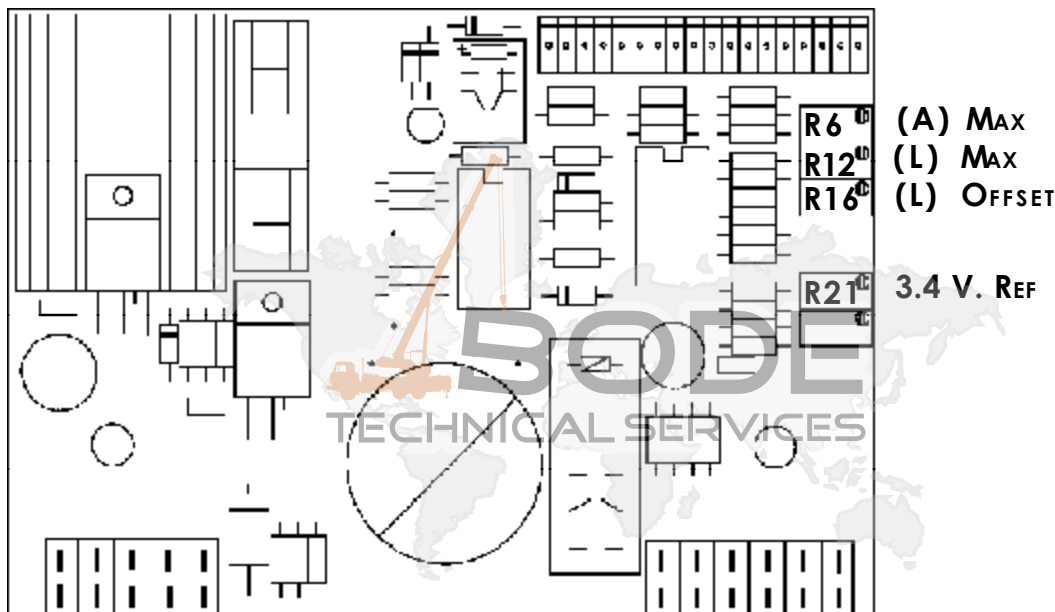
If the voltage is not in this range, loosen but do not remove the three screws that hold the Angle Pot in the mounting bracket. Rotate the angle pot to bring the voltage into the allowable range and tighten the screws.

If this is an HAP system continue at step 7.

5. With the boom fully retracted, carefully loosen the spring lock nuts on the back side of the cable reel, apply tension to the cable to the boom head and tighten them out of the way so the reel can turn freely.



6. Push the L button and check the minimum boom length setting (HLAP ONLY). Use a volt meter and put the positive lead on terminal #2 on the 6 pin terminal strip in the cable reel and the negative lead on terminal #1. the voltage should be in a range of 0.995 to 1.005 volts DC. If the voltage needs adjustment, rotate the arm on the back of the length pot in the cable reel until the panel indicates the proper boom length.
7. Push the A button and check the angle indication on the panel in the cab. It should be zero degrees. Boom up to the maximum boom angle and measure the boom angle with an angle finder. Verify that the panel indicates the correct angle.
8. If the panel reading is not correct, the indication may be adjusted at this time using pot **R6** **(A) Max** rotate until the panel reading is correct.



9. Check several boom angles between zero and maximum to verify the system's operation.
10. To check the low angle preset warning. With a boom angle greater than 10 degrees, set the low angle preset to 10 degrees. Boom down until the light and horn come on. This must occur between 10 and 12 degrees. If the light and horn come on too late or too early, remove the black cover on the knob, loosen the screw in the middle of the knob and adjust the knob until it is correct. Tighten the screw and replace the cover.
11. To check the high angle preset warning. Turn the low angle knob to zero degrees and boom down below 10 degrees. Turn the high angle preset knob to 10 degrees. Boom up until the light and horn come on. This must occur between 8 and 10 degrees. In the light and horn come on too late or too early, remove the black cover on the knob, loosen the screw in the middle of the knob and adjust the knob until it is correct. Tighten the screw and replace the cover.



12. To check the angle preset warning at a high boom angle. Set the high angle preset warning to 70 degrees. Boom up until the light and horn come on. This must occur between 68 and 70 degrees. If the warning occurs too early or too late, adjust pot **R21 3.4 V. Ref** in the panel until it is correct.

Set the high preset knob to maximum.

13. To check the low angle preset warning at a high boom angle. Boom up above 70 degrees. Set the low angle preset warning to 70 degrees. Boom down until the light and horn come on. This must occur between 70 and 72 degrees. If the warning occurs too early or too late, adjust **R21 3.4 V. Ref** in the panel until it is correct.

If this is an HAP system continue at step 17.

14. Check and adjust the length indication (HLAP ONLY). Push the L button to select length indication. The length should read the fully retracted boom length. If it does not, adjust pot **R16 (L) Offset** in the panel until it is correct.
15. Fully extend the boom (including any manual or pinned section). Check the length indication against the actual boom length. If it is incorrect, adjust pot **R12 (L) Max** in the panel until the correct length is indicated.
16. Fully retract the boom and check the length indication. If necessary re-adjust pot **R16 (L) Offset** in the panel. Calibration of the retracted and extended boom lengths interact, which may make it necessary to repeat these steps for proper length indication.
17. Complete installation of Crane function shut off system, if required.
18. Create a Two-Block condition by lifting the counterweight at the boom head. Check that the light and horn come on. If equipped with a Crane function shut off system the following functions should be dis-abled.

Boom Hoist - Down
Boom Telescope - Out
Main Winch / Front or Right hand Drum - Up
Aux. Winch / Rear or Left hand Drum - UP

19. Lower the counterweight to verify that the light and horn go off and all crane functions return to normal operation.
18. The machine is ready for operation.



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FOREWORD

The purpose of this handbook is to provide the operator with information on the proper operation of the KRÜGER - "H(L)AP" family of Indicating Systems.

The "H(L)AP" family of Indicating Systems is designed to provide an audible and visual warning of an IMMEDIATE TWO-BLOCK condition with an analog display of MAIN BOOM LENGTH or MAIN BOOM ANGLE. The "H(L)AP" family of Indicating Systems can actuate an optional crane function shut off system.

This manual covers the operation of a system that incorporates TWO-BLOCK, MAIN BOOM ANGLE with ANGLE PRESET and MAIN BOOM LENGTH.

WARNING

DO NOT CONSIDER THIS SYSTEM A SUBSTITUTE FOR GOOD JUDGEMENT, EXPERIENCE AND ACCEPTED SAFE CRANE OPERATIONAL PRACTICES.

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NOTE

This system utilizes a series of electrical and mechanical components and cannot be 100% failsafe.

This system should only be serviced by qualified individuals, either PAT-KRUEGER Corporation, Inc. service technicians or those who have received special training from Krüger GmbH & Co. KG. or their authorized representatives.

To avoid damage and loss of warranty consideration, we recommend repair only be attempted by individuals with a strong electrical/electronic background.

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INTRODUCTION

The Krüger "H(L)AP" family of Indicating Systems incorporate state-of-the-art design to provide components for integration into operating systems for most crane specific applications.

The compact display panel provides easy to read analog display, clear function identification and easy to operate controls.

The electrical components are mounted to a single PC Board for ease of service.

The "HAP" - MODEL AA 103 indicator covered by this publication provides indication of imminent TWO-BLOCK, MAIN BOOM ANGLE with ANGLE PRESET.

The "HLAP" - MODEL AA 103 indicator covered by this publication provides indication of imminent TWO-BLOCK, MAIN BOOM ANGLE with ANGLE PRESET and MAIN BOOM LENGTH.

SPECIFICATIONS

Power Supply:	12VDC \pm 20% (24VDC \pm 20% Optional)
Current Draw:	Ca. 60mA
Working Temperature:	-22°F to 160°F (-30°C to +70°C)
Relative Humidity:	95%/40°C
Enclosure:	IP65 (NEMA 4)
Display:	Analog meter with 105° illuminated scale
Accuracy of Display:	
Angle:	-2° to 0° of actual angle, 1.0° increments
Length:	\pm 2%, 1.0 Ft. increments

FEATURES

Angle Preset: Both high and low boom angle adjustable from 0-90°

Warnings: Visual warning with LED in Push Button.

Audible warning is an Electronic Beeper With temporary by-pass



WARRANTY

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NEW EQUIPMENT WARRANTY

The manufacturer warrants each new product made by the manufacturer to be free from defects in material and workmanship. At its option, all obligation and liability under this warranty is limited to free of charge replacement, repair or reconditioning, at its factory, of any part proven defective under normal use and service within twelve (12) months from the date of delivery. The system or component must be on record with the manufacturer as being delivered by the distributor. If the system or component is not on record as being delivered by the distributor, the warranty period will commence on the date of shipment from the factory. This warranty shall not include any transportation, customs or other charges or the cost of installation or any liability for the cost of installation or any other liability for direct, indirect or consequential damage or delay resulting from the defect. The manufacturer is not responsible for, and makes no warranties in connection with, the installation or servicing, use or operation of the product. Any repair, alteration or adjustment of the product or any substitution of parts without the express written consent of the manufacturer shall void this warranty. This warranty covers only the products of KRÜGER including products replaced, repaired or reconditioned by KRÜGER. The products of other manufacturers are covered only by such warranties as are made by their manufacturers.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF THE OBLIGATIONS OR LIABILITY ON THE PART OF THE MANUFACTURER, AND KRÜGER NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH SUCH EQUIPMENT!

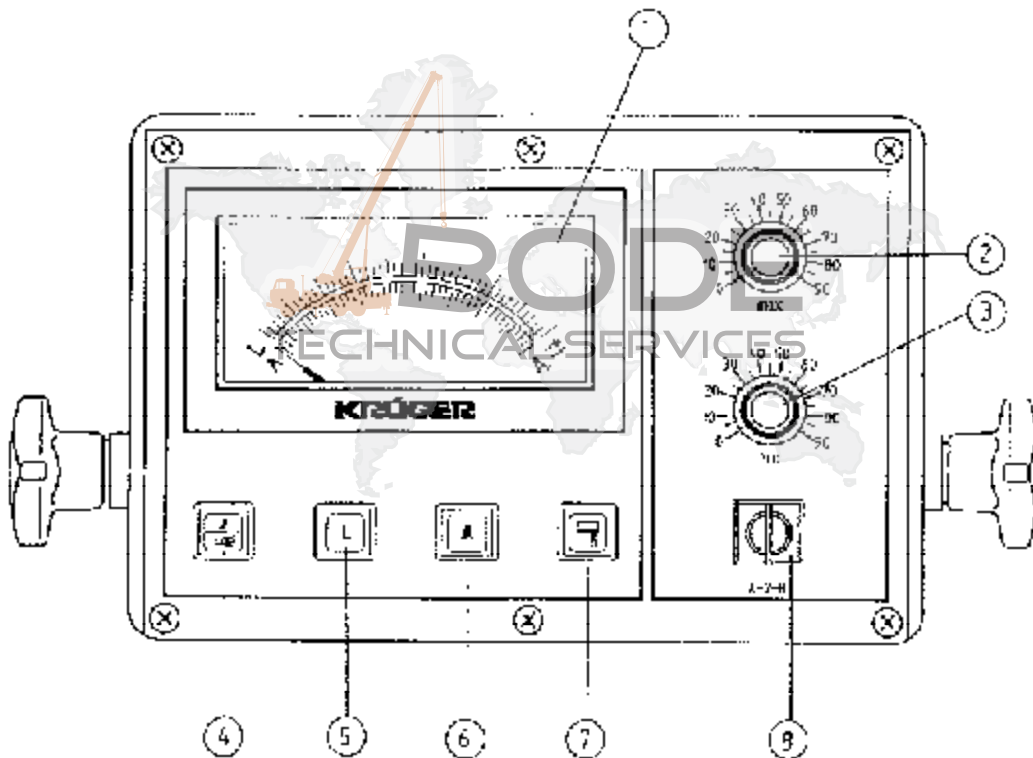


OPERATION AND FUNCTION

This section of the manual will provide the operator with information on the location and operation of the displays, push buttons, lights and selector switches of the "H(L)AP" family of Indicating Systems.

The "H(L)AP" family of Indicating Systems is designed to provide an audible and visual warning of an IMMEDIATE TWO-BLOCK condition and analog indication of MAIN BOOM ANGLE with ANGLE PRESET and MAIN BOOM LENGTH. The "H(L)AP" family of Indicating Systems can actuate an optional crane function shut off system.

This manual covers both the HAP and H LAP Indicator systems. The panel shown below is the H LAP Indicator. The HAP panel is similar in design. Buttons 5, LENGTH, and 6, ANGLE, are not required for the HAP indicator.



1. ANALOG METER

The analog meter is used to display angle and length indication.

BOOM ANGLE

The actual boom angle, the angle between the longitudinal centerline of the boom base section and horizontal plane, is displayed in 2° increments.



BOOM LENGTH

The Main Boom Length is displayed on this meter. Various scales are used depending on the Boom Length.

2. UPPER BOOM ANGLE PRE-SET

The Upper boom angle limit is set by rotating the selector switch. This setting determines the maximum boom angle for crane operation.

If the actual boom angle is equal to or exceeds the pre-set value; the RED pilot light (4) and the electronic buzzer, located on the back of the panel, are activated. The warning is cleared by lowering the boom to an angle less than the Upper Pre-Set value.

The electronic buzzer can be temporarily silenced by pushing the horn/pilot light button (4). The horn warning is automatically reset when the warning is cleared.

3. LOWER BOOM ANGLE PRE-SET

The Lower boom angle limit is set by rotating the selector switch. This setting determines the minimum boom angle for crane operation.

If the actual boom angle is equal to or goes below the pre-set value; the RED pilot light (4) and the electronic buzzer, located on the back of the panel, are activated. The warning is cleared by raising the boom to an angle greater than the Lower Pre-Set value.

The electronic buzzer can be temporarily silenced by pushing the horn/pilot light button (4). The horn warning is automatically reset when the warning is cleared.

4. HORN / PRE-SET LIMIT PUSH BUTTON

The RED push button is the visual warning that one of the pre-set angles has been reached or exceeded. This push button also temporarily silences the audible electronic buzzer. Temporarily disabling the electronic buzzer does not turn off the RED light.

5. "L" LENGTH PUSH BUTTON

Push this button when you want the analog meter to display the actual boom length. The button will light to indicate that the Boom Length is being displayed. The length is the distance from the boom pivot pin to the center of the boom head sheaves.

This button is only used on the HLAP Indicator.



6. "A" ANGLE PUSH BUTTON

Push this button when you want the analog meter to display the actual boom angle. The button will light to indicate that the Boom Angle is being displayed. The angle displayed is the angle between the longitudinal centerline of the boom base section and the horizontal plane.

This button is only used on the HLAP Indicator.

7. A-2-B WARNING LIGHT

If the A-2-B circuit is "open" the warning light "A-2-B" comes on and a shut off relay is utilized to stop specific crane functions, if the crane is equipped with a crane function shut-off system. The shut off function can be by-passed using the momentary "By Pass" key switch in the panel. If the A-2-B switch is activated and the "By Pass" key switch is used, the A-2-B warning light will remain on until the pending 2-Block condition ceases.

8. BY-PASS KEY SWITCH

The shut off function can be by-passed using the momentary "By Pass" key switch in the panel.

THE BYPASS KEY SWITCH SHOULD BE USED WITH DISCRETION, AS UNWARRANTED USE OF IT TO OVERRIDE THE CRANE FUNCTION SHUT OFF SYSTEM COULD RESULT IN LOSS OF LIFE, DESTRUCTION OF PROPERTY AND/OR IRREPARABLE DAMAGE TO THE CRANE. SOUND JUDGEMENT MUST BE USED WHEN USING THE BYPASS KEY.

9. AUDIBLE ALARM

Integrated into the back of the panel is an electronic beeper which is activated by:

1. Open A-2-B circuit
2. If the pre-set Upper or Lower Angle limits are reached or exceeded.

The audible alarm can be silenced by pushing the HORN button. The audible alarm will automatically be reactivated for both functions after leaving the limited values for angle preset or pending two-block condition.



SYSTEM OPERATION

SET UP

This section will provide a step by step sequence of start up and operation of the "H(L)AP" Indicating System.

1. Install jumper cable or dummy plug in the appropriate receptacles at the boom tip and attachment(s) for the machine configuration being used.

NOTE

The dummy plug is only used if the machine is equipped with two (2) winches and two (2) or more A-2-B switches.

Install the dummy plug only if a single A-2-B switch is being employed, with this type machine configuration.

2. Install counterweight(s) on A-2-B switches to be checked.

CAUTION

THE LENGTH OF THE CHAIN IS IN ACCORDANCE WITH HOOK SPEED AND SENSITIVITY OF THE OPTIONAL SHUT OFF SYSTEM AND SHOULD NOT BE SHORTENED OR A POSSIBLE TWO-BLOCK CONDITION COULD RESULT PRIOR TO ACTUAL FUNCTION SHUT OFF.

NOTE

With even parts of hoist line, the counterweight should be attached to the dead end line.

With odd parts of hoist line, the counterweight should be attached to the slowest speed line.

3. Start the crane according to the crane manufacturer instructions.
4. At start up the "H(L)AP" Indicating System will display either the Boom Length or Boom Angle that was in use at the time of system shut off. The push button corresponding to the displayed value will be lighted.
5. Check the Upper and Lower Boom Angle pre-set values. Follow instructions in the previous section to change these values, if a change is required.



PHYSICAL CHECK

This portion of the checkout must be performed with extreme care and can be bypassed if the crane operator is sure that the shut off system is operational.

6. With the boom at a low angle, lift the A-2-B counterweight by hand to simulate a two-block condition. The following should occur:
 - * RED "A-2-B" light is ON.
 - * Audible alarm sounds. Push "HORN" button to silence the horn.
 - * If so equipped, the optional shut off system is deactivated and the following crane functions are inoperative:
 - * Hoist up both main and auxiliary winches
 - * Boom lowering
 - * Telescope out (Hydraulic Machine Only)

Begin Safe operation of the crane. PROCEED WITH APPROPRIATE CARE.

NORMAL OPERATING CONDITIONS

During normal crane operation the Operating Panel will

- * Have the RED "Horn/Pre-Set Limit" light OFF
- * Have either the "L" or "A" light ON. For HLAP only.
- * Have the audible alarm SILENT
- * If so equipped, the Crane Function Shut Off System is activated and all crane functions are operational.

TWO-BLOCK DURING OPERATION

When a two-block condition occurs during operation the panel will display the following:

- * The RED "A-2-B" light is ON
- * The audible alarm SOUNDS. It can be silenced by pushing the RED "Horn/Pre-Set Limit" button.
- * If so equipped, the Crane Function Shut Off System is deactivated and the following crane functions are inoperative:
 - * Hoist up both main and auxiliary
 - * Boom lowering
 - * Telescope out (Hydraulic Machine Only)

TO CORRECT: Lower the load, Raise the boom or Retract the boom. Use the crane function which best suits the immediate situation and jobsite conditions.

When the two-block condition has been corrected:

- * The RED "A-2-B" light is "OFF"
- * The audible alarm is silent
- * The horn is reset, if it had been silenced previously.

Return to normal crane operation. PROCEED WITH APPROPRIATE CARE.



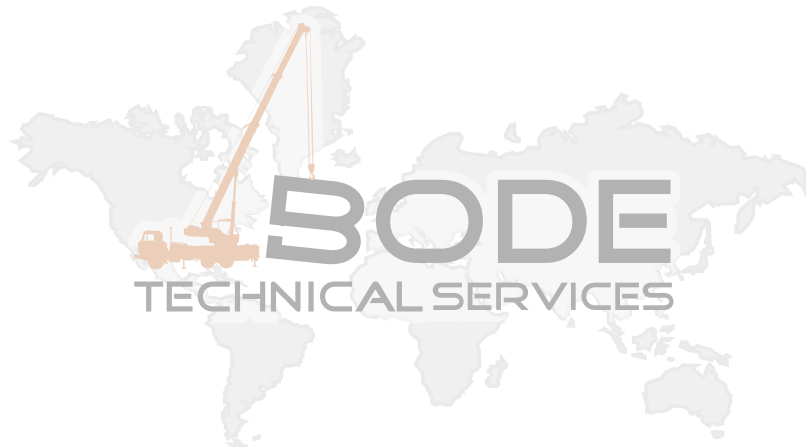
PRE-SET LIMIT EXCEEDED

When either the Upper or Lower Pre-set Limit is reached or exceeded during operation the panel will display:

- * The RED "Horn/Pre-Set Limit" light is "ON"
- * Audible alarm sounds. Push the "HORN/PRE-SET LIMIT" button to shut off the horn.

TO CORRECT: Either raise or lower the boom to operate within the pre-set limits previously set.

These limits can be used to improve the cycle time of repetitive operations such as a concrete pour. Set the Upper limit to locate the concrete bucket at the truck. Set the lower limit to locate the position for the pour.





PREVENTIVE MAINTENANCE

The "H(L)AP" Indicating System uses electronic, electrical and mechanical components. The system should only be serviced by PAT-KRUEGER Corporation, Inc. Service Technicians or those who have received special training from Krüger GmbH or their authorized representatives.

The operator retains the responsibility for inspection of the system components. To insure that no external damage will affect proper system operation inspections should include:

DAILY INSPECTION

1. Inspect all anti-2-block switches for free movement of the lever arm that supports the counterweight.
2. Counterweights should be free of obstructions in the operating position and installed on all switches where a load line is being used for a lift.
3. Insure that the anti-2-block portion of the system is properly wired at the boom nose.
 - A. Install JUMPER CABLE from auxiliary attachment to the boom nose receptacle, if used.
 - B. Install DUMMY PLUG in the boom nose receptacle, if the machine is equipped with two (2) winches and NO auxiliary attachment is being used.
4. Check for proper connection of the Anti-Two-Block cable at the strain relief anchor at the boom head.
5. Closely inspect the cable between the Anti-Two-Block switch at the boom head and the cable reel on the boom base section for cuts and/or abrasions.
6. Check anti-2-block operation. Individually lift each counterweight. The RED - A-2-B light on the Control Panel should be lit and the audible alarm should sound. If equipped with an optional Crane Function Shut Off System, this system should be deactivated.
7. Report all damage to your supervisor for appropriate action

SEMI-ANNUAL INSPECTION

In addition to the requirements of the DAILY INSPECTION the LENGTH and ANGLE INDICATING portion of the system should be tested.

Length and Angle Indicating system testing should be performed by a Service Technician of PAT-KRUEGER Corporation, Inc. or someone who has received special training by Krüger GmbH or their authorized representatives.

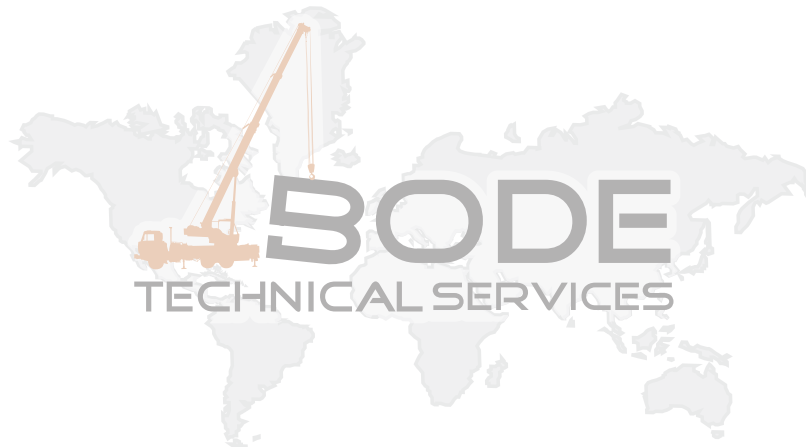
1. All functions of the System will be inspected for continued compliance with manufacturer operational specifications.



- 2. Calibrate to meet Current SAE Specifications, if necessary
 - J375 Apr85 Radius-of-Load or Boom Angle Indicating System
 - J1108 Oct80 Telescopic Boom Length Indicating System
 - J1305 Jun87 Two-Block Warning and Limit System

ANNUAL INSPECTION

Certification by an authorized Testing Company shall include calibration verification, as required by applicable laws.



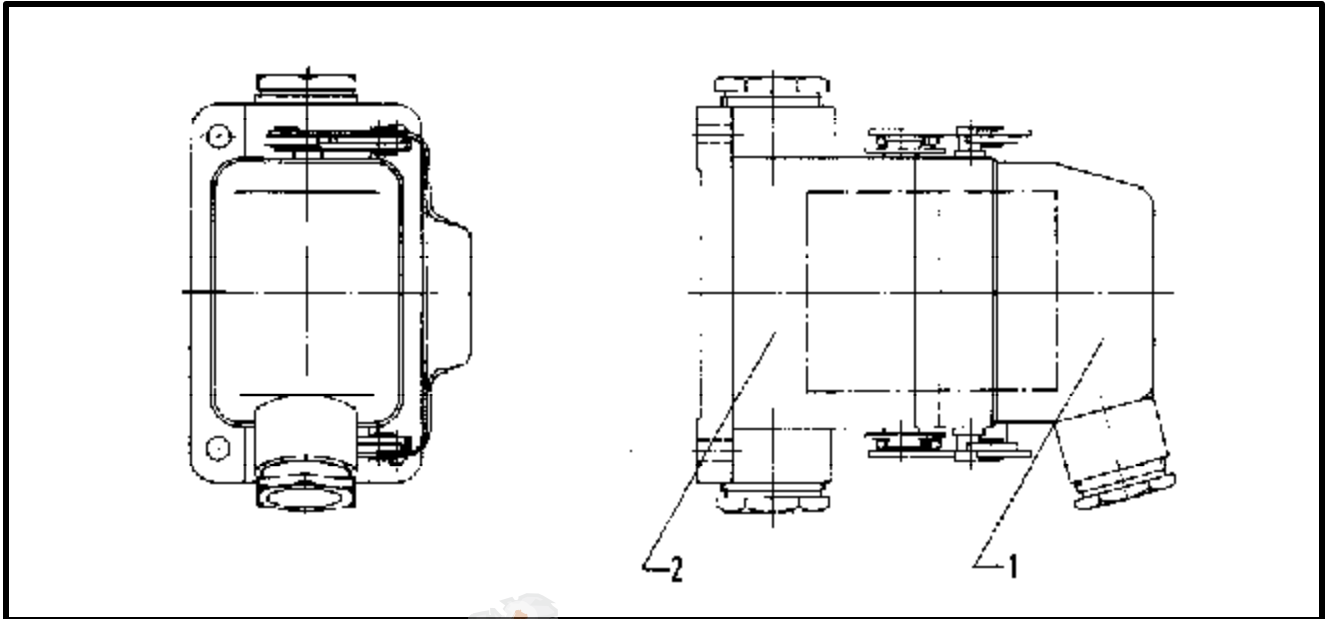


PAT America Inc.
 980 Industrial Ct. Loves Park, IL 61111-7512

COMPONENT LISTING

Component: **6 Pin - Plug/Receptacle**

Article No.:



<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	6 Pin Plug		1-0011642.00
	- Housing	1	2-0001005.00
	- Male Insert	1	1-0016377.00
Not Shown	- Cable Connector - PG 16	1	1-0011867.00
2	6 Pin Receptacle		1-0011641.00
	- Housing	1	2-0001006.00
	- Female Insert	1	1-0016037.00
Not Shown	- Cable Connector - PG 16	2	1-0011867.00
	- Blind Plug - PG 16 (Metallic)	1	2-0000813.00
	Required for mounting - Order separately		
	Weld Plate	1	2-0000255.00

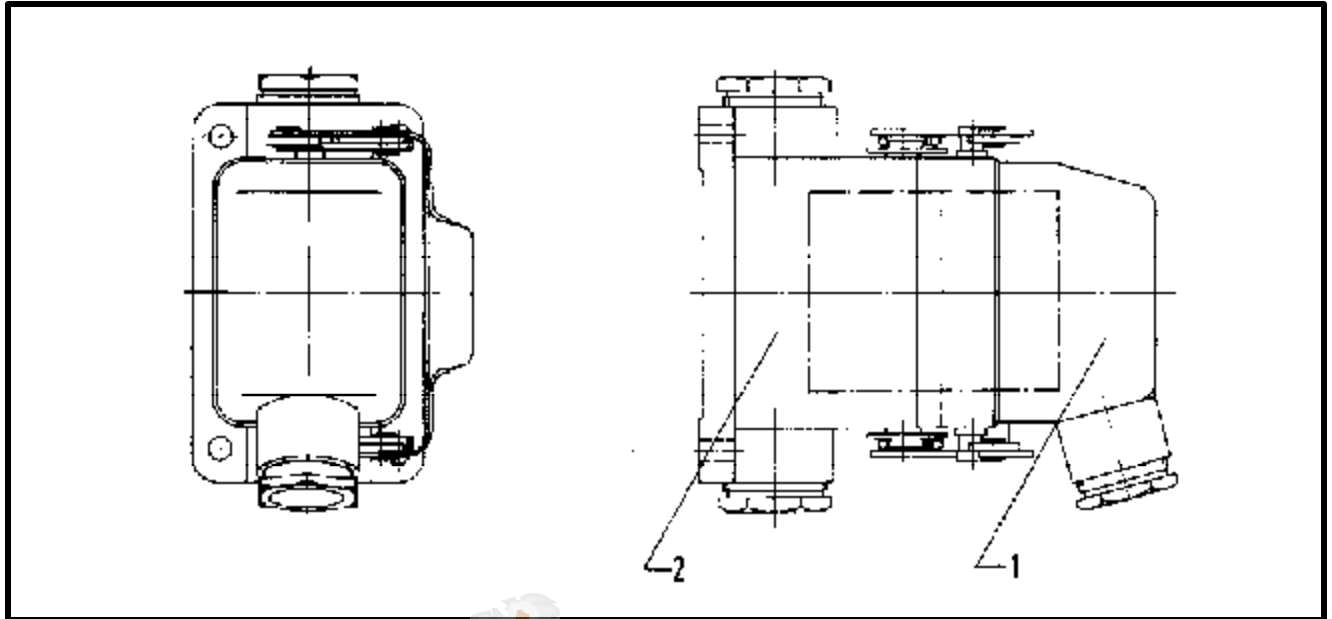


PAT America, Inc.
 980 Industrial Ct. Loves Park, IL 61111-7512

COMPONENT LISTING

Component: **10 Pin - Plug/Receptacle**

Article No.:



<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	10 Pin Plug		1-0011059.00
	- Housing	1	2-0001007.00
	- Male Insert	1	1-0016378.00
Not Shown	- Cable Connector - PG 16	1	1-0011867.00
2	10 Pin Receptacle		1-0011058.00
	- Housing	1	2-0001008.00
	- Female Insert	1	1-0016375.00
Not Shown	- Cable Connector - PG 16	2	1-0011867.00
	- Blind Plug - PG 16 (Metallic)	1	2-0000813.00
	Required for mounting - Order separately		
	Weld Plate	1	2-0000255.00

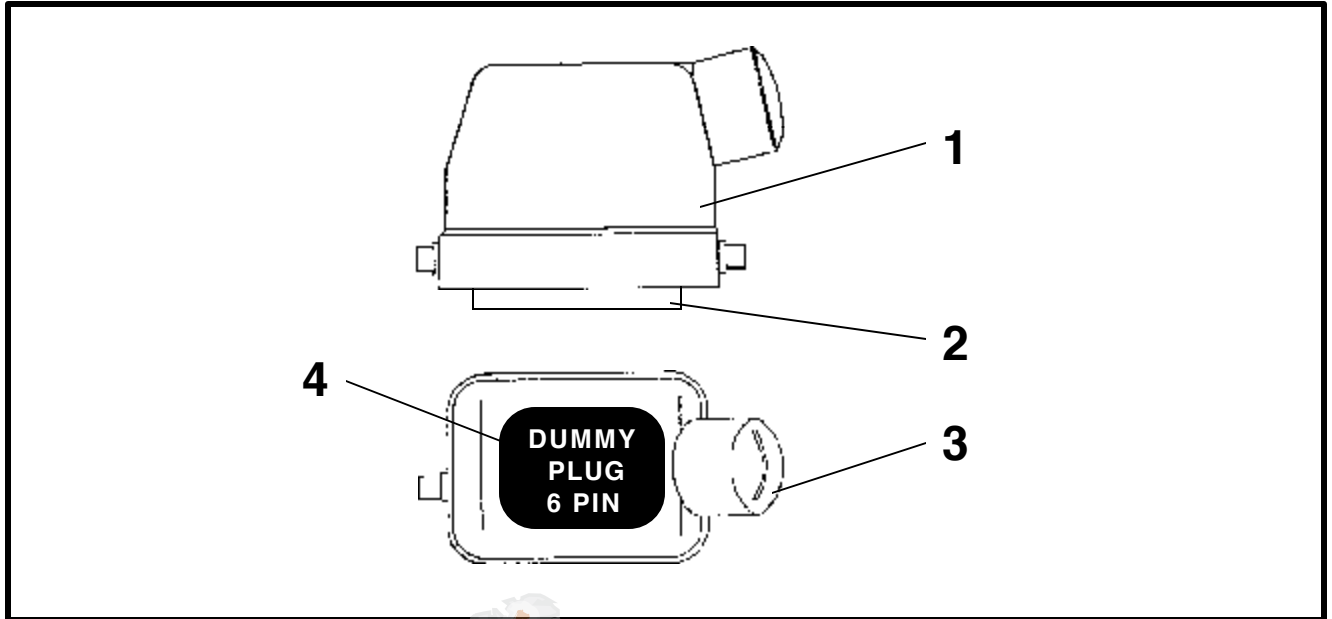


PAT America, Inc.
980 Industrial Ct. Loves Park, IL 61111-7512

COMPONENT LISTING

Component: **Dummy Plug - 6 Pin**

Article No.: **1-0011642.20**



<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Housing	1	2-0001005.00
2	Male Insert	1	1-0016377.00
3	Blind Plug - PG 16 (Metallic)	1	2-0000813.00
4	Decal	1	2-0000992.00

SODE
TECHNICAL SERVICES

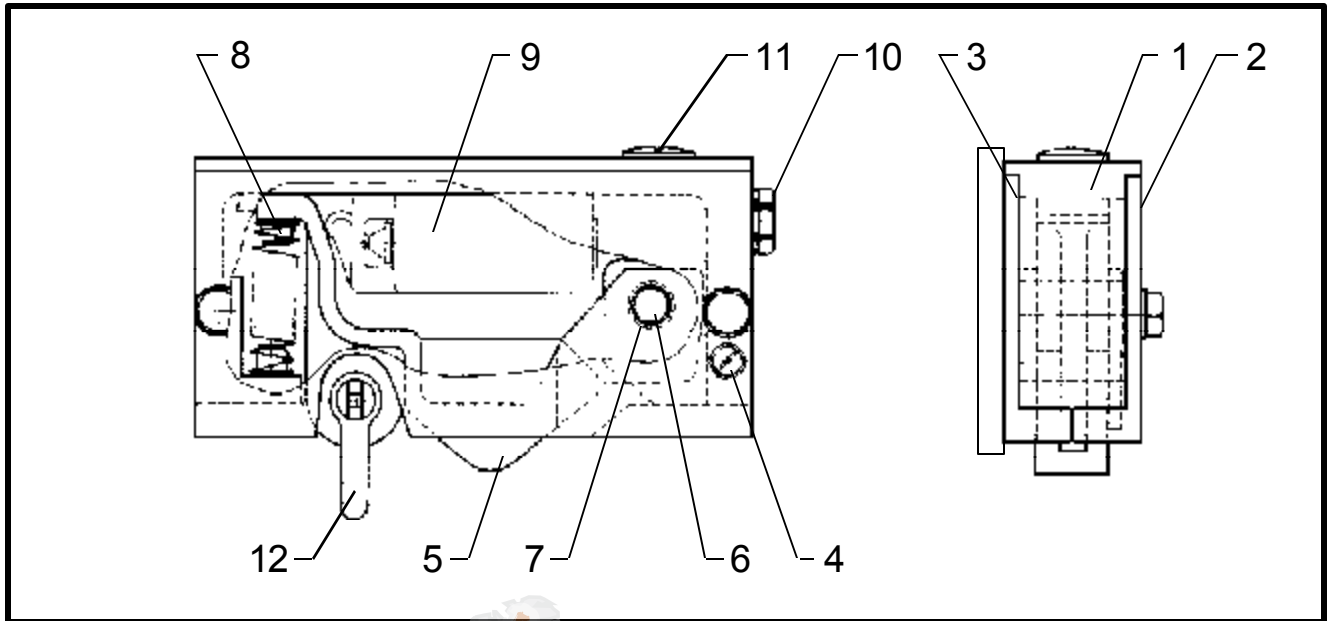


PAT America Inc.
 980 Industrial Ct. Loves Park, IL 61111-7512

COMPONENT LISTING

Component: **A-2-B Switch**

Article No.: **1-0024849.20**



<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Center Housing	1	1-0112531.00
2	Cover - Left	1	1-0010045.00
3	Cover - Right	1	1-0010044.00
4	Slotted Flat Head Screw - M5 x 8	2	1-0013391.00
5	Lever	1	1-0010041.00
6	Straight Pin	1	1-0010042.00
7	Bushing	1	1-0010104.00
8	Spring	1	1-0100326.00
9	Micro Switch	1	1-0010039.00
10	Cable Connector	1	1-0010037.00
11	Blind Plug	1	1-0010038.00
12	Shackle with Cotter Pin	1	1-0009999.00
Required for Mounting - Order Separately			
	Weld Plate	1	1-0010046.00
	Hex Head Capscrew - M8 x 50	2	1-0010083.00
	Lock Washer - M8	2	1-0010097.00

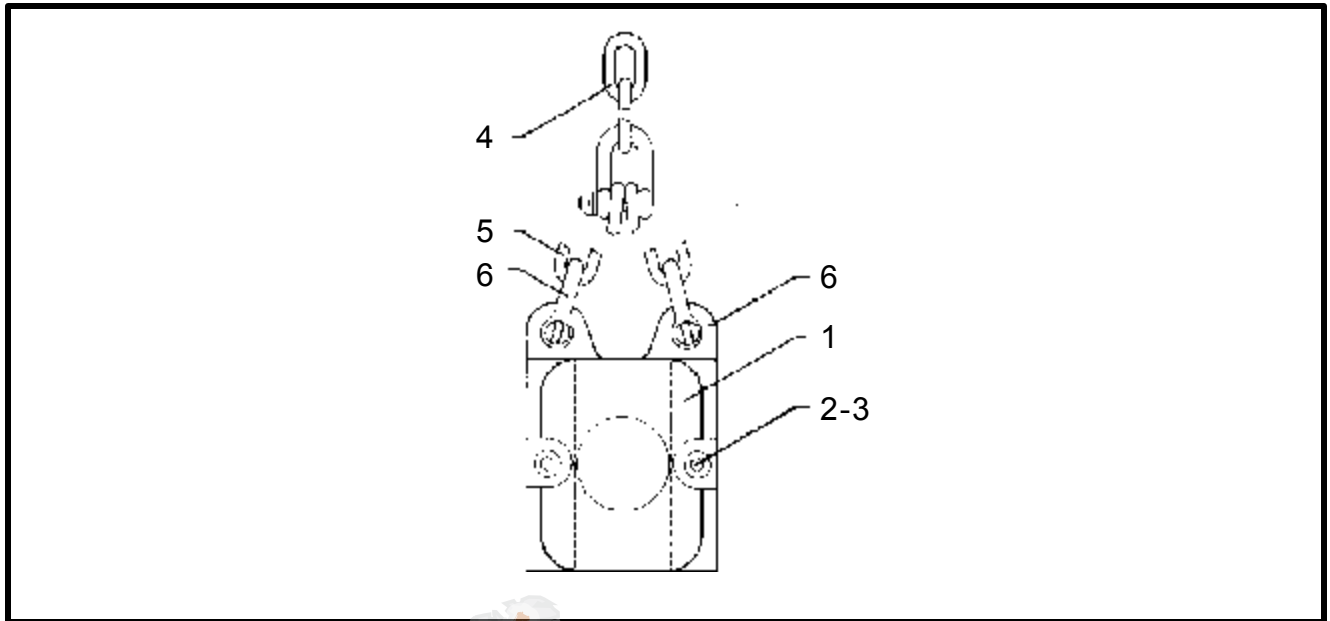
COMPONENT LISTING



PAT America Inc.

Component: **Counterweight with Chain**

Article No.: **1-0016800.11**

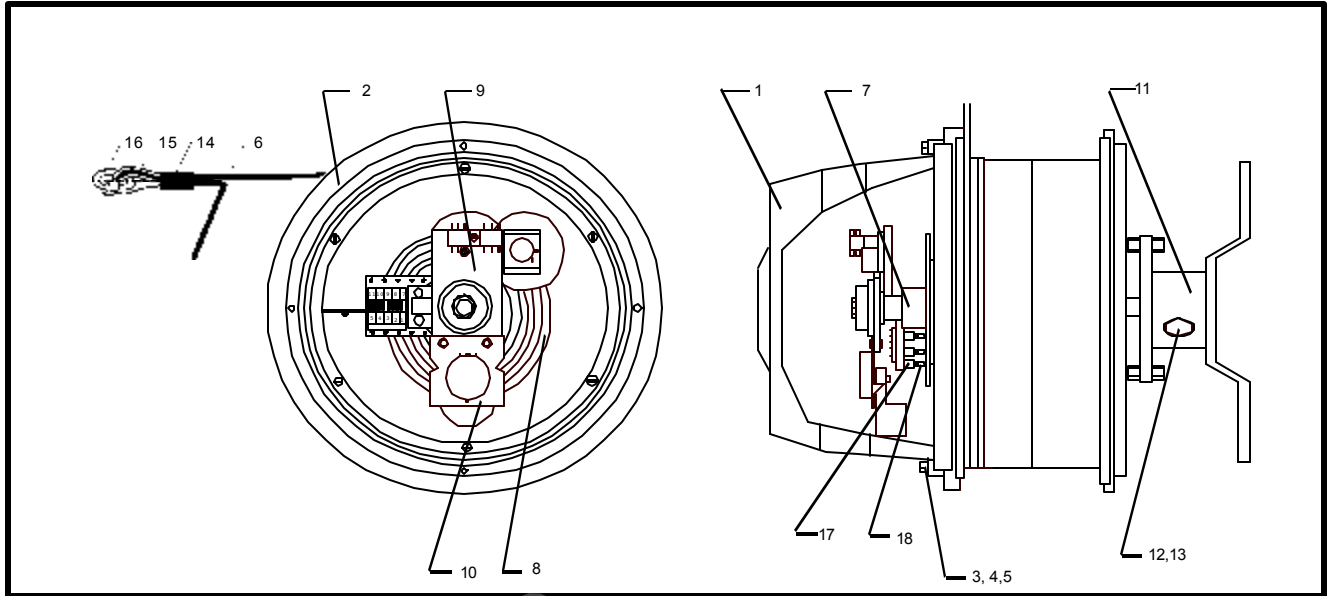


<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Counterweight Half (Drilled)	2	1-0009995.00
2	Clevis Pin	2	2-0001388.00
3	Cotter Pin	2	2-0001389.00
4	Chain #1	1	1-0016908.00
5	Chain #2	2	1-0016909.00
6	Shackle	3	1-0010107.00



Component: **LMI Cable Reel - 24/30M**

Article No.: **1-0115463.20**

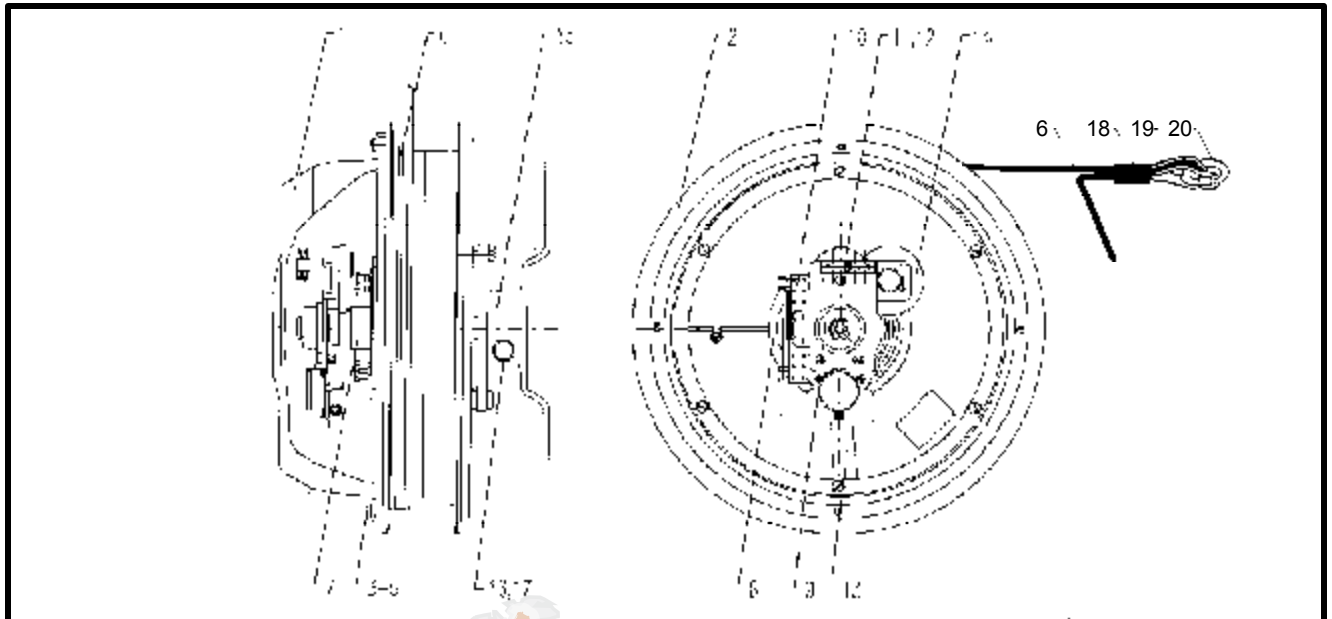


<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Cover Complete	1	1-0107886.00
2	Cable Reel Body	1	1-0107885.00
3	Angle Clamp	4	1-0010613.00
4	Slotted Flat Head Screw - M5 x 14	4	1-0012350.00
5	Nylon Washer - M5	4	1-0010581.00
6	Shielded Cable 1 x 1	30M	1-0010328.00
7	Receiver Complete	1	1-0010615.00
8	Slip Ring Disk	1	1-0021448.00
9	Length Gear Drive	1	1-0107887.00
	- Angle Bracket	1	1-0010175.00
	- Pot	1	1-0013697.00
	- Terminal Strip	1	1-0011684.00
10	Angle Transducer	1	1-0015601.00
	- Mounting Plate	1	1-0010626.00
	- Pot	1	1-0012157.00
	- Pendulum	1	1-0015113.00
11	Mounting Bracket	1	1-0027856.00
12	Hex Head Capscrew - M10 x 45	1	1-0012207.00
13	Lock Washer - M10	1	1-0010096.00
14	Shrink Tubing - Alpha 1/4"	2	3-0000117.00
15	Thimble	1	1-0009988.00
16	Thimble Link	1	1-0009987.00
17	Contact Socket	3	1-0110095.00
18	Contact Pin	3	1-0110094.00
19	Contact Holding Plate	1	1-0116041.00



Component: **LMI Cable Reel - 32/45M**

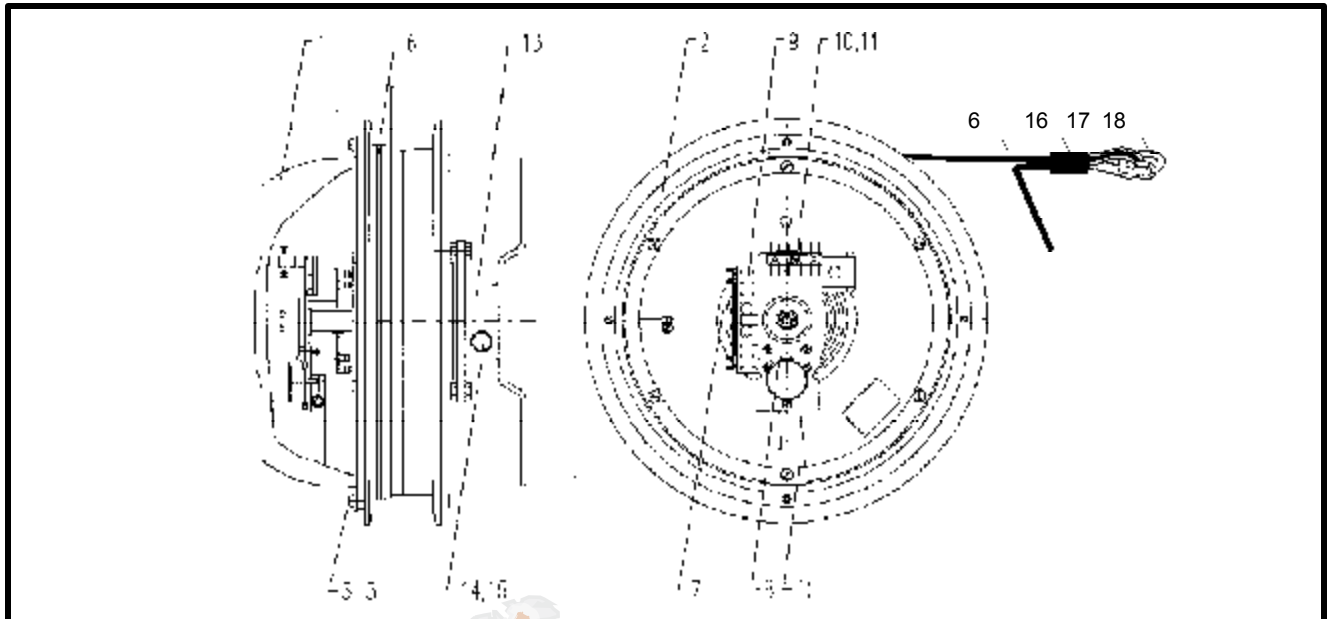
Article No.: **1-0106926.20**



<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Cover Complete	1	1-0016897.00
	- Cover	1	1-0010159.00
	- Rubber Seal	1	1-0010631.00
2	Cable Reel Body	1	1-0010653.00
3	Angle Clamp	4	1-0010613.00
4	Slotted Flat Head Screw - M5 x 14	4	1-0012350.00
5	Nylon Washer - M5	4	1-0010581.00
6	Shielded Cable 1x1	45M	1-0102079.00
7	Receiver	1	1-0010615.00
8	Slip Ring Disk	1	1-0021448.00
9	Angle Bracket	1	1-0010175.00
10	Slipper Complete (2x2)	1	1-0017383.00
	- Slipper - Contact Spring	4	1-0023914.00
	- Strip	1	1-0010627.00
11	Terminal Strip	1	1-0011684.00
12	Slotted Flat Head Screw - M4 x 10	1	1-0010582.00
13	Angle Transducer Complete	1	1-0015601.00
	- Mounting Plate	1	1-0010626.00
	- Pot	1	1-0012157.00
	- Pendulum	1	1-0010628.00
14	Gear Drive Complete	1	1-0107887.00
	- Pot	1	1-0013697.00
15	Mounting Bracket	1	1-0027856.00
16	Hex Head Capscrew - M10 x 45	1	1-0012207.00
17	Lock Washer - M10	1	1-0010096.00
18	Shrink Tubing - Alpha 1/4" x 2"	1	1-0009986.00
19	Thimble	1	1-0009988.00
20	Thimble Link	1	1-0009987.00

Component: **HAP Cable Reel - 32/45M**

Article No.: **1-0104326.20**



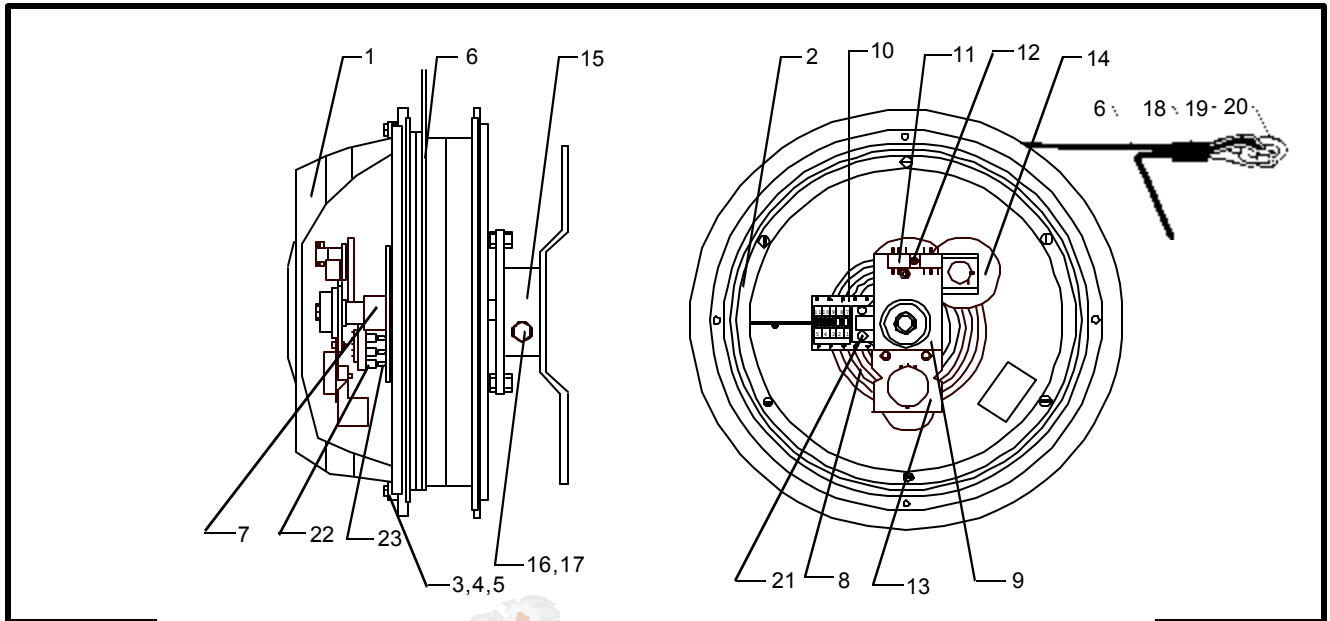
<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Cover Complete	1	1-0016897.00
	- Cover	1	1-0010159.00
	- Rubber Seal	1	1-0010631.00
2	Cable Reel Body	1	1-0010653.00
3	Angle Clamp	4	1-0010613.00
4	Slotted Flat Head Screw - M5 x 14	4	1-0012350.00
5	Nylon Washer - M5	4	1-0010581.00
6	Shielded Cable - 1x1	45M	1-0102079.00
7	Slip Ring Disk	1	1-0021448.00
8	Angle Bracket	1	1-0010175.00
9	Slipper Complete	1	1-0017383.00
	- Slipper - Contact Spring	4	1-0023914.00
	- Strip	1	1-0010627.00
10	Terminal Strip	1	1-0011684.00
11	Slotted Flat Head Screw - M4 x 10	1	1-0010582.00
12	Angle transducer Complete	1	1-0015264.00
	- Mounting Plate	1	1-0010626.00
	- Pot	1	1-0012157.00
	- Pendulum	1	1-0010628.00
13	Mounting Bracket	1	1-0027856.00
14	Hex Head Capscrew - M10 x 45	1	1-0012207.00
15	Lock Washer - M10	1	1-0010096.00
16	Shrink Tubing - Alpha 1/4" x 2"	1	1-0009986.00
17	Thimble	1	1-0009988.00
18	Thimble Link	1	1-0009987.00



COMPONENT LISTING

Component: **LMI Cable Reel - 32/45M**

Article No.: **1- 0115068.20**

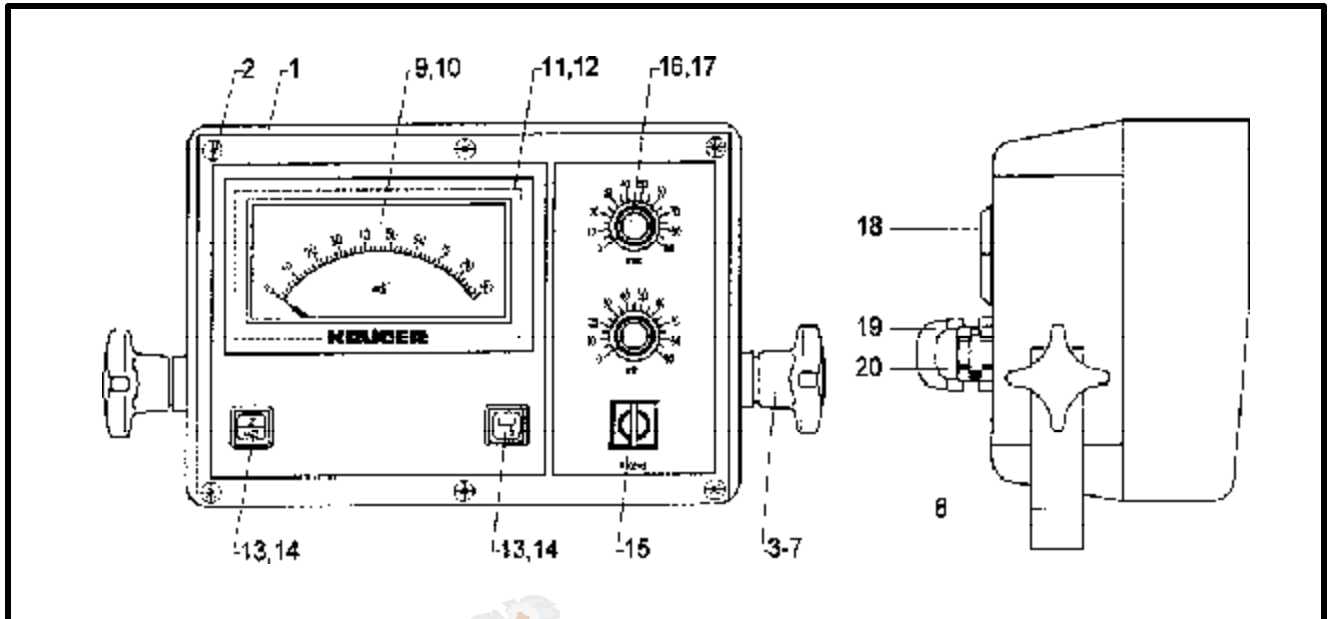


<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Cover Complete	1	1-0016897.00
	- Cover	1	1-0010159.00
	- Rubber Seal	1	1-0010631.00
2	Cable Reel Body	1	1-0010653.00
3	Angle Clamp	4	1-0010613.00
4	Slotted Flat Head Screw - M5 x 14	4	1-0012350.00
5	Nylon Washer - M5	4	1-0010581.00
6	Shielded Cable 1x1	45M	1-0102079.00
7	Receiver	1	1-0010615.00
8	Slip Ring Disk	1	1-0021448.00
9	Angle Bracket	1	1-0010175.00
10	Contact Holding Plate	1	1-0116041.00
11	Terminal Strip	1	1-0011684.00
12	Slotted Flat Head Screw - M4 x 10	1	1-0010582.00
13	Angle Transducer Complete	1	1-0015601.00
	- Mounting Plate	1	1-0010626.00
	- Pot	1	1-0012157.00
	- Pendulum	1	1-0010628.00
14	Gear Drive Complete	1	1-0107887.00
	- Pot	1	1-0013697.00
15	Mounting Bracket	1	1-0027856.00
16	Hex Head Capscrew - M10 x 45	1	1-0012207.00
17	Lock Washer - M10	1	1-0010096.00
18	Shrink Tubing - Alpha 1/4" x 2"	1	1-0009986.00
19	Thimble	1	1-0009988.00
20	Thimble Link	1	1-0009987.00
21	Screw 2.3 mm slotted flat head	1	1-0011819.00
22	Contact Socket	3	1-0110095.00
23	Contact Pin	3	1-0110094.00



Component: **Panel - IP 65 HAP Ind.**

Article No.: **1-0110622.00**

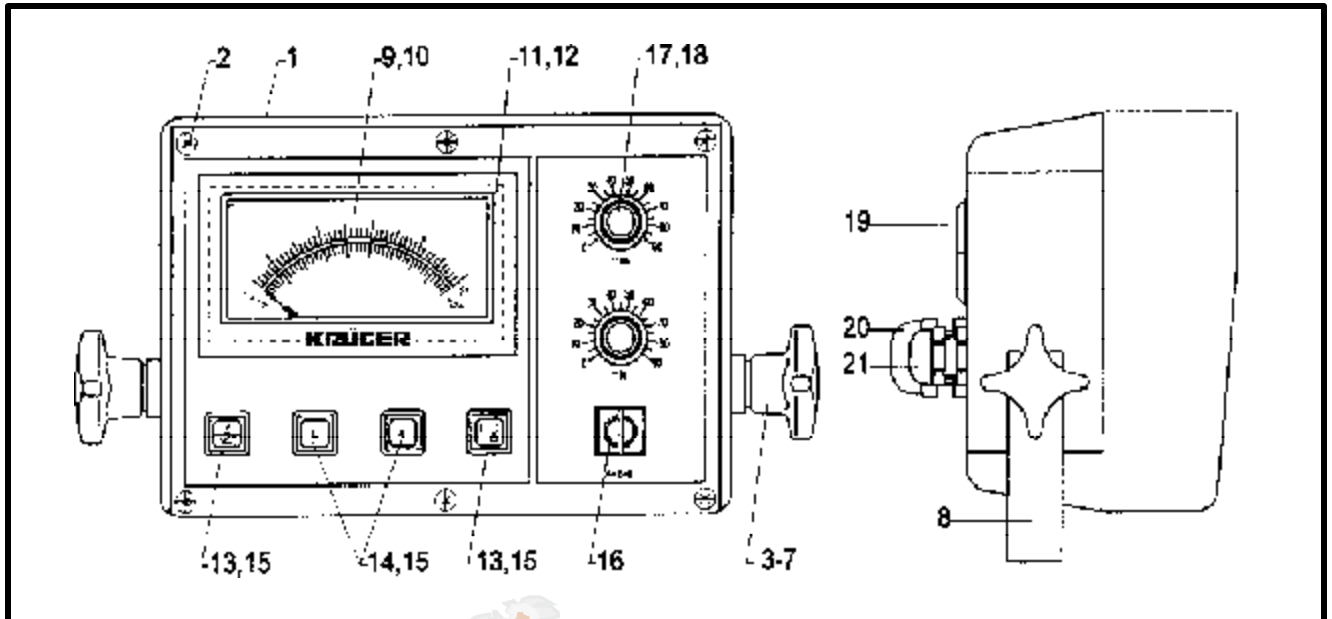


<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Housing	1	1-0110637.00
2	Countersunk Head Screw M4 X 12	6	1-0015282.00
3	Mounting Knob	2	1-0010528.00
4	Hex Head Cap Screw M8 X 30	2	1-0010322.00
5	Nut - M8	2	1-0010427.00
6	Lock Washer M8	2	1-0010094.00
7	Sealing Washer - M8	2	1-0012073.00
8	Mounting Bracket	1	1-0110699.00
9	Analog Meter	1	1-0010924.00
10	Scale 0-90 Degree	1	1-0013333.00
11	P.C. Board (HLAP)	1	1-0107534.00
12	Extended P.C. Board	1	1-0109416.00
13	Tile(red)	2	1-0111491.00
14	Illuminated Push Button	2	1-0111490.00
15	Key Switch	1	1-0110697.00
16	Knob (complete)	2	1-0027564.00
17	Potentiometer	2	1-0020587.00
18	Electronic Beeper	1	1-0012135.00
29	Cable Connector - PG 13.5	1	1-0010536.00
20	Cable Connector - PG 9	2	1-0010333.00



Component: **Panel - IP 65 H LAP Ind.**

Article No.: **1-0110623.00**

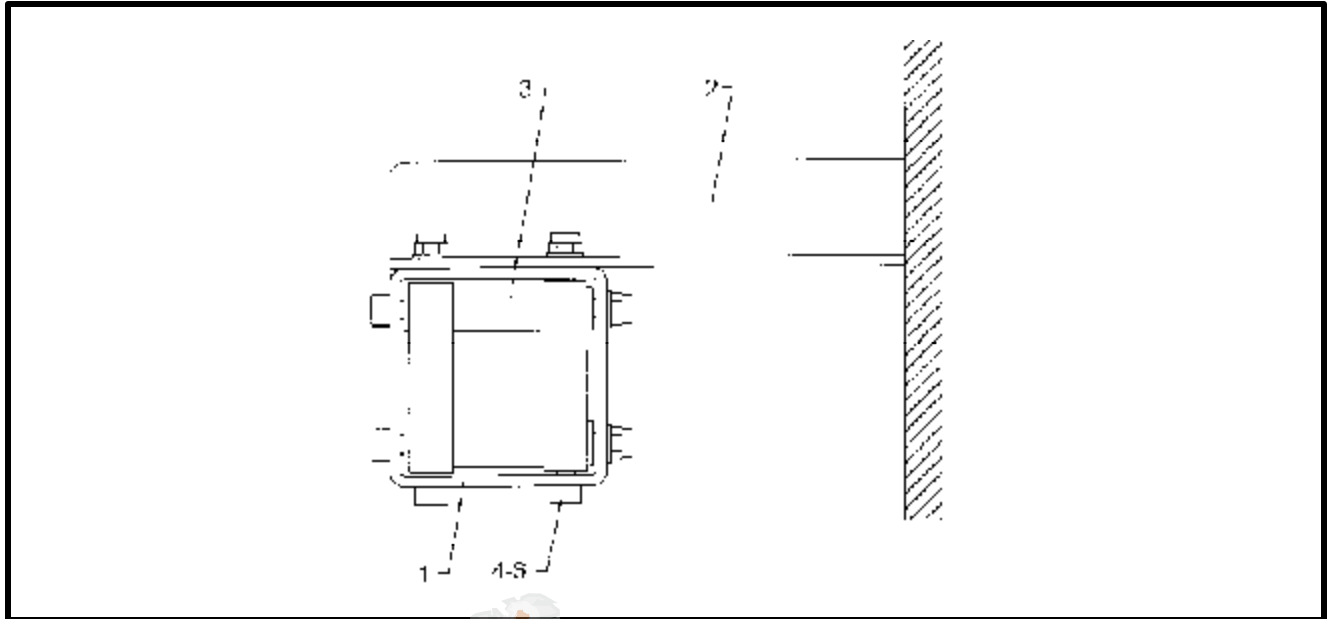


<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Housing	1	1-0110637.00
2	Countersunk Head Screw M4 X 12	6	1-0015282.00
3	Mounting Knob	2	1-0010528.00
4	Hex Head Cap Screw M8 X 30	2	1-0010322.00
5	Nut - M8	2	1-0010427.00
6	Lock Washer M8	2	1-0010094.00
7	Sealing Washer - M8	2	1-0012073.00
8	Mounting Bracket	1	1-0110699.00
9	Analog Meter	1	1-0010924.00
10	Scale 20-80 ft / 0-90 Degr.	1	1-0015042.00
11	P.C. Board (HLAP)	1	1-0107532.00
12	Extended P.C. Board	1	1-0109416.00
13	Tile(red)	2	1-0111491.00
14	Tile(transparent)	2	1-0111494.00
15	Illuminated Push Button	4	1-0111490.00
16	Key Switch	1	1-0110697.00
17	Knob (complete)	2	1-0027564.00
18	Potentiometer	2	1-0020587.00
19	Electronic Beeper	1	1-0012135.00
20	Cable Connector - PG 13.5	1	1-0010536.00
21	Cable Connector - PG 9	2	1-0010333.00

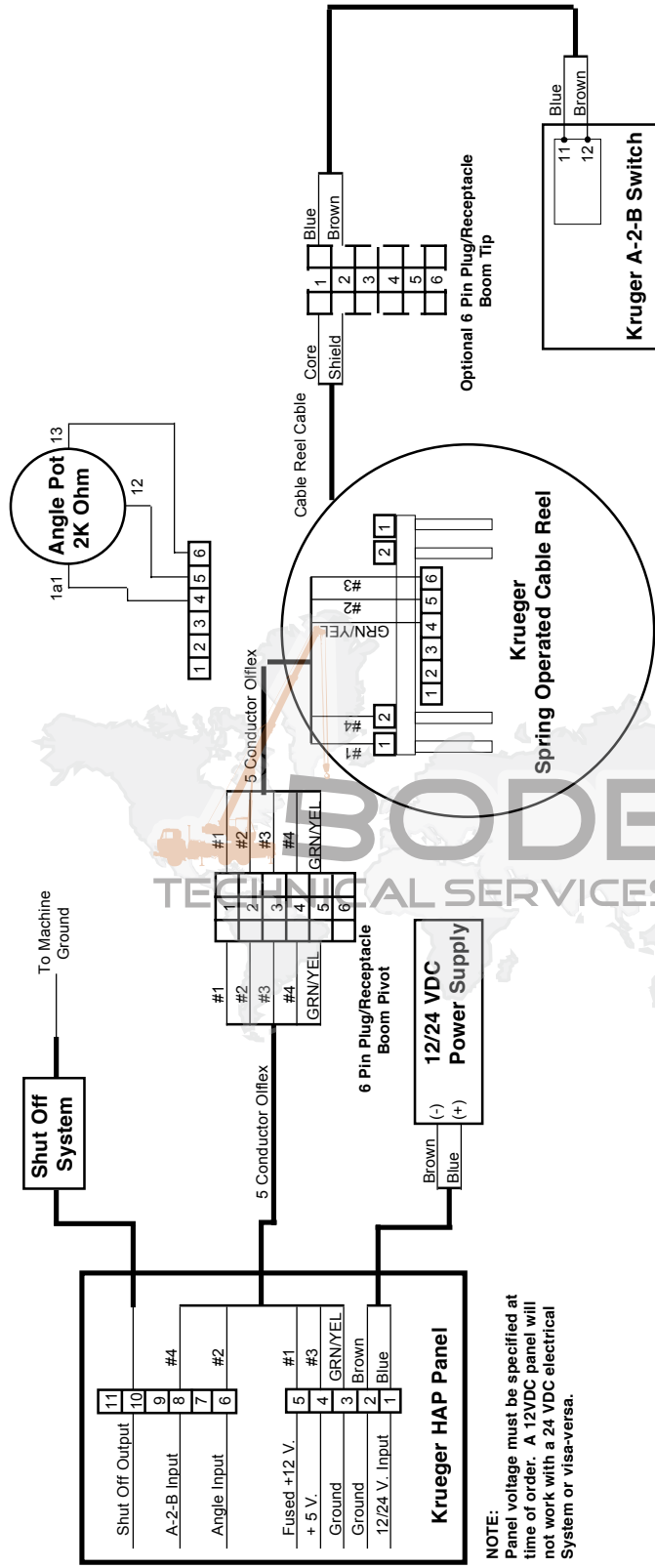


Component: **Roller Guide**

Article No.: **1-0010561.00**



<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>QUAN.</u>	<u>ARTICLE NO.</u>
1	Frame	1	1-0012365.00
2	Angle Bracket	1	1-0012367.00
3	Roller	4	1-0010589.00
4	Countersunk Hex Capscrew - #10-32 x 3"	4	1-0009977.00
5	Hex Nut w/ teflon Insert - #10	4	1-0009975.00
6	Flat Washer - #10	2	2-0000882.00



NOTE:
 Panel voltage must be specified at time of order. A 12VDC panel will not work with a 24 VDC electrical System or visa-versa.

Use 2 Conductor Olflex cable unless otherwise noted.

WIRING DIAGRAM
HAP System (IP-65)
J.G.
06/22/95

Revised 06/29/99

