

**B&D**  
**MANUFACTURING**  
safe efficient solutions

# B&D Multi Handler Diesel with MD4

## Service and Maintenance Manual





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# B&D Multi Handler Service Manual

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## Foreword

This Guide may be available in your native language. Check with your local distributor.

Congratulations on your purchase of a B&D Manufacturing product.

This Service Manual provides the user with detailed servicing information to help you further service your B&D Manufacturing Equipment.

The objective of this manual is to provide simple, clear, and complete details, procedures and instructions. These objectives are backed by B&D Manufacturing's commitment to offer superior custom designed equipment and technical support.

Every effort has been undertaken to ensure the accuracy and completeness of information in this manual. Constant efforts are made to improve the quality and performance of B&D Manufacturing products. Some details included in this Service Manual may differ slightly from your piece of equipment. If you have any questions about these differences, please contact B&D Manufacturing.

If you do not understand the information, instructions or procedure explanation in this manual or if you require further service information, contact your local distributor or B&D Manufacturing.



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## B&D Multi Handler Service Manual

### Important Contacts

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## Safety Information

### General

The operator **must** understand all outlined potential hazards described in the **Safety** section located at the front of this manual prior to operating, performing maintenance on, or troubleshooting of your equipment.

It shall be the responsibility of the employer or owner to ensure that all operators have received proper training prior to operating, performing maintenance on, or troubleshooting.

The operator **must** follow all specific site procedures and guidelines when operating, performing maintenance on, or troubleshooting this piece of equipment. In **no circumstance** shall the instructions and procedures outlined in this manual take precedence over your established **specific site procedures and guidelines**.

**Do not** undertake the operation, maintenance, troubleshooting, repairs or servicing of your piece of equipment unless you are familiar with the operation and servicing of technical equipment and have received proper training.

If your level of training, skill or comprehension of the Manual's instructions or procedures could possibly result in injury to personnel or damage to equipment, have the work done by a qualified B&D Manufacturing Representative. Your common sense and good judgment are crucial to the safe and successful operation.

At any time, if the operator suspects that a safety issue may be present with this piece of equipment perform an immediate shutdown, disconnect power source by performing a lock and tag out procedure and immediately notify your supervisor.


**NEVER permit anyone to operate, or perform maintenance on, or perform troubleshooting without first receiving proper training. Failure to do so could result in serious injury to personnel.**

- Read and understand this Manual before you operate your piece of equipment.
- Read the Cautions, Warnings, and Dangers in this section before operating.
- Review the **Safety** section and all relevant cautions, warnings and dangers each time you prepare to perform maintenance on or troubleshooting.
- Improper usage can cause injury to personnel or damage to equipment. Read and understand your site specific safety instructions **thoroughly** before operating.
- Contact B&D Manufacturing for additional training opportunities.


## Safety Notices

There are three types of Safety notices used in this manual.


- Caution Notices

| <b>CAUTION</b>  |  |
|---|--|
|  | Caution notice indicates a potential hazardous situation that if not avoided, may result in personnel injury or damage to equipment. |

- Warning Notices

| <b>WARNING</b>   |   |
|--|---|
|  | Warning notice indicates a potential hazardous situation that if not avoided, may result in serious injury or death to personnel. |

- Danger Notices

| <b>DANGER</b>   |   |
|---|---|
|  | Danger notice indicates an imminently hazardous situation that if not avoided, will result in serious injury or death to personnel. |

## **Cautions, Warnings and Dangers**

It shall be the responsibility of the employer or owner to furnish all the tools and personnel protective equipment that are required to safely operate this equipment.


Always follow established specific site procedures and guidelines and ensure tools and personnel protective equipment (PPE) are in good condition prior to Operating this piece of equipment.

Although not all of the personnel protective safety equipment is necessary to perform all instructions, procedures and tasks, most sites and facilities require them as a standard and it is good practice to use them at all times.


It is critical that the appropriate protective safety equipment be worn at all times when you operate or perform maintenance or troubleshooting.

The following lists the perceived Cautions, Warnings and Dangers that potential exist when operating. Every effort has been made to outline the potential Caution, Warning and Danger notices that may arise when operating. Even though every effort has been made the operator **must** use common sense and good judgment when operating as unforeseen hazards may develop.


**Cautions**

| <b>CAUTION</b>  |                         |
|---|-------------------------|
|  | <b>Training Caution</b> |


Refer to this Operation Manual before operating, maintaining or troubleshooting or in proximity of equipment.

| <b>CAUTION</b>  |                               |
|---|-------------------------------|
|  | <b>Eye Protection Caution</b> |


Wear Eye Protection, safety glasses with side shields or goggles, at all times when operating or in proximity of equipment.

| <b>CAUTION</b>   |                                |
|--|--------------------------------|
|  | <b>Foot Protection Caution</b> |


Wear Foot Protection at all time when operating, maintaining or troubleshooting equipment.

| <b>CAUTION</b>  |                                |
|---|--------------------------------|
|  | <b>Head Protection Caution</b> |


Wear a Hard Hat at all time when operating, maintaining or troubleshooting equipment.

| <b>CAUTION</b>  |                                    |
|---|------------------------------------|
|  | <b>Clothing Protection Caution</b> |


Never wear loose Clothing in and around equipment. Ensure that any loose items of clothing, such as sleeve cuffs and pant legs, are buttoned up or tucked in at all time when operating or in proximity of equipment.

| <b>CAUTION</b>  |                               |
|---|-------------------------------|
|  | <b>Ear Protection Caution</b> |


Operators are cautioned to wear Ear Protection as appropriate to protect against harmful levels of noise that may be present in the immediate area near equipment.

| <b>CAUTION</b>  |                                |
|---|--------------------------------|
|  | <b>Hand Protection Caution</b> |

Wear Protective Gloves at all times when performing maintenance or troubleshooting equipment.

| <b>CAUTION</b>   |                          |
|--|--------------------------|
|  | <b>Long Hair Caution</b> |

Operators with long hair must ensure that their long hair is tied, pinned or capped up prior to operating, maintaining or troubleshooting equipment.

| <b>CAUTION</b>  |                            |
|---|----------------------------|
|  | <b>Do Not Weld Caution</b> |


This Equipment contains sensitive electronics. Welding on the equipment may damage its electronic components. Prior to welding you must contact B&D Manufacturing and receive permission to proceed with your welding request.

Failure to do so may result in damage to the sensitive electronic components.

In the event that permission is granted to you to proceed with welding you should observe the following guidelines.


- The Disconnect Switch must be placed in the off position. Always install your keyed lock into Disconnect Switch handle. Perform your site's required Lock-out and Tag-out procedure.
- The ground wire of the Welder shall be positioned as close as possible to the area of welding.
- The cables on the Welder shall never be placed near any electrical wires, cables or harnesses of the Multi Handler's electrical and control system.

**Warnings**

| <b>WARNING</b>  |                            |
|---|----------------------------|
|  | <b>Pinch Point Warning</b> |


could result in serious injury or death.

Always ensure that the supplied Safety Guards are in place before operating. Never place any parts of your body, including loose clothing, hair or jewelry, in close proximity to or inside any moving parts. Failure to do so

| <b>WARNING</b>  |   |
|---|---|
|  | <b>Chain and Sprocket Pinch Point Warning</b> |


could result in serious injury or death.

Always ensure that the supplied Safety Guards are in place before operating. Never place any parts of your body, including loose clothing, hair or jewelry, in close proximity to or inside any moving parts. Failure to do so

| <b>WARNING</b>  |                               |
|---|-------------------------------|
|  | <b>Rotating Parts Warning</b> |

could result in serious injury or death.

Always ensure that the supplied Safety Guards are in place before operating. Never place any parts of your body, including loose clothing, hair or jewelry, in close proximity to or inside any moving parts. Failure to do so

| <b>WARNING</b>  |                                |
|---|--------------------------------|
|  | <b>Tripping Hazard Warning</b> |

Always visually inspect and stay alert when walking, stepping onto or off of equipment. Failure to do so could result in serious injury or death.

| <b>WARNING</b>  |                     |
|---|---------------------|
|  | <b>Fall Warning</b> |

where there is a risk of falling. Failure to do so could result in serious injury or death.

Always ensure that the Safety Gates are properly closed and you are fully aware of your surrounding when standing on elevated surface or work decks. Make sure you are wearing proper PPE when working in areas

**WARNING****Burn Warning**

Keep your hands, clothing and other body parts away from potentially hot surfaces when in proximity, during operation and after shutdown of equipment. These surfaces may become extremely hot and may


seriously burn you. Wait until the equipment cools before performing maintenance or troubleshooting. Failure to do so could result in serious injury.

**WARNING****Drive Assembly Warning**

Always visually inspect the Safety Perimeter around equipment for other personnel, tools or other objects before any directional rotation of equipment drives (eg. track drives, wheel drives etc.). Failure to do so


could result in serious injury or death.

**Dangers**


| <b>DANGER</b>   |                              |
|---|------------------------------|
|  | <b>Rotating Parts Danger</b> |

could result in serious injury or death.


Always visually inspect the area around equipment for objects, tools or other personnel, before operating. Advise all personnel to immediately clear the safety perimeter prior to beginning operations. Failure to do so

| <b>DANGER</b>   |                           |
|---|---------------------------|
|  | <b>Pinch Point Danger</b> |

Always visually inspect all of the equipment's pinch points for any obstructions. Ensure that all guards are securely in place prior to beginning operations of equipment. Failure to do so could result in serious injury or death.


| <b>DANGER</b>   |                          |
|---|--------------------------|
|  | <b>Entrapment Danger</b> |

Always visually inspect for other personnel, the Safety Perimeter around the equipment and along the path you intend on driving and steering the equipment through. Failure to do so could result in serious injury or death.


| <b>DANGER</b>   |                              |
|---|------------------------------|
|  | <b>Falling Object Danger</b> |

Failure to do so could result in serious injury or death.


Stand clear of the area when the equipment is supporting a load, is being hoisted or moved through the air with properly rated lifting equipment. Only lifting equipment that is properly rated for the weight load of the equipment must be used.

| <b>DANGER</b>   |                        |
|---|------------------------|
|  | <b>Lock Out Danger</b> |


Always install your keyed lock into equipment's Disconnect Switch handle when performing maintenance and to prevent others from actuating the equipment's functions. Failure to do so could result in serious injury or death.

| <b>DANGER</b>   |                            |
|---|----------------------------|
|  | <p><b>Fire Danger,</b></p> |

Diesel Fuel is flammable and explosive under certain conditions. Never remove the Diesel Fuel Tank's Cap when the Diesel Engine is in operation. Never refuel the Diesel Fuel Tank when the Diesel Engine is in operation. Keep all open flames or other forms of ignition away from the equipment at all times. Failure to do so could result in serious injury or death to personnel.

| <b>DANGER</b>   |   |
|---|---|
|  | <p><b>Exhaust &amp; Harmful Emissions Danger.</b></p> |

Internal combustion engines produce carbon monoxide gas during operation. The accumulation of carbon monoxide gas within an area that is not properly ventilated could cause illness or death. Never operate the Diesel Engine in an enclosed area without proper ventilation. Never block the means of ventilation if the Diesel Engine is in operation. Failure to do so could result in serious injury or death to personnel.

| <b>DANGER</b>   |                                |
|---|--------------------------------|
|  | <p><b>Explosion Danger</b></p> |

Never short out Battery terminals. Shorting of battery terminals may result in the ignition of a spark that could lead to an explosion fire.

## **Servicing Your Equipment Safely**

Performing routine maintenance is important in keeping your Multi Handler in good operating condition.

B&D Manufacturing recommends that all maintenance be performed indoors, whenever possible, to prevent environmental conditions, such as rain, wind, or snow from damaging any of the Multi Handler's components.

The information contained in this section should be used as a general guideline for maintaining your Multi Handler in good operating condition. B&D Manufacturing recommends that your site establish its own periodic maintenance schedule based on the recommendations set forth in this manual.

**NEVER permit anyone to do maintenance on, or perform troubleshooting on your Multi Handler without first receiving proper training. Failure to do so could result in serious injury or death to personnel.**

- Read and understand this Manual before you perform maintenance or troubleshooting your Multi Handler.
- Read the Cautions, Warnings and Dangers in the **Safety** section of this manual before you operate or perform maintenance on, or perform troubleshooting on your Multi Handler.
- Read instructions and procedures thoroughly before you start to operate or perform maintenance on, or perform troubleshooting on your Multi Handler.
- Review all warnings, cautions and dangers that accompany any instruction or procedure.
- Review the **Safety** section and all relevant warnings, cautions and dangers each time you prepare to perform maintenance on or troubleshooting on your Multi Handler.
- Safety decals on the Multi Handler serve as additional reminders for safe operating practices.
- Contact B&D Manufacturing for additional training opportunities.
- B&D Manufacturing recommends that the daily maintenance requirements listed in this section be performed each day prior to starting the Multi Handler.

Keep all parts of your equipment in good condition and properly installed as per OEM recommendations. It is imperative to keep equipment as clean as possible to aid in diagnosing any possible issues. Fix and repair any damaged, worn or broken parts immediately.



## **Component Overview**

This section of the manual provides a visual overview of the major components and assemblies incorporated into the Multi Handler supplied by B&D Manufacturing.

The Multi Handler consists of the following major components and assemblies.

- Drive Wheel Assemblies
- Strut Assemblies
- Steering Assemblies
- Cross Slide Assemblies
- Operator Work Deck
- Diesel Engine
- Controls System
- Electrical System
- Hydraulic System

Refer to B&D Manufacturing parts manual for replacement parts.

## Major Components

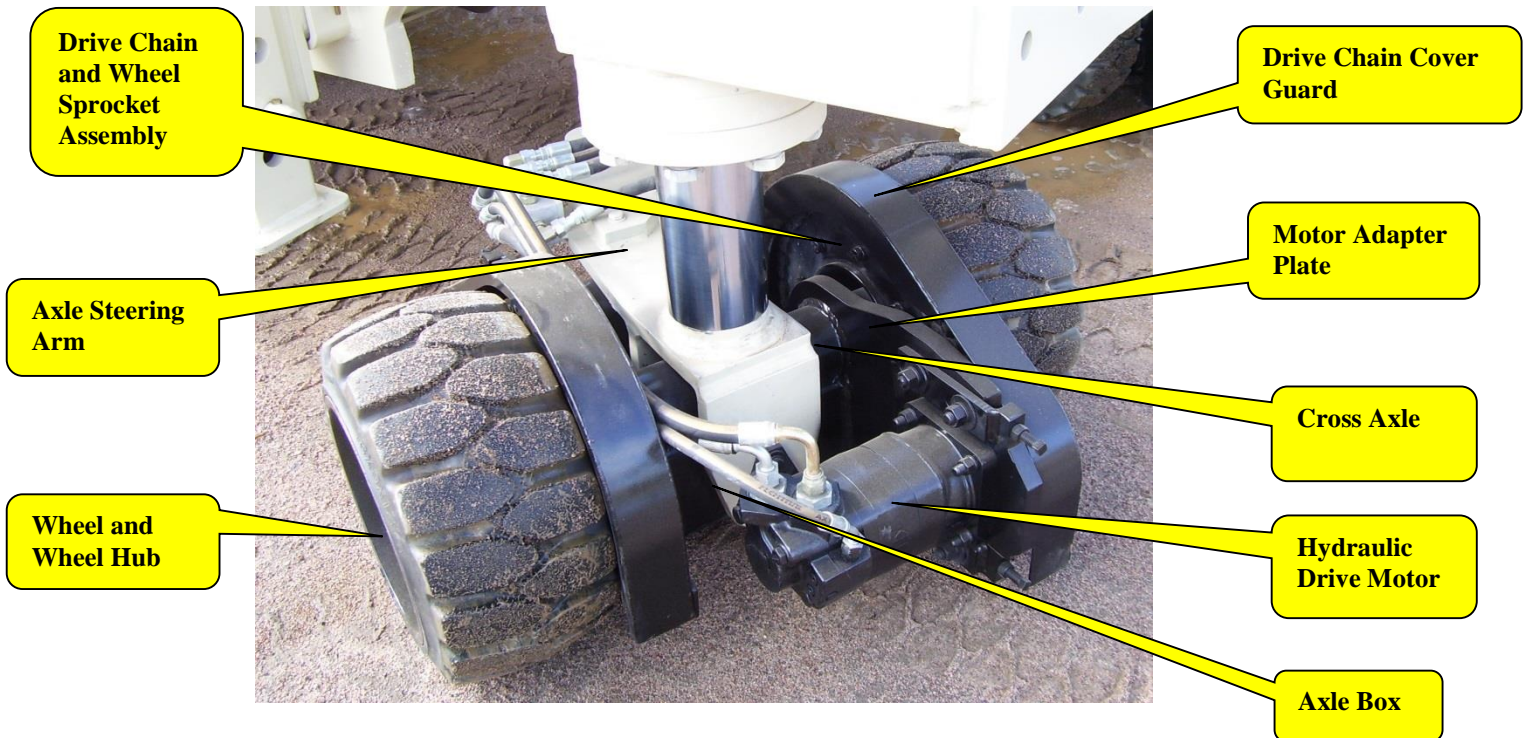
### Drive Wheel Assemblies

The Multi Handler is equipped with three drive wheel assemblies. One located on the front left side, one located on the front right side and the other located inside the rear of the Multi Handler's main frame.



The Drive Wheel Assemblies consist of the following components.

- Hydraulic Drive Motor
- Motor Adapter Plate
- Axle Box
- Axle Steering Arm
- Cross Axle
- Wheel and Wheel Hub
- Drive Chain and Wheel Sprocket Assembly
- Drive Chain Cover Guard



### **Hydraulic Drive Motor**

The hydraulic drive motor consists of a motor with 12,000 in.lb of holding torque that will operate within nominal hydraulic pressures of up to 2500 psi.

The purpose of the hydraulic drive motor is to provide hydraulically coupled fluid drive power to the drive wheel assembly.

### **Motor Adapter Plate**

The purpose of the motor adapter plate is to provide a means to facilitate the tightening of the drive chain.

### **Axle Box**

The axle box provides a pivoting anchor point for the drive wheel assemblies.

### **Axle Steering Arm**

The axle steering arm provides a point of attachment for both front steering assembly tie rod steering arm and the rear steering assembly's steering cylinder.

### **Cross Axle**

The cross axle provides a means of mounting the wheel and wheel hub to the drive wheel assembly.

### **Wheel and Wheel Hub**

The wheel consists of a vulcanized rubber assembly that is pressed on to the wheel hub.

### **Drive Chain and Wheel Sprocket Assembly**

Each drive wheel assembly includes two sprockets. The drive sprocket is located on the drive motor and mounted via a spline style shaft. The driven sprocket is mounted to and located on the drive wheel and axle assembly. Together the 1.5" pitch drive chain and sprocket assembly mechanically links the hydraulic drive motor to the wheel and wheel hub assembly. This mechanical drive link also includes a mechanical gear reduction.

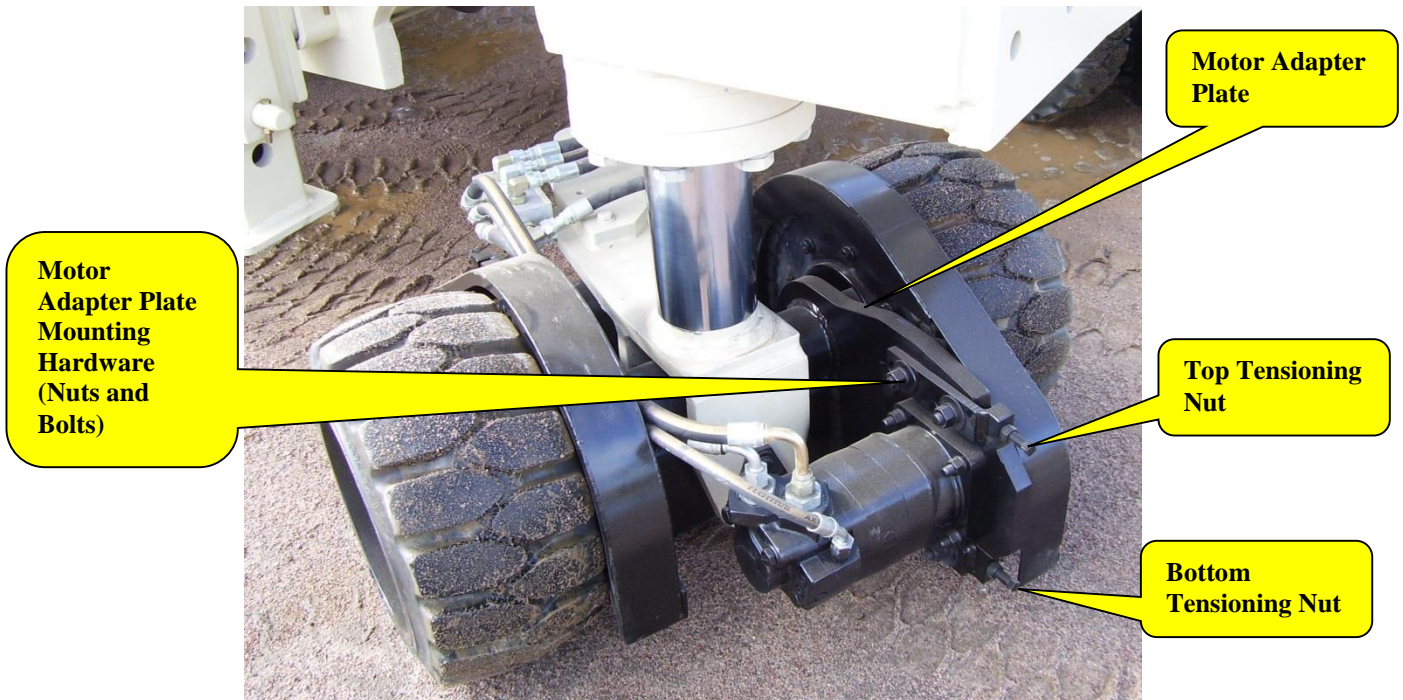
Apply spray on chain lubricant to the drive chain approximately once every 20 hours.

**Note:** If you are operating your Multi Handler in an above average dirty environment we recommend you monitor and lubricate your drive chain more frequently.

### **Drive Chain Cover Guard**

The purpose of the drive chain cover guard is to act as a safety guard and to eliminate the pinch point hazard that exists between the moving parts of the drive sprocket, the driven sprocket and the drive chain of the drive wheel assembly.

## Drive Chain Tightening and Loosening Procedure



Use the following procedure to adjust the drive chain tension:

- Shut down and perform lock-out procedure on your Multi Handler.
- Loosen the Motor Adapter Plate's mounting hardware, nuts and bolts.
- Turn the top and bottom tensioning nuts, located on the Motor Adapter Plate, in the clockwise direction to tighten the drive chain or in the counterclockwise direction to loosen the drive chain.
- Once the desired tension is achieved, re-tighten the Motor Adapter Plate's mounting hardware, nuts and bolts.

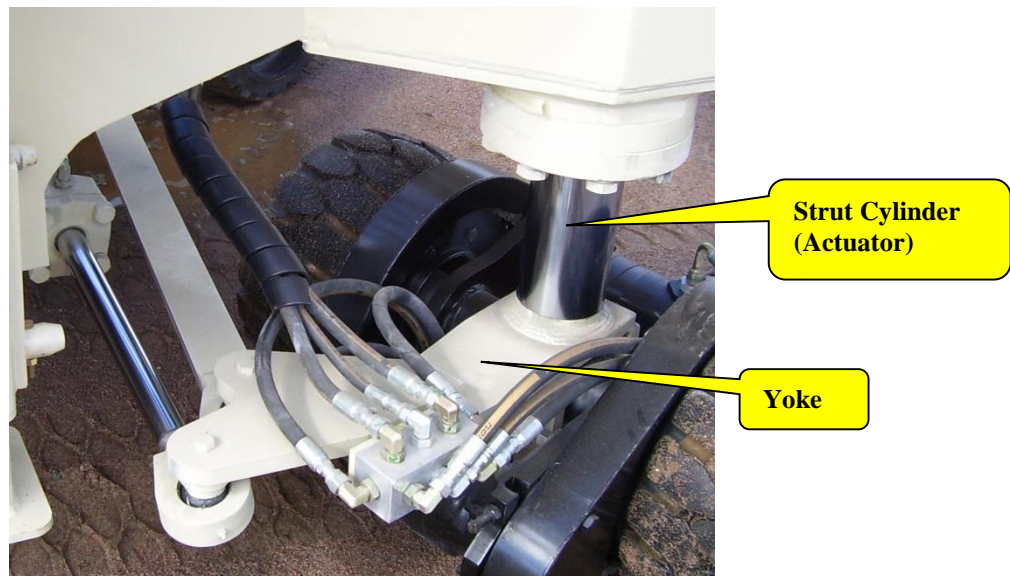
### Strut Assemblies

The Multi Handler is equipped with three strut assemblies. One located on the front left side, one located on the front right side and the other located inside the rear of the Multi Handler's main frame.



The Strut Assemblies consist of the following components.

- Strut Cylinder (Actuator)
- Motion and Flow Control
- Yoke

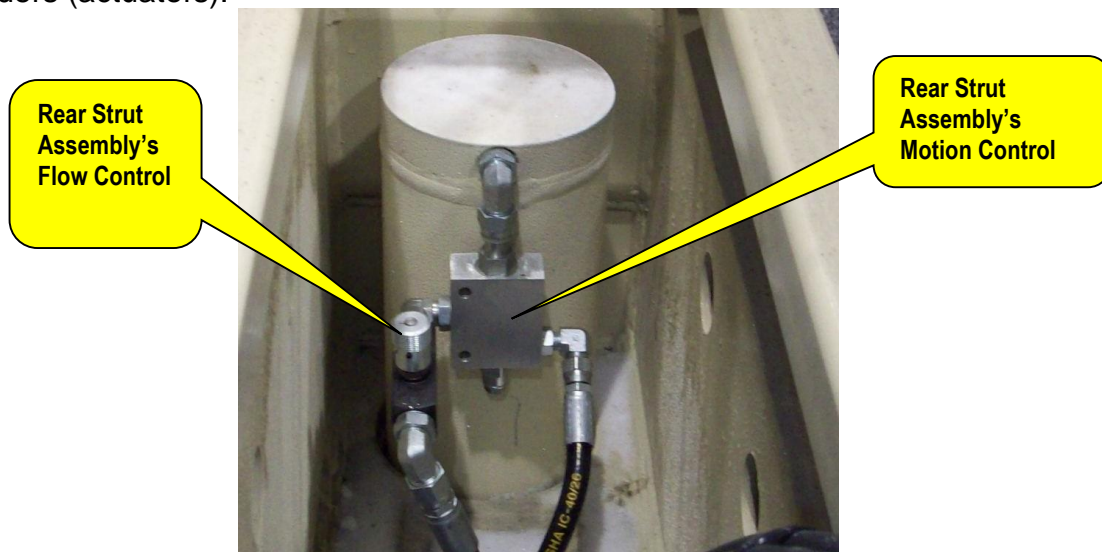


### Strut Cylinder (Actuator)

The strut cylinder consists of a heavy duty hydraulic cylinder that will operate within nominal hydraulic pressures of up to 2500 psi.

### Motion and Flow Control

The motion control prevents the strut assemblies from being lowered in the event of a hydraulic hose failure. The motion control also includes an embedded flow control to assist in controlling the lowering speed of the strut assemblies by limiting the flow rate of the hydraulic oil exiting the cylinders (actuators).

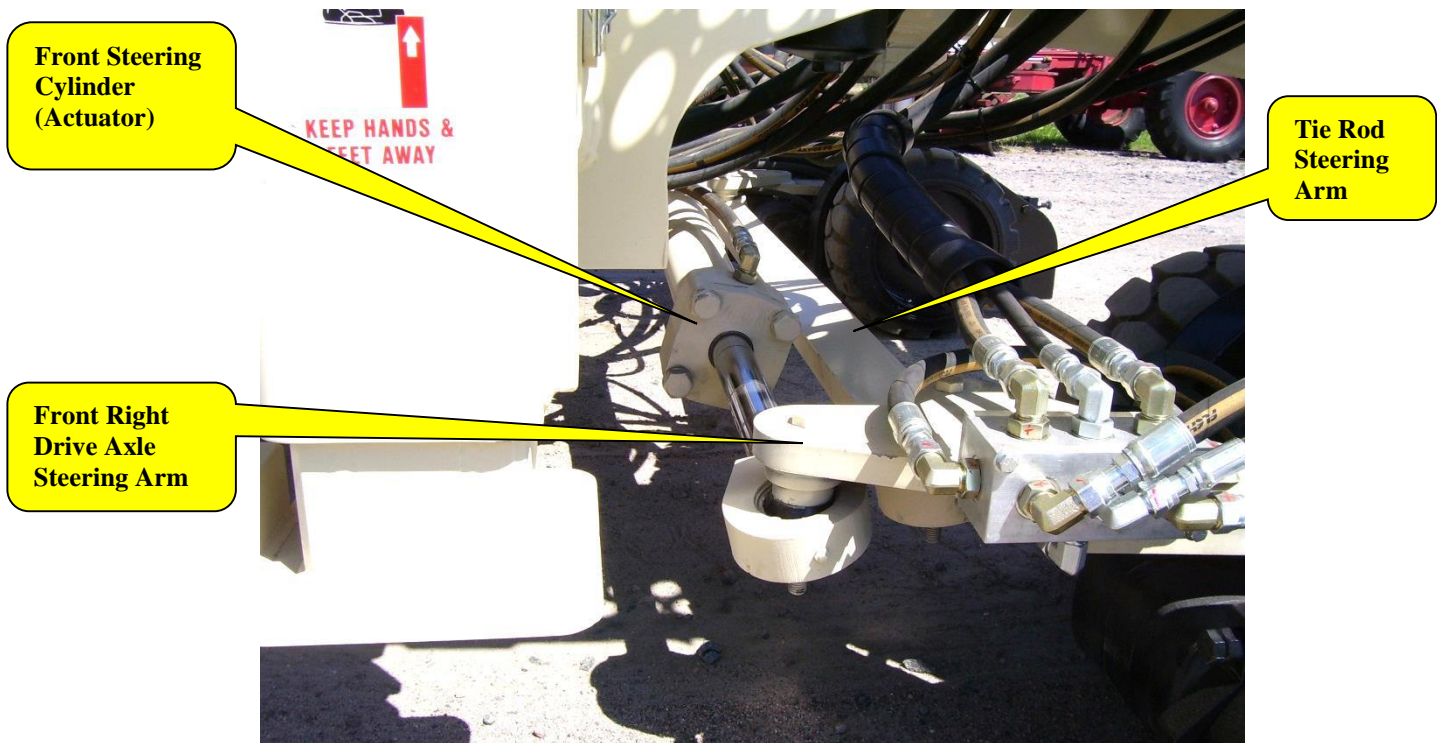


### Yoke

The purpose of the yoke is to provide a means of mechanically attaching the strut cylinder (Actuator) to the drive wheel assembly.

## Steering Assemblies

The Multi Handler is equipped with two steering assemblies. One located inside the front of the Multi Handler's main frame and the other one located inside the rear of the Multi Handler's main frame.



The Front Steering Assembly consists of the following components.

- Front Steering Cylinder (Actuator)
- Tie Rod Steering Arm

The Rear Steering Assembly consists of the following component.

- Steering Cylinder (Actuator)

## Steering Cylinder

The Steering Cylinders consist of a heavy duty hydraulic cylinder that will operate within nominal hydraulic pressures of up to 2500 psi. The Steering Cylinder's function is to pivot the Drive Wheel Assemblies in the left or right directions.



### **Tie Rod Steering Arm**

The purpose of the Tie Rod Steering Arm is to provide a mechanical link between the front left and front right drive wheel assemblies.

The tie rod steering arm is attached to the front left drive wheel assembly's axle steering arm at one end and to the front right drive wheel assembly's axle steering arm at the other. Provisions have been included to adjust the overall length of the tie rod end.

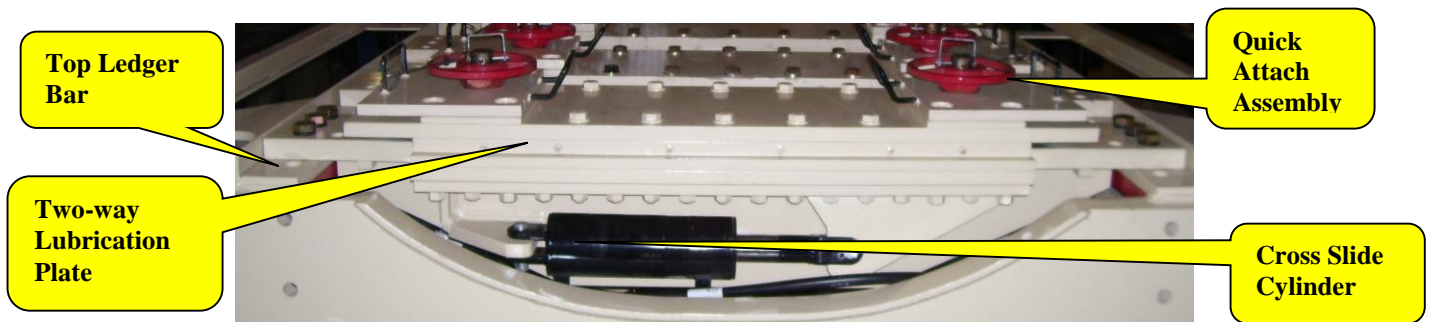
### Cross Slide Assemblies

The Multi Handler is equipped with two Cross Slide Assemblies. One located inside the front of the Multi Handler's main frame and the other one located inside the rear of the Multi Handler's main frame.



The Cross Slide Assemblies consist of the following components.

- Cross Slide Cylinders (Actuators)
- Quick Attach Clamp Plate
- Quick Attach Locking Handle
- Two-way Lubrication (Slider) Plate
- Lower Frame Assembly



The Cross Slide Assemblies are fastened to the Multi Handler's main frame by way of mounting bolts that are installed through the Cross Slide Assembly and main frame's top ledger bar.

**Cross Slide Cylinders (Actuators)**

There are two hydraulic cylinders included in the design of each Cross Slide Assembly. The Cross Slide Cylinders consist of a heavy duty hydraulic cylinder that will operate within nominal hydraulic pressures of up to 2500 psi.

The Cross Slide Cylinder includes a cap fixed clevis style mount at both ends, one for securing it to the lower frame assembly and the other to attach it to the two-way lubrication plate.

**Quick Attach Clamp Plate and Locking Handle**

Each Cross Slide Assembly includes two quick attach clamp plate and locking handle. The purposes of the quick attach clamp plate and locking handle is to provide a means of securing truck specific component attachments to the Multi Handler.

**Two-way Lubrication Plate**

A Two-way Lubrication Plate is included with the Cross Slide Assemblies. The two-way lubrication plate facilitates the left and right movement of the cross slide assembly and wheel motor attachment.

### Operator Work Deck

The Multi Handler is equipped with an operator work deck. The operator work deck provides the operator with a platform to stand on while removing and installing the truck's wheel motor group.

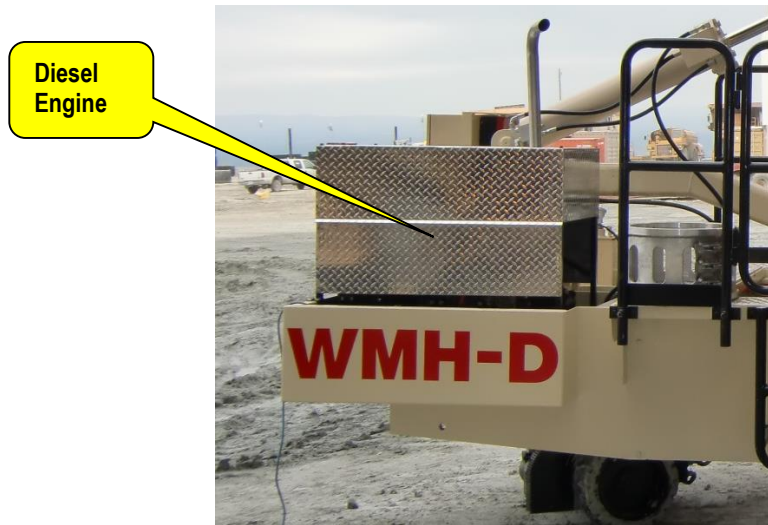


The operator work deck consists of the following components.


- Safety Gate
- Step Ladder
- Hand Rails
- Catwalk

### Diesel Engine

Two types of diesel engine are included in your Multi Handler. A low altitude diesel engine will come standard in a Multi handler and a high altitude engine is generally equipped when working at greater than 10 000ft above sea level.



B&D Manufacturing’s Diesel Engine meets EPA (Environmental Protection Agency) emission control standards and California ARB (Air Resources Board) regulations.

| <b>DANGER</b>   |  |
|---|--|
|  | <b>Exhaust &amp; Harmful Emissions Danger.</b> |

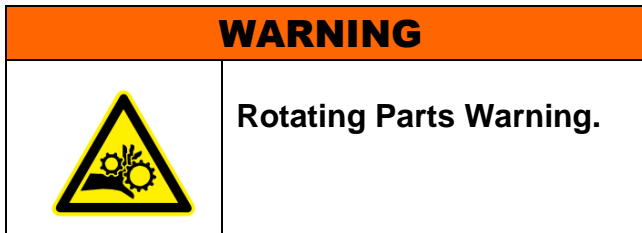
The diesel engine is located inside rear of the Multi Handler’s main frame. It is important to fill the diesel engine with engine oil that meets or exceeds the guidelines and classifications recommended by the engine manufacturer.

The Diesel Engine consists of the following main components.

- Cooling System
- Fuel System
- Inlet Air Heater
- Diesel Engine Micro Panel

### Cooling System

The Diesel Engine is generally liquid cooled. Only fill the cooling system with engine coolant that meets the guidelines and specifications recommended by the engine manufacturer.



### Fuel System

The Diesel Engine's fuel system is equipped with the following:

- Fuel Pump
- Fuel Filter and Water Separator
- Fuel Tank Reservoir

### Fuel Tank Reservoir

The fuel tank reservoir is located inside the rear center of the Multi Handler's main frame. Fuel tank capacity is 47 liters (12.5 US gallons).



Only fill the fuel tank reservoir with diesel fuel that complies with the specifications recommended engine manufacturer. **Refer to the recommended fluids list for further information.**

## Controls System

The Controls System components are located on and inside of the electrical panel assembly.

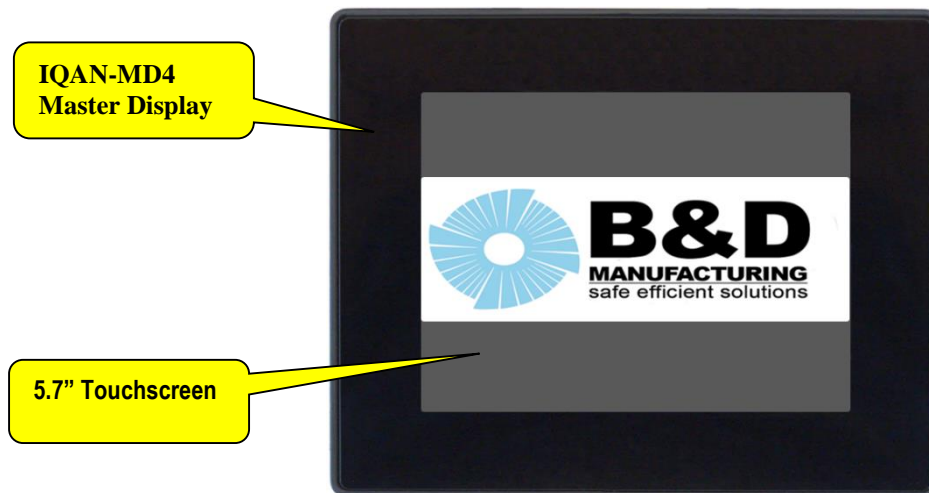
The Controls System consists of the following components.

- Display Module
- Expansion Modules
- Radio Terminal
- Base Unit
- Warning Horn
- Motion Beeper

The Master Display, the Expansion Modules, the Base Unit and the Radio Terminal communicate via serial CAN-bus communications and function as the Multi Handler's controls system.

### Display Module IQAN-MD4

The Master Display, IQAN-MD4, is the heart of the Multi Handler's Controls System and is mounted on the exterior door's surface of the electrical panel assembly.



The display module contains the Multi Handler's application software, displays conditional text messages, performs application calculations and decisions and, initiates all communications to and from the two expansion modules and the Base Unit.

The IQAN-MD4 display has a capacitive touch screen enabling the user to control the display with the use of fingers, passive stylus, thin gloves or thicker gloves with conductive material in the finger tips. The touch sensor is protected from wear behind a glass surface.

The rear of the IQAN-MD4 is equipped with four (4) CAN buses, CAN-A to CAN-D and two Ethernet communication ports, port A (C3) and port B (C4). The CAN buses are configured for use with the IQAN expansion modules and IQAN Bluetooth adapter (dongle).



The following table lists the IQAN-MD4's C1 connector pin assignments.

| Description | Pin Assignment | Comments   |
|-------------|----------------|--|
| -BAT        | 1              | DC Common (Ground)   |
| CAN-A-L     | 2              | CAN-bus A Serial Communications Low Signal To IQAN Bluetooth adapter (IQAN-G11-3)  |
| CAN-B-L     | 3              | CAN-bus B Serial Communications Low Signal To XC43 Expansion Module (XC-C1-B0:2)   |
| CAN-C-L     | 4              | CAN-bus C Serial Communications Low Signal To Base Unit (MC-IRX J5-1)              |
| CAN-D-L     | 5              | CAN-bus D Serial Communications Low Signal To XC43 Expansion Module (XC-C1-D1:2)   |
| ADDR-L      | 6              | Low side address tag   |
| ADDR-H      | 7              | High side address tag  |
| CAN-D-H     | 8              | CAN-bus D Serial Communications High Signal To XC43 Expansion Module (XC-C1-D1:18) |
| CAN-C-H     | 9              | CAN-bus C Serial Communications High Signal To Base Unit (MC-IRX J5-3)             |
| CAN-B-H     | 10             | CAN-bus B Serial Communications High Signal To XC43 Expansion Module (XC-C1-B0:18) |
| CAN-A-H     | 11             | CAN-bus A Serial Communications High Signal To IQAN Bluetooth adapter (IQAN-G11-4) |
| +BAT        | 12             | +12VDC Power Supply Input  |

The following table lists the IQAN-MD4's C2 connector pin assignments.

| Description  | Pin Assignment | Comments        |
|--------------|----------------|-----------------|
| VIN-A/DIN-I  | 1              | Not Used        |
| VIN-B/DIN-J  | 2              | Not Used        |
| DIN-A/DOUT-A | 3              | Not Used        |
| DIN-B/DOUT-B | 4              | Not Used        |
| DIN-C/DOUT-C | 5              | Not Used        |
| DIN-D/DOUT-D | 6              | Not Used        |
| DIN-E        | 7              | Not Used        |
| DIN-F        | 8              | Not Used        |
| DIN-G        | 9              | Not Used        |
| DIN-H        | 10             | Not Used        |
| +Vref        | 11             | Not Used        |
| +RTC         | 12             | Real Time Clock |

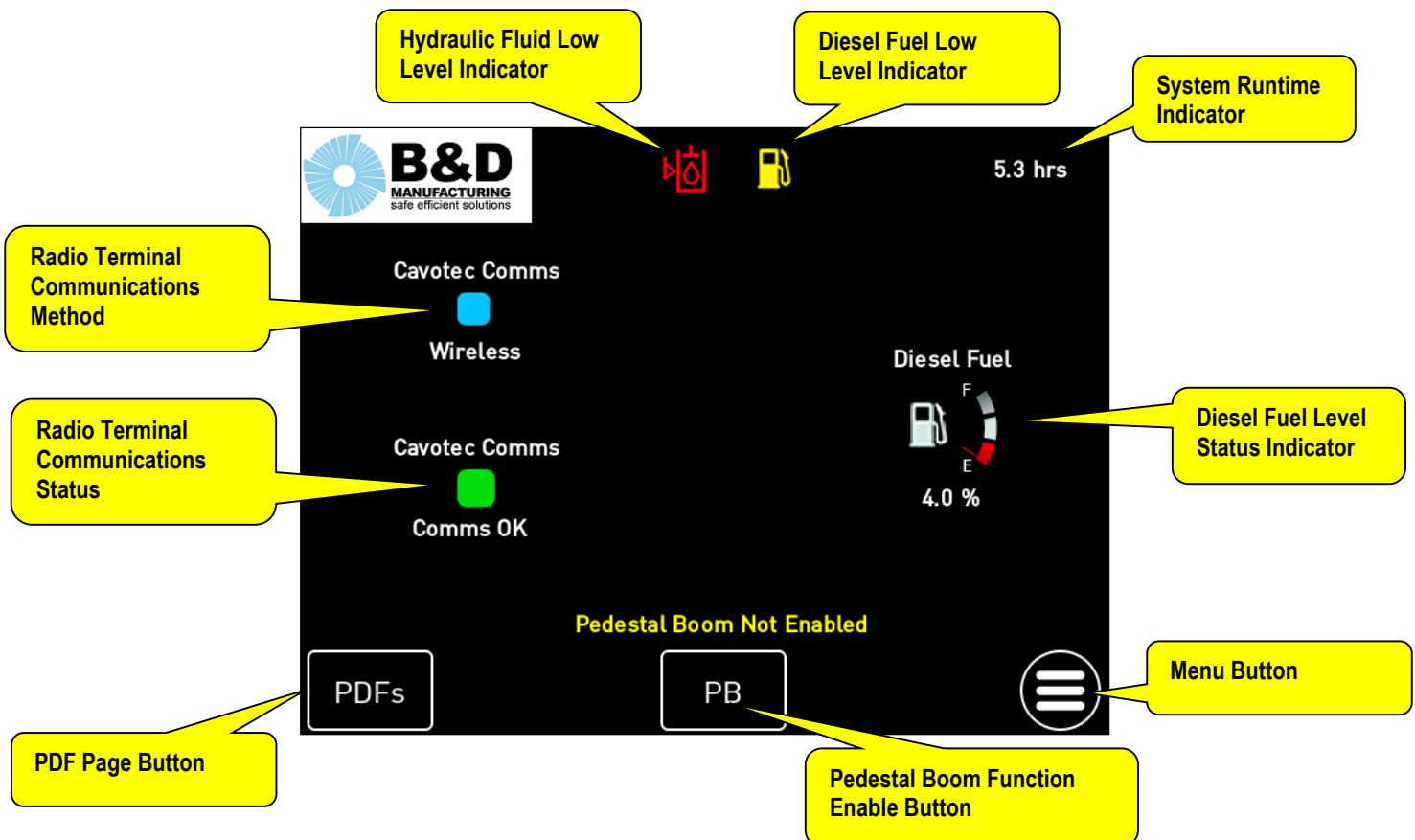
### Start Up Image

When the IQAN-MD4 Master Display starts after power to it is switched on, a start-up image will be displayed on the Master Display for a short period of time before the Main Display screen appears shown. The start-up image is shown below.



### Main Display Screen

The Main Display screen will replace the Start Up image on the IQAN-MD4 Master Display within a few seconds of having power applied to the Master Display. The Main Display screen is shown below.



The IQAN-MD4 Main Display screen consists of the following components.

- **Diesel Fuel Level Indicator.** The Diesel Fuel Level Indicator provides the operator with a graphical indication of the diesel fuel level contained in the Reservoir.

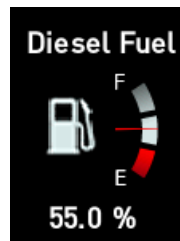
The Diesel Fuel Level Indicator's icon will be displayed as "gray" in color whenever the diesel fuel is above the low level set point value.



The Diesel Fuel Level Indicator's icon will be displayed as "yellow" in color whenever the diesel fuel reservoir becomes low.



- **Diesel Fuel Status.** The Diesel Fuel Status provides the operator with a numerical and graphical indication of the diesel fuel level that remains in the Reservoir. The current value of the Diesel Fuel Status is monitored via the Fuel Gauge sensor located on top of the fuel tank.



- **Hydraulic Fluid Indicator.** The Hydraulic Fluid Indicator provides the operator with a graphical indication of the ok status of the hydraulic fluid level contained in the Hydraulic Fluid Tank Reservoir.

The Hydraulic Fluid Indicator's icon will be displayed as "gray" in color whenever the hydraulic fluid level contained in the Hydraulic Fluid Tank Reservoir is above the low level setpoint value and its status is ok.



The low level setpoint is a discrete digital input signal hardwired into the IQAN-XC43 module.

The Hydraulic Fluid Indicator's icon will be displayed as "red" in color whenever the hydraulic fluid fuel level contained in the Hydraulic Fluid Tank Reservoir is below the low level setpoint value and its status is low.



- **System Runtime Indicator.** The Runtime Indicator provides the operator with a numerical indication of the total runtime, in hours, accumulated on the Multi Handler. The runtime indicator will start incrementing whenever the Multi Handler's IQAN-MD4 Master Display is powered.
- **Radio Terminal Comms Status.** The Radio Terminal Comms Status provides the operator with a textural and graphical indication of the communication status between the Cavotec Radio Terminal and Base Unit.

The Radio Terminal Comms Status icon will be displayed as "red" in color and its text indicator will display "Not OK" whenever communications has not been established or has been terminated between the Radio Terminal and the Base Unit.



The Radio Terminal Comms Status icon will be displayed as "green" in color and its text indicator will display "Comms OK" whenever communications has been established and the data being transmitted between the Radio Terminal and the Base Unit is valid been.



- **Radio Terminal Comms Method.** The Radio Terminal Comms Method provides the operator with a textural and graphical indication of the means of communication between the Cavotec Radio Terminal and Base Unit.

The Radio Terminal Comms Method icon will be displayed as "cyan" in color and its text indicator will display "Wireless" whenever communications between the Radio Terminal and the Base Unit is being achieved wirelessly.



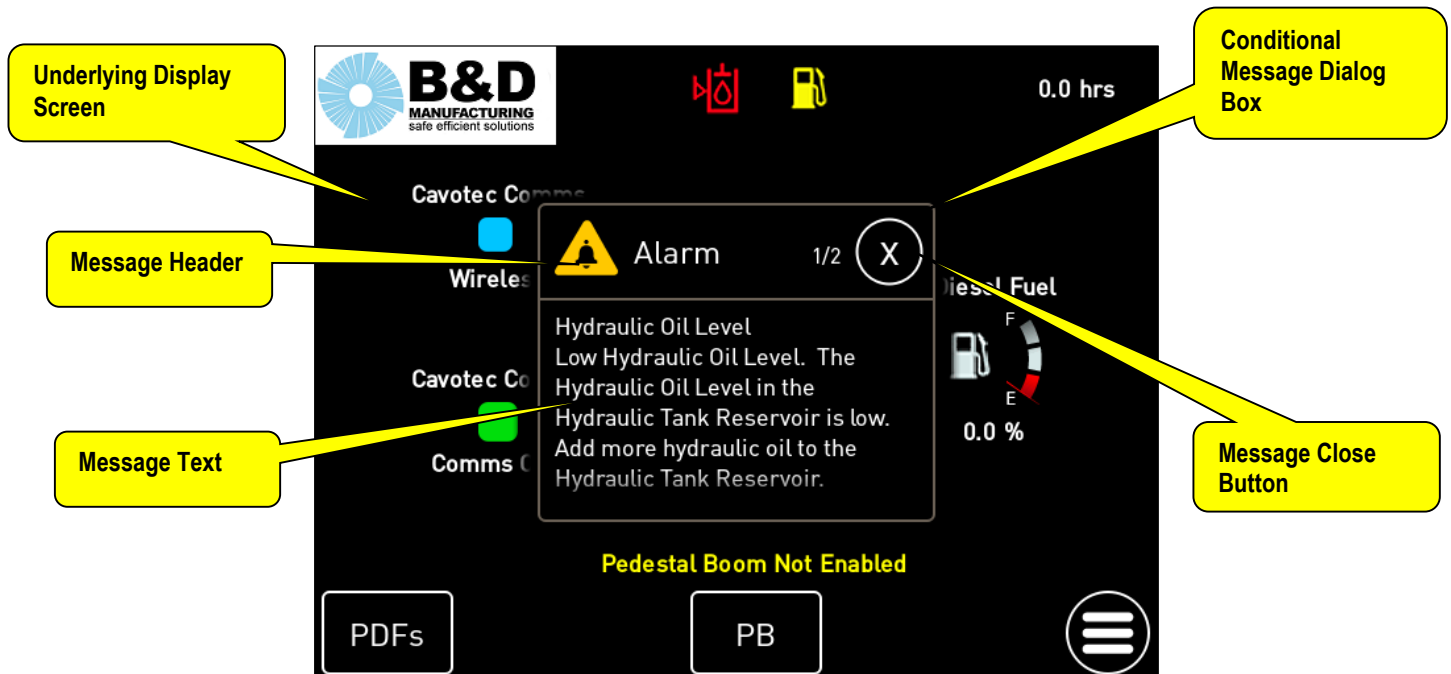
The Radio Terminal Comms Method icon will be displayed as "green" in color and its text indicator will display "Hardwired" whenever communications between the Radio Terminal and the Base Unit is being achieved via the communication cable.



## Conditional Messages

When activated by the IQAN-MD4's application, conditional messages will be displayed in Dialog Boxes that will appear on top of the IQAN-MD4's active display screen. The Dialog box window is smaller than the total IQAN-MD4 display size. This means that the underlying display screen will be visible around the conditional message Dialog Box. All of the underlying display screen's buttons will be disabled while the Dialog Box is visible on the IQAN-MD4 display.

A typical conditional message that may appear on an IQAN-MD4 Master Display screen is shown below.



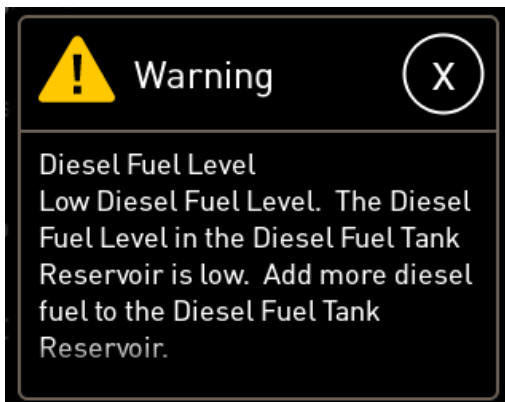
The conditional messages that appear on the IQAN-MD4 Master Display will remain visible until either the operator presses the message close button or the activating condition is no longer present.

The following conditional messages may be displayed on the IQAN-MD4's Master Display.

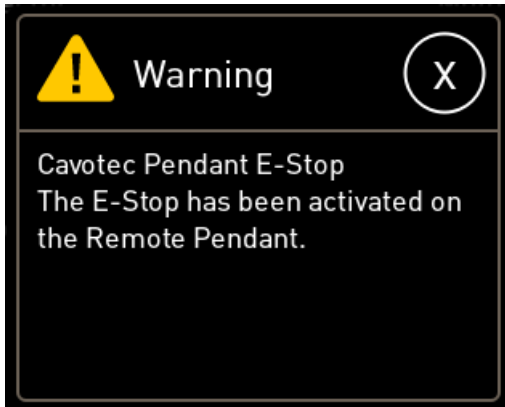
- Low Hydraulic Oil Level. The Hydraulic Oil Level in the Hydraulic Tank Reservoir is low. Add more hydraulic oil to the Hydraulic Tank Reservoir.



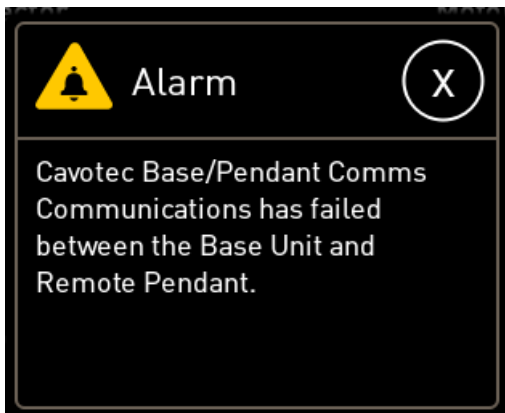
- Low Diesel Fuel Level. The diesel fuel level in the diesel fuel tank reservoir is low. add more diesel fuel to the diesel fuel tank reservoir.



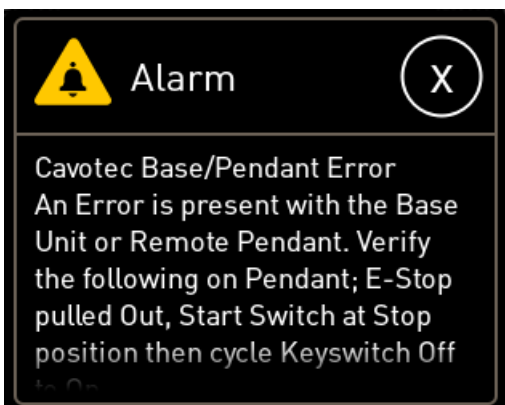
- Cavotec Pendant E-Stop. The E-Stop (emergency stop) pushbutton has been activated, pushed down, on the Cavotec Radio Terminal.



- Cavotec Base/Pendant Comms. Communications between the Cavotec Radio Terminal and Base Unit has failed.



- Cavotec Base/Pendant Error. An Error is present with the Cavotec Radio Terminal and/or Base Unit. Verify the state of each of the following on the Radio Terminal; E-Stop (emergency stop), Motor switch and Keyswitch.



### Parameters and Settings

The Operator can view and adjust certain system, IQAN module and IQAN channel parameters and settings as well as re-configure the IQAN-MD4's date and time by accessing the Main Parameters and Settings navigation display screen.

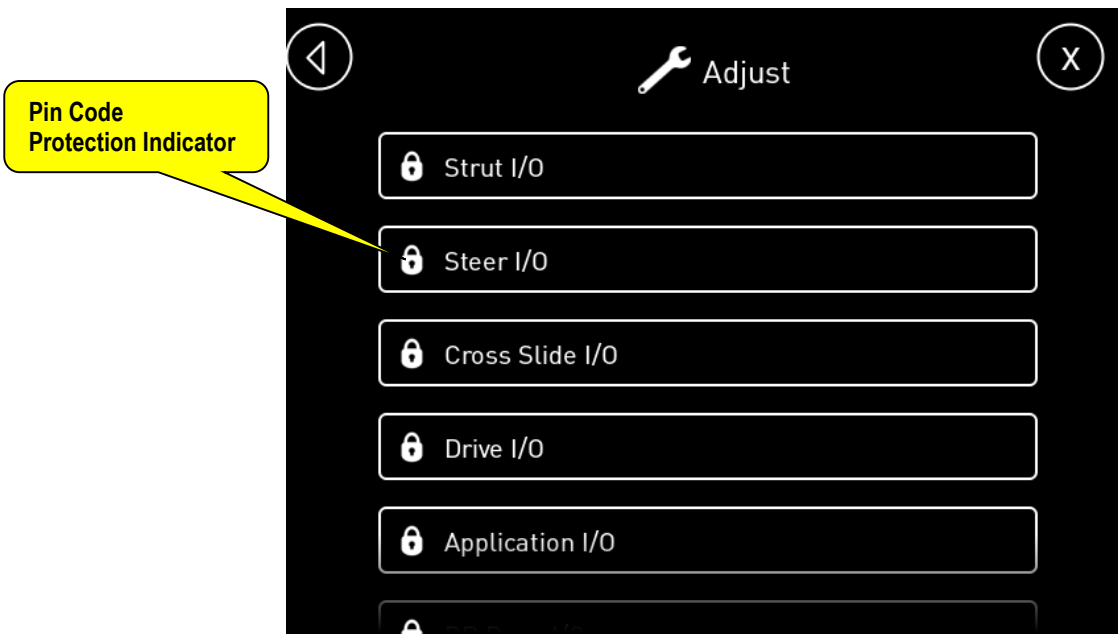
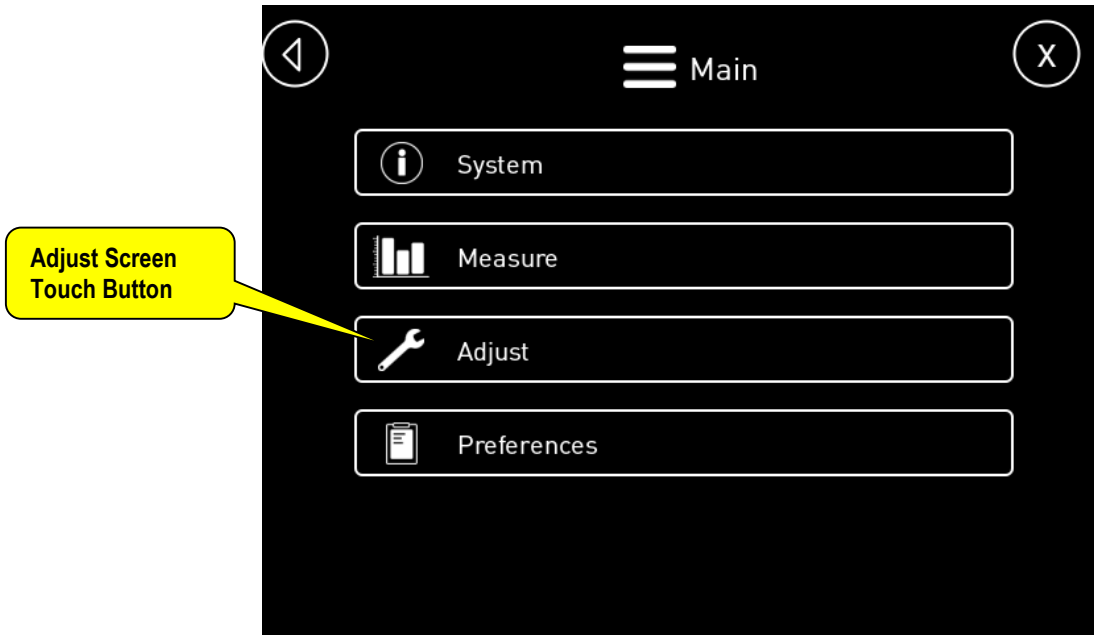
The operator can access the Main Parameters and Settings navigation display screen from the IQAN-MD4's Main Display screen by pressing on the Menu button located on the display screen.



## Adjust Menu

Some of the IQAN channels in your Multi Handler’s application have been made adjustable. This means that those pre-defined channels have parameters that can easily be adjusted from the IQAN-MD4 Master Display. This allows the operator to easily adjust parameters for new replacement sensors without having to update the IQAN software application.

The operator can gain access to the pre-defined adjustable IQAN module channels by pressing on the Adjust Menu screen touch button. The Adjust Menu screen is display below.



The Multi Handler's IQAN application has been programmed with thirteen (13) Adjust Channel Groups.

Authorized personnel can view and modify settings to all of the Adjust Channel Groups with the exception of the Serial Number adjust group. The Serial Number adjust group is available only to B&D Manufacturing Representatives. Its value is typically adjusted at B&D Manufacturing during the production testing phase of the Multi Handler prior to being expedited to the end-user.

The entered value of the Serial Number adjust group can however be viewed by the operator via the System Info screen from the Main Parameters and Settings navigation screen.

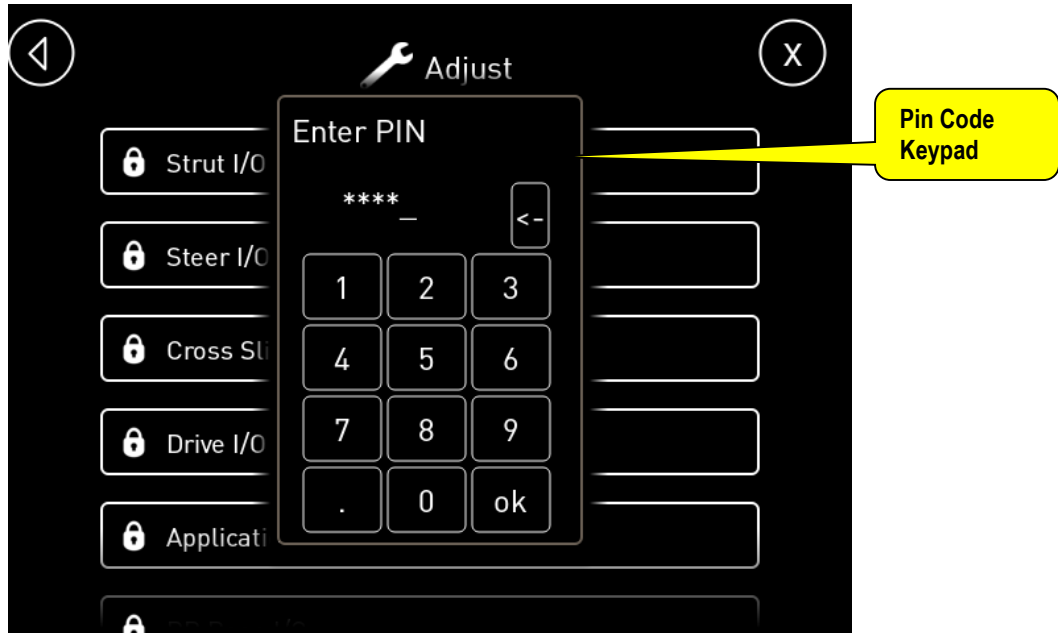
To assist authorized personnel in finding specific channels, the adjust groups have been organized and their channels have been grouped into the relevant I/O operating functions of the Multi Handler.

The following Adjust Channel Groups are viewable by authorized personnel.

- Strut I/O
- Steer I/O
- Cross Slide I/O
- Drive I/O
- Application I/O
- PB Base I/O
- PB Boom I/O
- PB Dipper I/O
- PB Extend I/O
- PB Tilt I/O
- PB Angle I/O
- PB Grab I/O

The "Lock" icon that is displayed to the left of an Adjust Channel Group indicates that the Adjust Channel Group has been protected from viewing by a PIN code. PIN codes have been implemented in the Multi Handler's IQAN application to prevent unauthorized personnel from gaining access to the Adjust Channel Group and modifying a specific channel's settings. A PIN code always consists of a four (4) digit number. Contact your site supervisor in order to obtain the authorization to access the Adjust Channel Groups and the PIN codes that have been assigned to your Multi Handler.

Press on the individual adjust group screen buttons to gain access to individual adjust groups. Once the adjust group's button is pressed a keypad will be displayed on the screen. Use the keypad to enter the four (4) digit PIN code digits and then press the OK button to accept the PIN code value.

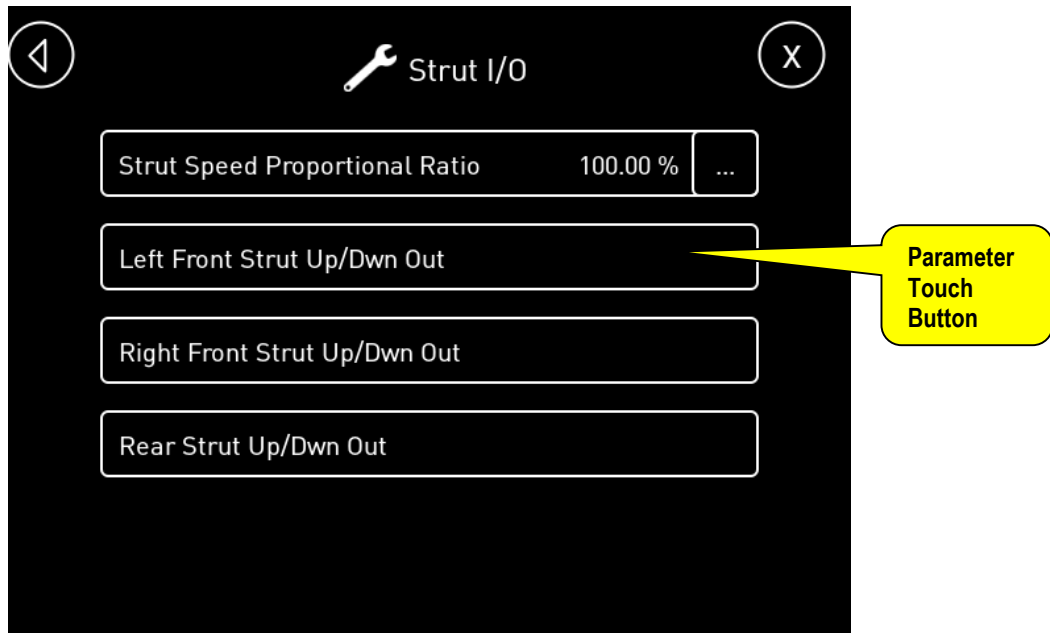


Once the operator enters the correct PIN Code, the selected Adjust Channel Group menu will be displayed. The message 'Wrong Pin!' will be momentarily displayed whenever the operator enters an incorrect PIN Code.

The last correctly entered Pin Code will remain active until the IQAN-MD4 display is powered off. Every time the IQAN-MD4 is powered on the operator will need to re-enter the correct PIN Code to view the individual Adjust Channel Groups.

### Strut I/O Adjust Group

Once the operator has gain access to the Strut I/O Adjust Group the following screen will be displayed.

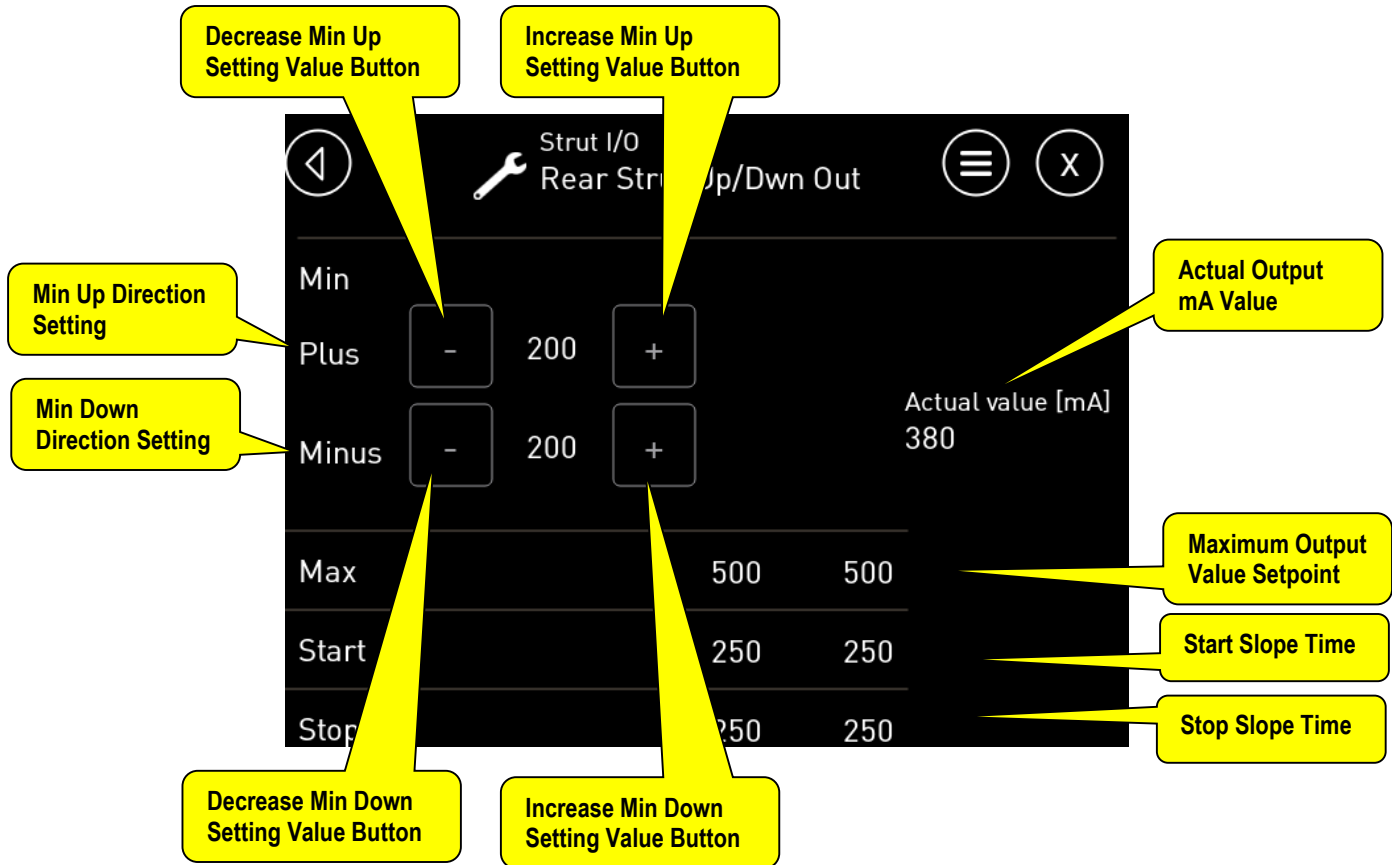


The Strut I/O Adjust Group consists of four (4) members.

- **Strut Speed Proportional Ratio.** Internal function parameter used for setting the raising/lowering speed of the struts.
- **Left Front Strut Up/Dwn Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to the Multi Handler’s directional valve left front strut section.
- **Right Front Strut Up/Dwn Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to the Multi Handler’s directional valve right front strut section.
- **Rear Strut Up/Dwn Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to the Multi Handler’s directional valve rear strut section.

To access a specific Strut I/O Adjust Group member press on the parameter’s interactive touch button.

For example, when the operator selects the “Rear Strut Up/Dwn Out” adjust channel, the following will be displayed.



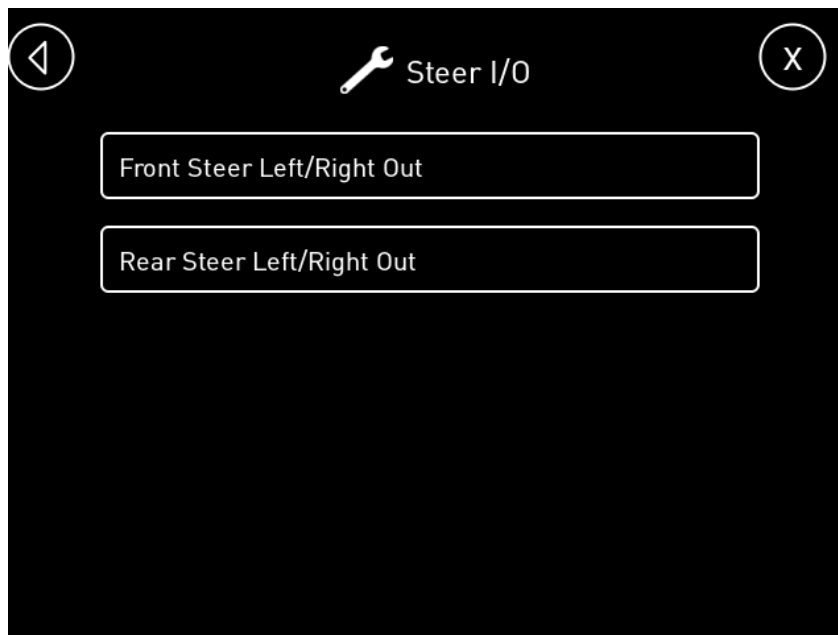
- **Adjust Group Assignment.** Displays the Adjust Group that the displayed channel is assigned to.
- **Minimum Output Value Setpoint.** Displays the currently entered minimum value, in mA, of the signal that is being used by the IQAN application to control the channel’s output.
- **Maximum Output Value Setpoint.** Displays the currently entered maximum value, in mA, of the signal that is being used by the IQAN application to control the channel’s output.
- **Start Slope Time.** Displays the Start Slope Time setpoint value. This is the time it will take for the output’s value to change from minimum to maximum value.
- **Stop Slope Time.** Displays the Stop Slope Time setpoint value. This is the time it will take for the output’s value to change from maximum to minimum value.

The following lists the other Adjust Group Channel's and their individual channel members. All of the settings in these channels are adjusted in a similar manner as the Strut I/O Adjust Group settings described above. Refer to the Application I/O Adjust Channel Group below for a detailed description on how to adjust a Voltage input.

### Steer I/O Adjust Group

The Steer I/O Adjust Group consists of two (2) members.

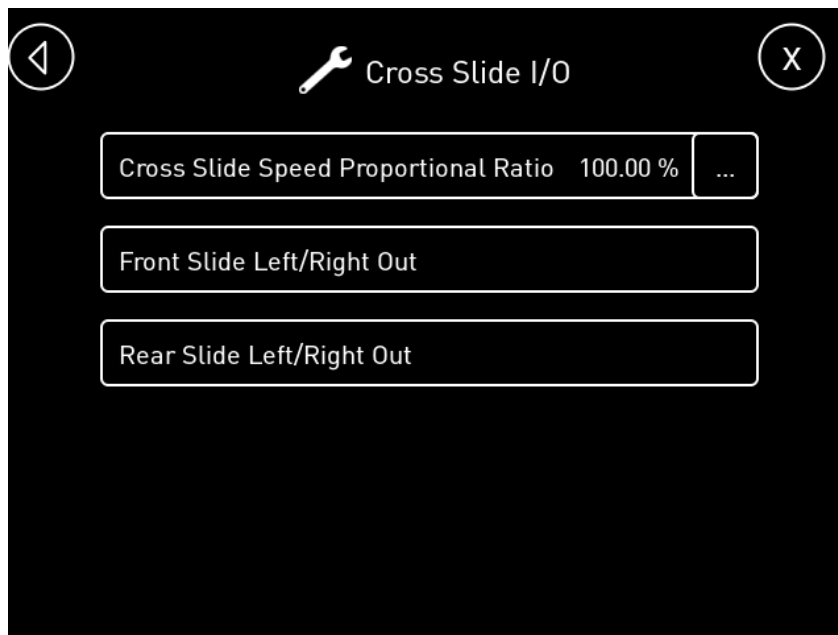
- **Front Steer Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to the Multi Handler's directional valve front steer section.
- **Rear Steer Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to the Multi Handler's directional valve rear steer section.



### Cross Slide I/O Adjust Group

The Cross Slide I/O Adjust Group consists of three (3) members.

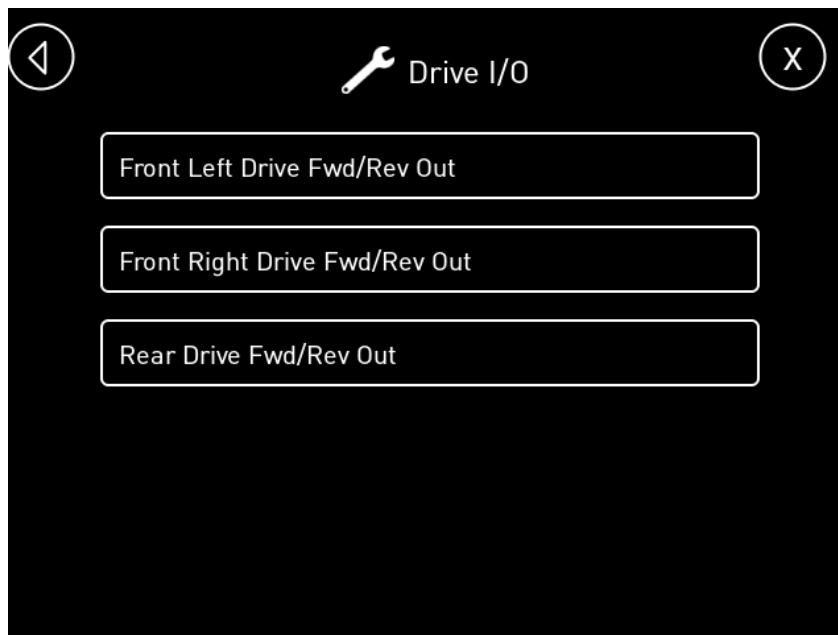
- **Cross Slide Speed Proportional Ratio.** Internal function parameter used for setting the sliding speed of the cross slides.
- **Front Slide Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to the Multi Handler's directional valve front cross slide section.
- **Rear Slide Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to the Multi Handler's directional valve rear cross slide section.



### Drive I/O Adjust Group

The Drive I/O Adjust Group consists of three (3) members.

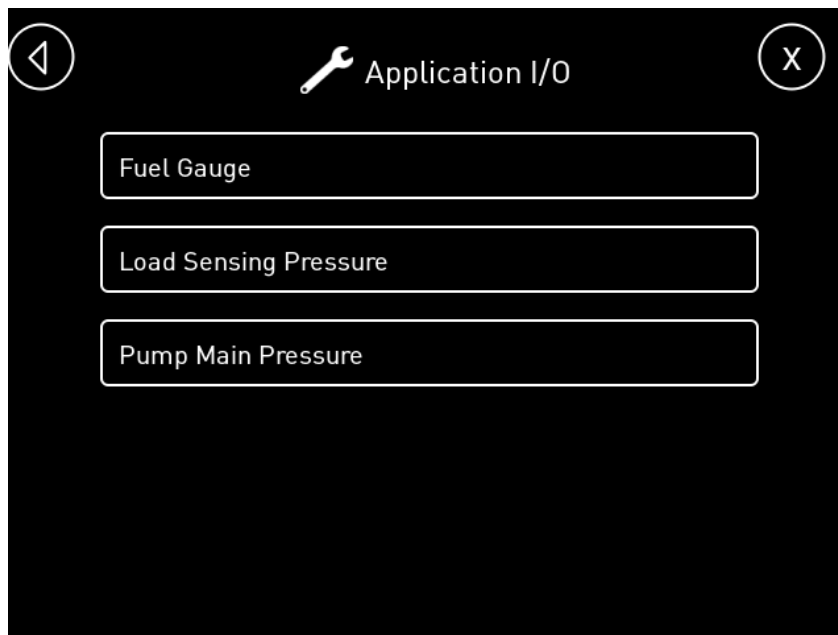
- **Front Left Drive Fwd/Rev Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to the Multi Handler's directional valve front left drive section.
- **Front Right Drive Fwd/Rev Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to the Multi Handler's directional valve front right drive section.
- **Rear Drive Fwd/Rev Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to the Multi Handler's directional valve rear left drive section.



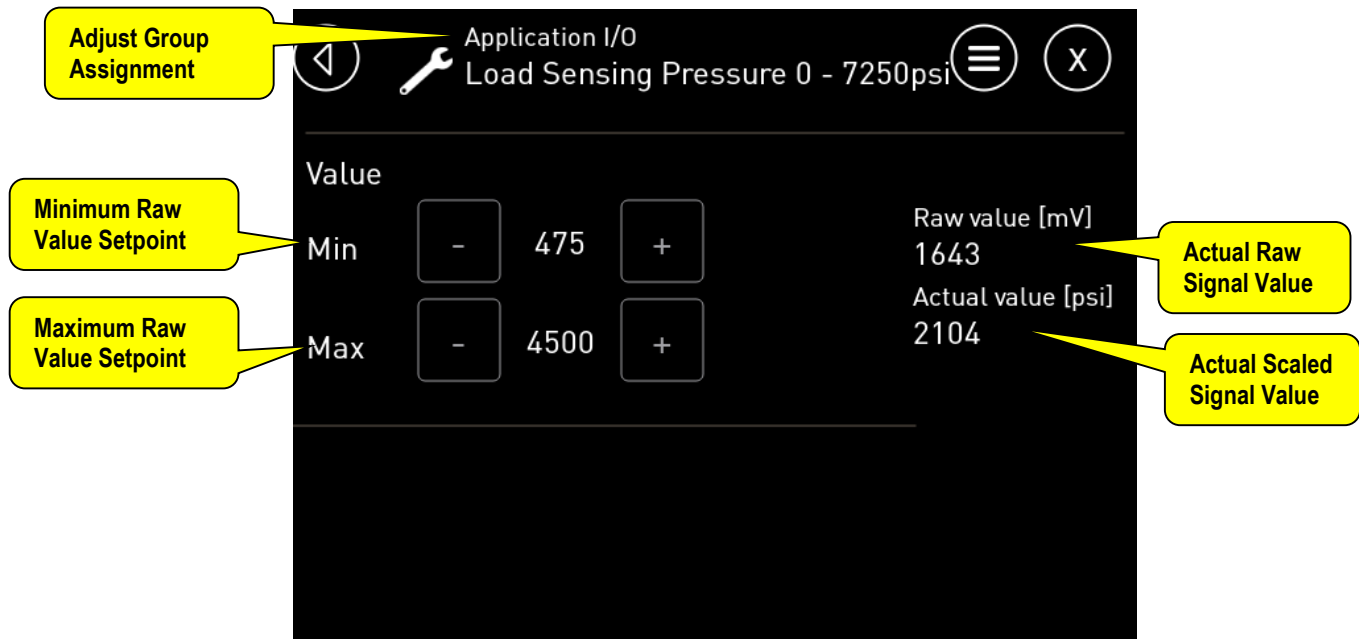
### Application I/O Adjust Group

The Application I/O Adjust Group consists of three (3) members.

- **Fuel Gauge.** Voltage input hardwired from load sensing pressure transducer to IQAN-XC43 module.
- **Load Sensing Pressure.** Voltage input hardwired from load sensing pressure transducer to IQAN-XC43 module
- **Pump Main Pressure.** Voltage input hardwired from pump main pressure transducer to IQAN-XC43 module.



When the operator selects the “Load Sensing Pressure” adjust channel, the following will be displayed.



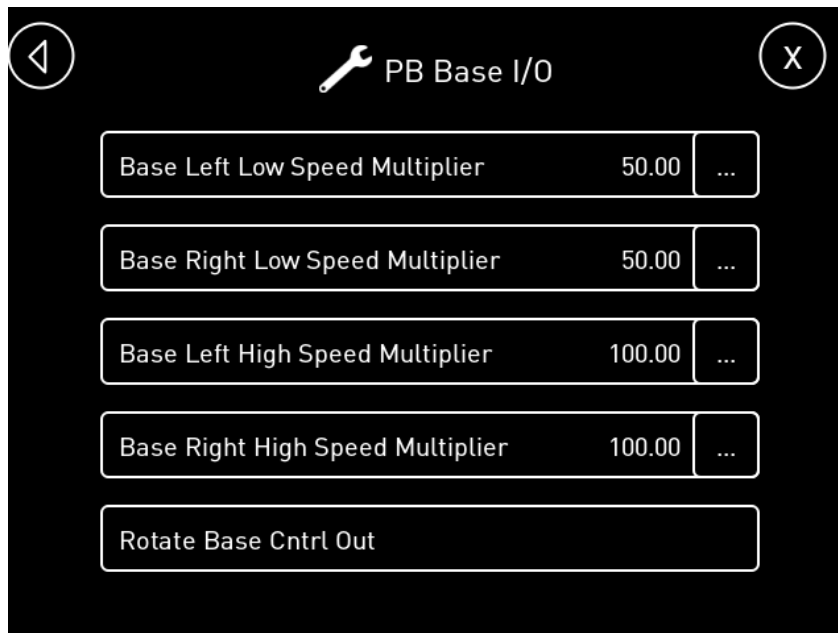
- **Adjust Group Assignment.** Displays the Adjust Group that the displayed channel is assigned to.
- **Actual Raw Signal Value.** Displays the channel’s actual raw signal value, in mV, that is currently present at the IQAN module’s C1 Connector.
- **Actual Scaled Signal Value.** Displays the channel’s actual scaled signal value, in %, that is currently present at the IQAN module’s C1 Connector.
- **Minimum Raw Value Setpoint.** Displays the currently entered minimum value, in mV, of the signal that is being used by the IQAN application to calculate the channel’s signal value.
- **Maximum Raw Value Setpoint.** Displays the currently entered maximum value, in mV, of the signal that is being used by the IQAN application to calculate the channel’s signal value.

Note: The pedestal boom must be enabled on the main display screen in order to access and adjust any of the pedestal boom I/O adjust channel groups.

### PB Base I/O Adjust Group

The PB Base I/O Adjust Group consists of five (5) members.

- **Base Left Low Speed Multiplier.** Internal function parameter used for setting the low left direction rotating speed of the pedestal boom's base.
- **Base Right Low Speed Multiplier.** Internal function parameter used for setting the low right direction rotating speed of the pedestal boom's base.
- **Base Left High Speed Multiplier.** Internal function parameter used for setting the high left direction rotating speed of the pedestal boom's base.
- **Base Right High Speed Multiplier.** Internal function parameter used for setting the high right direction rotating speed of the pedestal boom's base.
- **Rotate Base Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve base section.



### PB Boom I/O Adjust Group

The PB Boom I/O Adjust Group consists of five (5) members.

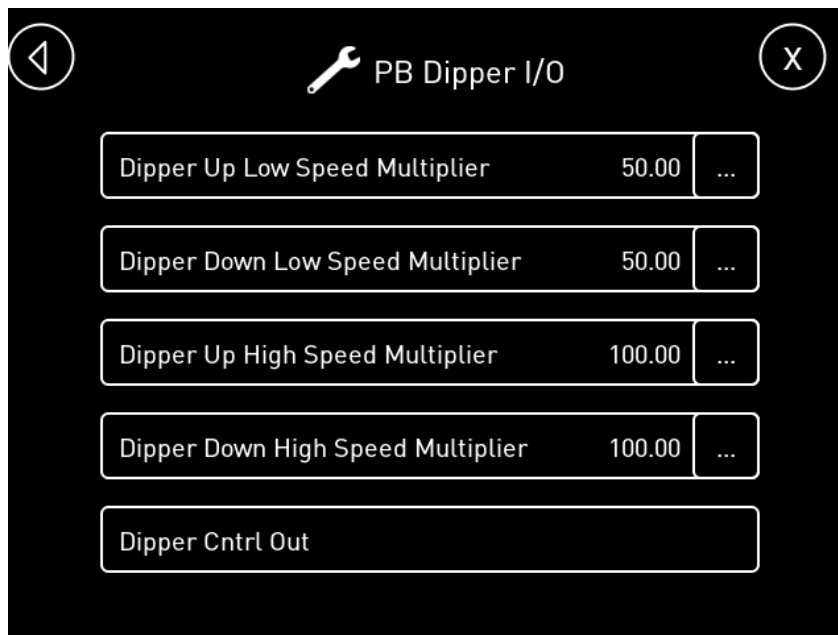
- **Boom Up Low Speed Multiplier.** Internal function parameter used for setting the low up direction speed of the pedestal boom's boom.
- **Boom Down Low Speed Multiplier.** Internal function parameter used for setting the low down direction speed of the pedestal boom's boom.
- **Boom Up High Speed Multiplier.** Internal function parameter used for setting the high up direction speed of the pedestal boom's boom.
- **Boom Down High Speed Multiplier.** Internal function parameter used for setting the high down up direction speed of the pedestal boom's boom.
- **Boom Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve boom section.



### PB Dipper I/O Adjust Group

The PB Dipper I/O Adjust Group consists of five (5) members.

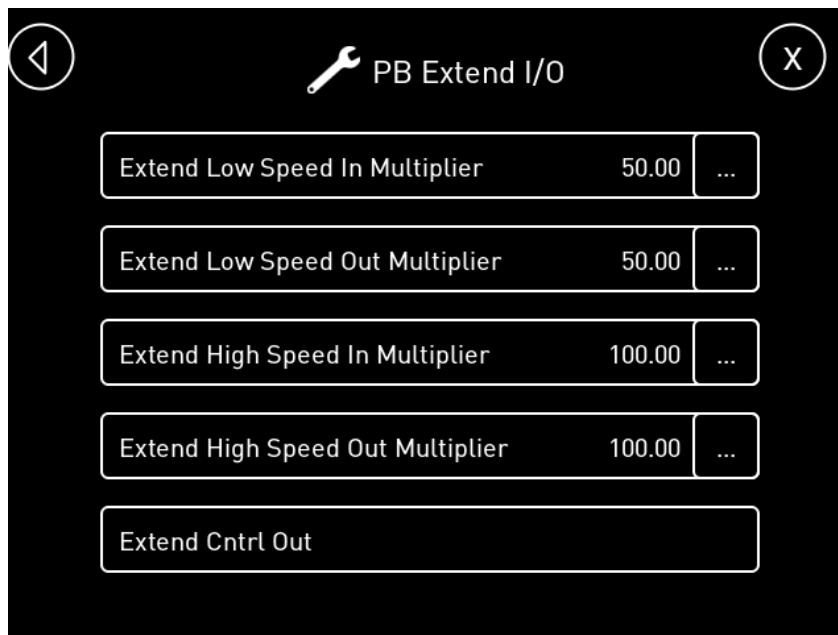
- **Dipper Up Low Speed Multiplier.** Internal function parameter used for setting the low up direction speed of the pedestal boom's dipper.
- **Dipper Down Low Speed Multiplier.** Internal function parameter used for setting the low down direction speed of the pedestal boom's dipper.
- **Dipper Up High Speed Multiplier.** Internal function parameter used for setting the high up direction speed of the pedestal boom's dipper.
- **Dipper Down High Speed Multiplier.** Internal function parameter used for setting the high down up direction speed of the pedestal boom's dipper.
- **Dipper Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve dipper section.



### PB Extend I/O Adjust Group

The PB Extend I/O Adjust Group consists of five (5) members.

- **Extend Low Speed In Multiplier.** Internal function parameter used for setting the low in direction speed of the pedestal boom's extend.
- **Extend Low Speed Out Multiplier.** Internal function parameter used for setting the low out direction speed of the pedestal boom's extend.
- **Extend High Speed In Multiplier.** Internal function parameter used for setting the high in direction speed of the pedestal boom's extend.
- **Extend High Speed Out Multiplier.** Internal function parameter used for setting the high out up direction speed of the pedestal boom's extend.
- **Extend Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve extend section.



### PB Tilt I/O Adjust Group

The PB Tilt I/O Adjust Group consists of five (5) members.

- **Tilt Low Speed Fwd Multiplier.** Internal function parameter used for setting the low tilt forward direction speed of the pedestal boom's tilt.
- **Tilt Low Speed Bck Multiplier.** Internal function parameter used for setting the low tilt backward direction speed of the pedestal boom's tilt.
- **Tilt High Speed Fwd Multiplier.** Internal function parameter used for setting the high tilt forward direction speed of the pedestal boom's tilt.
- **Tilt High Speed Bck Multiplier.** Internal function parameter used for setting the high tilt backward direction speed of the pedestal boom's tilt.
- **Tilt Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve tilt section.



The screenshot displays the PB Tilt I/O Adjust Group interface. It features a title bar with a back arrow, a wrench icon, and the text "PB Tilt I/O", and a close button (X). Below the title bar are five rows, each representing a parameter. The first four rows show the parameter name, its current value, and an edit icon (three dots). The fifth row shows the parameter name without a value or edit icon.

| Parameter Name                 | Current Value | Edit Icon |
|--------------------------------|---------------|-----------|
| Tilt Low Speed Fwd Multiplier  | 50.00         | ...       |
| Tilt Low Speed Bck Multiplier  | 50.00         | ...       |
| Tilt High Speed Fwd Multiplier | 100.00        | ...       |
| Tilt High Speed Bck Multiplier | 100.00        | ...       |
| Tilt Cntrl Out                 |               |           |

### PB Angle I/O Adjust Group

The PB Angle I/O Adjust Group consists of five (5) members.

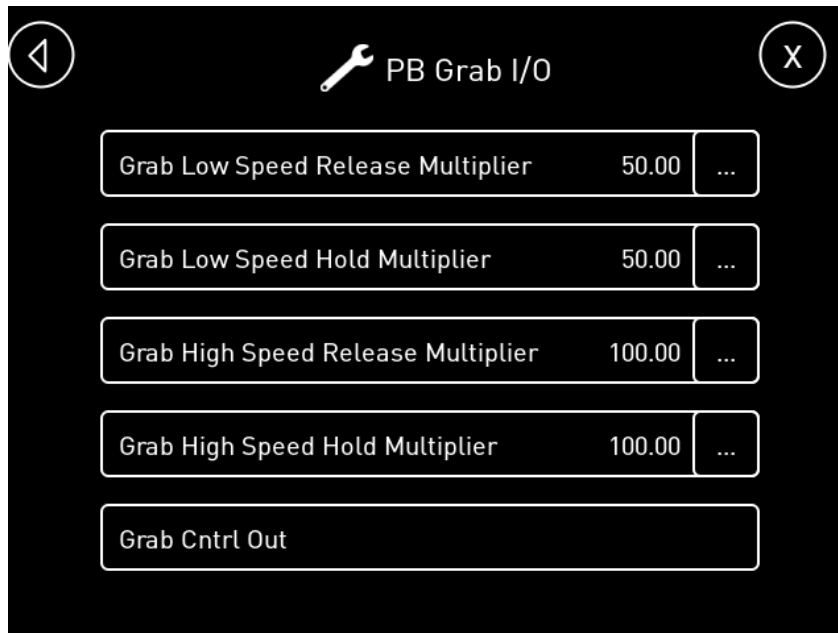
- **Angle Left Low Speed Multiplier.** Internal function parameter used for setting the low angle left direction speed of the pedestal boom's angle.
- **Angle Right Low Speed Multiplier.** Internal function parameter used for setting the low angle right direction speed of the pedestal boom's angle.
- **Angle Left High Speed Multiplier.** Internal function parameter used for setting the high angle left direction speed of the pedestal boom's angle.
- **Angle Right High Speed Multiplier.** Internal function parameter used for setting the high angle right direction speed of the pedestal boom's angle.
- **Angle Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve angle section.



### PB Grab I/O Adjust Group

The PB Grab I/O Adjust Group consists of five (5) members.

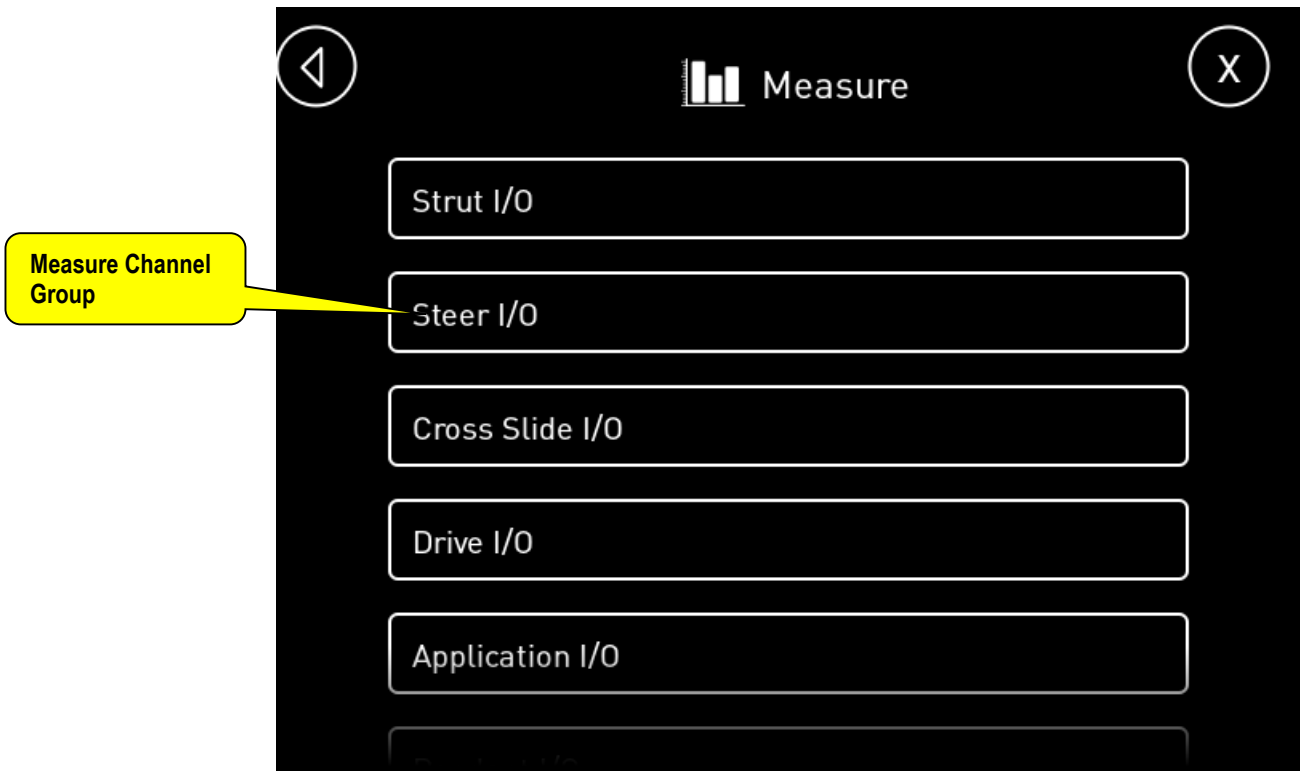
- **Grab Low Speed Release Multiplier.** Internal function parameter used for setting the low grab release direction speed of the pedestal boom's grab.
- **Grab Low Speed Hold Multiplier.** Internal function parameter used for setting the low grab hold direction speed of the pedestal boom's grab.
- **Grab High Speed Release Multiplier.** Internal function parameter used for setting the high grab release direction speed of the pedestal boom's grab.
- **Grab High Speed Hold Multiplier.** Internal function parameter used for setting the high grab hold direction speed of the pedestal boom's grab.
- **Grab Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve grab section.



### Measure Menu

Some of the IQAN module channel values in your Multi Handler’s application are viewable by the operator via Measure Groups. This means that those pre-defined channels values can be viewed in their scaled and/or raw value formats from the IQAN-MD4 Master Display. This allows the operator to monitor individual IQAN module channels without requiring the IQAN software application.

The operator can gain access to the pre-defined measurable IQAN module channels by pressing on the Measure Menu screen touch button. The Measure Menu screen is display below.



The following Measure I/O Groups are viewable by the operator.

- Strut I/O
- Steer I/O
- Cross Slide I/O
- Drive I/O
- Application I/O
- Pendant I/O
- PB Base I/O
- PB Boom I/O
- PB Dipper I/O

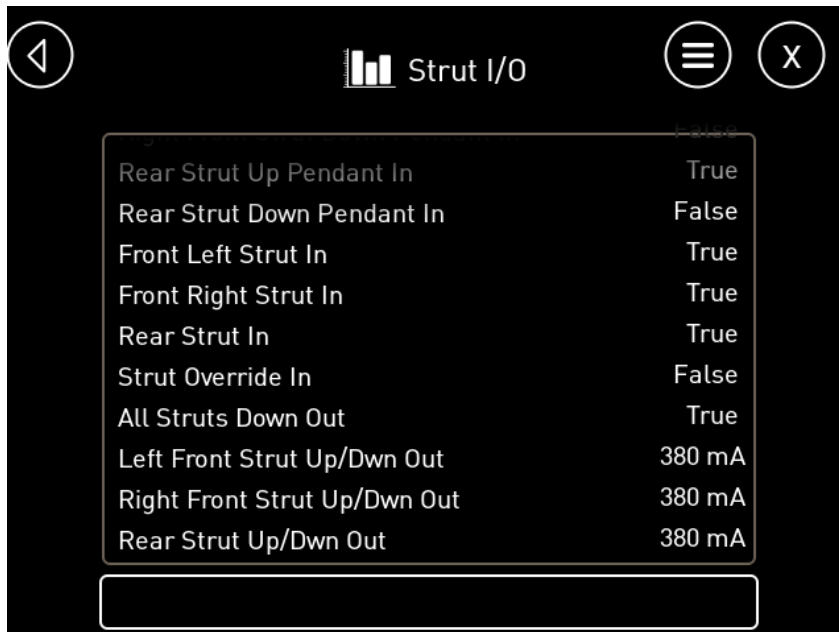
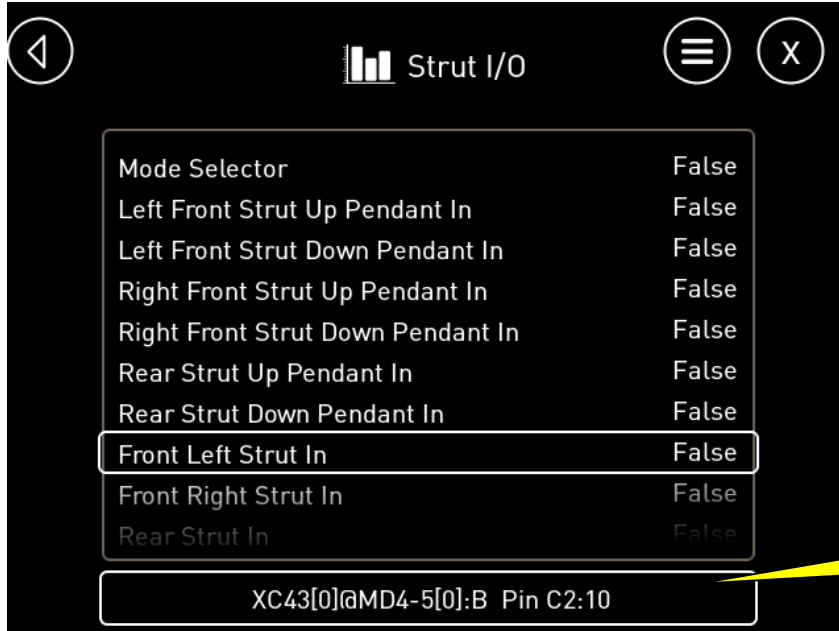
- PB Extend I/O
- PB Tilt I/O
- PB Angle I/O
- PB Grab I/O

Press on the individual measure group screen buttons to gain access to individual measure I/O groups.

### Strut I/O Measure Group

The Strut I/O Measure Group consists of fifteen (15) members.


- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Left Front Strut Up Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Left Front Strut Down Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Right Front Strut Up Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Right Front Strut Down Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rear Strut Up Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rear Strut Down Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Left Strut In.** Digital input hardwired from Multi Handler's left front strut down limit switch to Multi Handler's IQAN-XC43 module.
- **Front Right Strut In.** Digital input hardwired from Multi Handler's right front strut down limit switch to Multi Handler's IQAN-XC43 module.
- **Rear Strut In.** Digital input hardwired from Multi Handler's rear strut down limit switch to Multi Handler's IQAN-XC43 module.
- **Strut Override In.** Digital input hardwired from Multi Handler's strut override pushbutton to Multi Handler's IQAN-XC43 module.
- **All Struts Down Output.** Digital output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's all struts down indicator light.
- **Left Front Strut Up/Dwn Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's directional valve front left strut section.
- **Right Front Strut Up/Dwn Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's directional valve front right strut section.
- **Rear Strut Up/Dwn Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's directional valve rear strut section.



### Steer I/O Measure Group

The Steer I/O Measure Group consists of five (5) members.

- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Steer Left/Right Pendant In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rear Steer Left/Right Pendant In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Steer Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's directional valve front steer section.
- **Rear Steer Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's directional valve rear steer section.

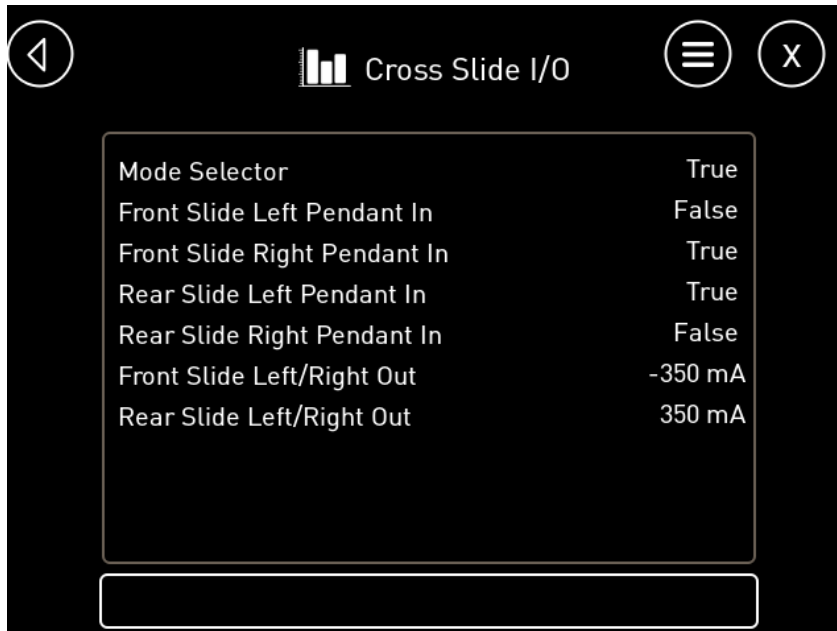


| Steer I/O                         |         |
|-----------------------------------|---------|
| Mode Selector                     | True    |
| Front Steer Left/Right Pendant In | 108     |
| Rear Steer Left/Right Pendant In  | -85     |
| Front Steer Left/Right Out        | 456 mA  |
| Rear Steer Left/Right Out         | -396 mA |

### Cross Slide I/O Measure Group

The Cross Slide I/O Measure Group consists of seven (7) members.

- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Slide Left Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Slide Right Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rear Slide Left Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rear Slide Right Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Slide Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's directional valve front cross slide section.
- **Rear Slide Left/Right Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to Multi Handler's directional valve rear cross slide section.

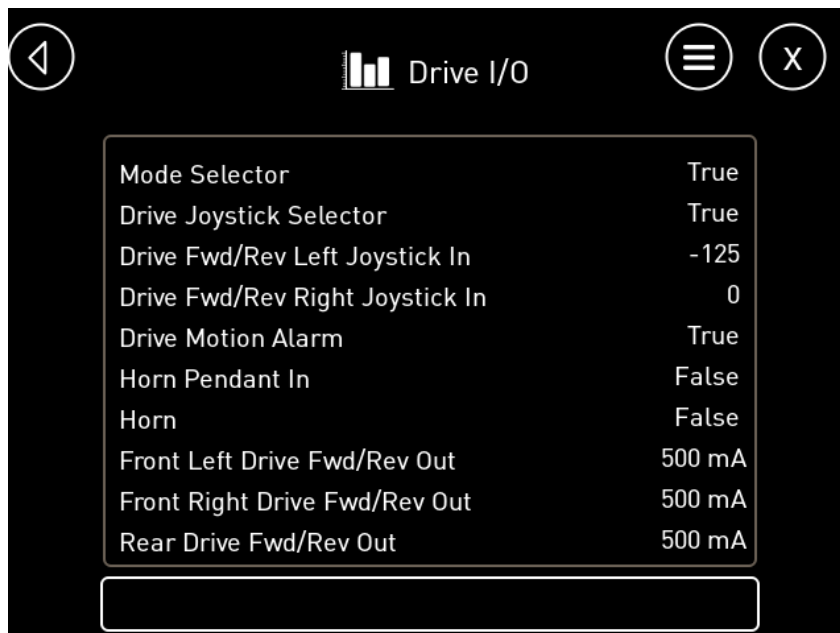


| Item                         | Status  |
|------------------------------|---------|
| Mode Selector                | True    |
| Front Slide Left Pendant In  | False   |
| Front Slide Right Pendant In | True    |
| Rear Slide Left Pendant In   | True    |
| Rear Slide Right Pendant In  | False   |
| Front Slide Left/Right Out   | -350 mA |
| Rear Slide Left/Right Out    | 350 mA  |

**Drive I/O Measure Group**

The Drive I/O Measure Group consists of ten (10) members.

- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Drive Joystick Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Drive Fwd/Rev Left Joystick In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Drive Fwd/Rev Right Joystick In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Drive Motion Alarm.** Digital output hardwired from Multi Handler’s IQAN-XC43 module to Multi Handler’s drive motion alarm interposing control relay.
- **Horn Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Horn.** Digital output hardwired from Multi Handler’s IQAN-XC43 module to Multi Handler’s horn interposing control relay.
- **Front Left Drive Fwd/Rev Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to Multi Handler’s directional valve left front drive section.
- **Front Right Drive Fwd/Rev Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to Multi Handler’s directional valve right front drive section.
- **Rear Drive Fwd/Rev Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to Multi Handler’s directional valve rear drive section.

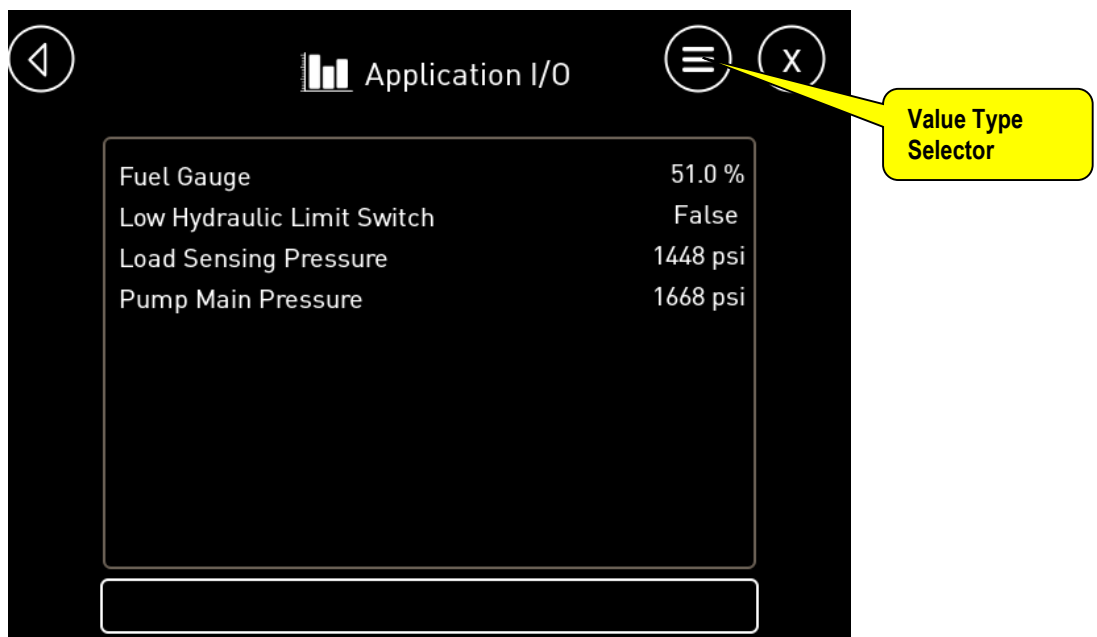


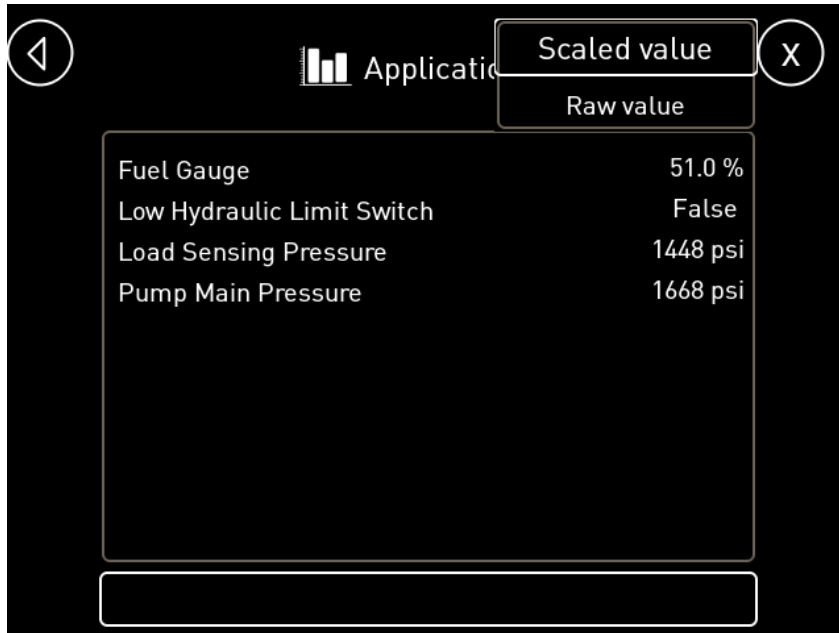
| Label                           | Value  |
|---------------------------------|--------|
| Mode Selector                   | True   |
| Drive Joystick Selector         | True   |
| Drive Fwd/Rev Left Joystick In  | -125   |
| Drive Fwd/Rev Right Joystick In | 0      |
| Drive Motion Alarm              | True   |
| Horn Pendant In                 | False  |
| Horn                            | False  |
| Front Left Drive Fwd/Rev Out    | 500 mA |
| Front Right Drive Fwd/Rev Out   | 500 mA |
| Rear Drive Fwd/Rev Out          | 500 mA |

### Application I/O Measure Group

The Application I/O Measure Group consists of four (4) members.

- **Fuel Gauge.** Voltage input hardwired from Multi Handler's diesel fuel tank level sensor to Multi Handler's IQAN-XC43 module.
- **Low Hydraulic Limit Switch.** Digital input hardwired from Multi Handler's hydraulic tank level sensor to Multi Handler's IQAN-XC43 module.
- **Load Sensing Pressure.** Voltage input hardwired from Multi Handler's load sensing pressure transducer to Multi Handler's IQAN-XC43 module.
- **Pump Main Pressure.** Voltage input hardwired from Multi Handler's pump main pressure transducer to Multi Handler's IQAN-XC43 module.



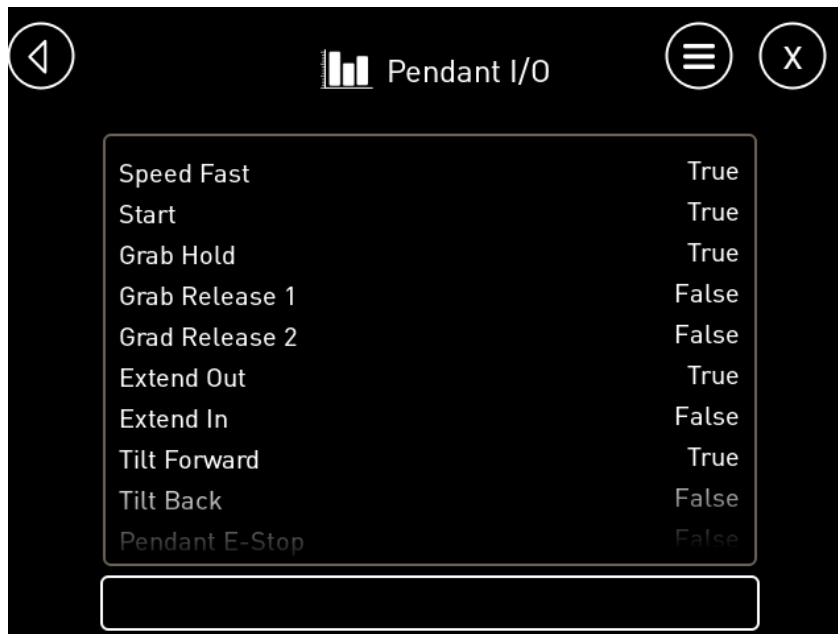


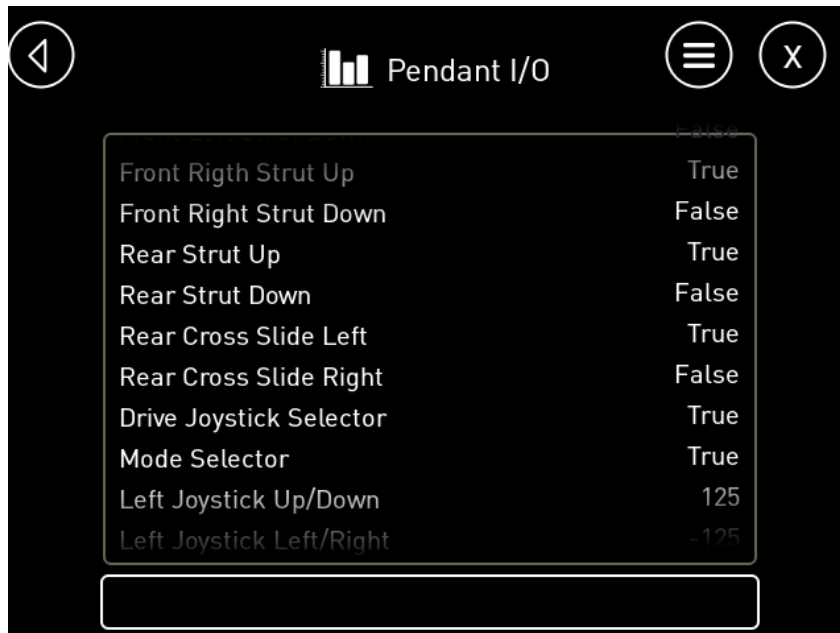
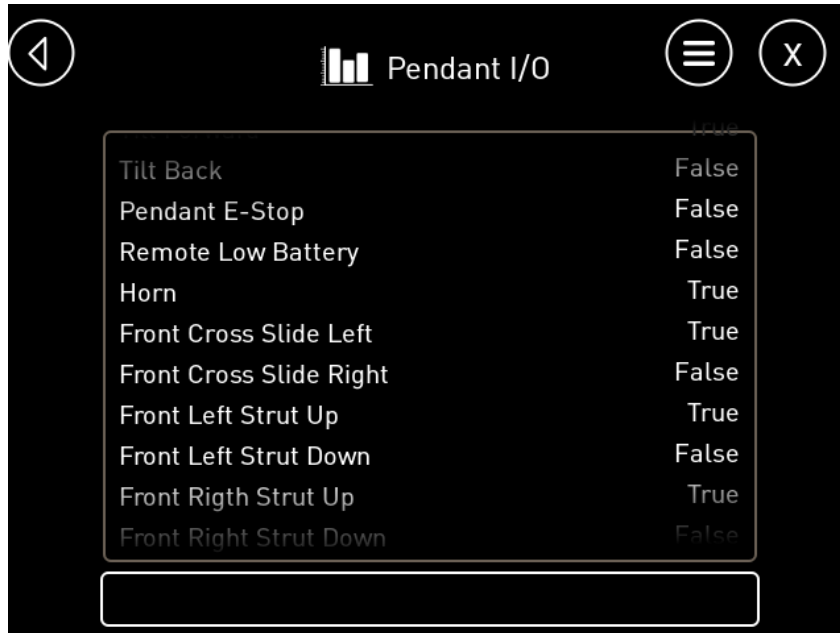
## Pendant I/O Measure Group

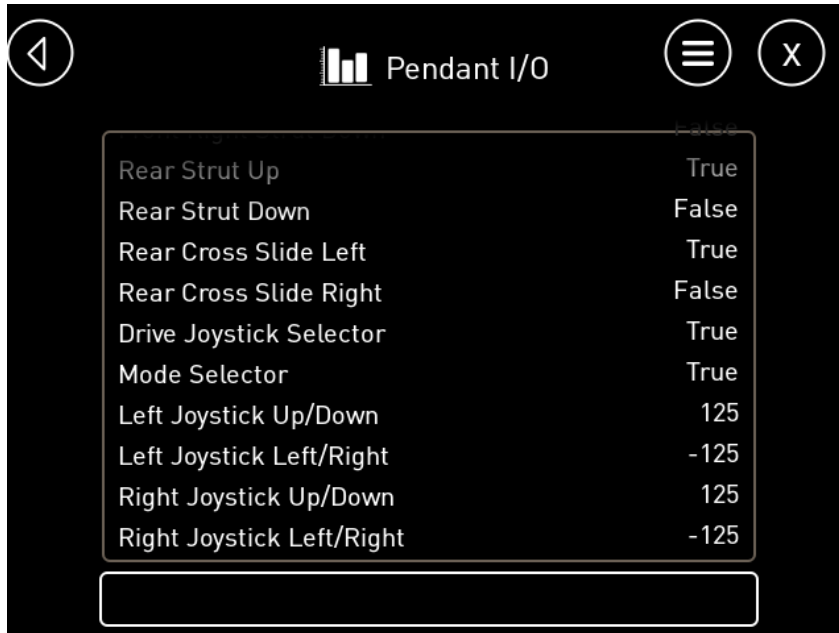
The Pendant I/O Measure Group consists of twenty-eight (28) members.

- **Speed Fast.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Start.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Grab Hold.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Grab Release 1.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Grab Release 2.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Extend Out.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Extend In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Tilt Forward.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Tilt Back.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Pendant E-Stop.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Remote Low Battery.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Horn.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Cross Slide Left.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Cross Slide Right.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Left Strut Up.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Left Strut Down.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Right Strut Up.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Front Right Strut Down.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus..
- **Rear Strut Up.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rear Strut Down.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rear Cross Slide Left.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.

- **Rear Cross Slide Right.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Drive Joystick Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Left Joystick Up/Down.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Left Joystick Left/Right.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Right Joystick Up/Down.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Right Joystick Left/Right.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.



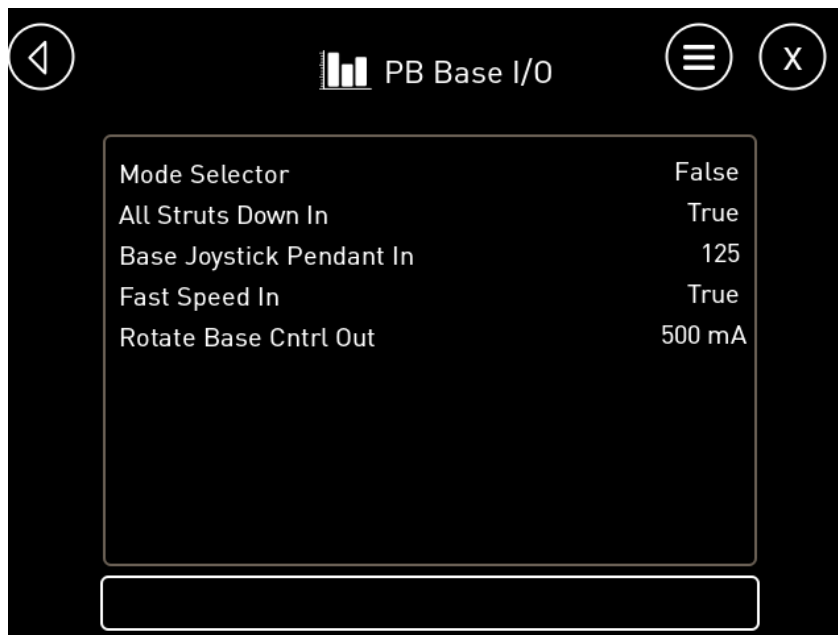




### PB Base I/O Measure Group

The PB Base I/O Measure Group consists of five (5) members.

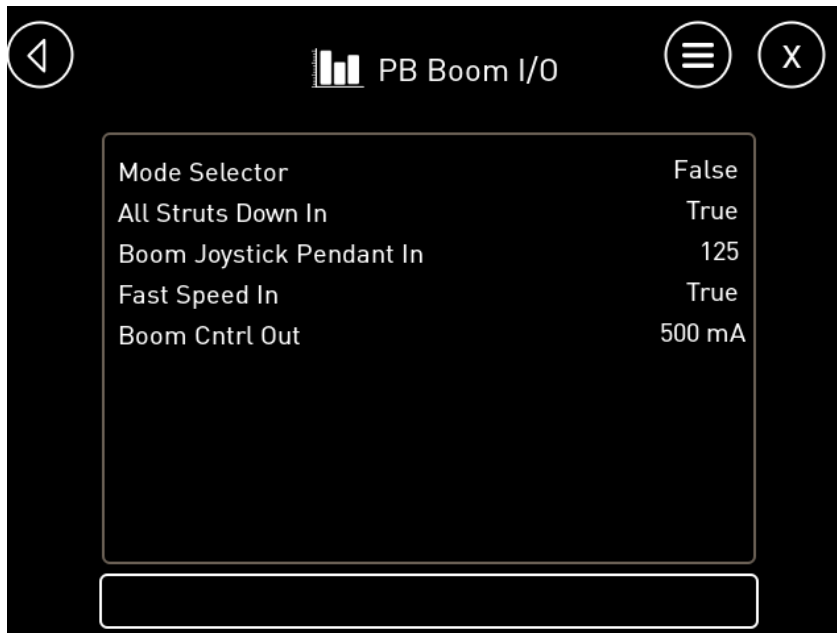
- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **All Struts Down In.** Internal input indicating the combined down status of all three strut limit switches.
- **Base Joystick Pendant In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Fast Speed In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Rotate Base Cntrl Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to pedestal boom attachment’s directional valve base section.



### PB Boom I/O Measure Group

The PB Boom I/O Measure Group consists of five (5) members.

- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **All Struts Down In.** Internal input indicating the combined down status of all three strut limit switches.
- **Boom Joystick Pendant In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Fast Speed In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Boom Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve boom section.

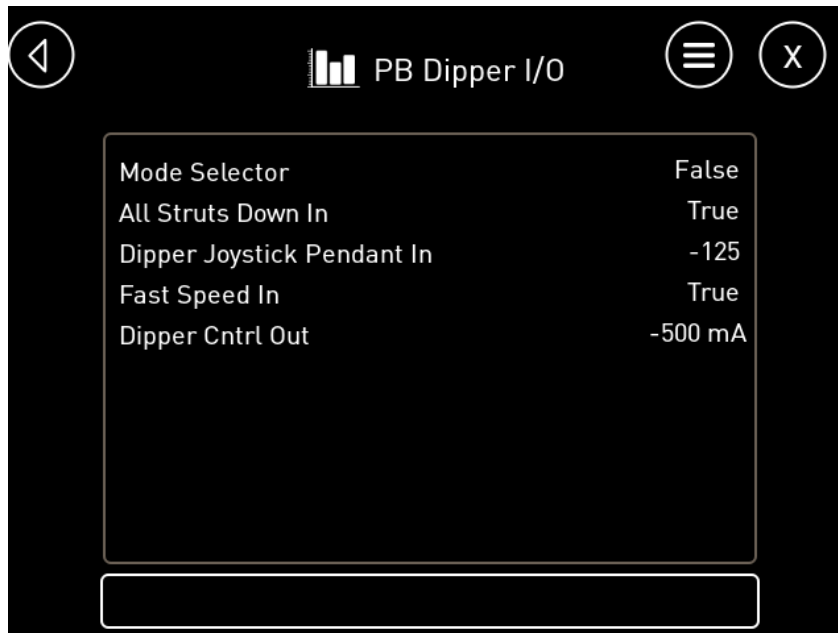


| PB Boom I/O              |        |
|--------------------------|--------|
| Mode Selector            | False  |
| All Struts Down In       | True   |
| Boom Joystick Pendant In | 125    |
| Fast Speed In            | True   |
| Boom Cntrl Out           | 500 mA |

### PB Dipper I/O Measure Group

The PB Dipper I/O Measure Group consists of five (5) members.

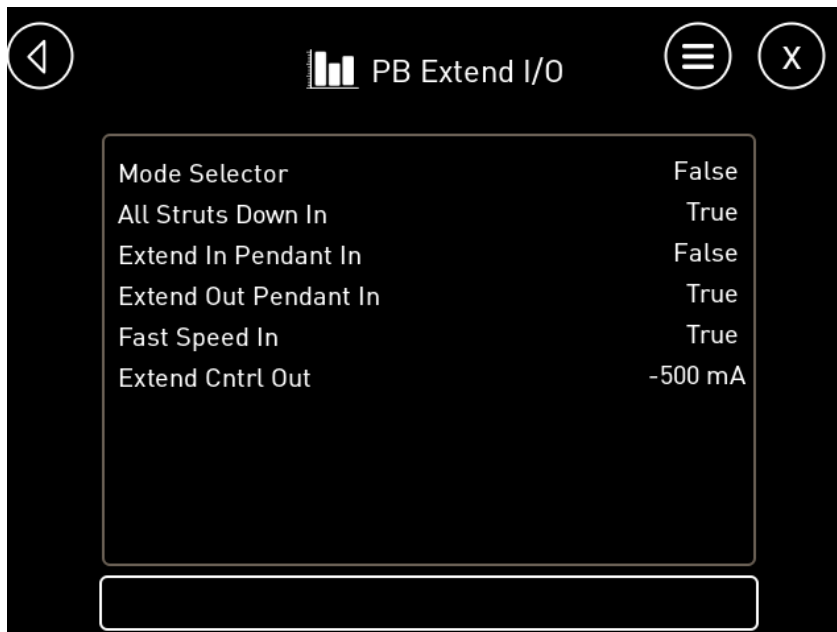
- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **All Struts Down In.** Internal input indicating the combined down status of all three strut limit switches.
- **Dipper Joystick Pendant In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Fast Speed In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Dipper Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve dipper section.



### PB Extend I/O Measure Group

The PB Extend I/O Measure Group consists of six (6) members.

- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **All Struts Down In.** Internal input indicating the combined down status of all three strut limit switches.
- **Extend In Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Extend Out Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Fast Speed In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Extend Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve extend section.

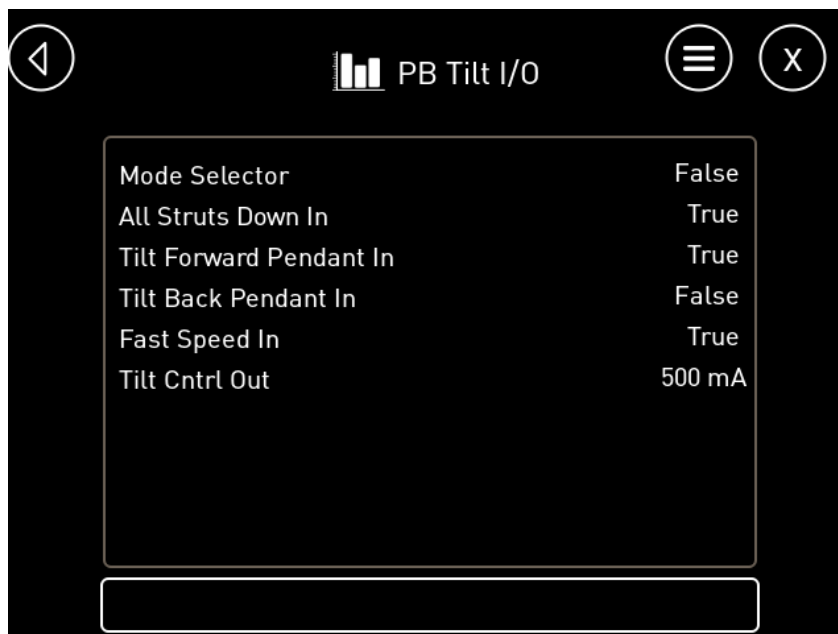


| PB Extend I/O         |         |
|-----------------------|---------|
| Mode Selector         | False   |
| All Struts Down In    | True    |
| Extend In Pendant In  | False   |
| Extend Out Pendant In | True    |
| Fast Speed In         | True    |
| Extend Cntrl Out      | -500 mA |

### PB Tilt I/O Measure Group

The PB Tilt I/O Measure Group consists of six (6) members.

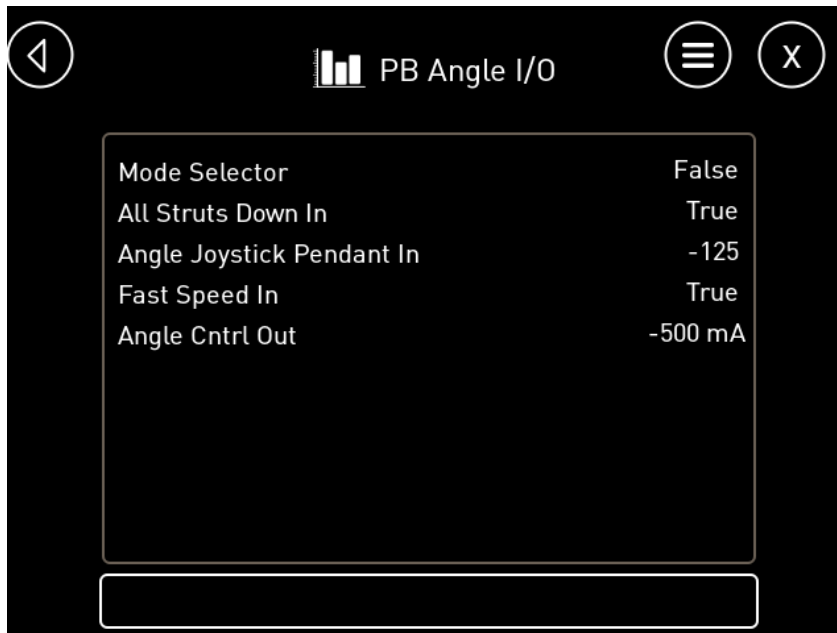
- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **All Struts Down In.** Internal input indicating the combined down status of all three strut limit switches.
- **Tilt Forward Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Tilt Back Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Fast Speed In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Tilt Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve tilt section.



### PB Angle I/O Measure Group

The PB Angle I/O Measure Group consists of five (5) members.

- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **All Struts Down In.** Internal input indicating the combined down status of all three strut limit switches.
- **Angle Joystick Pendant In.** Analog input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Fast Speed In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Angle Cntrl Out.** Current output hardwired from Multi Handler's IQAN-XC43 module to pedestal boom attachment's directional valve angle section.

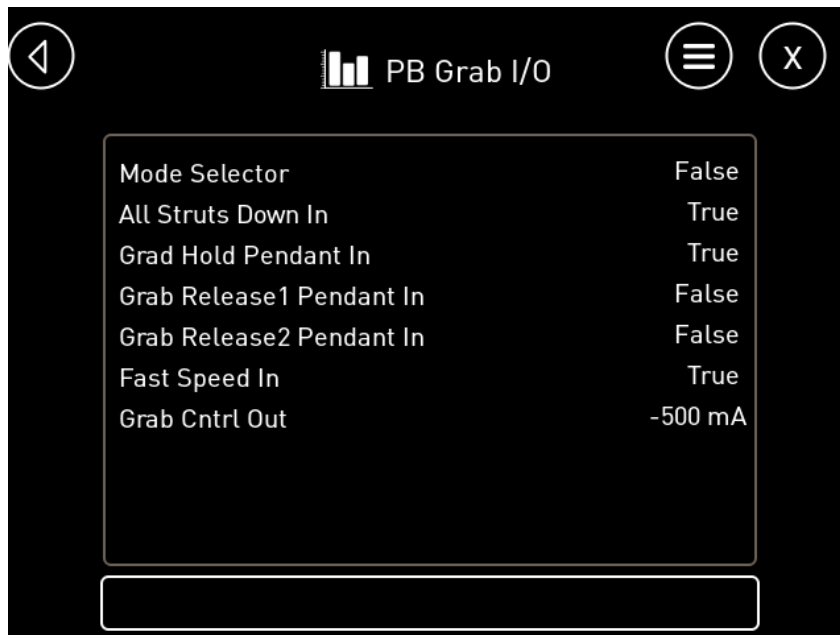


| PB Angle I/O              |         |
|---------------------------|---------|
| Mode Selector             | False   |
| All Struts Down In        | True    |
| Angle Joystick Pendant In | -125    |
| Fast Speed In             | True    |
| Angle Cntrl Out           | -500 mA |

### PB Grab I/O Measure Group

The PB Grab I/O Measure Group consists of seven (7) members.

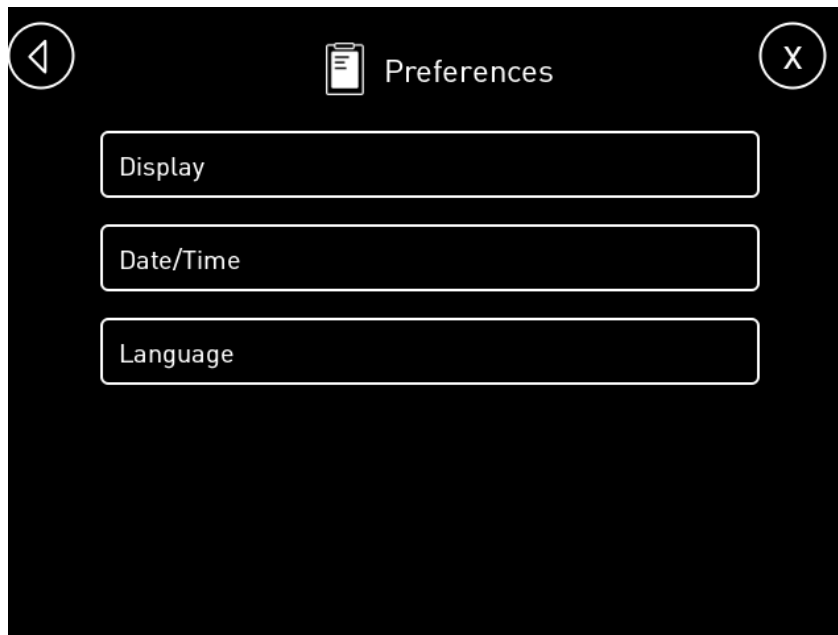
- **Mode Selector.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **All Struts Down In.** Internal input indicating the combined down status of all three strut limit switches.
- **Grab Hold Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Grab Release 1 Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Grab Release 2 Pendant In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Fast Speed In.** Digital input hardwired to Cavotec Radio Terminal and communicated to IQAN-MD4 from Base Unit via J1939 CAN-Bus.
- **Grab Cntrl Out.** Current output hardwired from Multi Handler’s IQAN-XC43 module to pedestal boom attachment’s directional valve grab section.



### Preferences Menu

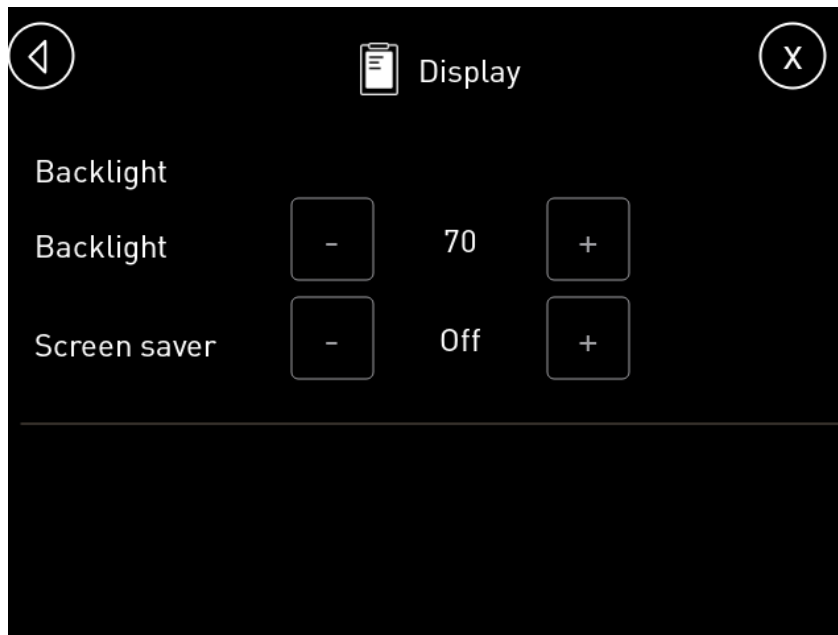
The operator can modify certain display settings, re-configure the IQAN-MD4's date and time settings and select the application's displayed language on the IQAN-MD4's screen.

The operator can gain access to the Preferences settings by pressing on the Preferences screen touch button once the Main Parameters and Settings navigation screen is displayed. The Preference Menu screen is display below.



## Display Settings

The operator can gain access to the Display Settings by pressing on the Display touch button once the Preferences navigation screen is displayed. The Display Settings screen is display below.



- **Backlight.** The operator can vary the intensity of the IQAN-MD4's screen by increasing or decreasing the value of the Backlight setting.
- **Screen Saver.** The operator can enable the Screen Saver by selecting the "Black" or "Dimmed" values and then by entering values for the Timeout period and Dimmed setting.

### Date/Time Settings

The operator can gain access to the Date/Time Settings by pressing on the Date/Time touch button once the Preferences navigation screen is displayed. The Date/Time Settings screen is display below.



- **Date.** The operator can change the IQAN-MD4's date value.
- **Time.** The operator can change the IQAN-MD4's time value.

## Language Settings

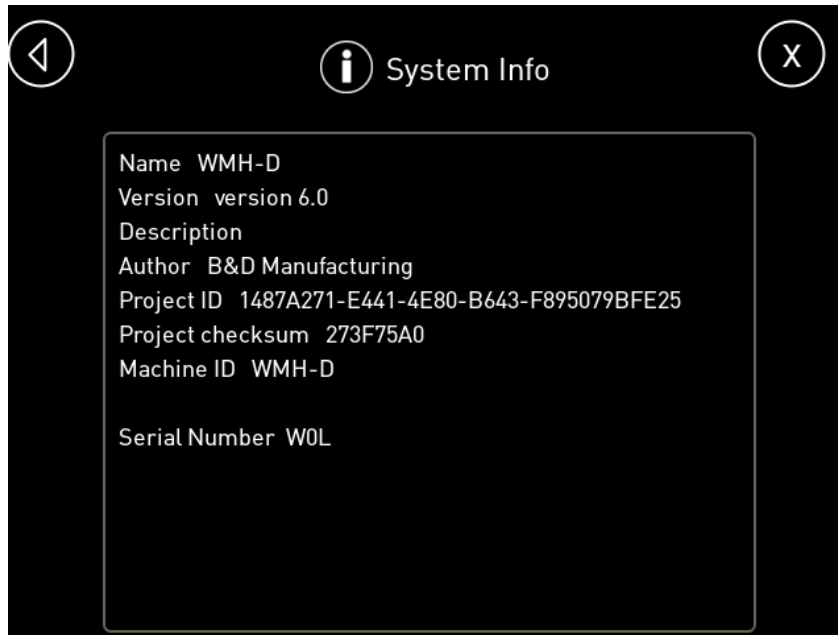
The operator can gain access to the Language Settings by pressing on the Language touch button once the Preferences navigation screen is displayed. The Language Settings screen is display below.



- **English.** The operator can change the current text displayed throughout the IQAN Multi Handler's software application to English by selecting the English setting.
- **Español.** The operator can change the current text displayed throughout the IQAN Multi Handler's software application to Spanish by selecting the Español setting.

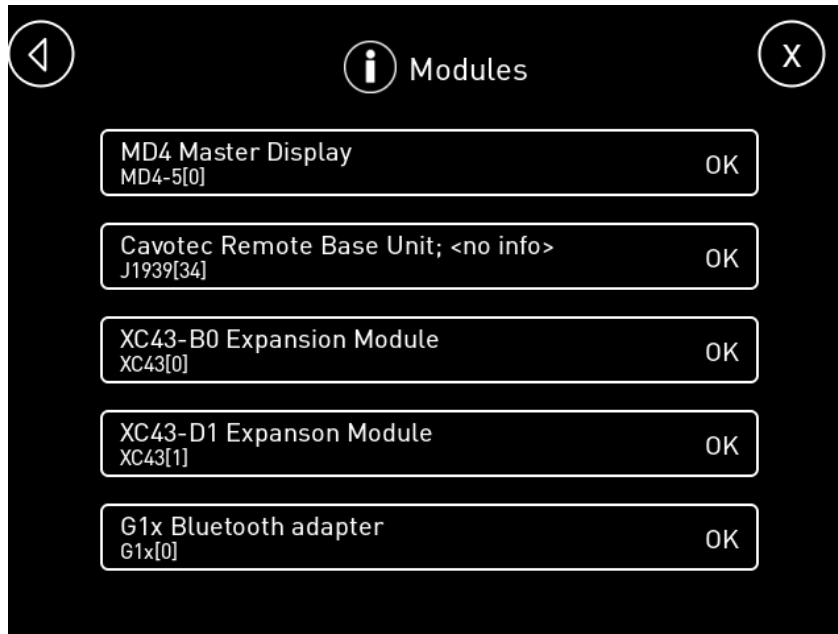
### System Info Screen

The operator can view certain information, IQAN Machine ID and B&D Multi Handler Serial Number from the System Info screen. The operator can access the System Info screen by pressing the Info touch button on the System screen. The Info screen is display below.



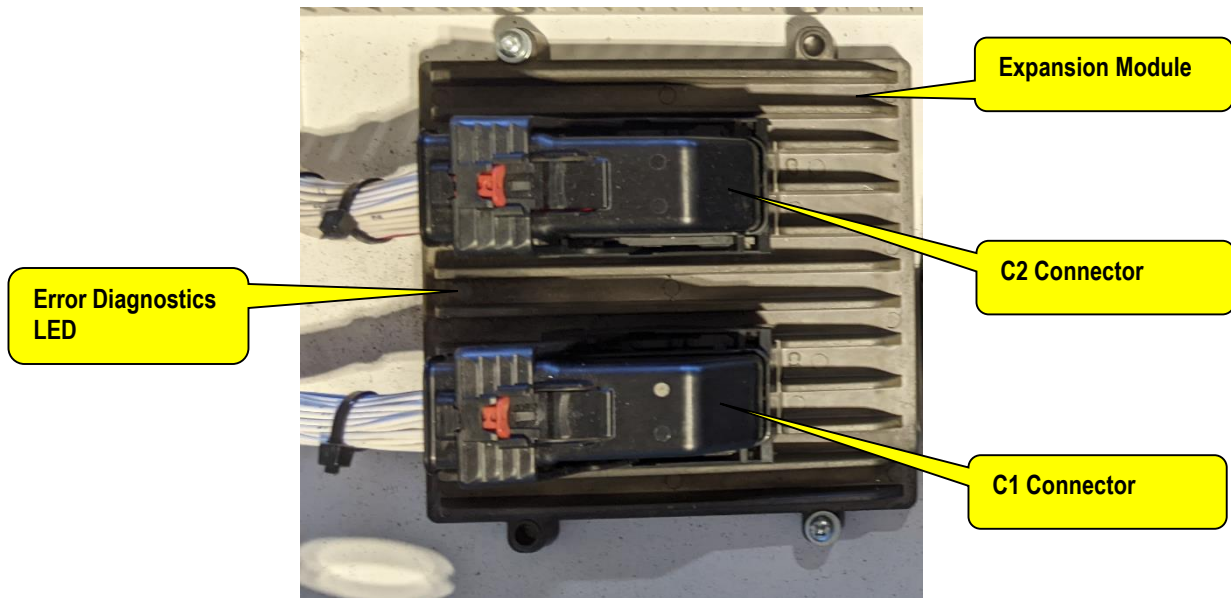
### Module Status

The operator can view the status of the individual modules integrated into the Multi Handler's application. The operator can access the Module Status by pressing the Modules touch button on the System screen., and individual IQAN Module status. The Modules Status screen is display below.



### Expansion Module IQAN-XC43

The expansion module is an I/O module that provides voltage inputs, digital inputs, digital outputs, and current outputs for the Multi Handler's Controls System.



There are two (2) expansion modules, XC43-B0 and XC43-D1, located inside of the Electrical Panel Assembly.

The top of the expansion module is equipped with an error diagnostics yellow/red LED. Under normal operating conditions the yellow/red LED will blink yellow approximately once per second. Under an error condition the yellow/red LED will begin to blink and alternate between red and yellow flashes.

The top of each of the IQAN-XC43 modules is equipped with two (2) I/O interface connectors, C1 and C2 connectors.

The following table lists the IQAN-XC43-**B0** module's C1 connector pin and function assignments.

| Description                                    | I/O Type            | Pin Assignment         | Units   | Comments   |
|--|---------------------|------------------------|---------|--|
| Hydraulic Pump Main Pressure Status            | Voltage Input       | C1:8                   | PSI     | Hydraulic Pump Pressure Sensor Status  |
| Load Sensing Pressure Status                   | Voltage Input       | C1:9                   | PSI     | Hydraulic Load Pressure Sensor Status  |
| Diesel Fuel Level Status                       | Voltage Input       | C1:10                  | %       | Diesel Fuel L Status   |
| Warning Horn Relay Power Supply                | Digital Output      | C1:45                  |         | 12Vdc Power Supply for Warning Horn Interposing Control Relay                  |
| Drive Motion Alarm (Beeper) Relay Power Supply | Digital Output      | C1:46                  |         | 12Vdc Power Supply for Audible Motion Alarm (Beeper) Interposing Control Relay |
| All Struts Down Relay Power Supply             | Digital Output      | C1:47                  |         | 12Vdc Power Supply for All Struts Down Indicator Light                         |
| Left Front Strut Up/Down Control               | Current Output      | C1:14, C1:39 and C1:55 | mA      | Left Front Strut Up and Down Position Control                                  |
| Right Front Strut Up/Down Control              | Current Output      | C1:15, C1:40 and C1:56 | mA      | Right Front Strut Up and Down Position Control                                 |
| Rear Strut Up/Down Control                     | Current Output      | C1:16, C1:41 and C1:57 | mA      | Rear Strut Up and Down Position Control  |
| Front Steer Left/Right Control                 | Current Output      | C1:30, C1:42 and C1:58 | mA      | Front Steer Left and Right Direction Control                                   |
| Rear Steer Left/Right Control                  | Current Output      | C1:31, C1:43 and C1:59 | mA      | Rear Steer Left and Right Direction Control                                    |
| Front Cross Slide Left/Right Control           | Current Output      | C1:32, C1:44 and C1:60 | mA      | Front Slide Left and Right Direction Control                                   |
| CAN-bus Address (ADDR-H and ADDR-H)            | Termination Input   | C1:4 and C1:20         | Ohms    | CAN-bus Address ID Tag ( <b>Address 0</b> ) + 120 ohm Termination Resistor     |
| CAN-bus B Communications (CAN-H and CAN-L)     | Serial Input/Output | C1:2 and C1:18         |         | CAN-bus B Serial Communications Network from MD4 C1:10 and C1:3                |
| DC Voltage Input (+BAT and -BAT)               | Voltage Input       | C1:65 and C1:66        | Vdc     | 12Vdc Voltage Input Power Supply   |
| DC Voltage Reference (+VREF and -VREF)         | Voltage Output      | C1:23 and C1:7         | VRef dc | 5Vdc Voltage Output for Voltage Inputs.  |

The following table lists the IQAN-XC43-**B0** module's C2 connector pin and function assignments.

| Description                               | I/O Type       | Pin Assignment         | Units | Comments  |
|---|----------------|------------------------|-------|---|
| All Struts Down Override Control          | Digital Input  | C2:9                   |       | All Struts Down Override Control                        |
| Front Left Strut Down Position Status     | Digital Input  | C2:10                  |       | Front Left Strut Down Position Status                   |
| Front Right Strut Down Position Status    | Digital Input  | C2:11                  |       | Front Left Strut Down Position Status                   |
| Rear Strut Down Position Status           | Digital Input  | C2:12                  |       | Rear Strut Down Position Status                         |
| Hydraulic Fluid Low Level Status          | Digital Input  | C2:25                  |       | Low Hydraulic Fluid Level Sensor Status                 |
| Rear Cross Slide Left/Right Control       | Current Output | C2:47, C2:13 and C2:29 | mA    | Rear Slide Left and Right Direction Control             |
| Front Left Drive Forward/Reverse Control  | Current Output | C2:48, C2:14 and C2:30 | mA    | Front Left Drive Forward and Reverse Direction Control  |
| Front Right Drive Forward/Reverse Control | Current Output | C2:67, C2:15 and C2:31 | mA    | Front Right Drive Forward and Reverse Direction Control |
| Rear Drive Forward/Reverse Control        | Current Output | C2:68, C2:16 and C2:32 | mA    | Rear Drive Forward and Reverse Direction Control        |
| DC Voltage Input (+BAT)                   | Voltage Input  | C2:73                  | Vdc   | 12Vdc Voltage Input Power Supply                        |

The following table lists the IQAN-XC43-D1 module's C1 connector pin and function assignments.

| Description                                | I/O Type            | Pin Assignment         | Units   | Comments   |
|--|---------------------|------------------------|---------|--|
| PB Dipper Up/Down Control                  | Current Output      | C1:14, C1:39 and C1:55 | mA      | PB Dipper Up and Down Direction Control                                    |
| PB Extend In/Out Control                   | Current Output      | C1:15, C1:40 and C1:56 | mA      | PB Extend In and Out Direction Control                                     |
| PB Angle Left/Right Control                | Current Output      | C1:16, C1:41 and C1:57 | mA      |  |
| PB Tilt Forward/Back Control               | Current Output      | C1:30, C1:42 and C1:58 | mA      | PB Angle Left and Right Direction Control                                  |
| PB Base Rotate Left/Right Control          | Current Output      | C1:31, C1:43 and C1:59 | mA      | Front Right Drive Forward and Reverse Direction Control                    |
| PB Boom Up/Down Control                    | Current Output      | C1:32, C1:44 and C1:60 | mA      | Rear Drive Forward and Reverse Direction Control                           |
| CAN-bus Address (ADDR-H and ADDR-H)        | Termination Input   | C1:4 and C1:20         | Ohms    | CAN-bus Address ID Tag ( <b>Address 1</b> ) + 120 ohm Termination Resistor |
| CAN-bus D Communications (CAN-H and CAN-L) | Serial Input/Output | C1:2 and C1:18         |         | CAN-bus D Serial Communications Network from MD4 C1:8 and C1:5             |
| DC Voltage Input (+BAT and -BAT)           | Voltage Input       | C1:65 and C1:66        | Vdc     | 12Vdc Voltage Input Power Supply   |
| DC Voltage Reference (+VREF and -VREF)     | Voltage Output      | C1:23 and C1:7         | VRef dc | 5Vdc Voltage Output for Voltage Inputs.                                    |

The following table lists the IQAN-XC43-D1 module's C2 connector pin and function assignments.

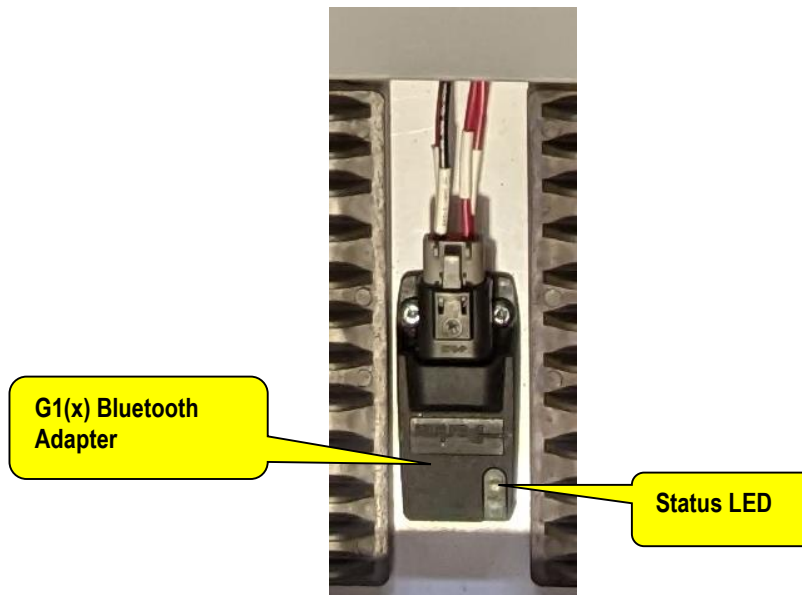
| Description                  | I/O Type       | Pin Assignment         | Units | Comments                                   |
|------------------------------|----------------|------------------------|-------|--|
| PB Grab Hold/Release Control | Current Output | C2:47, C2:13 and C2:29 | mA    | PB Grab Hold and Release Direction Control |
| DC Voltage Input (+BAT)      | Voltage Input  | C2:73                  | Vdc   | 12Vdc Voltage Input Power Supply           |

### Bluetooth Adapter IQAN-G1(x)

The IQAN-G1(x) Bluetooth adapter allows for a wireless connection to the Multi Handler's IQAN-MD4 display through a smartphone that has the Parker IQANgo application installed on it. This feature allows for on-site diagnostics or off-site connectivity and support by B&D technicians over the internet.

IQAN-G1(x) wireless communication range over Bluetooth is up to 20 meters, typically 5 to 10 meters and up to a maximum speed of 70Kbit/sec.

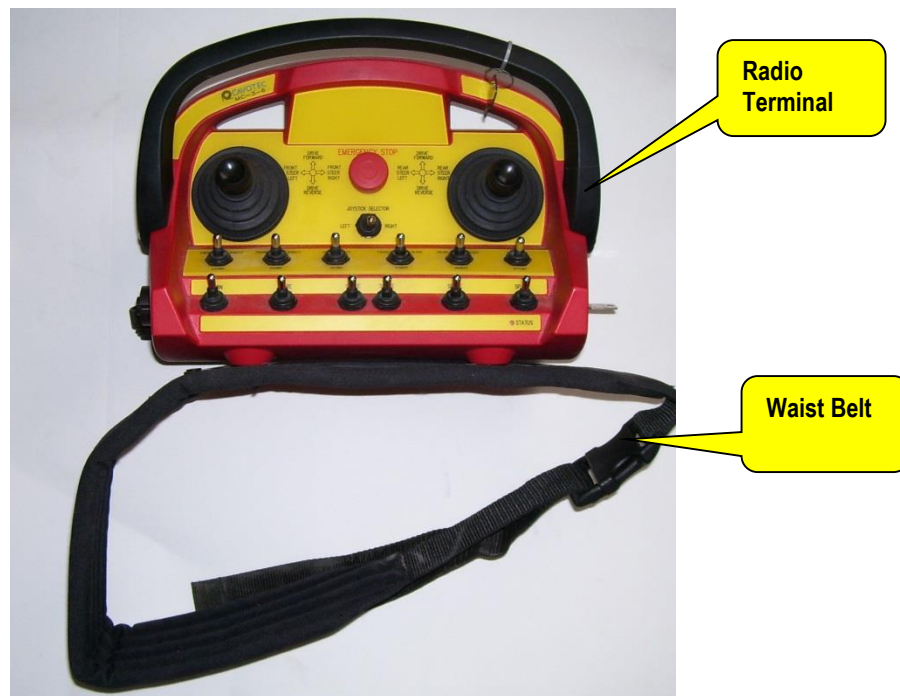
The top of the Bluetooth adapter is equipped with a status diagnostic LED. Under normal operating conditions the LED will blink yellow approximately once per second, on for 900ms and off for 100ms. Under an error condition the LED will begin to blink and alternate between red and yellow flashes.



## Radio Terminal

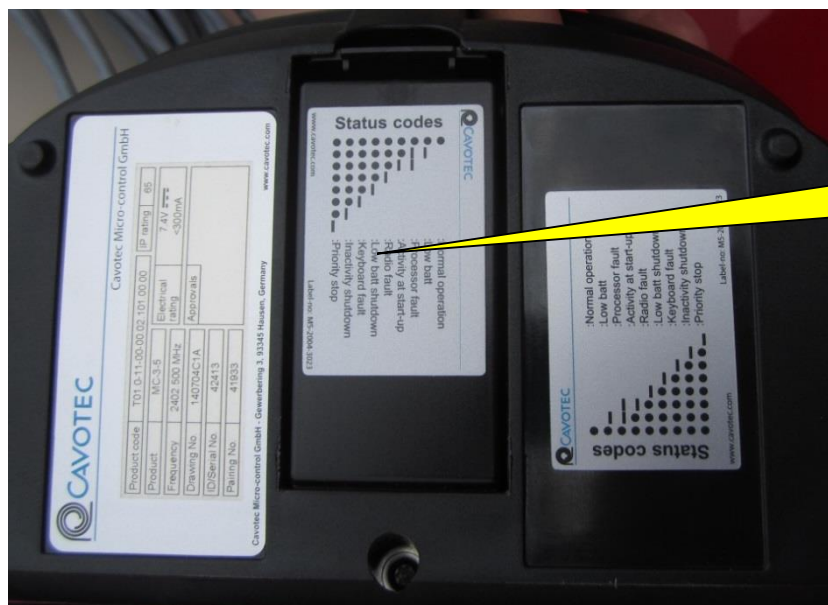
The Radio Terminal provides the operator with means of operating the Multi Handler.

The Radio Terminal communicates wirelessly with the Base Unit via embedded radio remote control components. The Radio Terminal can also communicate with the Base Unit via a hardwired Communications cable.



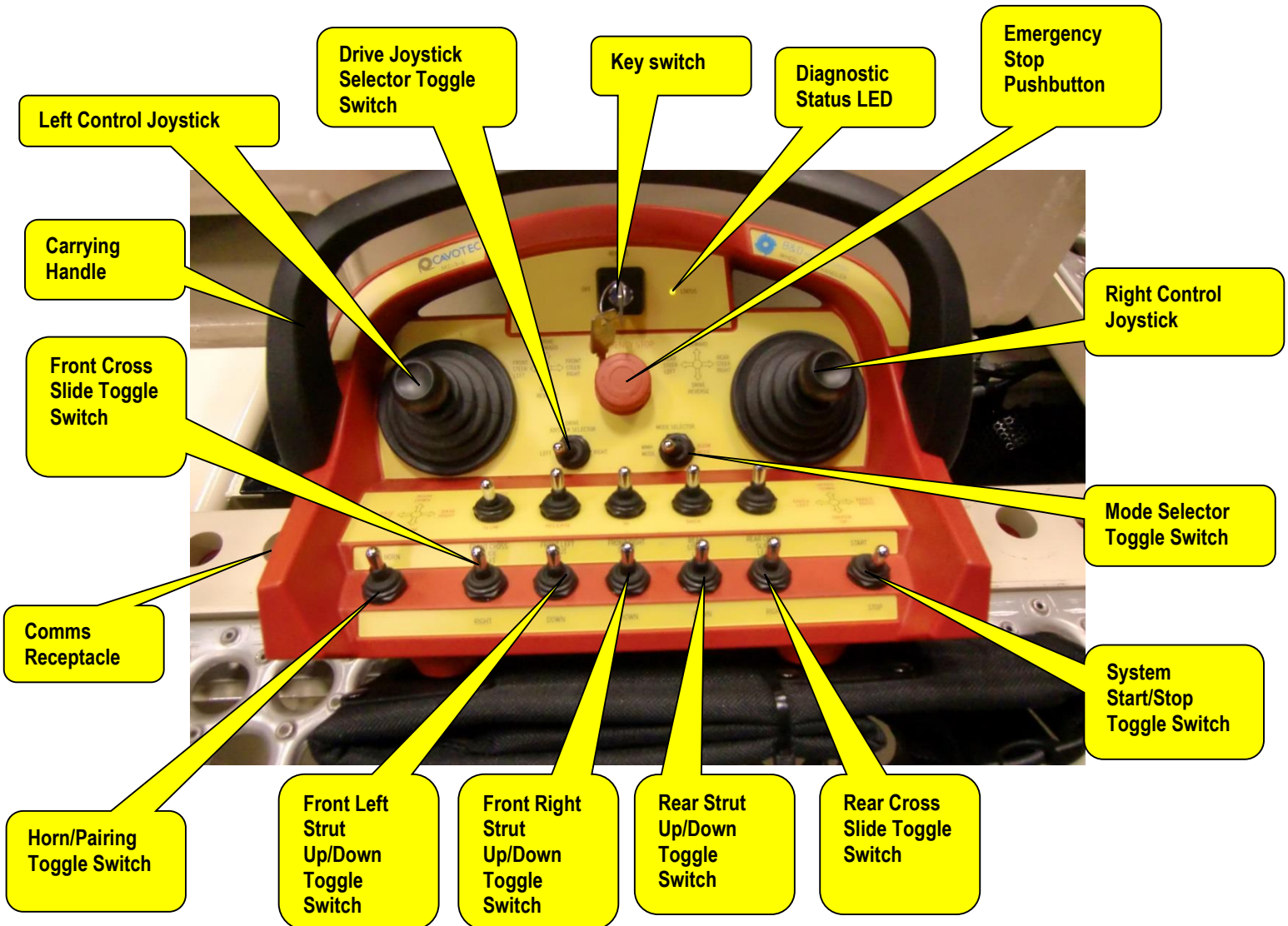
The Radio Terminal consists of the following components.

- Left control joystick
- Right control joystick
- Drive Joystick Selector toggle switch
- Mode Selector toggle switch
- PB Speed toggle switch
- PB Grab Hold/Release toggle switch
- PB Extend Out/In toggle switch
- PB Tilt Forward/Back toggle switch
- PB Grab Release toggle switch
- Front Left Strut Up/Down toggle switch
- Front Right Strut Up/Down toggle switch
- Rear Strut Up/Down toggle switch
- Front Cross Slide toggle switch
- Rear Cross Slide toggle switch
- System Start/Stop toggle switch
- Warning Horn/Cable Pairing control toggle switch
- Emergency Stop Pushbutton
- Diagnostics Status LED
- Communications Receptacle
- Key switch
- Rechargeable Batteries
- Waist Belt
- Battery Charger

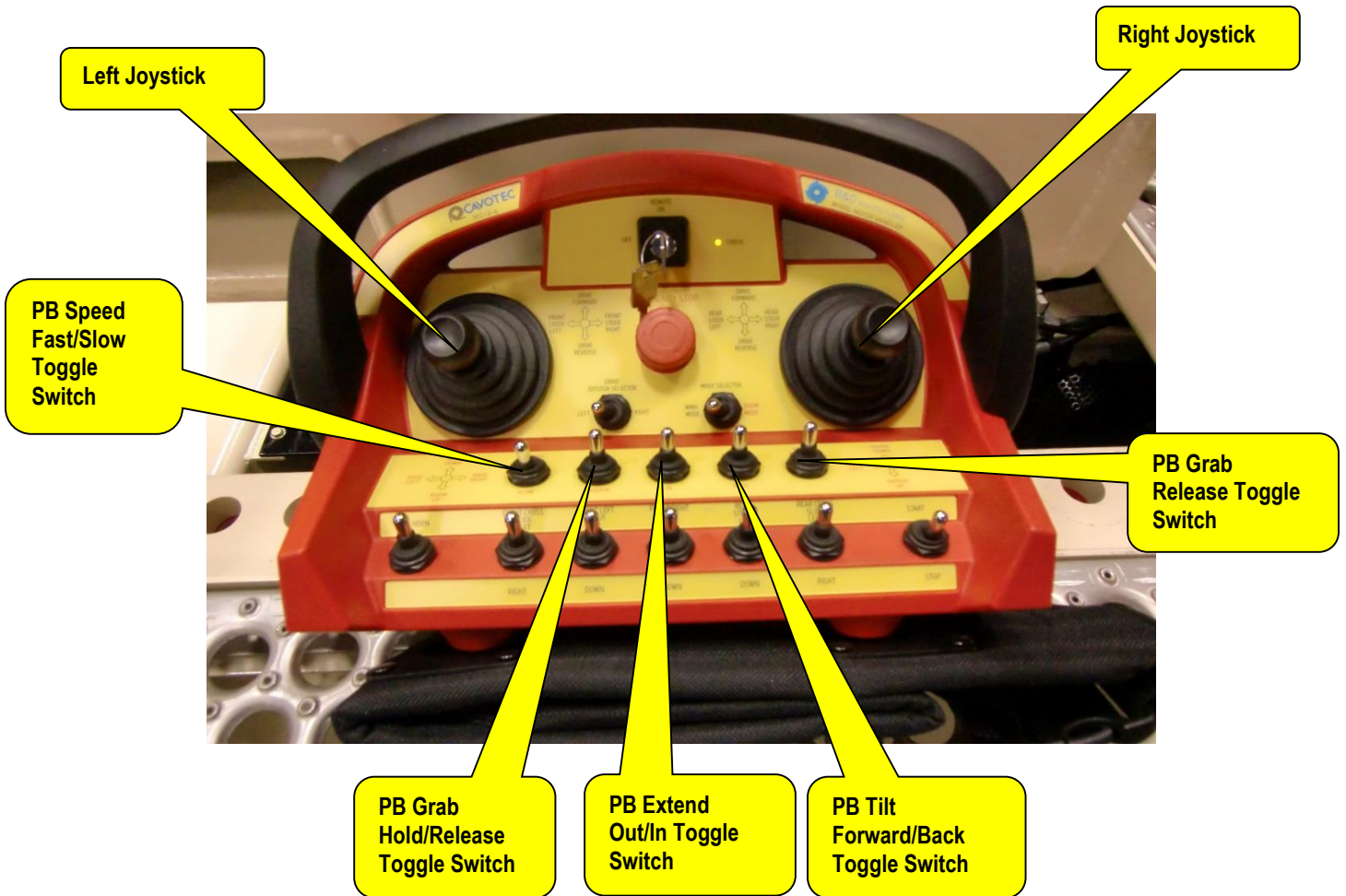


**Rechargeable  
Lithium Ion  
Battery**

WMH Mode



**Boom Mode**



### **Left Control Joystick**

In WMH Mode, the Drive Forward/Reverse and Front Steer Left/Right control joystick consist of a dual axis control operator, Drive Forward and Reverse control in the y-axis direction and Front Steer Left and Right control in the x-axis direction.

In Boom Mode, the Boom Down/Up and Base Left/Right control joystick consist of a dual axis control operator, Boom Up and down control in the y-axis direction and Base Left and Right control in the x-axis direction.

### **Right Control Joystick**

In WMH Mode, the Drive Forward/Reverse and Front Steer Left/Right control joystick consist of a dual axis control operator, Drive Forward and Reverse control in the y-axis direction and Rear Steer Left and Right control in the x-axis direction.

In Boom Mode, the Dipper Down/Up and Angle Left/Right control joystick consist of a dual axis control operator, Dipper Up and down control in the y-axis direction and Angle Left and Right control in the x-axis direction.

### **Drive Joystick Selector Toggle Switch**

The Drive Joystick Selector toggle switch consists of a two-position maintained. To drive with the Left Joystick push the switch in the left direction and to drive with the right Joystick push the switch in the right direction.

### **Front Left Strut Up/Down Toggle Switch**

In WMH Mode, the Front Left Strut Up/Down toggle switch consist of a three-position spring return. The operator uses the Front Left Strut Up and Down toggle switch to raise or lower the Front Left Strut Assembly when the Multi Handler is in operation.

Pushing the toggle switch in the upward direction towards the Up label will cause the Front Left Strut Assembly to move in the up vertical direction.

Pushing the toggle switch in the downward direction towards the Down label will cause the Front Left Strut Assembly to move in the down vertical direction.

### **Front Right Strut Up/Down Toggle Switch**

In WMH Mode, the Front Right Strut Up/Down toggle switch consist of a three-position spring return. The operator uses the Front Right Strut Up and Down control toggle switch to raise or lower the Front Right Strut Assembly when the Multi Handler is in operation.

Pushing the toggle switch in the upward direction towards the Up label will cause the Front Right Strut Assembly to move in the up vertical direction.

Pushing the toggle switch in the downward direction towards the Down label will cause the Front Right Strut Assembly to move in the down vertical direction.

### **Rear Strut Up/Down Toggle Switch**

In WMH Mode, the Rear Strut Up/Down toggle switch consist of a three-position spring return. The operator uses the Rear Strut Up and Down control toggle switch to raise or lower the Rear Strut Assembly when the Multi Handler is in operation.

Pushing the toggle switch in the upward direction towards the Up label will cause the Rear Strut Assembly to move in the up vertical direction.

Pushing the toggle switch in the downward direction towards the Down label will cause the Rear Strut Assembly to move in the down vertical direction.

### **Front Cross Slide Toggle Switch**

In WMH Mode, the Front Cross Slide toggle switch consists of a three-position spring return. The operator uses the Front Cross Slide toggle switch to move the Front Cross Slide Assembly left or right when the Multi Handler is in operation.

Pushing the toggle switch in the upward direction towards the Left label will cause the Front Cross Slide Assembly to move in the left direction.

Pushing the toggle switch in the downward direction towards the Right label will cause the Front Cross Slide Assembly to move in the right direction.

### **Rear Cross Slide Toggle Switch**

In WMH Mode, the Rear Cross Slide toggle switch consists of a three-position spring return. The operator uses the Rear Cross Slide toggle switch to move the Rear Cross Slide Assembly left or right when the Multi Handler is in operation.

Pushing the toggle switch in the upward direction towards the Left label will cause the Rear Cross Slide Assembly to move in the left direction.

Pushing the toggle switch in the downward direction towards the Right label will cause the Rear Cross Slide Assembly to move in the right direction.

### **Grab Hold/Release Toggle Switch**

In Boom Mode, the Grab Hold/Release toggle switch consists of a three-position spring return. The operator uses the Grab Hold and Release toggle switch to spool and unspool both hydraulic winch straps when the Multi Handler is in operation.

Pushing the toggle switch in the upward direction towards the Hold label will cause hydraulic winch straps to tighten its grasp.

Pushing the toggle switch in the downward direction towards the Release label will cause hydraulic winch straps to loosen its grasp.

**Note:** In order to release the Hydraulic Winch Straps, the operator must simultaneously push **down** on the Grab Hold/Release control toggle switch and push **up** on the Grab Release control toggle switch.

### **Grab Release Toggle Switch**

In Boom Mode, the Grab Release control toggle switch consists of a two-position spring return. The operator uses the Grab Release toggle switch along with the Grab Hold/Release toggle switch in order to release the load. This safety measure has been incorporated in order for operator to be fully willing and prepared to release his load in a safe manner

**Note:** In order to release the Winch Straps, the operator must simultaneously push **up** on the Grab Release control toggle switch and push **down** on the Grab Hold/Release control toggle switch.

### **Extend In/Out Toggle Switch**

In Boom Mode, the Extend In/Out control toggle switch consist of a three-position spring return. The operator uses the Extend In and out toggle switch to extend the Pedestal Boom Attachment out away from the Multi Handler and retract the Pedestal Boom Attachment in towards the Multi Handler Pedestal Boom Attachment.

Pushing the toggle switch in the upward direction towards the Out label will cause the End-Effector to move out and away from the Multi Handler.

Pushing the toggle switch in the downward direction towards the In label will cause the End-Effector to move in and towards the Multi Handler.

### **Tilt Forward/Back Toggle Switch**

In Boom Mode, the Tilt Forward and Back toggle switch consist of a three-position spring return. The operator uses the Tilt Forward and Back toggle switch to tilt forward and tilt back the Pedestal Boom.

Pushing the toggle switch in the upward direction towards the Forward label will cause the End-Effector to away from the Multi Handler.

Pushing the toggle switch in the downward direction towards the Back label will cause the End-Effector to move in towards the Multi Handler.

### **Speed Fast Control Toggle Switch**

In Boom Mode, the Speed Fast toggle switch consists of a two-position maintained. When equipped with a Pedestal Boom this switch will either increase the available speed of the pedestal boom or decrease its speed of function.

Pushing the toggle switch in the upward direction towards the Fast label will increase the speed of attached Pedestal Boom

Pushing the toggle switch in the downward direction towards the slow label will decrease the speed of the attached pedestal boom.

**Note:** The Fast control toggle switch must be in the slow position prior to turning the Radio Terminal's Key switch to the 'on' position. Control of the Pedestal Boom Attachment via the Radio Terminal will be inhibited whenever the key switch is turned to the 'on' position and the Fast control toggle switch is in the 'Fast' position. The Radio Terminal will provide diagnostic feedback of this condition via its Diagnostic Status LED.

Refer to the Diagnostic Status LED section for more information regarding the description on the Radio Terminal's Diagnostic Status LED.

### **Mode Selector Toggle Switch**

The Mode Selector WMH/Boom control toggle switch consists of a two-position maintained switch. The WMH functions control in the left position and Pedestal Boom functions control in the right position.

### **System Start/Stop Toggle Switch**

The System Start/Stop control toggle switch consists of a two-position maintained control switch.

Pushing the toggle switch in the upward direction towards the Start label will activate the Radio Terminal's selected control.

Pushing the toggle switch in the downward direction towards the Stop label will deactivate any of the Radio Terminal's selected functions.

**Note:** The System Start/Stop control toggle switch must be in the 'Stop' position prior to turning the Radio Terminal's Key switch to the 'on' position. Control of the Multi Handler or Pedestal Boom functions via the Radio Terminal will be inhibited whenever the key switch is turned to the 'on' position and the System Start/Stop control toggle switch is in the 'Start'

position. The Radio Terminal will provide diagnostic feedback of this condition via its Diagnostic Status LED.

Refer to the Diagnostic Status LED section for more information regarding the description on the Radio Terminal's Diagnostic Status LED.

### **Horn/Pairing Toggle Switch**

The Multi Handler is equipped with an audible Warning Horn. The Warning Horn control toggle switch consists of a two-position momentary switch.

Pushing the toggle switch in the upward direction towards the Horn label will cause the Warning Horn to sound.

The Multi handler radio remote has a new cable pairing feature. This cable pairing feature enables new radio remote controls to be quickly flashed and utilized to operate the Multi Handler without having to re-flash entire system.

### **Emergency Stop Pushbutton**

The Emergency Stop pushbutton provides a means for the operator to initiate an immediate stop function of the radio control system only.

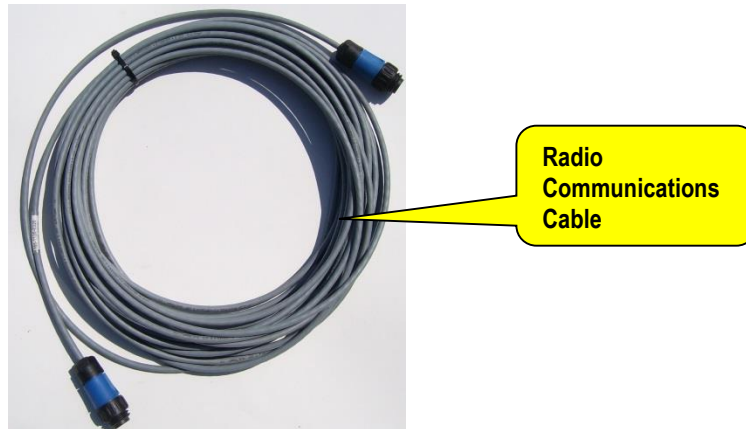
**Note:** The Emergency Stop Pushbutton must be in the pulled up, position prior to turning the Radio Terminal's key switch to the 'on' position. Control of the Multi Handler via the Radio Terminal will be inhibited whenever the key switch is turned to the 'on' position and the Emergency Stop Pushbutton is in the activated, pushed down, position. The Radio Terminal will provide diagnostic feedback of this condition via its Diagnostic Status LED.

Refer to the diagnostic status LED section for more information regarding the description on the Radio Terminal's Diagnostic Status LED.

### **Communications Receptacle**

The Communications Receptacle is a multi-conductor receptacle. The Communications Receptacle is used when the operator needs to have the Radio Terminal communicate via a hardwired connection with the Base Unit.

The Radio Communications Cable can be connected to the Base Unit via a receptacle at one end and the other end is to be connected to the radio terminal's communications receptacle.



The operator simply needs to connect the plug end of the communications cable into the Radio Terminal's communication Receptacle and then turn the Radio Terminal's key switch to the 'on' position

### **Key switch**

A power Key switch has been included in the design of the Radio Terminal. The Key switch provides the operator with a means to turn power on to the Radio Terminal.

### **Waist Belt**

A Waist Belt has been provided with your Multi Handler's Radio Terminal. The Waist Belt mates to the bottom of the Radio Terminal and provides the operator with a means to secure the Radio Terminal around his/her waist.

### **Diagnostic Status LED**

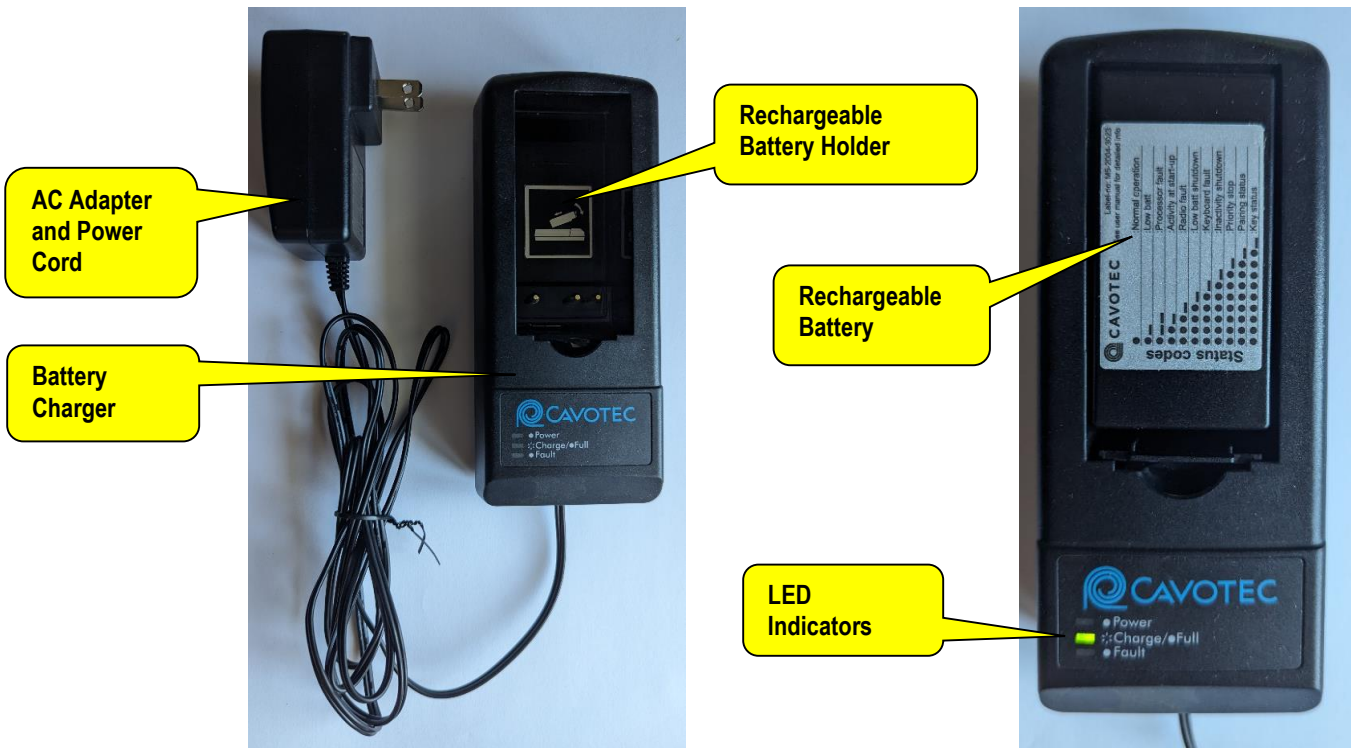
A Diagnostic Status LED, yellow (amber) in color, has been included. The Diagnostic Status LED provides the operator with a visual feedback indication of the status of the Radio Terminal.

The most common feedback states indicated by the Diagnostic Status LED are:

- Steady Light – Normal operation, no errors have been detected and the rechargeable battery voltage level is ok.
- Flashing Light, 1 flash per second – Rechargeable battery voltage level is low. Change or recharge batteries.
- Flashing Light, 2 flashes with a stop (pause) – One or more of the control joysticks or maintained switches are in the active, contact, position when the Radio Terminal's Key switch is turned on. Deactivate the function and cycle power to the Radio Terminal.
- Flashing light, 3 flashes with a stop (pause) – Radio fault Radio Module error.
- Flashing light, 4 flashes with a stop (pause) – Shutdown due to low battery voltage. Replace Battery with fully charged one.
- Flashing light, 5 flashes with a stop (pause) – Keyboard fault, Terminal is not able to "read" switches, joysticks. There is a fault at the input module.
- Flashing light, 6 flashes with a stop (pause) – Shutdown due to inactivity. The terminal will soon turn itself off since no switches or joysticks have been activated. Turn terminal off and on again to restart normal operation.
- Flashing light, 7 flashes with a stop (pause) – Priority stop. Emergency stop button on the radio remote terminal has been activated. Ensure button is in the out position. Turn terminal off and on again to start normal operation.

### Battery Charger

A Battery Charger has also been provided with your Multi Handler's Radio Terminal. The operator uses the Battery Charger to recharge the Radio Terminal's Rechargeable Batteries whenever the Radio Terminal's Diagnostic Status LED is indicating a state of low battery voltage.



The Battery Charger includes an AC adapter and power cord to power the unit.

LED indicators common states are:

- Power LED: Solid yellow (amber) – Not charging, battery is in stand-by safe state mode and will not charge. Replace battery
- Charge/Full LED: Flashing green – Battery is charging. Solid green – Battery is fully charged.
- Fault: Solid red – Battery voltage is too low or battery temperature is too low (cold) or high (hot) to charge. Allow battery temperature to come to room temperature if too cold or too hot prior to charging.

All LEDs will light up on startup to do a short self-test.

## Cable Pairing Procedure

The Multi Handler's radio remote system includes a new cable pairing technology. This cable pairing feature enables a new radio terminal to be quickly linked to an existing Multi Handler's base (receiver) unit.

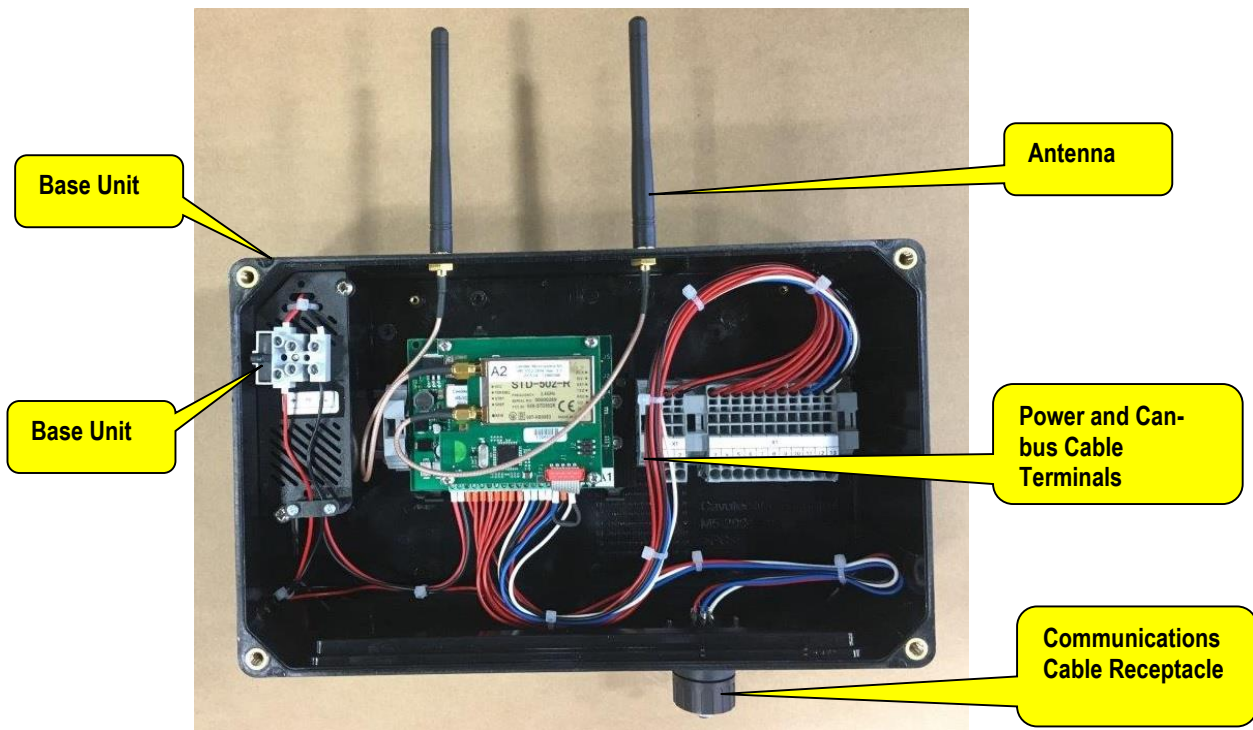
To perform the cable pairing procedure:

- Turn the key switch located on the radio terminal to the 'off' position.
- Connect the new radio terminal to the base unit using the backup communication cable.
- Turn on power to the base (receiver) unit by turning the lock-out switch located on the Multi Handler's diesel engine cover to the "on" position, by deactivating the emergency stop push button located on the electrical panel's door by pulling up on the pushbutton's head and then by turning the key switch located on the diesel engine micro panel in the clockwise direction to the heat position. The IQAN-MD4 display module should now be powered on.
- Deactivate the emergency stop pushbutton located on the radio terminal by pulling up on the pushbutton's head.
- Push the start/stop control toggle switch located on the radio terminal downward to the 'stop' position.
- Push the speed fast/slow control toggle switch located on the radio terminal downward to the 'slow' position.
- On older version remotes, you may also need to push the grab release control toggle switch located on the right side in the middle row on the radio terminal in the downward direction.
- Push up on the horn/pairing control toggle switch.
- Turn the key on the radio remote terminal to the 'on' position while still pushing up on the horn/pairing control toggle switch.
- Continue pushing up on the horn/pairing control toggle switch while observing the status LED on the radio terminal. The status LED will begin to flash. After the 8 flashes the status LED will stop flashing and change to a steady illuminated state. Once the LED is on steady the pairing function between the radio terminal and base unit is complete.
- Release the horn/pairing control toggle switch.
- Turn the key on the radio terminal to the off position.
- The newly paired radio terminal should now be able to operate and control the Multi Handler. You may now disconnect the communications cable from the radio terminal and verify that the new radio terminal controls all of the Multi Handler's functions via wireless communications. **Note:** The radio terminal's rechargeable batteries must be installed in the back of the radio terminal in order for the radio terminal to communicate with the base (receiver) unit via wireless communications.

### Base (Receiver) Unit

The Base Unit serves as the main interposing device between the Radio Terminal and the IQAN-MD4 Master Display. The Base Unit is located at the rear Electrical System's Controls Panel Assembly.

The Base Unit monitors the data transmitted between it and the Radio Terminal, checks the data packets for validity, monitors the status of the Radio Terminal's Emergency Stop Pushbutton and transmits the status of the control joysticks and control toggle switches to the IQAN-MD4 Master Display via a J1939 Can-bus communications protocol.



The Base Unit consists of the following components.

- Radio Frequency Module
- Antennas
- Communications Cable Receptacle
- Power and Can-bus Cable Terminals
- Fuse and Fuse Holder

### Antennas

Two (2) omni directional Antennas have been included in the design of the Base Unit. The Antennas screw into receptacles located on the exterior housing of the Base Unit.

The function of the Antennas are to extend the communications ability of the Base Unit with the Radio Terminal.

### **Communications Cable Receptacle**

The Communications Cable Receptacle is located on the bottom of the Base Unit's housing. It provides a means of connecting the backup communications cable from the Radio Terminal to the Base Unit.

### **Power Can-bus Cable Terminals**

The Power Can-bus Cable is hardwired to the Base Unit's terminals at one end and to the Electrical System's Controls Panel Assembly at the other end.

The Power Can-bus Cable includes conductors to supply 12Vdc power to the Base Unit and Can-bus communications between the Base Unit and the IQAN-MD4 Master Display.

Refer to the Electrical Schematics for more detailed information on the Electrical System supplied with your Multi Handler.

### **Fuse and Fuse Holder**

A 5x20mm 5amp 250V rated Slo-Blo glass body style cartridge fuse is included inside of the Base Unit. To remove the fuse simply pull up on the tap located on the fuse holder.

### Warning Horn

The Multi Handler is equipped with an audible warning horn. The warning horn is mounted to the exterior bottom of the electrical panel enclosure.



The Warning Horn is a 12VDC 112db (decibels) high tone trumpet style horn.

The operator can sound the Warning Horn control toggle switch by pushing the Horn control toggle switch located on the Radio Terminal.

### **Drive Motion Beeper**

The Multi Handler is equipped with an audible Drive Motion Beeper. The Drive Motion Beeper is mounted to the exterior bottom of the Electrical Panel Assembly Enclosure.



The Drive Motion Beeper is a 12VDC 400mA 97db (decibels) medium to low noise surround type C audible alarm.

The Multi Handler's application will automatically activate the audible Drive Motion beeper whenever the one of the Multi Handler's drive joysticks in activated on the radio terminal.

## Electrical System

The Electrical System consists of the following main components.

- Safety Lock-out Switch
- Electrical Panel Assembly
- Engine Battery

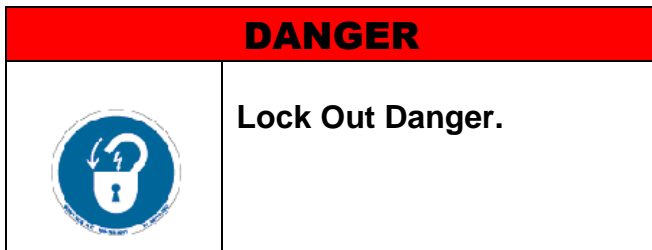
Refer to the Electrical Schematics located in your service manual

### Safety Lock-out Switch

The Safety Lock-out Switch is located on the rear right side of the Multi Handler's Diesel Engine Cover.



The DC Common supply from the Engine Battery is hardwired directly of the Safety Lock-out Switch.



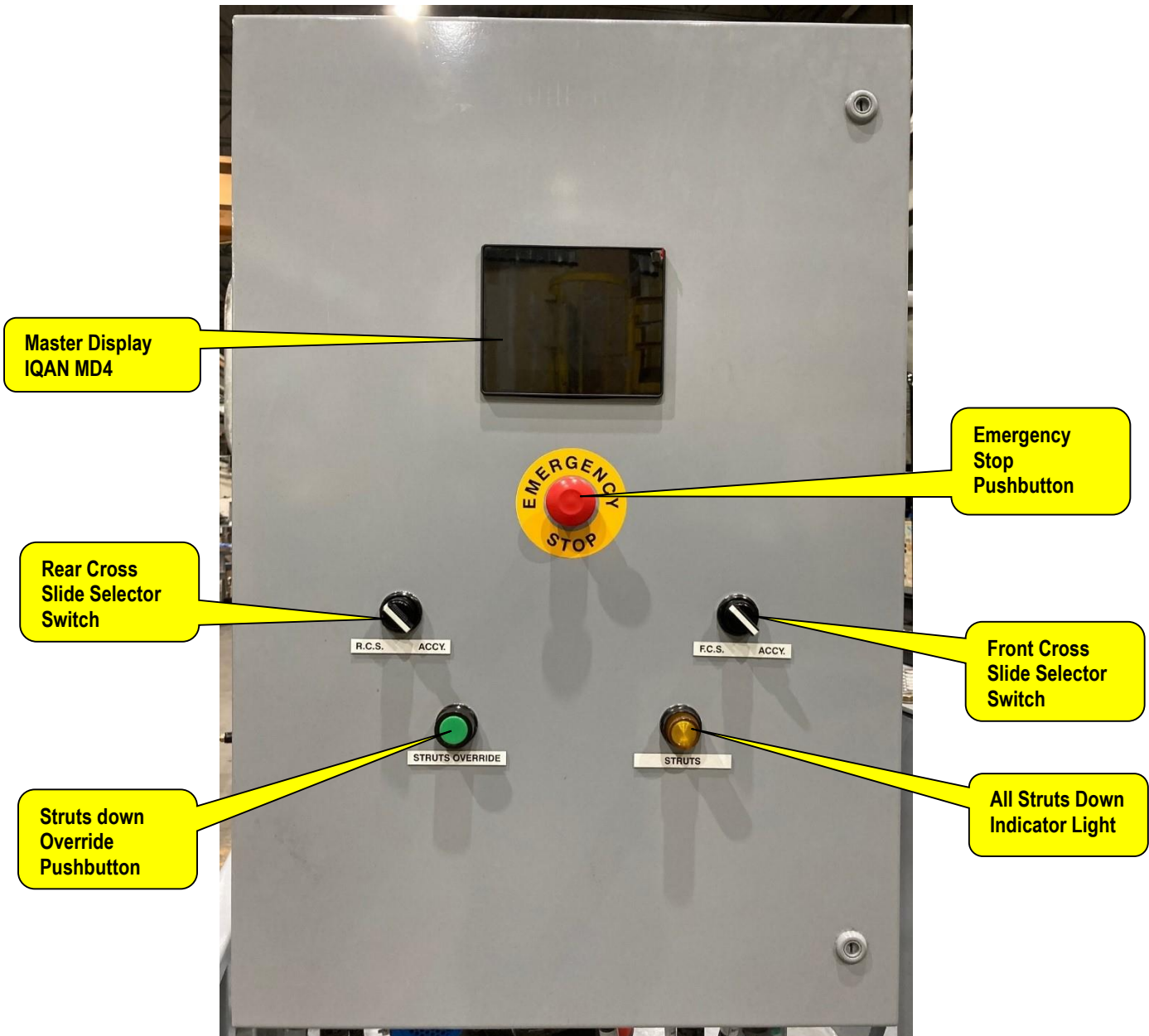
The Safety Lock-out Switch is equipped with a provision for a keyed lock this is the operator location to perform a lock out, tag out procedure. When the safety lock-out switch is in the off position your Multi Handler will have no means of being powered on.

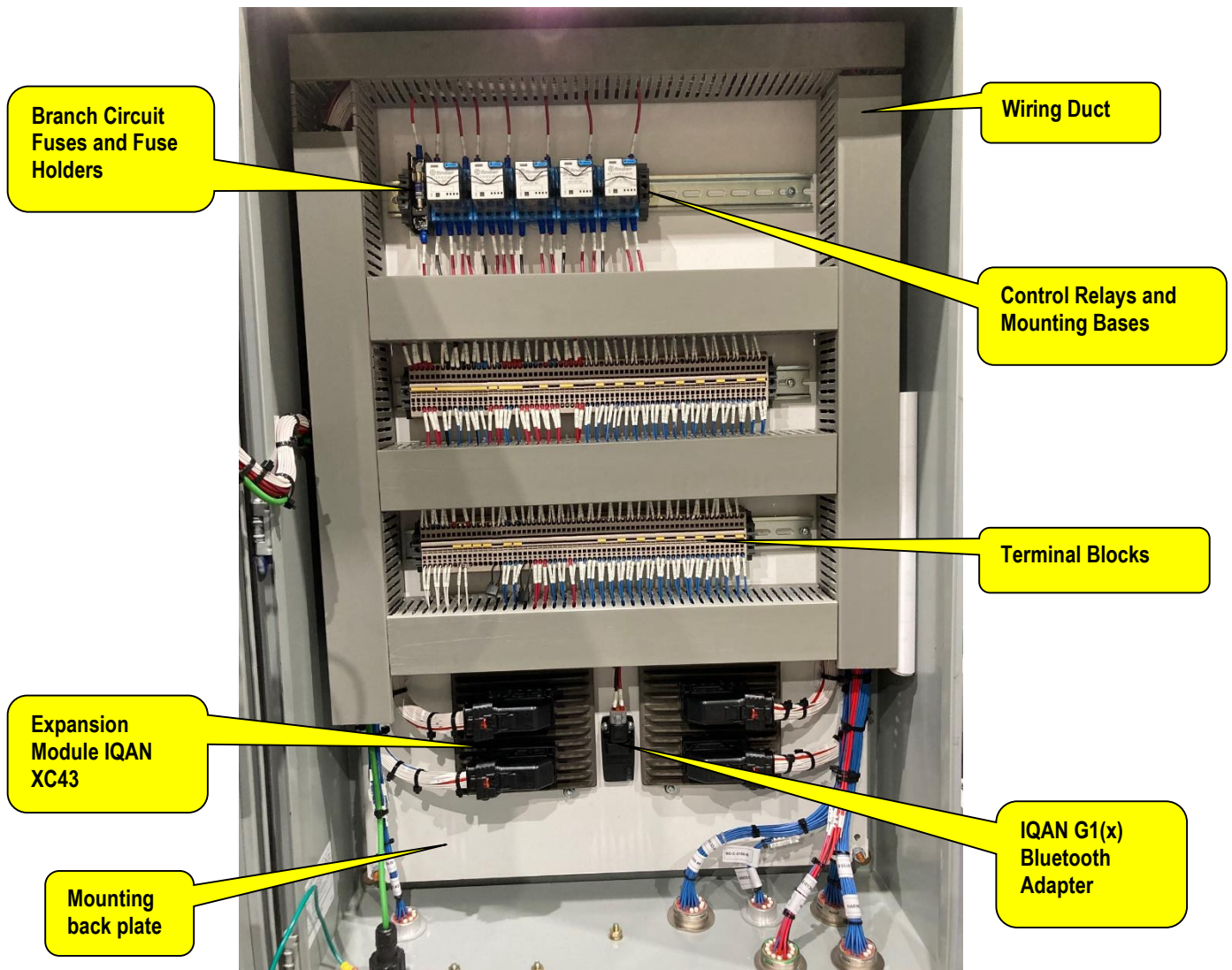
## **Electrical Panel Assembly**

The Electrical Panel Assembly is located on the left, at the rear of the Multi Handler.

The Electrical Panel Assembly consists of the following main components.

- Master Display (IQAN MD4)
- Expansion Modules (IQAN XC43)
- Emergency Stop Pushbutton
- Rear Cross Slide Selector Switch (R.C.S)
- Front Cross Slide Selector Switch (F.C.S)
- All Struts Down Indicator Light
- Struts Down Override Pushbutton
- Control Relays and Mounting Bases
- Branch Circuit Fuses and Fuse Holders
- Terminal Blocks, Wiring Duct and Mounting Back plate
- USB Interface Cable
- B&D Manufacturing's Nameplate





### Master Display (IQAN MD4)

One (1) IQAN-MD4 Master Display module has been incorporated into the Multi Handler's Controls System design. For information on the IQAN-MD4 Master Display refer to the **Controls System** section of this manual.

### Expansion Module

There are two (2) IQAN-XC43 expansion modules, XC43-B0 and XC43-D1 incorporated into the Multi Handler's Controls System design. For information on the IQAN-XC43 expansion modules refer to the **Controls System** section of this manual.

### Emergency Stop Pushbutton

This Emergency Stop Pushbutton will force off power to the Multi Handler's Controls System. Activate the Emergency Stop Pushbutton by pushing down on the pushbutton's head. Deactivate the Emergency Stop Pushbutton pulling up on the pushbutton's head.

### Rear Cross Slide Selector Switch

A two-position maintained Rear Cross Slide Accessory Selector Switch has been included in the Multi Handler's Controls System.

The purpose of the Rear Cross Slide Selector Switch is to redirect the flow of hydraulic fluid from the rear cross slide hydraulic cylinders to the outlet port of the Rear Cross Slide (R.C.S) valve assembly in order to control optional Multi Handler attachments.



Rear Cross Slide  
Accessory Valve

When the Rear Cross Slide Selector Switch is placed in the R.C.S. position, the Rear Cross Slide accessory valve assembly's electric operated solenoid will remain de-energized allowing the operator to control the rear cross slide hydraulic cylinders via the Rear Cross Slide toggle switch located on the Radio Terminal.

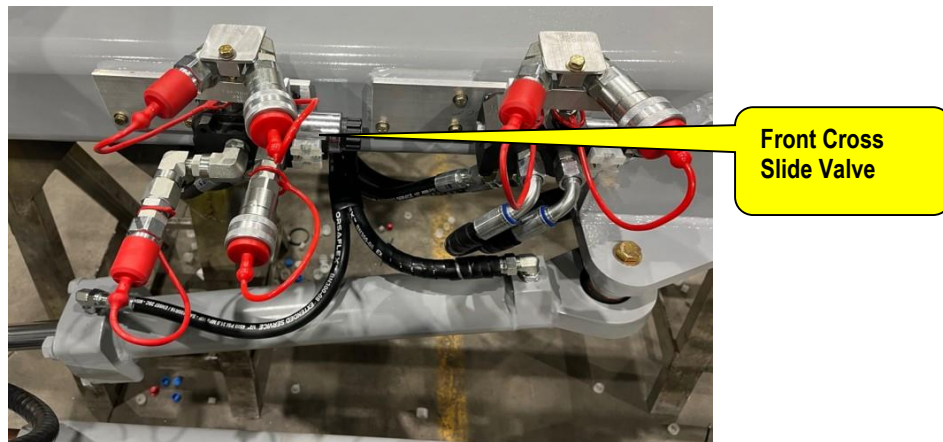
When the Rear Cross Slide Accessory Selector Switch is placed in the ACCY position, the Rear Cross Slide valve will allow the operator to control the Multi Handler attachment that is connected to the outlet port of the Rear Cross Slide (R.C.S) valve assembly via the Rear Cross Slide toggle switch located on the Radio Terminal.

**Note:** The operator is not able to command the movement of the Rear Cross Slide hydraulic cylinders whenever the selector switch is in the ACCY position.

### Front Cross Slide Selector Switch

A two position maintained Front Cross Slide Accessory Selector Switch has also been included in the Multi Handler's Controls System.

The purpose of the Front Cross Slide Selector Switch is to redirect the flow of hydraulic fluid from the front cross slide hydraulic cylinders to the outlet port of the Front Cross Slide (F.C.S) valve in order to control optional Multi Handler attachments.



When the Front Cross Slide Selector Switch is placed in the F.C.S. position, the Front Cross Slide valve will allow the operator to control the front cross slide hydraulic cylinders via the Front Cross Slide toggle switch located on the Radio Terminal.

When the Front Cross Slide Selector Switch is placed in the ACCY position, the Front Cross Slide will allow the operator to control Multi Handler attachment that is connected to the outlet port of the Front Cross Slide (F.C.S) valve via the Front Cross Slide toggle switch located on the Radio Terminal.

**Note:** The operator is not able to command the movement of the Front Cross Slide hydraulic cylinders whenever the selector switch is in the ACCY position.

### Strut Down Position Limit Switches

Three (3) Struts down Position Limit Switches have been incorporated into the Multi Handler's Electrical and Controls System design.

The three struts down position limit switches are located underneath the multi handler main frame at each of the multi handler strut assemblies.



Strut Down Position  
Limit Switch

The purpose of the Strut down Position Limit Switches is to provide down position feedback to the Multi Handler's application. The Multi Handler's application will automatically inhibit the control of the Pedestal Boom Attachment's various functions whenever one or more of the three Multi Handler Strut Assemblies are not in the fully down position.

Whenever the three (3) strut assemblies are in the fully down position, the All Struts down Indicator Light located on the Electrical Panel Assembly's door will illuminate and the Multi Handler's application will allow the operator to control the various Pedestal Boom Attachment's functions.

### Strut Override Pushbutton

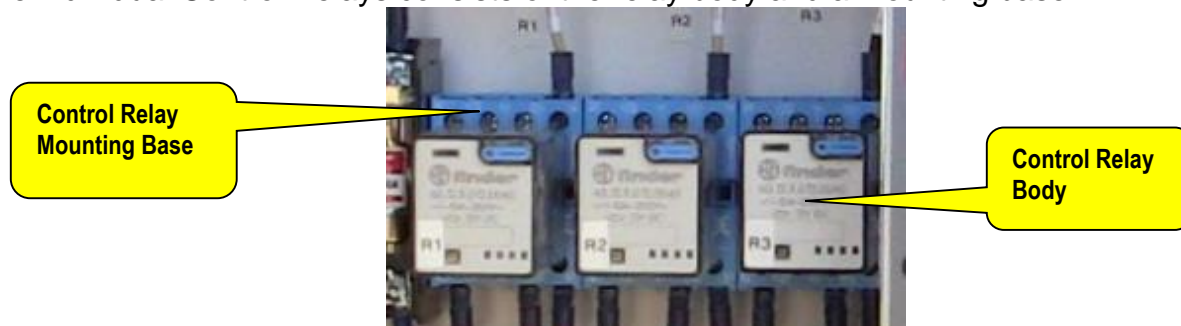


The purpose of the Strut Override Pushbutton is to override the position feedback of all three strut assemblies. By activating the pushbutton, the operator is able to regain control of the Pedestal Boom Attachment's various functions and rectified the position of the Pedestal Boom Attachment.

### Control Relays and Mounting Bases

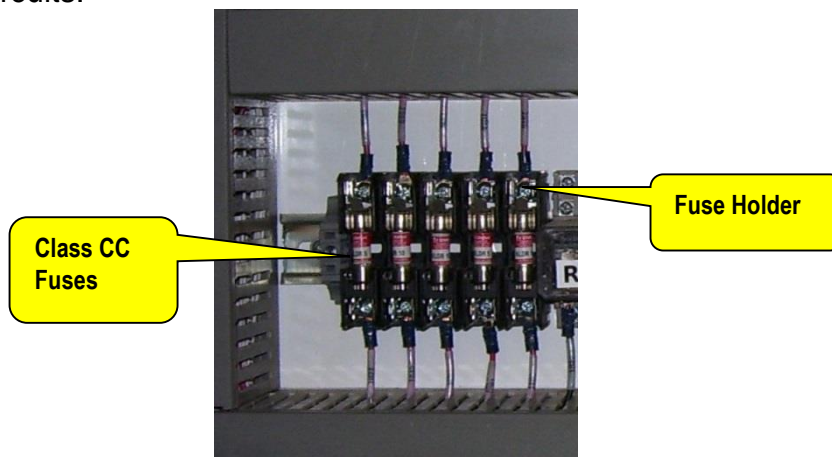
The Electrical System is equipped with five (5) Control Relays, labeled R1 thru R5.

The individual Control Relays consists of the relay body and a mounting base.



### Branch Circuit Fuses and Fuse Holders

Current limiting Class CC Time Delay Fuses have been installed on Electrical System's electrical branch circuits.





### Terminal Blocks, Wiring Duct and Mounting back plate

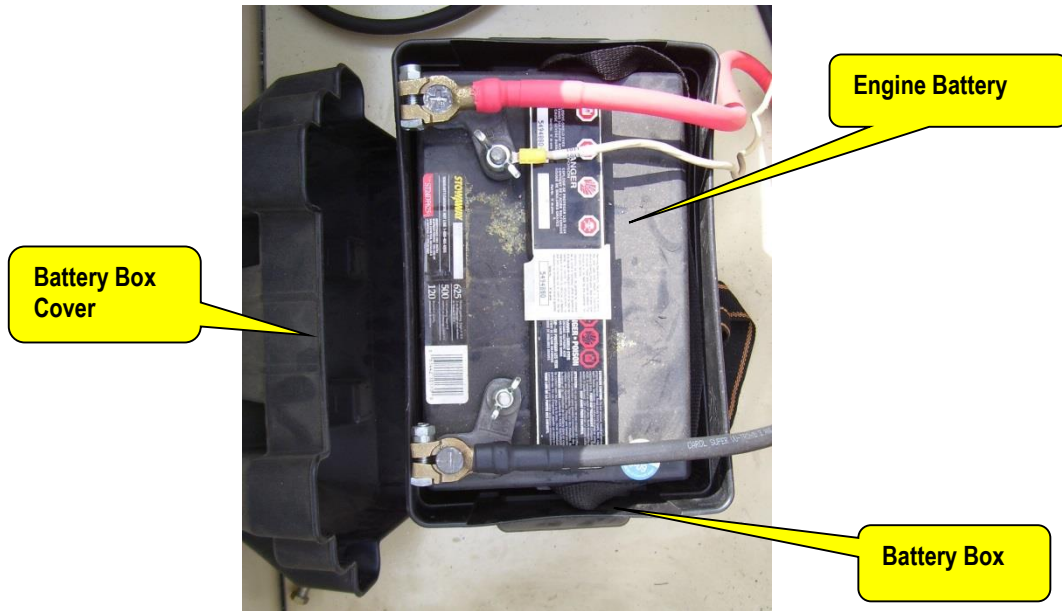
The Electrical Panel Assembly components are fastened to the Mounting back plate. The Mounting back plate is installed inside of the Electrical Panel Assembly's Enclosure and secured in place by four mounting standoffs.

### Engine Battery

The Engine Battery supplied with your Multi Handler is a 12VDC automotive style deep cycle battery. The Engine Battery is located inside the rear of the Multi Handler's Main Frame to the right of the Diesel Engine.

| <b>WARNING</b>  |                      |
|---|----------------------|
|  | <b>Burn Warning.</b> |

| <b>DANGER</b>   |                         |
|---|-------------------------|
|  | <b>Explosion Danger</b> |



The Engine Battery supplies electrical power to the following Multi Handler components.

- Diesel Engine Starter
- Master Display
- Expansion Modules
- Base Unit
- Warning Horn
- Motion Beeper
- Diesel Engine Micro Panel

## Hydraulic System

The Multi Handler's Hydraulic System is a closed centered load sense system with a flowrate of up to 17 GPM (64 lpm) at 1800 RPM and maximum operating pressure of 2500 psi. The hydraulic system consists of the following components.

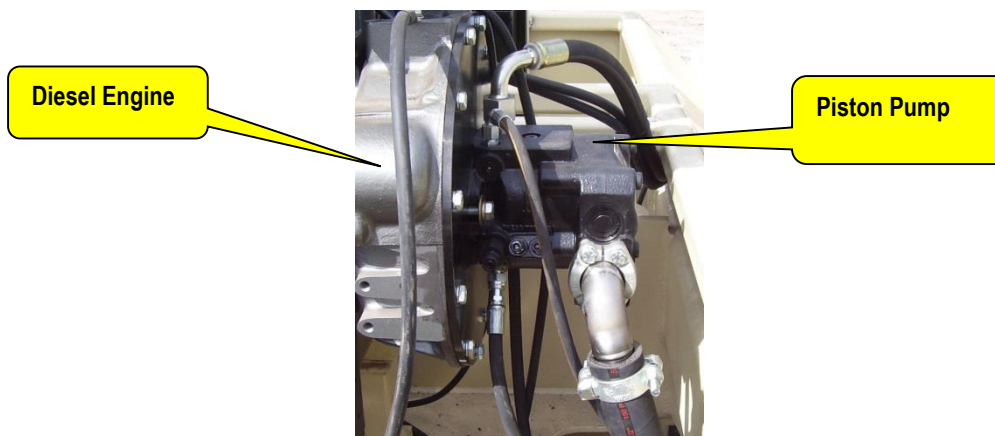
- Piston Pump, pressure compensated
- Pressure Filter
- Directional Valve Assemblies
- Return Filter
- Breather Filter
- Fluid Tank Reservoir
- Fluid Level Gauge
- Motion Control
- Actuators

A hydraulic system can be rather simple to maintain. However, like any mechanical device, it must be properly operated and maintained. A hydraulic system can be damaged as a result of too much speed, heat, pressure or contaminations.

Properly scheduled maintenance will reduce hydraulic issues and help eliminate common problems.

Escaping fluids under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic lines. Tighten all connections before applying any pressure.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or serious infections may result.



### Hydraulic Piston Pump

The Hydraulic Piston Pump is pressure compensated, load and torque sense controlled. The Hydraulic Piston Pump is bolted to the Pump Motor Adapter.

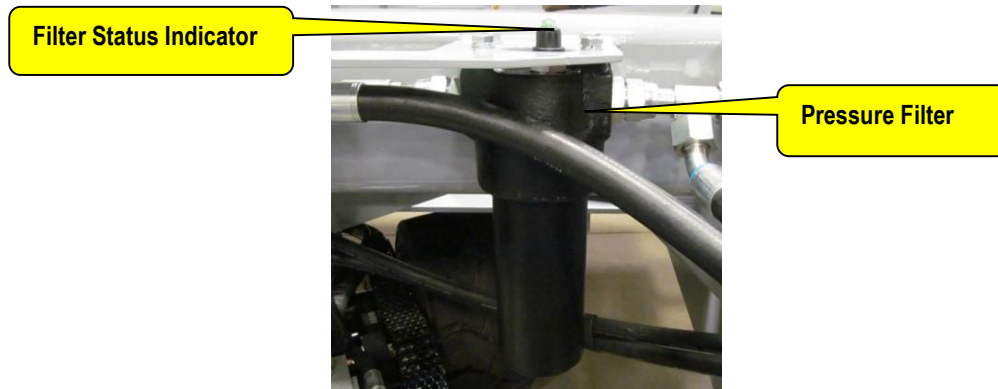
### **Installation and removal of hydraulic pump**

When the need for a pump replacement occurs on your piece of equipment the following procedures should be used. This will help to ensure the longevity of your new hydraulic pump.

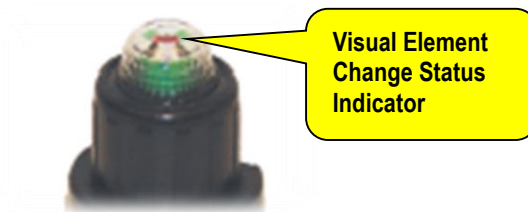
- Shut down and perform lock-out procedure on your Multi Handler.
- Thoroughly clean the reservoir, suction lines, suction strainers, drain lines etc., before re-installation of the new pump. Premature pump failures will occur when contaminants from a previous failure have not been completely removed from the system.
- A hydraulic fluid sample can be collected and sent out for analysis to further determine hydraulic fluid conditions.
- The hydraulic fluid must be removed from the tank and the Multi Handler's hydraulic system via the quick coupling located near the hydraulic tank.
- The lid of the hydraulic tank should also be removed, inspected and the hydraulic tank thoroughly cleaned.
- It is highly recommended that both pressure and return filter elements be replaced with new filter elements.
- Take meticulous care when reinstalling the pump exactly the same as the old pump.
- Special care should be taken to ensure that no dirt or contaminants are allowed to enter the system when the suction line is re-assembled.
- Ensure the suction hose clamps are tight and will not allow air into the lines.
- Inspect the O-rings on the pump fittings and ensure they are in good condition, failure to do so may introduce air into the system.
- When all components have been re-assembled, the hydraulic tank should always be filled through the return filter quick coupler. This will help to ensure that all the new hydraulic oil introduced into the system is passed through a filter and kept clean.
- Before starting a new pump, it is recommended to fill the case with clean oil. For a flooded suction, the air can be purged from the suction lines by cracking the pressure line and or the vent plug on the pump body. This will help to prevent an airlock condition and allow for faster priming.
- Always verify for proper rotation.
- It is recommended to start pump with an open circuit whenever possible to reduce the pumps compensator to its minimum setting during start-up.
- Verify that the pump main pressure value displayed in the IQAN-MD4 master display application I/O measure screen is between 300-400 psi. These values are an indication that the pump has been correctly primed and ready to resume system operation.

### Pressure Filter

The purpose of the Pressure Filter is to protect the hydraulic system from wear and tear as a result of the Hydraulic Piston Pump.

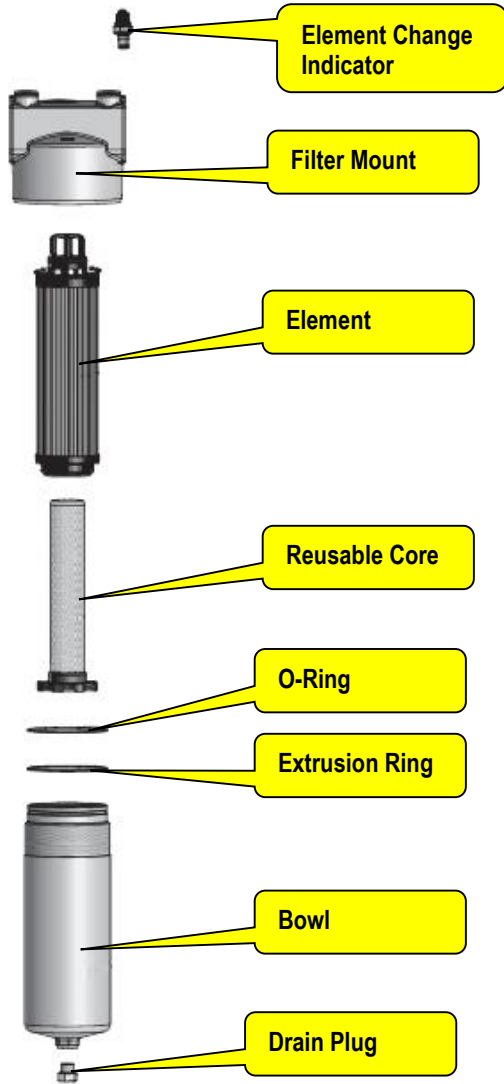


The pressure filter is mounted inside the rear right side of the Multi Handler's main frame to the right of the return filter and is equipped with a visual element change status indicator. As the pressure filter's element gradually becomes dirty the indicator's visual status will change to red. Once the indicator turns to red, a new element replacement is recommended in order to keep your hydraulic fluid clean for any dirt particulate. **Note:** The style or type of status indicator may be different on you WMH than the one shown in the picture below.



### Pressure Filter Component Layout

The image below details the individual components that make up the pressure filter assembly supplied with your Multi Handler.



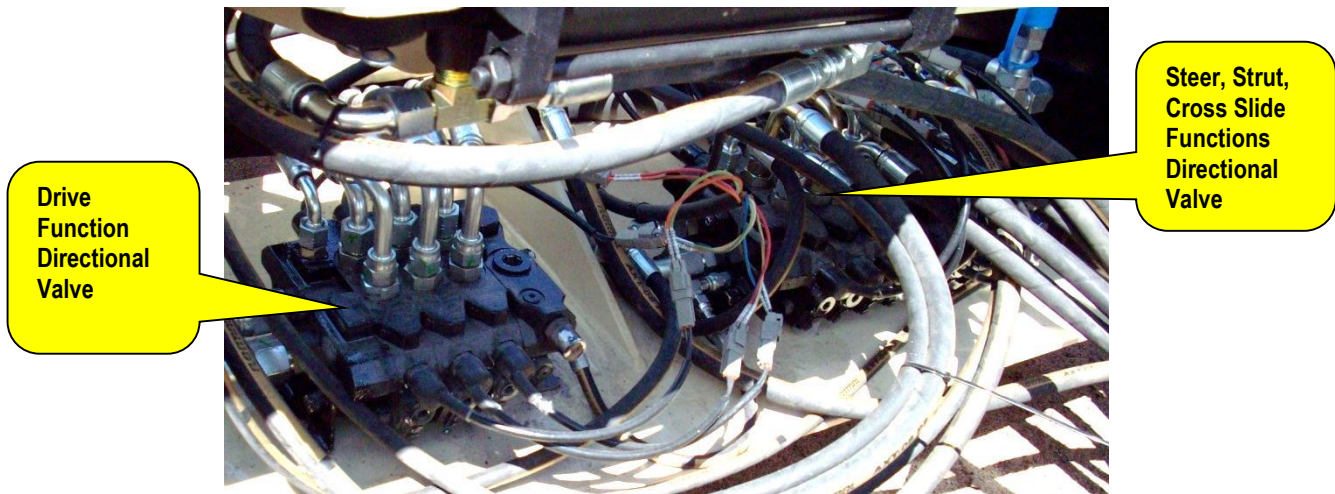
### **Pressure Filter Element Replacement Procedure**

Use the following procedure to replace the pressure filter's element:

- Shut down and perform lock-out procedure on your Multi Handler.
- Drain the filter assembly thru the drain plug, located on the bottom of the bowl.
- Remove bowl and element assembly.
- Remove element by pulling downward with a slight twisting motion and discard used element.
- Clean reusable core thoroughly and retain for reinstallation.
- Insert reusable core in new element until it snaps together.
- Install element assembly into bowl.
- Inspect O-ring and extrusion ring. Lubricate element O-ring with system hydraulic fluid.
- Install bowl with new element.
- Torque bowl to filter mount to 42-50 ft. lbs.
- Power up Multi Handler system and confirm there are no leaks present.

### Directional Valve Assembly

There are two (2) Directional Valve Assemblies included in the Multi Handler, one for the Multi Handler's drive functions and the other for the steer, strut and cross slide functions. Both of the Directional Valve Assemblies are load sensed proportionally controlled 12VDC solenoid operated.



Both of the Directional Valve Assemblies are located inside the Multi Handler's Main Frame, below the Directional Valve's Protective Guard.

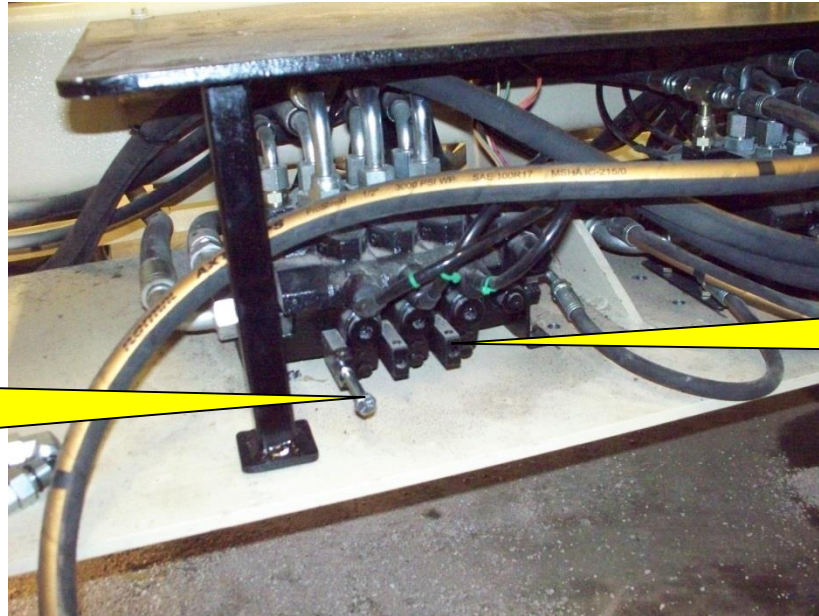
### Hydraulic Valve Section Manual Override

Each valve section used on the Multi Handler includes a manual override feature. The manual override is directly coupled to the section's spool and provides a means to manually operate and shift the hydraulic pulsar solenoid.

The manual override feature allows service and maintenance personnel to cycle the spool in order to isolate functional issues with the equipment.

- The manual override located on each valve section includes 5/16" NC tapped threaded hole and can be operated with either a lever or bolt. It is recommended not to leave levers or bolts installed in valve section manual overrides after servicing and maintenance have been complete. Foreign objects could accidentally actuate a valve section or inhibit one from operating as intended.
- Whenever the manual override is actuated and the components linked to this valve section operate, the issue is most likely not hydraulic in nature. The issue is most likely an electrical wiring or control system issue.
- Whenever the manual override is actuated and the components linked to this valve section do not operate, the issue is most likely hydraulics in nature.
- **Note:** In order to activate a section with the manual override feature, the engine or motor and the hydraulic pump must be in operation.

**Note:** Caution should be used when using the manual override feature to ensure that the correct function is being operated in the correct direction to avoid personal injury and potential damage to the equipment.

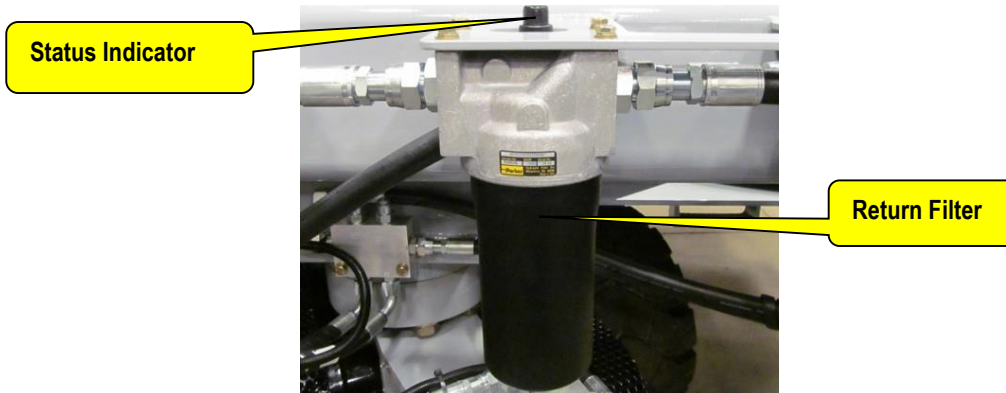


5/16" bolt threaded into valve section manual override

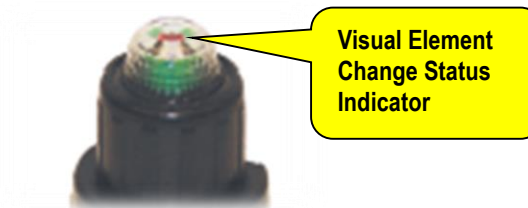
Manual Override installed on each Valve Section Shaft

## Return Filter

The purpose of the Return Filter is to remove dirt particles injected into the Hydraulic System. The Return Filter will capture the particles of dirt before the hydraulic fluid is dumped back into the Fluid Tank Reservoir.

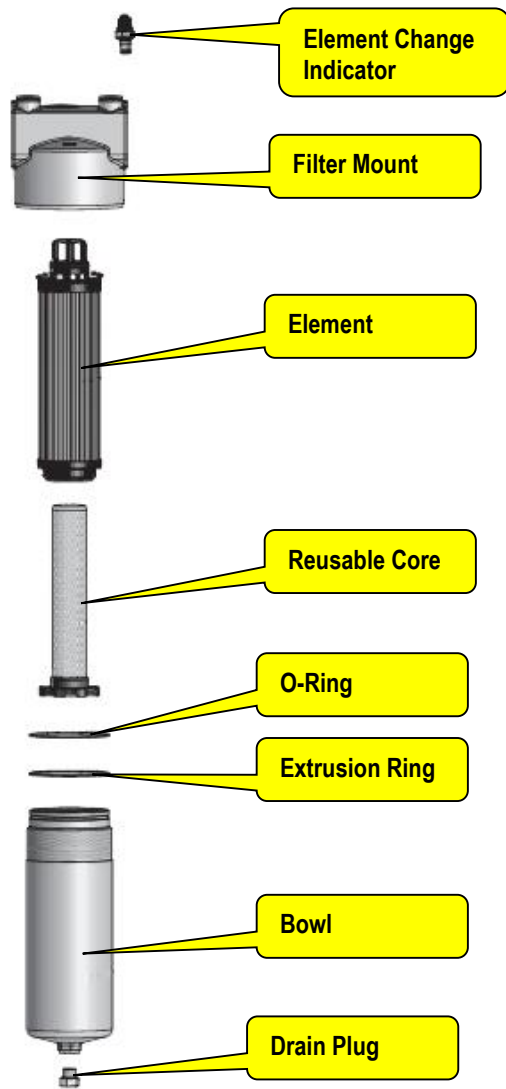


The return filter is mounted inside the rear center of the Multi Handler's main frame to the left of the pressure filter and is equipped with a visual element change status indicator. As the return filter's element gradually becomes dirty the indicator's visual status will change to red. Once the indicator turns to red, a new element replacement is recommended in order to keep your hydraulic fluid clean for any dirt particulate. **Note:** The style or type of status indicator may be different on your WMH than the one shown in the picture below.



### Return Filter Component Layout

The image below details the individual components that make up the return filter assembly supplied with your Multi Handler.



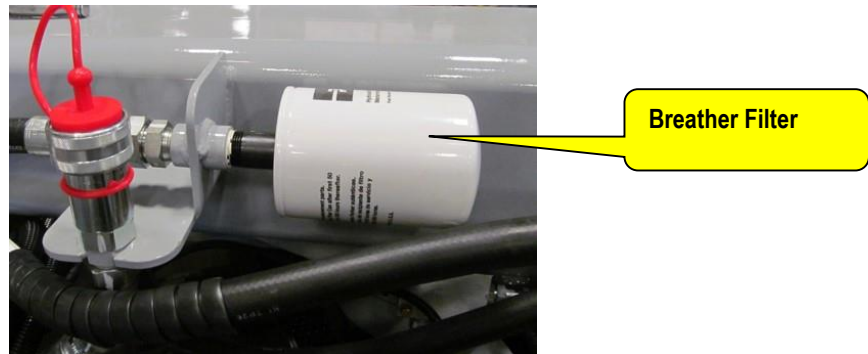
### Return Filter Element Replacement Procedure

Use the following procedure to replace the pressure filter's element:

- Shut down and perform lock-out procedure on your Multi Handler.
- Drain the filter assembly thru the drain plug, located on the bottom of the bowl.
- Remove bowl and element assembly.
- Remove element by pulling downward with a slight twisting motion and discard used element.
- Clean reusable core thoroughly and retain for reinstallation.
- Insert reusable core in new element until it snaps together.
- Install element assembly into bowl.
- Inspect O-ring and extrusion ring. Lubricate element O-ring with system hydraulic fluid.
- Install bowl with new element.
- Torque bowl to filter mount to 42-50 ft. lbs.
- Power up Multi Handler system and confirm there are no leaks present.

### Breather Filter

The purpose of the Breather Filter is to protect the Hydraulic System from air borne particles of dirt being injected into the Fluid Tank Reservoir.



The breather filter is mounted inside the rear center of the Multi Handler's main frame to the left of the return filter. It is crucial that the breather be changed periodically in order to keep all air borne dust and contaminants from entering your hydraulic system. See preventative maintenance schedule for change intervals.

**Note:** If you are operating your Multi Handler in an above average dusty environment we recommend you change your breather more frequently.

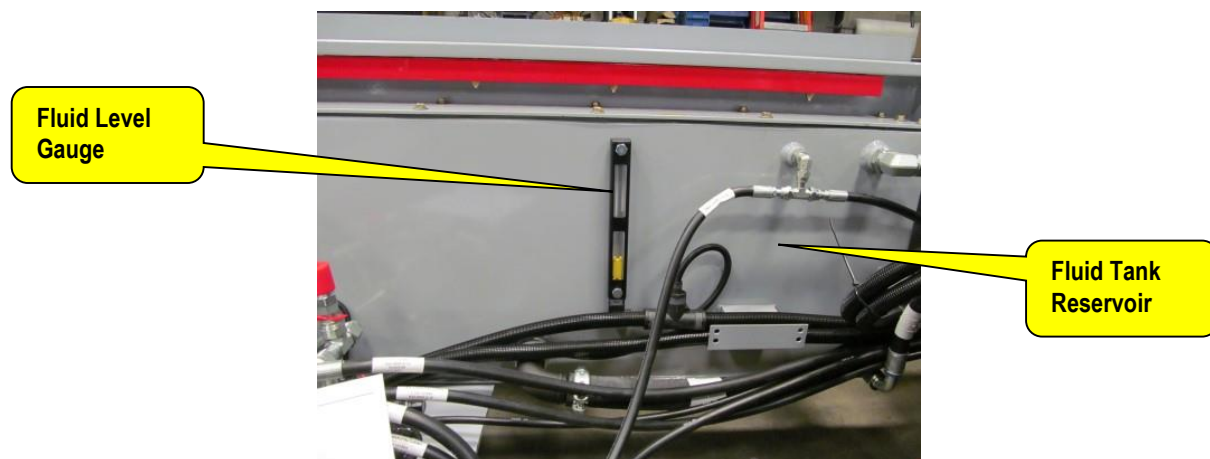
### **Fluid Level Gauge**

The purpose of the Fluid Level Gauge is to provide a visual indication of the hydraulic fluid level remaining in the Fluid Tank Reservoir. The Fluid Level Gauge is mounted to the Fluid Tank Reservoir.

The Fluid Level Gauge includes a discrete low level switch that is hardwired to a digital input on the IQAN-XC43-B0 module. The IQAN-MD4's display will display the following conditional message whenever a low hydraulic fluid level condition becomes active, "Low Hydraulic Oil Level. The Hydraulic Oil Level in the Hydraulic Tank Reservoir is low. Add more hydraulic oil to the Hydraulic Tank Reservoir."

### **Hydraulic Fluid Tank Reservoir**

The purpose of the Hydraulic Fluid Tank Reservoir is to hold the Multi Handler's Hydraulic System fluid. The hydraulic tank fluid level capacity is 25 US gallons (95 liters).



The Fluid Tank Reservoir is located inside the right side of the Multi Handler's Main Frame.

Connections have been provided for adding and removing the hydraulic fluid to and from the Multi Handler's Hydraulic Fluid Tank Reservoir. This will help to ensure that the fluid entering the system is filtered before entering the Hydraulic Fluid Tank Reservoir.

A transfer pump must be used in conjunction with the supplied fill coupler and drain nipple to transfer fluid. Care should be taken to ensure that the transfer pump and lines are clean and free of other fluids that may contaminate the Hydraulic System.

Hydraulic Fluid Fill Port



Hydraulic Fluid Drain Port



Drain (Pump Out) Nipple



Fill Coupler

### Hydraulic System Oil

Use premium quality hydraulic oil with a viscosity range between 150-250 SSU (30-50cst.) at 38 C (100 F).

Normal operating viscosity range between 80-1000 SSU (17-180 cst.) and maximum start up viscosity is 4000 SSU (1000 cst.).

Consult your hydraulic fluid supplier for the appropriate hydraulic fluid for your operating environment.

### **Hydraulic Fluid Maintenance**

There is no recommended hydraulic oil change interval for the Multi Handler.

Generally, there are only two conditions that necessitate changing the oil in a hydraulic system:

- Base oil degradation
- Additive depletion

Periodic oil sampling and analysis will determine if either of these conditions arise. Consult your hydraulic fluid supplier for their recommended hydraulic fluid sampling frequency.

The Pressure Filter and Return Filter Status Indicators should be checked periodically.

**Motion Control**

Motion Control valves have been included throughout the Multi Handler's Hydraulic System.

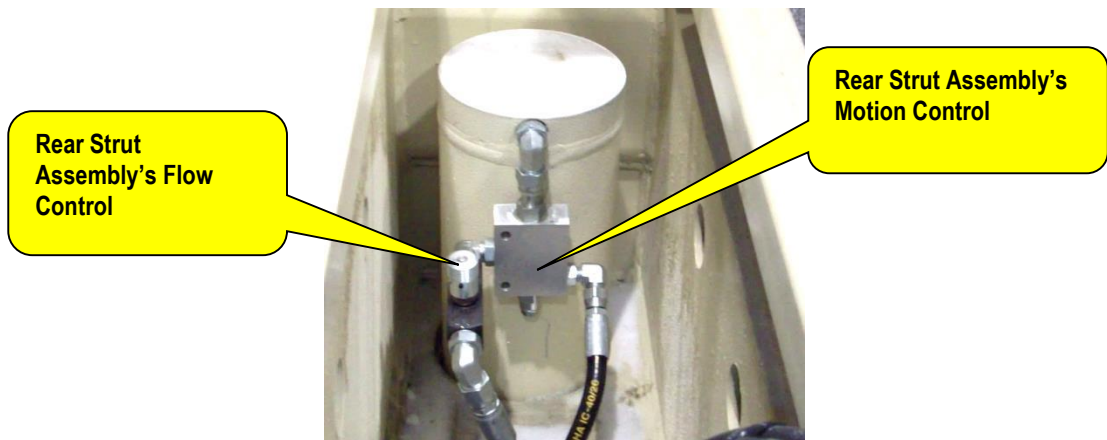
Each Drive Wheel Assembly, three (3) in total, includes a dual motion control/counter balance valve. The Motion Control provides hydrostatic braking capabilities to the Multi Handler's Drive Wheel Assemblies and control the movement of the Drive Wheels to prevent mechanical runaway of the Multi Handler.

**\*\*\*IT IS IMPORTANT TO NOTE THAT A HOSE FAILURE OR LEAK BETWEEN THE MOTION CONTROL VALVE AND THE HYDRAULIC MOTOR WOULD CAUSE THE MACHINE BRAKING CAPABILITY TO BECOME COMPROMISED.\*\*\***



Rear Drive Wheel Assembly's Motion Control

Each Strut Assembly, three (3) in total, includes a motion control. The Motion Control prevents the Strut Assemblies from being lowered in the event of a hydraulic hose failure. The Motion Control also includes an embedded flow control to assist in controlling the lowering speed of the Strut Assemblies by limiting the flow rate of the hydraulic oil exiting the cylinders (actuators).



Rear Strut Assembly's Flow Control

Rear Strut Assembly's Motion Control

## **Actuators**

Hydraulic Cylinders are incorporated into each of the following components on the Multi Handler.

- Front Left Strut Assembly
- Front Right Strut Assembly
- Rear Strut Assembly
- Front Steer Assembly
- Rear Steer Assembly
- Front Cross Slide Assembly
- Rear Cross Slide Assembly

Hydraulic Motors are incorporated into each of the following components on the Multi Handler.

- Front Left Drive Wheel Assembly
- Front Right Drive Wheel Assembly
- Rear Drive Wheel Assembly

## Hydraulic Fitting Tightening Procedure

Important: Kinking or twisting hoses during installation may shorten the life cycle of hydraulic hoses.

Follow proper installation procedures when tightening hose fittings:

- Tighten fitting or nut to their recommended torque values.
- Use one wrench to hold body and one to tighten nut.
- In the case of a hose, it may be necessary to use three wrenches to prevent twist; one on body, one on nut, and one on hose fitting.

## O-Ring Installation

Follow proper installation procedures when installing O-rings on hydraulic fittings:

- Inspect groove (A) and/or seat (B).
- For Flat face O-ring seal (A), apply petroleum jelly to O-ring and place in groove.
- For O-ring boss (B), install O-ring carefully over threads.
- Hand tightened fitting first until snug, position adjustable fittings by unscrewing no more than one turn.
- Tighten according to recommended torque values.



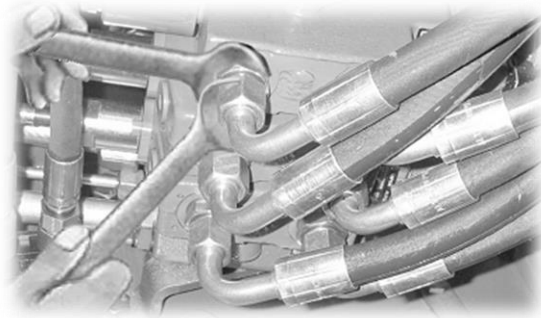
## Replacing Hydraulic Hoses, Couplers, Tubing, or Connectors

Caution: Escaping fluids under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying any pressure.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or serious infections may result.

Follow proper procedures when relieving hydraulic pressure:

- Relieve hydraulic pressure de-energizing hydraulic pump by shutting down motor or engine.
- Manually cycle the hydraulic valve spool to the section you will be working on to allow fluid pressure to be bled back to tank. **Important:** To prevent twisting of the hydraulic tubes, use two wrenches when removing or connecting hoses to tubes.
- Remove and replace hydraulic components.
- Route and/or tie off hydraulic hoses to avoid contact with other components.
- Energize the hydraulic pump by turning on the motor or engine, cycle the section and check for leaks.
- Check hydraulic oil level in hydraulic tank. Refill if oil level is low.



## Hydraulic Cylinders

### Troubleshooting Hydraulic Cylinder Creeping

If a hydraulic cylinder is being suspected of creeping or drifting there could be 2 common issues.

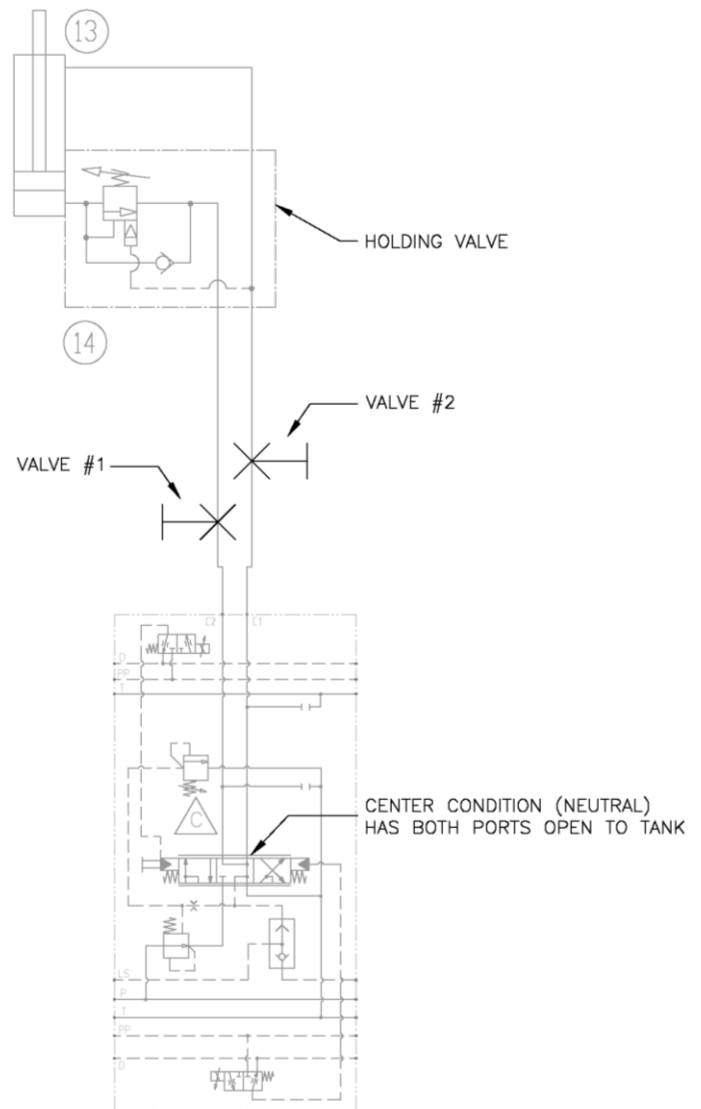
1. Most cylinders incorporated in your piece of equipment have a holding valve. Which in principle holds oil into the cylinder. If for some unknown reason the oil is bypassing the the load holding valve, the cylinder will creep.
2. The second cause of a creeping cylinder would be leaking through the piston seals. If this was to happen, oil would be bypassing the piston and returning to tank via the open center condition in the control valve.
- 3.

To prove or disprove either of these options, 3000psi rated ball valves can be temporarily installed in each of the hydraulic lines feeding the cylinder in question.

**!!! CAUTION DO NOT OPERATE THE HYDRAULICS WITH THESE VALVES CLOSED !!!**

Closing valve #1 will stop oil flow back to tank from a bypassing holding valve.

If the cylinder is still creeping, closing valve #2 will stop the oil flow to tank from a bypassing piston. *Note: it will take a bit of time for the pressure to equalise on both sides of the piston to stop the creeping.*



## **Preventative Maintenance Schedule**

Performing routine maintenance is important in keeping your Multi Handler in good operating condition. This section of the Manual outlines the daily and periodic maintenance requirements for your Multi Handler.

B&D Manufacturing recommends that all maintenance be performed indoors whenever possible in order to prevent environmental conditions, such as rain, wind, or snow from damaging any of the Multi Handler's components.

The periodic maintenance intervals will vary depending on your site's environmental conditions and frequency of usage of your Multi Handler. The information contained in this section should be used as a general guideline for maintaining your Multi Handler in good operating condition. B&D Manufacturing recommends that your site establish its own periodic maintenance schedule based on the recommendations set forth in this section.

B&D Manufacturing recommends that the daily maintenance requirements listed in this section be performed each day prior to starting the Multi Handler.

| System                               | Item   | Daily | 50 hours | 100 hours | 200 hours | 400 hours | 500 hours | Yearly | 800 | 1500 hours | 3000 hours | Two years |   |
|--------------------------------------|--|-------|----------|-----------|-----------|-----------|-----------|--------|-----|------------|------------|-----------|---|
| Diesel Engine                        | Check fuel pipes and clamp bands                             |       | •        |           |           |           |           |        |     |            |            | •         |   |
|                                      | Check engine oil   | •     |          |           |           |           |           |        |     |            |            |           |   |
|                                      | Change engine oil  |       | •        |           | •         | •         |           |        |     |            |            |           |   |
|                                      | Change engine oil filter                                     |       | •        |           | •         |           |           |        |     |            |            |           |   |
|                                      | Clean air filter element                                     |       |          |           |           |           |           |        |     |            |            |           |   |
|                                      | Check Battery level  |       |          |           |           |           |           |        |     |            |            |           |   |
|                                      | Check Fuel Tank reservoir                                    | •     |          |           |           |           |           |        |     |            |            |           |   |
|                                      | Check fan belt   |       |          |           |           |           |           |        |     |            |            |           |   |
|                                      | Drain/Clean Water Separator                                  |       |          | •         |           | •         |           |        |     |            |            |           |   |
|                                      | Check Radiator Hoses/Coolant                                 | •     |          |           | •         |           |           |        |     |            |            |           |   |
|                                      | Check intake air line  |       |          |           | •         |           |           |        |     |            |            |           |   |
|                                      | Remove sediment in fuel tank                                 |       |          |           |           |           |           | •      |     |            |            |           |   |
|                                      | Clean water jacket (radiator interior)                       |       |          |           |           |           |           | •      |     |            |            |           |   |
|                                      | Replace Fan belt   |       |          |           |           |           |           | •      |     |            |            |           |   |
|                                      | Replace air cleaner element                                  |       |          |           |           |           |           | •*     |     |            |            |           |   |
|                                      | Check for damages in electrical wiring and loose connections |       |          |           |           |           |           | •      |     |            |            |           |   |
|                                      | Check valve clearance  |       |          |           |           |           |           |        |     | •          |            |           |   |
|                                      | Check Fuel injection nozzle injection pressure               |       |          |           |           |           |           |        |     |            | •          |           |   |
|                                      | Check injection pump   |       |          |           |           |           |           |        |     |            |            | •         |   |
|                                      | Change radiator coolant(L.L.C)                               |       |          |           |           |           |           |        |     |            |            |           | • |
| Replace Battery                      |  |       |          |           |           |           |           |        |     |            |            | •         |   |
| Replace Radiator Hoses & clamp Bands |  |       |          |           |           |           |           |        |     |            |            | •         |   |
| Replace Fuel pipes and clamp bands   |  |       |          |           |           |           |           |        |     |            |            | •         |   |
| Replacement of intake air line       |  |       |          |           |           |           |           |        |     |            |            | •         |   |

**Important:**

- Air cleaner should be cleaned more often in dusty environments.
- Air cleaner elements should be replaced after 6 times of cleaning.
- Replace air intake line only if necessary.
- Change engine oil after the initial 50 hours of operation and at every 200 hours of operation interval thereafter. When then annual operating hours are below 200 hours, replace the oil and oil filter every year.

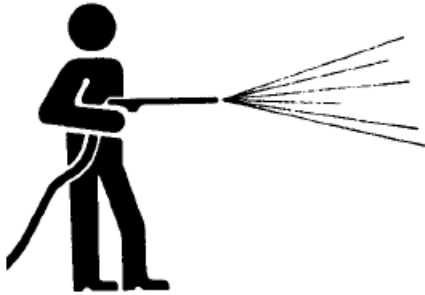
| System                    | Item   | Daily | Every 20 hours | Every 40 hours | Every 200 hours | Every 500 hours |
|---------------------------|--|-------|----------------|----------------|-----------------|-----------------|
| Hydraulic System          | Check Fluid Tank Reservoir                             | •     |                |                |                 |                 |
|                           | Check Pressure Filter                                  |       |                |                | • (note 1)      |                 |
|                           | Check Return Filter                                    |       |                |                | • (note 1)      |                 |
|                           | Check Breather Filter                                  |       |                |                |                 | • (note 2)      |
| Cross Slide Assemblies    | Grease Cross Slide (12 nipples each Cross Slide)       |       |                |                | •               |                 |
| Drive Wheel Assembly      | Apply spray-on chain lubricant to Drive Chains         |       | •              |                |                 |                 |
|                           | Check Drive Chain tension                              |       |                | •              |                 |                 |
|                           | Grease Drive Wheels (1 nipple on each wheel)           |       | •              |                |                 |                 |
|                           | Grease Axle Box Pin (1 nipple on each pin)             |       |                | •              |                 |                 |
| Steering Tie Rod          | Grease Steering Tie Rod (1 nipple on each tie rod end) |       |                | •              |                 |                 |
| Steer Cylinder (Actuator) | Grease Steer Cylinder Eye (1 nipple on cylinder eye)   |       |                | •              |                 |                 |
| Outriggers (if included)  | Grease Outrigger Surfaces                              |       |                |                | •               |                 |

**Note 1:** In order to check the Hydraulic System Pressure and Return Filters the Electric Motor must be in operation and a drive function, forward or reverse, must be operated via the Radio Terminal. The Pressure and Return Filters only need to be changed when their visual change element status indicators turn red in color.

**Note 2:** Hydraulic Breather should be replaced more frequently in any above normal dusty environments.

## Keep Equipment Clean

- Spilled grease, oil, dirt etc... can cause a slip or trip injury. Always keep your B&D Equipment clean and tidy.
- If water gets into the electrical system, there is possibility that may cause damage to sensitive electrical components. It is recommended not to use water or steam to clean any sensors, connectors or the inside of an electrical enclosure.
- Use extreme care when washing the electrical enclosure. It is recommended to keep high pressure spray away from electrical enclosure to avoid from damaging display modules or any electrical components affixed.
- Keep water spray away from electrical harnesses, switches and other electrical enclosure.



## Troubleshooting

This section of the Manual provides the operator with suggestions to help troubleshoot, diagnose and resolve issues that may arise with your Multi Handler.

### Warning Horn will not sound

1. Disconnect switch is in “off” position. Turn disconnect switch to “on” position.
2. Emergency stop pushbutton is activated. Pull out emergency stop pushbutton.
3. Radio Terminal is not communicating with Base Unit. Refer to ‘Radio Terminal Failure’ troubleshooting section below.
4. Fuse in horn’s control circuit located in fuse block is blown. Replace fuse.
5. Failed horn control relay. Replace control relay.
6. IQAN-XC43 module is offline. Check IQAN-MD4 display and correct issue with IQAN-XC43 if offline.
7. Low DC control voltage. Check output voltage of dc power supply.
8. Loose wiring connection. Check all horn circuit wiring connections.
9. Horn control toggle switch on Radio Terminal is not functioning, confirm toggle switch operation via IQAN-MD4 Pendant I/O Measure Channel Group. Replace control toggle switch.
10. Failed horn. Replace warning horn.

### Drive Motion Alarm (Beeper) will not sound

1. Disconnect switch is in “off” position. Turn disconnect switch to “on” position.
2. Emergency stop pushbutton is activated. Pull out emergency stop pushbutton.
3. Radio Terminal is not communicating with Base Unit. Refer to ‘Radio Terminal Failure’ troubleshooting section below.
4. Fuse in drive motion alarm (beeper) control circuit located in fuse block is blown. Replace fuse.
5. Failed drive motion alarm control relay. Replace control relay.
6. IQAN-XC43 module is offline. Check IQAN-MD4 display and correct issue with IQAN-XC43 if offline.
7. Low DC control voltage. Check output voltage of dc power supply.
8. Loose wiring connection. Check all horn circuit wiring connections.
9. Drive control joystick on Radio Terminal has failed. Check in the input signal ‘Left Joystick Up/Down’ and ‘Right Joystick Up/Down’ via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the inputs on the screen do not display a value from 0 to 125 when pressing the control joystick in up direction and 0 to -125 when pressing the control joystick in the down direction on the radio terminal. Replace control joystick.
10. Failed drive motion alarm (beeper). Replace drive motion alarm (beeper).

### **IQAN-MD4 Master Display does not power up**

1. Disconnect switch is in “off” position. Turn disconnect switch to “on” position.
2. Emergency stop pushbutton is activated. Pull out emergency stop pushbutton.
3. Fuse in IQAN-MD4 control circuit located in fuse block is blown. Replace fuse.
4. Low DC control voltage. Check output voltage of dc power supply.
5. Loose wiring connection or connector. Check IQAN-MD4 C1:12 and C1:1 circuit wiring connections and IQAN-MD4 C1 connector installation on back of IQAN-MD4.
6. Failed IQAN-MD4. **Note:** Must be replaced with a B&D pre-programmed IQAN-MD4 with the Multi Handler’s software application installed.

### **IQAN-MD4 Master Display real time clock (RTC) not connected**

1. Fuse in IQAN-MD4’s RTC circuit located in fuse block is blown. Replace fuse.
2. Loose wiring connection. Check IQAN-MD4 C2:12 RTC circuit wiring connection.

### **IQAN-XC43 Expansion Module does not power up**

1. Fuse in IQAN-XC43’s control circuit located in fuse block is blown. Replace fuse.
2. Loose wiring connection or connector. Check IQAN-XC43’s C1:65 and C1:66 circuit wiring connections and IQAN-XC43 C1 connector installation.
3. Failed IQAN-XC43 expansion module. Replace IQAN-XC43 expansion module.

### **IQAN-XC43 does not communicate**

1. Check power “on” status led located on top of IQAN-XC43. If led is “off” refer to ‘IQAN-XC43 Expansion Module does not power up condition above.
2. Loose wiring connection or connector. Check IQAN-XC43’s C1:18 and C1:2 CAN-bus circuit wiring connections and IQAN-XC43 C1 connector installation.
3. Failed IQAN-XC43 expansion module. Replace IQAN-XC43 expansion module.

### **Front Cross Slide Assembly will not move in left direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Front Cross Slide control toggle switch on Radio Terminal has failed. Check the input signal 'Front Cross Slide Left' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in up direction on the radio terminal.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Slide Left/Right Out' current output signal, XC43-B0 Pin C1:44/60, via the IQAN-MD4 Master Display Cross Slide I/O Measure Channel Group. A mA value greater than 100mA should be displayed when the control toggle switch is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-A1 C1:32, C1:44 and C1:60 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front cross slide section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front cross slide section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Front Cross Slide Assembly will not move in right direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Front Cross Slide control toggle switch on Radio Terminal has failed. Check in the input signal 'Front Cross Slide Right' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in down direction on the radio terminal.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Slide Left/Right Out' current output signal, XC43-B0 Pin C1:44/60, via the IQAN-MD4 Master Display Cross Slide I/O Measure Channel Group. A mA value less than -100mA should be displayed when the control toggle switch is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:32, C1:44 and C1:60 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front cross slide section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front cross slide section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Cross Slide Assembly will not move in left direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Rear Cross Slide control toggle switch on Radio Terminal has failed. Check in the input signal 'Rear Cross Slide Left' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in up direction on the radio terminal.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Slide Left/Right Out' current output signal, XC43-B0 Pin C2:13/29, via the IQAN-MD4 Master Display Cross Slide I/O Measure Channel Group. A mA value greater than 100mA should be displayed when the control toggle switch is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C2:47, C2:13 and C2:29 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear cross slide section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve rear cross slide section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Cross Slide Assembly will not move in right direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Rear Cross Slide control toggle switch on Radio Terminal has failed. Check in the input signal 'Rear Cross Slide Right' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in down direction on the radio terminal.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Slide Left/Right Out' current output signal, XC43-B0 Pin C2:13/29, via the IQAN-MD4 Master Display Cross Slide I/O Measure Channel Group. A mA value less than -100mA should be displayed when the control toggle switch is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C2:47, C2:13 and C2:29 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear cross slide section.
6. Verify proper hydraulic function by utilizing the hydraulic manual override feature on the directional valve rear cross slide section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Front Left Strut Assembly will not raise**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Front Left Strut control toggle switch on Radio Terminal has failed. Check in the input signal 'Front Left Strut Up' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in up direction on the radio terminal.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Left Front Strut Up/Dwn Out' current output signal, XC43-B0 Pin C1:39/55, via the IQAN-MD4 Master Display Strut I/O Measure Channel Group. A mA value greater than 100mA should be displayed when the control toggle switch is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:14, C1:39 and C1:55 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front left strut section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front left strut section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Front Left Strut Assembly will not lower**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Strut flow control limiting flowrate. Adjust the strut's flow control.
3. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
4. Front Left Strut control toggle switch on Radio Terminal has failed. Check in the input signal 'Front Left Strut Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in down direction on the radio terminal.
5. Loss of current output signal from XC43 module to directional control valve. Check the 'Left Front Strut Up/Dwn Out' current output signal, XC43-B0 Pin C1:39/55, via the IQAN-MD4 Master Display Strut I/O Measure Channel Group. A mA value less than -100mA should be displayed when the control toggle switch is being pushed.
6. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:14, C1:39 and C1:55 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front left strut section.
7. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front left strut section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

**Front Right Strut Assembly will not raise**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Front Right Strut control toggle switch on Radio Terminal has failed. Check in the input signal 'Front Right Strut Up' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in up direction on the radio terminal.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Left Right Strut Up/Dwn Out' current output signal, XC43-B0 Pin C1:40/56, via the IQAN-MD4 Master Display Strut I/O Measure Channel Group. A mA value greater than 100mA should be displayed when the control toggle switch is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:15, C1:40 and C1:56 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front right strut section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front right strut section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

**Front Right Strut Assembly will not lower**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Strut flow control limiting flowrate. Adjust the strut's flow control.
3. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
4. Front Right Strut control toggle switch on Radio Terminal has failed. Check in the input signal 'Front Right Strut Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in down direction on the radio terminal.
5. Loss of current output signal from XC43 module to directional control valve. Check the 'Left Right Strut Up/Dwn Out' current output signal, XC43-B0 Pin C1:40/56, via the IQAN-MD4 Master Display Strut I/O Measure Channel Group. A mA value less than -100mA should be displayed when the control toggle switch is being pushed.
6. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:14, C1:40 and C1:56 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front right strut section.
7. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front right strut section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Strut Assembly will not raise**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Rear Strut control toggle switch on Radio Terminal has failed. Check in the input signal 'Rear Strut Up' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in up direction on the radio terminal.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Strut Up/Dwn Out' current output signal, XC43-B0 Pin C1:41/57, via the IQAN-MD4 Master Display Strut I/O Measure Channel Group. A mA value greater than 100mA should be displayed when the control toggle switch is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:16, C1:41 and C1:57 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear strut section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve rear strut section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Strut Assembly will not lower**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Strut flow control limiting flowrate. Adjust the strut's flow control.
3. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
4. Rear Strut control toggle switch on Radio Terminal has failed. Check in the input signal 'Rear Strut Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value of 'True' when pressing the control toggle switch in down direction on the radio terminal.
5. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Strut Up/Dwn Out' current output signal, XC43-B0 Pin C1:41/57, via the IQAN-MD4 Master Display Strut I/O Measure Channel Group. A mA value less than -100mA should be displayed when the control toggle switch is being pushed.
6. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:16, C1:41 and C1:57 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear strut section.
7. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve rear strut section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

**Front Steer Assembly will not move in left direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Front Steer Left/Right control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Left/Right' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in left direction on the radio terminal. Replace control joystick.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Steer Left/Right Out' current output signal, XC43-B0 Pin C1:42/58, via the IQAN-MD4 Master Display Steer I/O Measure Channel Group. A mA value from 0 to 750mA should be displayed when the control joystick is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:30, C1:42 and C1:58 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front steer section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front steer section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

**Front Steer Assembly will not move in right direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Front Steer Left/Right control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Left/Right' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in right direction on the radio terminal. Replace control joystick.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Steer Left/Right Out' current output signal, XC43-B0 Pin C1:42/58, via the IQAN-MD4 Master Display Steer I/O Measure Channel Group. A mA value from 0 to -750mA should be displayed when the control joystick is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:30, C1:42 and C1:58 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front steer section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front steer section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Steer Assembly will not move in left direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Rear Steer Left/Right control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Left/Right' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in left direction on the radio terminal. Replace control joystick.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Steer Left/Right Out' current output signal, XC43-B0 Pin C1:43/59, via the IQAN-MD4 Master Display Steer I/O Measure Channel Group. A mA value from 0 to 750mA should be displayed when the control joystick is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:31, C1:43 and C1:59 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear steer section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve rear steer section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Steer Assembly will not move in right direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Rear Steer Left/Right control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Left/Right' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in right direction on the radio terminal. Replace control joystick.
4. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Steer Left/Right Out' current output signal, XC43-B0 Pin C1:43/59, via the IQAN-MD4 Master Display Steer I/O Measure Channel Group. A mA value from 0 to -750mA should be displayed when the control joystick is being pushed.
5. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:31, C1:43 and C1:59 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear steer section.
6. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve rear steer section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### Front Left Drive Assembly not rotate in forward direction

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Drive Joystick Selector toggle switch is in left position but operator is attempting to drive Multi Handler with the Right Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to right.
4. Drive Joystick Selector toggle switch is in right position but operator is attempting to drive Multi Handler with the Left Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to left.
5. Left Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in up direction on the radio terminal. Replace control joystick.
6. Right Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in up direction on the radio terminal. Replace control joystick.
7. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Left Drive Fwd/Rev Out' current output signal, XC43-B0 Pin C2:14/30, via the IQAN-MD4 Master Display Drive I/O Measure Channel Group. A mA value from 0 to 750mA should be displayed when the control joystick is being pushed.
8. Loose wiring connection, connector or wiring harness. Check XC43-B0 C1:48, C2:14 and C2:30 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front left drive section.
9. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front left drive section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Front Left Drive Assembly not rotate in reverse direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Drive Joystick Selector toggle switch is in left position but operator is attempting to drive Multi Handler with the Right Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to right.
4. Drive Joystick Selector toggle switch is in right position but operator is attempting to drive Multi Handler with the Left Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to left.
5. Left Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in down direction on the radio terminal. Replace control joystick.
6. Right Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in down direction on the radio terminal. Replace control joystick.
7. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Left Drive Fwd/Rev Out' current output signal, XC43-B0 Pin C2:14/30, via the IQAN-MD4 Master Display Drive I/O Measure Channel Group. A mA value from 0 to -750mA should be displayed when the control joystick is being pushed.
8. Loose wiring connection, connector or wiring harness. Check XC43-B0 C2:48, C2:14 and C2:30 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front left drive section.
9. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front left drive section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Front Right Drive Assembly not rotate in forward direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Drive Joystick Selector toggle switch is in left position but operator is attempting to drive Multi Handler with the Right Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to right.
4. Drive Joystick Selector toggle switch is in right position but operator is attempting to drive Multi Handler with the Left Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to left.
5. Left Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in up direction on the radio terminal. Replace control joystick.
6. Right Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in up direction on the radio terminal. Replace control joystick.
7. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Right Drive Fwd/Rev Out' current output signal, XC43-B0 Pin C2:15/31, via the IQAN-MD4 Master Display Drive I/O Measure Channel Group. A mA value from 0 to -750mA should be displayed when the control joystick is being pushed.
8. Loose wiring connection, connector or wiring harness. Check XC43-B0 C2:67, C2:15 and C2:31 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front right drive section.
9. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front right drive section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Front Right Drive Assembly not rotate in reverse direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Drive Joystick Selector toggle switch is in left position but operator is attempting to drive Multi Handler with the Right Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to right.
4. Drive Joystick Selector toggle switch is in right position but operator is attempting to drive Multi Handler with the Left Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to left.
5. Left Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in down direction on the radio terminal. Replace control joystick.
6. Right Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in down direction on the radio terminal. Replace control joystick.
7. Loss of current output signal from XC43 module to directional control valve. Check the 'Front Right Drive Fwd/Rev Out' current output signal, XC43-B0 Pin C2:15/31, via the IQAN-MD4 Master Display Drive I/O Measure Channel Group. A mA value from 0 to -750mA should be displayed when the control joystick is being pushed.
8. Loose wiring connection, connector or wiring harness. Check XC43-B0 C2:67, C2:15 and C2:31 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve front right drive section.
9. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve front right drive section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Drive Assembly not rotate in forward direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Drive Joystick Selector toggle switch is in left position but operator is attempting to drive Multi Handler with the Right Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to right.
4. Drive Joystick Selector toggle switch is in right position but operator is attempting to drive Multi Handler with the Left Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to left.
5. Left Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in up direction on the radio terminal. Replace control joystick.
6. Right Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to 125 when pressing the control joystick in up direction on the radio terminal. Replace control joystick.
7. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Drive Fwd/Rev Out' current output signal, XC43-B0 Pin C2:16/32, via the IQAN-MD4 Master Display Drive I/O Measure Channel Group. A mA value from 0 to 750mA should be displayed when the control joystick is being pushed.
8. Loose wiring connection, connector or wiring harness. Check XC43-B0 C2:68, C2:16 and C2:32 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear drive section.
9. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve rear drive section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### **Rear Right Drive Assembly not rotate in reverse direction**

1. Low hydraulic fluid level. Add hydraulic fluid to hydraulic fluid tank reservoir.
2. Radio Terminal is not communicating with Base Unit. Refer to 'Radio Terminal Failure' troubleshooting section below.
3. Drive Joystick Selector toggle switch is in left position but operator is attempting to drive Multi Handler with the Right Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to right.
4. Drive Joystick Selector toggle switch is in right position but operator is attempting to drive Multi Handler with the Left Drive Forward/Reverse control joystick on radio terminal. Move Drive Joystick Selector toggle switch to left.
5. Left Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Left Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in down direction on the radio terminal. Replace control joystick.
6. Right Drive Forward/Reverse control joystick on Radio Terminal has failed. Check in the input signal 'Right Joystick Up/Down' via the IQAN-MD4 Master Display Pendant I/O Measure Channel Group. Contact B&D Manufacturing if the input on the screen does not display a value from 0 to -125 when pressing the control joystick in down direction on the radio terminal. Replace control joystick.
7. Loss of current output signal from XC43 module to directional control valve. Check the 'Rear Drive Fwd/Rev Out' current output signal, XC43-B0 Pin C2:16/32, via the IQAN-MD4 Master Display Drive I/O Measure Channel Group. A mA value from 0 to -750mA should be displayed when the control joystick is being pushed.
8. Loose wiring connection, connector or wiring harness. Check XC43-B0 C2:68, C2:16 and C2:33 circuit wiring connections, wiring harnesses/receptacle mating at bottom of electrical panel and Deutsch connector at directional valve rear drive section.
9. Verify proper hydraulic operation by utilizing the hydraulic manual override feature on the directional valve rear drive section. This will confirm to you that the hydraulic valve spool is operating correctly and that the issue is not hydraulic.

### Drive Assembly Wheel drags (skids) at low travel speed

1. Drive's pwm output, forward and/or reverse, minimum (Min) value setting is too low. Increase the minimum value setting of the drive's forward and/or reverse pwm output via the IQAN-MD4 Master Display Drive I/O Adjust Channel Group. In order to maintain as much of the proportionality control of the drive as possible, make small incremental changes to the minimum value setting at a time, for example 1 value increment, then test and increase further if required.

**Note:** You will require the correct PIN code in order to access and modify any of the Drive I/O settings.

### Radio Terminal Failure

1. The diagnostic status LED on the radio terminal is flashing at approximately 1 flash per second, rechargeable batteries low voltage level. Recharge batteries.
2. The diagnostic status LED on the radio terminal 2 flashes with a pause and repeats, control function is active on radio remote. Push the System Start/Stop control toggle switch to 'stop' position and Speed Fast/Slow toggle switch to the 'slow' position and restart radio terminal.
3. The diagnostic status LED on the radio terminal 3 flashes with a pause and repeats, Radio fault Radio Module error. Contact B&D Manufacturing.
4. The diagnostic status LED on the radio terminal 4 flashes with a pause and repeats, shutdown due to low battery voltage. Recharge batteries or replace with fully charged battery.
5. The diagnostic status LED on the radio terminal 5 flashes with a pause and repeats, Keyboard fault, Terminal is not able to "read" control toggle switches or control joysticks. There is a fault at the input module. Contact B&D Manufacturing.
6. The diagnostic status LED on the radio terminal 6 flashes with a pause and repeats, Shutdown due to inactivity. The radio terminal will soon turn itself off because no control toggle switches or control joysticks have been activated. Turn terminal off and on again to restart normal operation.
7. The diagnostic status LED on the radio terminal 7 flashes with a pause and repeats, Priority stop. Emergency stop button on the radio terminal has been activated. Pull up on the emergency stop button to deactivate. Turn terminal off and on again to restart normal operations.

## Hydraulic System Failure Troubleshooting Tips

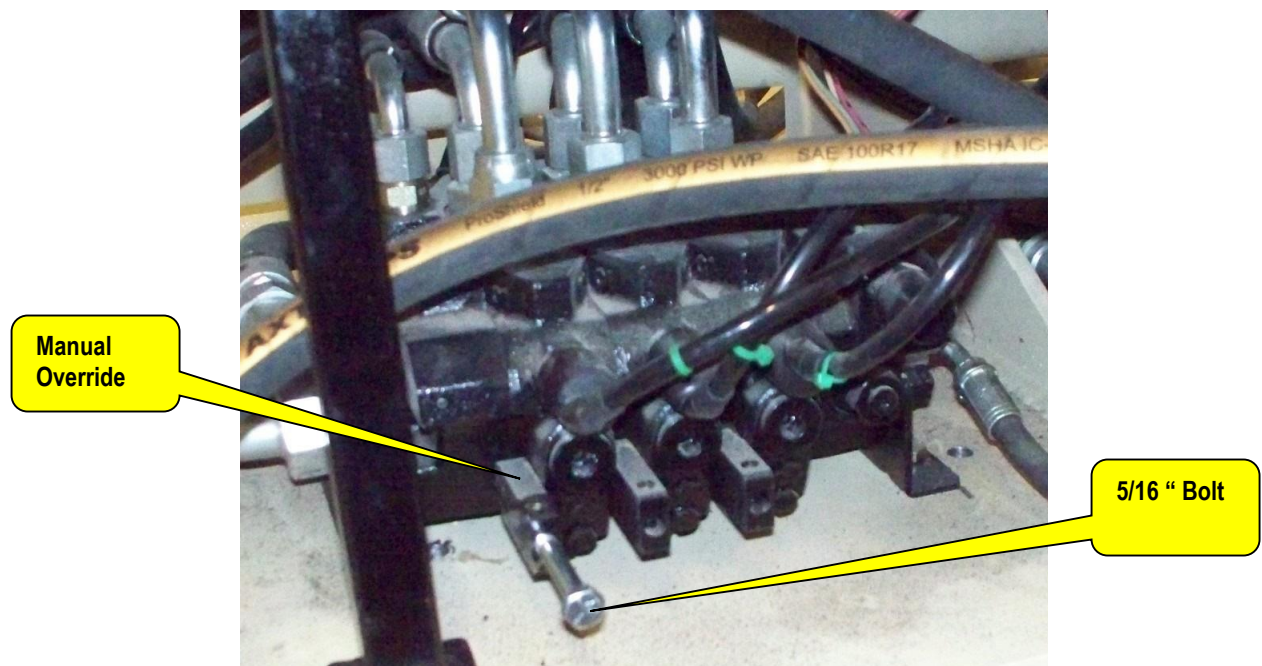
The Hydraulic System Failure troubleshooting suggestions listed below will assist with determining if the failure condition or symptom currently active with your Multi Handler is related to the Multi Handler's hydraulic system or if it is a Multi Handler component mechanical failure.

The following lists the components that are Multi Handler hydraulic functions and are operated by the Multi Handler hydraulic system.

- Front Left Strut Cylinder
- Front Right Strut Cylinder
- Rear Strut Cylinder
- Front Steer Cylinder
- Rear Steer Cylinder
- Front Cross Slide Cylinder
- Rear Cross Slide Cylinder
- Front Left Drive Wheel Motor
- Front Right Drive Wheel Motor
- Rear Drive Wheel Motor

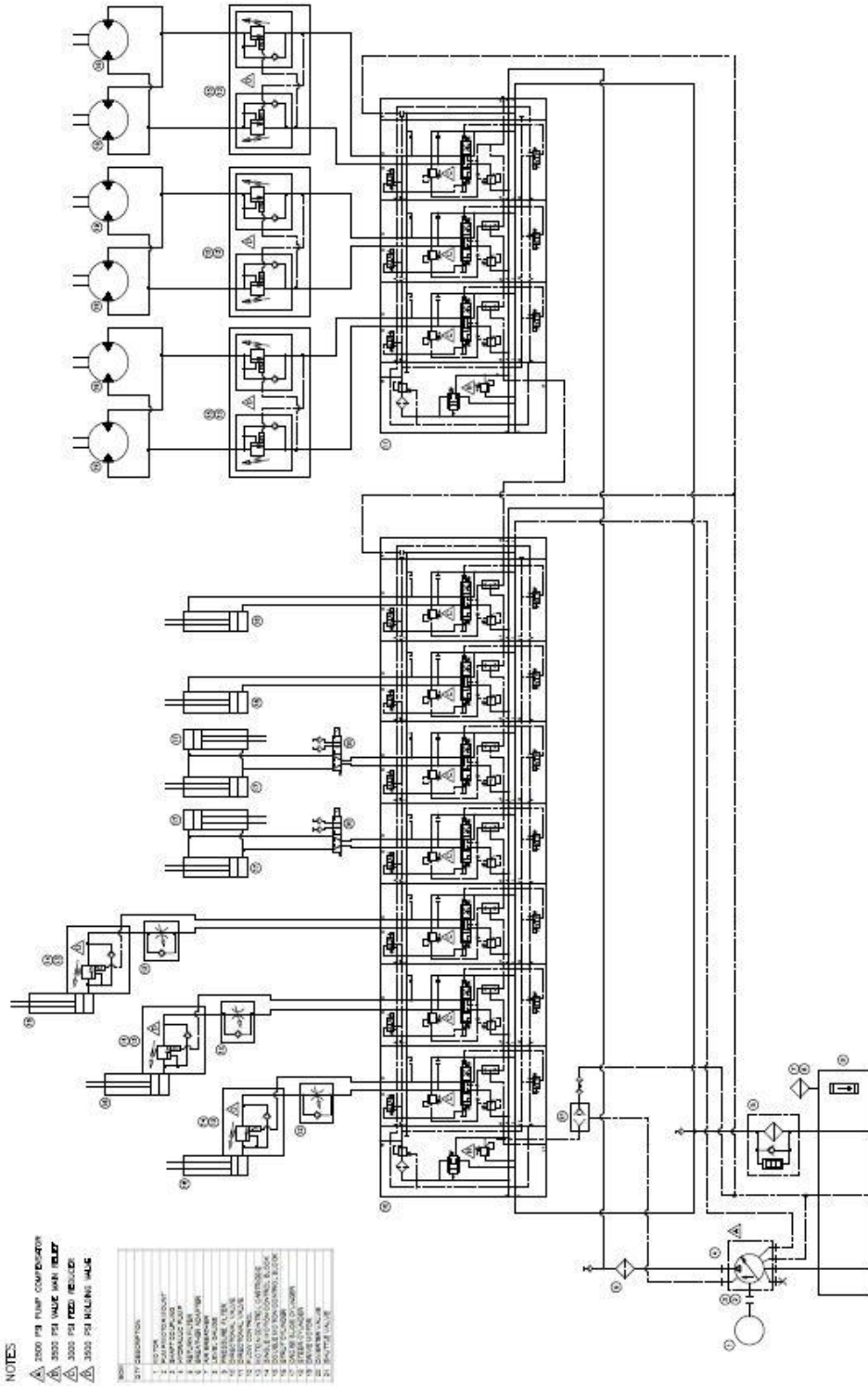
If any of the components listed above or any of their associated assemblies are not functioning as intended refer to the hydraulic system failure diagnostics listed below for further troubleshooting suggestions.

- Thread 5/16 inch bolt into the manual override of the hydraulic function's associated section located on the Directional Valve Assembly.



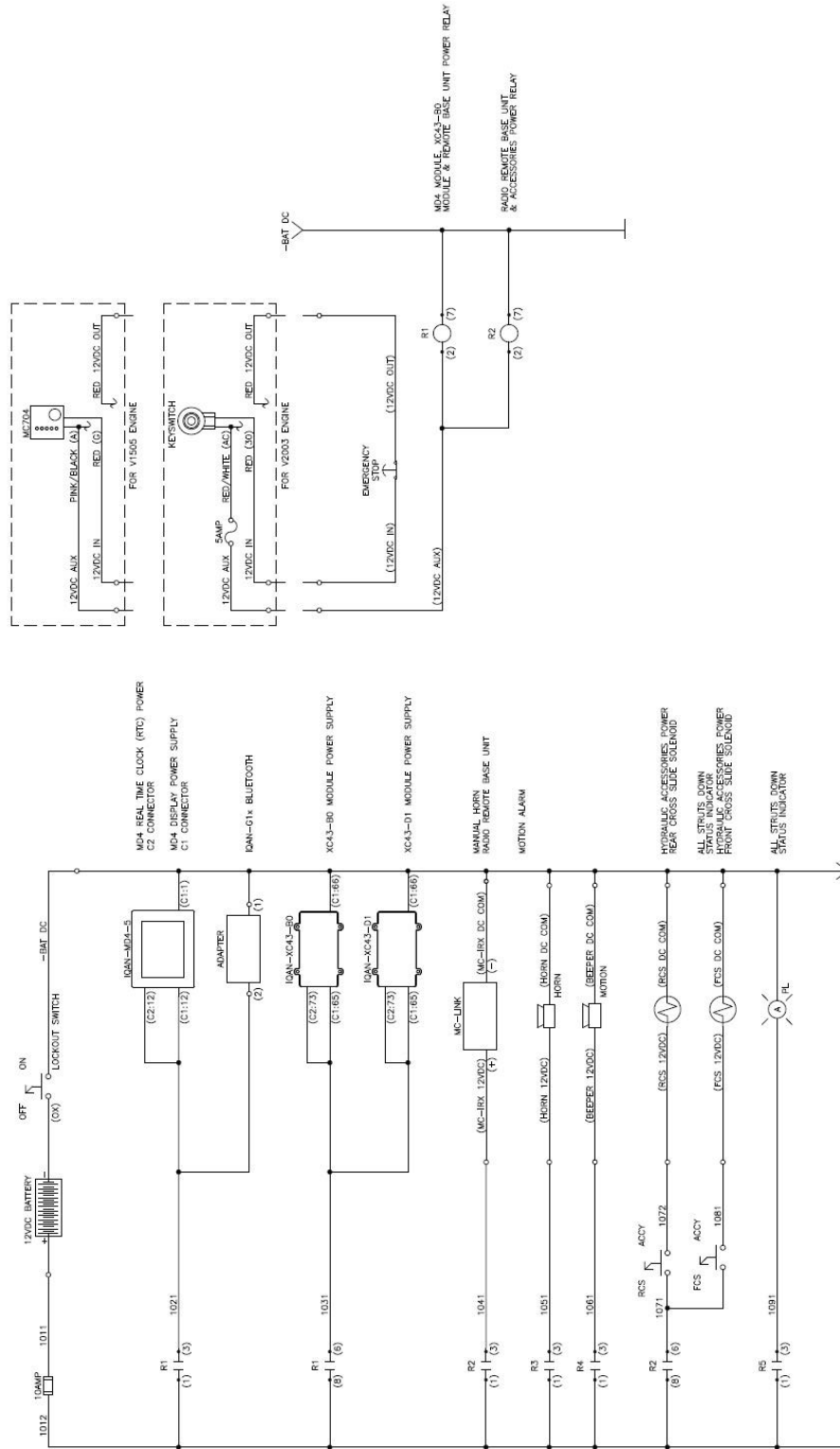
- If the hydraulic function begins to operate while the manual override is being operated then the active failure condition or symptom is not related to the Multi Handler's hydraulic system. The active failure condition or symptom is either an electrical, control or mechanical component failure. Refer to the troubleshooting suggestions listed above in this section for further tips.
- If the first hydraulic function does not operate manually then manually override another one of the Multi Handler's hydraulic sections located on the same Directional Valve Assembly. If the second hydraulic function begins to operate then the failure condition or symptom is isolated to the first hydraulic section. Replace the first hydraulic section's solenoid assembly located in the Directional Valve Assembly.
- If the second hydraulic function does not operate then the failure condition or symptom is likely related to the Multi Handler's hydraulic system.
- Operate any one of the control functions on the Radio Terminal and monitor the "Pump Main Pressure" voltage input value, XC43-B0 Pin C1:8, via the IQAN-MD4 Master Display Application I/O Measure Channel Group.
- The "Pump Main Pressure" value displayed should be greater than 300 psi.
- If the "Pump Main Pressure" value is less than 300 psi then the active failure condition or symptom is most likely a result of a failure of the hydraulic system's Piston Pump that is bolted to the Pump Motor Adapter. Replace the Piston Pump.
- If the "Pump Main Pressure" value is greater than 300 psi then the active failure condition or symptom is most likely a result of a failure of the hydraulic system's Directional Valve Assembly. Replace the Directional Valve Assembly.

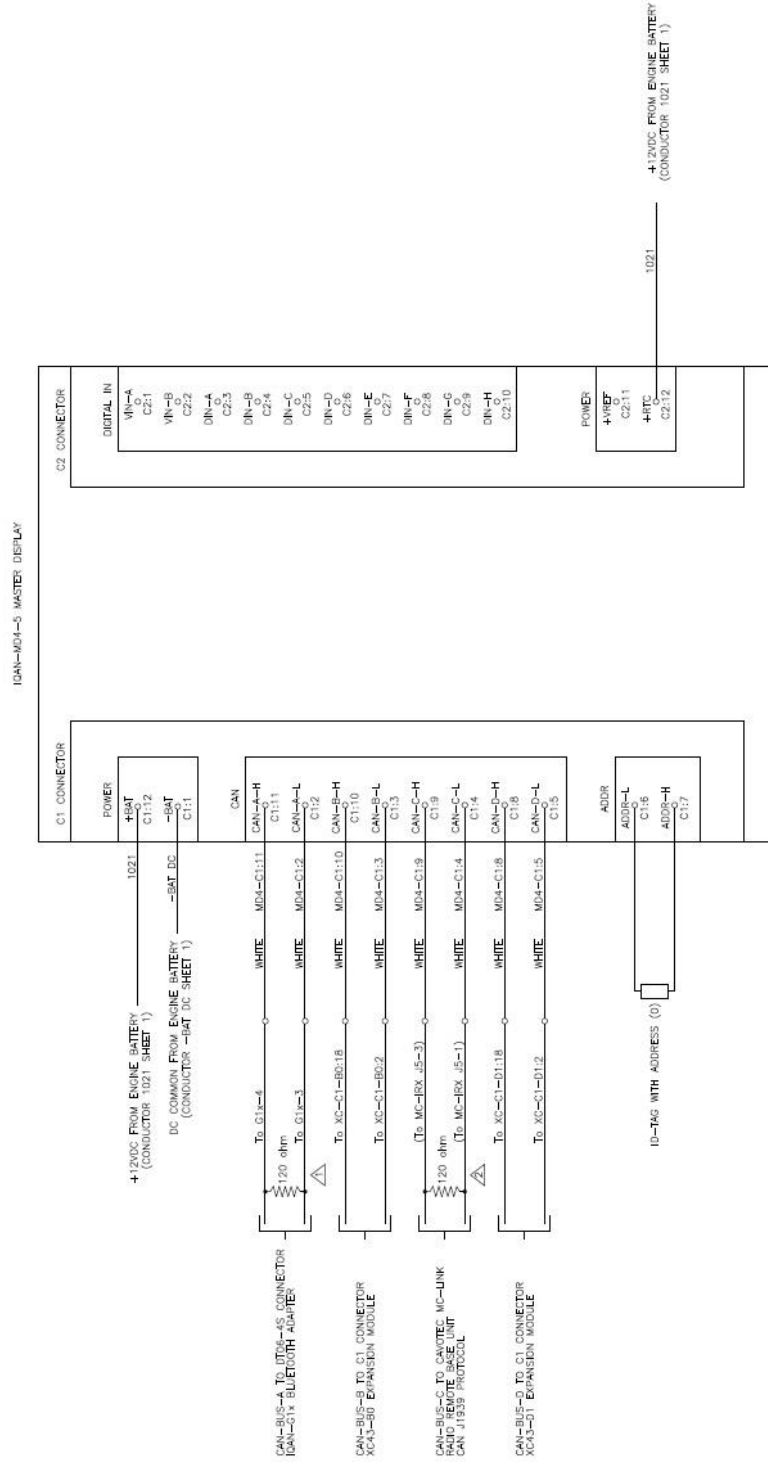
## Hydraulic System Schematic



## Electrical System Schematic

Sheet 1 of 4









## Warranty

All manufactured goods supplied by this Company are guaranteed against defective workmanship and material for a period of twelve (12) months from the date of shipment. If within that period the Company receives from the customer written notice of any alleged defect in or non-conformances of any such product and if in the Company's sole judgment the product does not conform or is found to be defective in material or workmanship, then the Distributor or Customer shall at the Company's request, return the part or product transportation prepaid and the Company, at its option and expense shall repair or replace the defective part or product, or repay to Distributor or Customer, the full price paid for such part or product by Distributor or Customer. Any repayment of purchase price shall be without interest. Warranty on third party items shall be limited to the warranty passed on to the company by the original manufacturer of such items.

## Limitations

The warranties of B&D Manufacturing do not cover, and the Company makes no warranty with respect to:

- Failures not reported to the Company within the warranty period specified above.
- Failures or damage due to misapplication, abuse, improper installation or abnormal condition of temperature, dirt or corrosion matter.
- Failures due to operation, either intentional or otherwise, above rate capacities or in an otherwise improper manner.
- Products which have been in any way tampered with or altered by anyone other than an authorized representative of the Company.
- Expenses incurred by Distributor or Customer in an attempt to repair or rework any alleged defective products.
- Failures resulting from attachments, accessory items, modifications and parts not sold or approved by B&D Manufacturing.
- The Company shall not be responsible for any special, indirect or consequential damage of any nature arising out of or relating to the manufacture, sale or use of the Company's products. Such excluded damages include, but are not limited to, loss of business profits, revenues, opportunities, loss of goodwill, down time of equipment and facilities, and all other type of damages, direct or indirect, foreseeable or unforeseeable.
- Any damage to the equipment caused by the Customer's personnel, freight forwarder, installation contractor or other personnel handling the equipment, during shipment, installation or prior to completion of commissioning is to be repaired at the Customer's expense.

Unless stated otherwise by the Client, via written exceptions, these terms and conditions are considered accepted by the Client upon receipt of a purchase order.

### **An Important Note about Alterations and Warranties**

Installation or alterations made to the original equipment as provided by B&D Manufacturing are not covered by the B&D Manufacturing Limited Warranty.