Form No. 1-862
August 2005

TC-200 Distributor Test Stand (47200) Shop Manual

CLOSE WINDOW

Meyer Products Inc.
18513 Euclid Ave. • Cleveland, Ohio 44112-1084
Phone (216) 486-1313
www.meyerproducts.com• email info@meyerproducts.com

Diamond Equipment
6 Angell Lane• Damariscotta, ME 04543-4507
Phone (207) 563-2227
www.diamondplow.com • email info@diamondplow.com

CONTENTS

CLOSE WINDOW

CONTENTS (CON'T)

CLOSE WINDOW

Chapter 1 – Electrical Safety

A. 120V Single Phase Operation

The power supplied to this machine is 120V single phase. Please note the dangers involved in using 120V single-phase energy. 120V single-phase electrical supply can and does cause electrical shock and other medical complications involved with its use. Please consult your local electrical authorities or commissions for the necessary safety guidelines and medical information required when using this type of power.

B. 12V DC Operation

This machine uses 12V DC power in its operation. This power while low voltage, can and will present danger to the operator if not correctly used. Please consult your local electrical authorities or commissions for proper instruction as to the medical requirements for use of a 12V DC system.

C. Electrocution

This machine uses single-phase power in the operation of the equipment. Please note that electrocution is possible if safety and proper use of the equipment is not followed. Please insure that any and all electrical precautions and/or instructions are read and thoroughly understood by operators and maintenance people to prevent any possibility of electrocution.

D. Use of Battery Cables

This machine requires the use of battery cables in order to supply the necessary 12V power for unit testing. The proper use and care of these battery cables are important for safety and good operation of the machine. Please read all instructions pertaining to the use of battery cables and become familiar with the use of battery cables in order to avoid any possible complications or danger to personnel.

E. Proper Grounding

This machine requires proper grounding in order to prevent the possibility of electrical shock or electrocution. Please consult your local electrical authority or commission on the necessary grounding for this machine.

F. No Wet Hand Operation

This machine uses electrical power for operation. Please insure that at no time does the operator and anyone involved in operating this machine do so when their hands are wet or standing in any type of water.

G. Circuit Breaker Protection

This machine utilizes a 20-amp circuit breaker integral to the electrical power cabinet to prevent short circuits or to interrupt power flow into the machine in the case of an electrical problem. Please become familiar with the circuit breaker when requiring to reset or disable power coming into the machine.

H. Fused Protection

This machine uses fuses in the protection of any feeder circuit lines going out to the hydraulic unit or test unit. These fuses are AGC glass axial type. Please become familiar with their location and rating. Under no circumstances are fuses to be replaced when power is applied to the machine. Turn off all power to the machine, and then replace fuses as necessary.

I. Motor Operation

This machine uses a single phase, 1 hp motor to develop the necessary hydraulic pressure. This motor, upon start-up, can for a brief time, require high current draws in order to bring the motor up to speed. Please become familiar with the use of this motor and do not start the motor up under any load.

J. Emergency Stop

This machine is equipped with an emergency stop button. This button is located on the front face of the electrical panel. This button is a normally closed switch, that when actuated removes main power from the machine. All machine motion will stop when the emergency stop button is activated.

K. Electrical Lock Out

Please note that anytime service is done to the machine, that the electrical panel is to be locked out or the machine unplugged, prior to any service being performed.

L. Battery Guard

This machine requires the use of a 12V DC battery. On base units, this battery is used to supply power to the test unit. Please ensure that the battery guard is in place when the machine is running.

DANGER; the risk of explosive gases working in the vicinity of a lead acid battery is dangerous. Batteries generate explosive gases during normal battery operation. For this reason, it is of utmost importance that each time the battery is used you read and follow all instructions exactly.

DANGER; Never alter AC or plug cord provided. Have a proper outlet installed by a qualified electrician. Improper connection can result in risk of electrical shock.

Section I: Safety

Chapter 2 – Machine Safety

A. Hydraulic Power Unit

This machine is equipped with a hydraulic power unit. This power unit provides hydraulic pressure and flow necessary to complete the testing of plow units.

B. Valves

The hydraulic power unit uses 2-way valves for the necessary operation. These valves in their de-energized state are normally closed. Please become familiar with the operation of these valves through a review of the hydraulic schematic. Failure to do so may result in personal injury.

C. Integrated Tank and Manifold Design

This machine utilizes an integrated tank and manifold design in order to provide a compact and efficient method of operation. Prior to servicing any of the components on this integrated tank and manifold design, please become familiar with its layout and operation. Failure to do so may result in personal injury.

D. Use of quick disconnects

This machine requires the use of quick disconnects in order to hook up the test unit. These quick disconnect upon completion of testing may be under pressure. Use extreme caution when attaching and removing quick disconnects from the test unit. Failure to do so may result in personal injury.

E. Hydraulic Cylinders in Motion

This machine requires the use of hydraulic cylinders in its operation. These cylinders are in motion during operation and can cause pinch points to become present. Please be aware of all danger warnings and signs that indicate that pinch points are present. Failure to do so may result in personal injury.

F. Hydraulic Oil Spillage

This machine requires the use of hydraulic oil for its operation. This oil is very thin and when spilled can present a very slippery and dangerous situation. Clean up any spills immediately. Use necessary oil absorbents and/or necessary danger markings when dealing with oil spillage. Failure to do so can result in improper machine operation and personal injury.

G. Inhalation or Injestion of Hydraulic Oil

This machine uses hydraulic oil in its operation. If this oil is inhaled or becomes ingested, please seek proper medical attention immediately. Prior to the operation and use of this machine, please consult your local OSHA and/or industrial safety commissions for the proper and necessary treatments of hydraulic oil inhalation or ingestion. Please consult the oil manufactures' material safety data sheets for applicable oil safety information.

H. Hose Breakage

This machine utilizes hydraulic hoses in the transmission of hydraulic power for its operation. These hoses have been designed with industry standard safety requirements and ratings. These design and safety ratings are per the guidelines listed by the National Fluid Power Association (NFPA). In the event of a hose breakage or hose leakage, please replace the hose immediately.

I. Hydraulic Oil under High Pressure

This machine uses hydraulic oil in its operation. This hydraulic oil is at times under high pressure. Extreme care must be exercised when using this machine. High-pressure oil can present a danger if improper operation or hose breakage should occur. Pay particular attention to gauge reading over pressure conditions. The relief valves on the hydraulic power units are preset. These setting are to insure safe operation during machine operation. Any changes or adjustments to these relief valves can and will present danger to the operator of this machine. Failure to follow the above instructions can and will present danger to personnel.

J. Mechanical

This machine is constructed of a weldment and several mechanical devices. Please note when making any mechanical adjustments on the machine to exercise care and to utilize proper practices.

K. Machine Deflection

This machine when under load at certain points in its operation will have a slight deflection to the framework. This deflection is normal under proper machine operation. Please inspect machine for sound mechanical construction periodically to insure that no welds have been broken or mechanical parts have come loose. In the event of cracked welds or mechanical damage, please discontinue use of this machine immediately and contact the original equipment manufacture. Failure to do so can and will result in personal injury.

L. Casters

This machine utilizes casters for mobility. Machine movement is to be done with the test unit securely in place and the machine unplugged. Grasp machine from front facing the front guarding when moving the equipment.

Warning; improper use of the casters or improper location of operator when moving this equipment can cause unpredictable and sudden movements of the equipment. Please review and make sure that equipment movement procedures are followed as outline in this manual.

DANGER; Failure to practice good machine movement procedures can and will result in personal injury.

M. Safety Front Guard

This machine is equipped with a front safety guard. The machine will not function when the guard door is open. Insure that the front guarding is in good operation and that the front latch works well. Failure to do so, can and will result in personal injury.

N. Oil Accumulation in Drip Pan

This machine is provided with a lower drip pan to contain any oil spills. Make sure that any and all oil spills that appear on the drip pan are immediately cleaned up for proper machine operation.

O. Machine Not In Use

When this machine is not in use, please remove 12V battery and store the battery cables in a dry and secure location.

P. Machine Lifting

This machine can be lifted by using the lifting device under the bottom two-frame supports. Do not lift this machine from the front or back of the machine. Only lift the machine by coming in through the left or right side and positioning lifting device under the mainframe rails. Failure to do so may result in personal injury.

Section I: Safety

This machine was constructed under the guidelines of the following organizations.

Electrical guidelines. This machine was constructed utilizing the National Electric Code NEC/NFPA70 sections 225, 270, and utilizing NFPA79 Electrical Standard for Industrial Machinery.

Hydraulic guidelines. The hydraulics on this machine were designed utilizing common practices and information as detailed by the National Fluid Power Association (NFPA). The NFPA in coming up with some of their guidelines did reference the ANSI B93 standards and SAEJ515, 517, 518, 524, 525, 1227, 1273, 1453, 1926, and the AS568 sections.

Section I: Safety

Chapter 4 – Usage

1. **Never use this equipment without getting familiar with the machine and all of its functions.**

2. **Always stand in front of the machine behind the front safety guarding during operation. Never proceed to the rear or side of the machine when the machine is in operation.**

3. **Note location of E-Stop (emergency stop button).**

4. **Never make adjustments to the machine without proper knowledge and authorization from original equipment manufacture.**

5. **When servicing this equipment use only recommended original equipment manufacture parts for replacement. Failure to do so may result in improper machine operation.**

Warning; the use of any other replacement spare parts other than the original equipment manufacture recommended spare parts may result in machine damage and/or injury to operator.

6. **Keep machine close to power outlet. Long extension cords may cause improper current draw due to line losses. This will result in poor machine operation and frequent circuit breaker tripping.**

7. **Keep machine clean, free of oil and oil accumulation. Make sure machine is in good working order and in good operation prior to continued use.**

8. **Use this equipment only as directed and for its design.**

Section II: Operation

Chapter 1 – Scope

A. Function

This machine is used for the testing of the snowplow hydraulic power units. The snowplow hydraulic power unit will be referred to as the test unit in this manual. The machine is divided into three sections in terms of design. Each section performs a specific function in the machine operation in order to give a good and sound basis for testing of the Snowplow hydraulic power unit. Note that some of the machines functions are option dependent, and that the test results can: visual inspection, a data recording or display that is done by the control of the machine.
The three main sections of the machine are mechanical, hydraulic, and electrical.

Mechanical: The function of the mechanical portion of the machine is to test the mechanical workings of the snowplow hydraulic power unit components. The mechanical testing looks for correct valve shifting, required cylinder movements, aids in testing the integrity of hydraulic seals, aids in testing the integrity of hydraulic connection points, aids in testing the integrity of pressure scaling and holding devices, aids in testing the integrity of pressure seals, test the connection points of electric devices such as solenoids and cable connectors.

Hydraulics: Test for the delivery of fluid power. Test the hydraulic pump to ensure that the pump is delivering the correct pressure and test that the pump can deliver maximum pressure. Test the hydraulic pump for sufficient flow so that hydraulic devices are actuated correctly. Test the hydraulic valves for operating correctly and in the correct sequence. Filters the hydraulic oil through a 10-micron filter on the test stand hydraulic power unit. Test the relief valve system. Test the cross over functions in the rake/angling cylinders of the snowplow. Test the leak down limiting ability of the Snowplow Hydraulic Power Unit. Note: This is commonly known as the railroad test, in which frequency type based oscillations are used in order to load and unload the lift cylinder on the snowplow. This loading/unloading simulates the snowplow vibrating up and down when on the road and a railroad crossing is transversed by the truck, or the road is bumpy and the plow shakes on the front of the truck. Test snowplow hydraulic manifold capability in terms of any obstruction.

Electrical: Test for correct operation of valve solenoids. Test for amp draw of hydraulic power unit motor. This is the amp draw used by the snowplow's hydraulic power unit to enable fluid power. Test the integrated controller of the snowplow for correct operation. This is a pass through mode, in which the snowplows truck controller is plugged into the test stand. The test stand simply provides 12V DC power to the controller. When used, the operator can use the integrated truck snowplow controller to cause snowplow motion.

CLOSE WINDOW

B. Benefits

The benefits of this test stand are a real value both in monetary and labor timesaving for the user. Note that some of these labor and timesaving benefits are option dependent. The use of options to reduce the amount of time in troubleshooting and testing snowplow hydraulic units is highly recommended.

The benefits of this test stand are self evident once the user becomes familiar with its operation and can quickly and easily manipulate through the control and identify the test that the snowplow's hydraulic power unit is going through. There will be a decrease in time to test and troubleshoot snowplow hydraulic power units. The test results will allow identification of problems and assist in locating problem areas. It will also help the technician too quickly identify areas of the snowplow hydraulic power unit that can have defective parts. The machine will simulate plow operation in a controlled environment. This will allow the operator to view the snowplow hydraulic power unit in its normal operating state and be able to control the results by having visual, or depending upon the options have data recorded feedback in order to measure snowplow hydraulic power unit performance. It is also beneficial that the testing can be done repeatedly to allow consistent test results to be viewed and collected.

The test stand design is a modular approach. The base unit has all the necessary functionality to test a Meyer Snowplow Hydraulic Unit. This testing will provide important and quick information to identify problem areas in the snowplow operation. The ease of upgrade to the test stand is one of convenience. As the complexity of the snowplow operations continues to grow, the test stand is upgradeable to meet that complexity. The modular design approach is used to make upgradeability quick, easy, and efficient for the end user.

Each test stand has its own serial number identifying system. This serial number is unique to each test stand, allows quick identification of the model, and options that each test stand came with. Become familiar with the serial number of your unit and keep it handy for quick reference when communicating with Meyer for any service or upgrades. The serial number system also allows continuous tracking of the test stands service history and upgrades. This keeps each test stand unique to its owner and allows personal service and specialized record keeping for each of the test stands.

Section II: Operation

Chapter 2 – Machine Construction

The distributor test stand is constructed to achieve optimum costing and quality for the end user. The construction of the distributor test stand has been put through testing to ensure longevity and safety in operation. The distributor test stand has been constructed with the user in mind to allow easy access to all phases of operation, and with service in mind to allow ease of maintenance and quick access to all components of the test stand.

Become familiar with the layout of your distributor test stand, and know each section of the test stand, and where components are located. In this manual in later sections, you will be presented with mechanical, hydraulic, and electrical drawings that detail each section of the distributor test stand to allow quick and easy identification of components and analysis of test stand functions and operations.
It is also recommend that each user of the distributor test stand, keep on hand the necessary spare parts to allow quick replacements of worn or damaged parts that may occur. The spare parts are necessary for continued operation and quickly bringing the distributor test stand back up to quality operation in a timely manner.

As in the preceding section, the machine construction is of a modular design. There are three basic sections to the modular design. The three sections are mechanical, hydraulic, and electrical. The following paragraphs detail each of the construction considerations and benefits to the user.

A. Mechanical

The mechanical design of the machine is from welded steel framework. This framework has been designed to allow the machine to be free standing. No special foundation requirements are needed, nor are there any specifications as to the location of the machine other than noted in other sections of this manual. The frame is designed to allow containment of load forces. This allows a self-contained unit to be delivered that does not require any bolting to a foundation or additional support structures to handle the ensuing load forces that are caused from testing. These forces are redistributed back through the framework, and dissipated within the steel structure. The framework is also coated with a powder coat paint that allows for tough resistance to commonly used shop methods and commonly used shop products (such as degreasers, oils, greases, etc.). The distributor test stand is also supplied with casters on the bottom of unit. These casters allow for mobility and ease of movement of the test stand.

The industrial grade casters are designed for shop floor environments. The unit can also come with an optional moveable test unit table to accommodate different strokes of snowplow lift cylinders. The table is easily and quickly moved by the removal of four (4) support bolts from the table ends. A quick mount design has been incorporated into the table to allow the snowplow to be easily mounted and removed from the test stand.

CLOSE WINDOW

The distributor test stand has an integrated lower drip pan that is located under the test stands power unit. This drip pan collects any oil spillage or leakage that can occur from defective snowplow power units.

Warning: it is recommended that any oil spills be quickly cleaned up to keep the danger of slippage from occurring. Failure to quickly cleanup oil spillage can result in personal injury.

Also integrated into the mechanical design is a front safety door. This safety door is a barrier between the operator and the testing. This safety door is made from a shatterproof Lexan material. The safety door allows a barrier to exist between the operator and any oil leakage or flying parts that could occur from a catastrophic failure during testing. This safety door has an integrated control interlock. Testing will not be allowed to occur unless the safety door is closed and latched into place.

Warning: the safety door must be closed at any time that testing is occurring on the snowplow hydraulic power unit, or when manually moving the distributor test stand or using any of its functions. Failure to do so or defeating the door interlock to allow the safety door to be opened during any machine testing or functioning can result in personal injury.

B. Hydraulic Power Unit

Distributor test stand hydraulic power unit has been designed for maximum efficiency, minimal cost and great flexibility. The compact and modular design of the distributor test stand hydraulic power unit is one that leads to ease of use and maintenance. The integrated manifold design allows for a single point maintenance and quick identification of all necessary components and parts.

A spin-on 10-micron filter for continuous oil filtering is provided and easily accessible. The spin-on filter is located on the integrated manifold assembly to allow quick and easy access to filter replacement.

The use of standard Meyer hydraulic oil allows the user to have a single oil supply point. The use of the same type of oil in the distributor test stand hydraulic power unit and the snowplow hydraulic power unit eliminates the possibility of contaminating the snowplow power unit with non-Meyer type oil.

An abundant five-gallon reservoir located on the distributor test stand hydraulic power unit ensures that there is adequate oil supply to run continuous testing again and again. The five-gallon reservoir is easily located and has easy access to fill ports and drain ports. The oil reservoir filler cap serves as both a breathing element to allow entrance/exit of air as the oil volume changes within the reservoir, and an easy to view dipstick that allows oil levels to be periodically checked for maintenance purposes.

The hydraulic circuitry used in the distributor test stand hydraulic power unit allows for both high and low pressure to be used in a single integrated common manifold.

Hydraulic gauge readouts that are easily located to the front of the distributor test stand allow the operator to quickly view pressures during testing. Easy to couple quick disconnects on the hydraulic hoses are used to connect to the snowplow hydraulic power unit. These quick couplings offer efficient and timesavings connections to the snowplow hydraulic power unit. The hoses used on the distributor test stand are high pressure, duty rated hydraulic hoses. These hoses are designed to withstand the high pressures and high frequency spikes that are delivered during testing of the snowplow hydraulic power unit. Quality hydraulic cylinders are used on the distributor test stand. The hydraulic lift load cylinder and the optional express mount cylinder have been designed to withstand the high pressures of testing and offer longevity of use of the distributor test stand.

C. Electrical

The distributor test stand has been designed with electrical safety in mind. The circuitry design and construction of the electrical section of the machine has been optimized to allow operator safety and to meet the necessary electrical design requirements set out by the National Electric Code. In design of the electrical portion of the distributor test stand many options are offered.

The electrical cabinet is a NEMA rated electrical enclosure that allows protection to the controls. The distributor test stand is PLC based, offering state of the art functionality and ease of upgradeability.

Operator interface is made through a 6" touch screen. The touch screen is of industrial design and offers a resilient front face for longevity. The touch screen is interactive to the operator merely by touching the necessary buttons on the touch screen face. These buttons can be actuated with/without gloves or through the use of some other device to activate the buttons.

Warning: the use of sharp or pointed objects to actuate the touch screen button is not recommended. Sharp or pointed objects can penetrate through the sealing membrane of the touch screen and cause damage to the underlying electrical matrix that is used to identify when a button has been pressed. Damage to the touch screen by the use of these objects will render the touch screen inoperable.

DANGER; the use of sharp or pointed objects on the touch screen can cause penetration of the sealing membrane and contact with the electrical matrix underneath the membrane. Conductive, sharp, or pointed objects when penetrating the membrane can cause a short circuit, and/or electrical shock to occur. It is not recommended that any sharp or pointed objects be used when actuating buttons on the touch screen.

CLOSE WINDOW

The control system has been set up with an easy to use menu style operator interface. The operator can quickly navigate between menus and select functions listed under those menus. The functions are clearly marked and actuated by push buttons located on the touch screen. All control interfacing and function selection is done through the touch screen.

Preconfigured plow testing for all Meyer brand snowplows is already programmed into the distributor test stand control. This allows for a single button selection to be used to set up the machine to test Meyer brand snowplow hydraulic power units.

National Electric Code standard circuitry and design was used in development of the distributor test stand controls. All solenoid power lines and all outputs from the PLC have been fused. The fuses are glass axial type quick acting fuses that immediately detect overloads or short circuits and burn open. This allows protection of the electrical control and safety for the operator in the event of an overload or short circuit condition.

Warning; the fuses are in place to provide protection to both the equipment and the operator. In the event of a fuse burning open, it is recommended not to just replace the fuse, but to take a careful look at the equipment to make sure that any unsafe condition has not occurred, or if there has been damage to the equipment. The purpose of the fusing is to keep the machine safe, and preserve the components within the machine.

DANGER; the failure of a fuse can indicate an unsafe or dangerous condition. It is recommended that upon fuse failure that the necessary qualified maintenance or service people are contacted to review the fuse failure and to determine if service/maintenance is to be done to the machine. Failure to do so can result in personal injury.

Solenoid connection points have been designed to accept either the bullet style solenoid connector, or the new Deutsch style solenoid connector. The bullet style solenoid connector is a single point connection based upon a male/female connection point. Grounding for the solenoid is provided through the framework of the machine. Deutsch style connection points offer separate power and ground leads to each solenoid. The connectors snap into place offering a secure and oil proof connection to the solenoid.

Power for the snowplow hydraulic power unit is supplied through a 12V battery. The battery is quickly hooked up to the machine through quick clamps on the positive and negative post terminals. Connection to the snowplow is offered through the same type of quick clamp connection. The cabling used in the clamps is rated to allow full current capability to be delivered to the snowplow hydraulic power unit motor.

The electrical requirements of distributor test stand are 120V single-phase. The distributor test stand has an integrated circuit breaker rated at 20 amps built into the electrical cabinet. This circuit breaker offers circuit protection to the machine in the event of a large overload current condition. The machine is rated to plug into a 120VAC duplex outlet.

Warning; the duplex used to power up the distributor test stand must conform to local building codes. The user is to ensure that the outlet supply is rated at 15 amps or higher. Special plugs are offered to allow the distributor test stand to be plugged into a 20 amp or higher 120V service.

DANGER; the machine electrical machine requirements are to be strictly adhered too. The use of a power outlet not rated to 15 amps may cause circuit breaker to open. This will cause the machine to loose power and stop functioning.

Section II: Operation

Chapter 3 – Function

A. Overview

The distributor test stand is made to test the snowplow hydraulic power unit through all of the common movements that the snowplow offers. Common movements within the snowplow are for example, the snowplow lift movement, the snowplow lower movement, the snowplow right angle or rake movement, the snowplow left angle or rake movement, the snowplow loading, the snowplow lift loading, the snowplow cross over function or relief function both right and left side.

These tests are based upon pressure levels and are timed tests. The tests offer visual results in the base unit to be interpreted to determine good or bad operation.

Warning; test results are determined by operator's visual inspection on base model. The determination of a good test or a bad test is strictly subjective and based upon operator experience and familiarity of the unit being tested.

The testing can be done in one of two modes: an Auto Full Mode or and Auto Step Mode. The selection of Auto Full or Auto Step allows the control to sequentially test each function of the snowplow's hydraulic power unit. This testing is done in a continuous process. The control performs each test until the test time is completed. Once each test is completed, the control will move to the next test and begin it. The mode selection is critical to the process. As explained in later chapters of the this section, the Auto Full or Auto Step selection in Auto Mode will determine how the control proceeds to the next test.

Testing is initiated by the selection of the Auto Mode and the selection of either Auto Full or Auto Step and pressing the cycle start touch screen button. Once the cycle start button is selected, testing will begin.

Testing can be stopped in three (3) ways. The selection of the manner of stopping the test determines where in the test the process is stopped and if upon selection of cycle start resumes from the point it was stopped or returns to a home state and begins the test process from there. The following three methods are available to stop testing on the distributor test stand.

- Cycle stop
- Open front safety door
- E-Stop button

<u>Warning;</u> opening the front door, or pressing the E-Stop disables the test procedure in process. The E-Stop function will also disable all other machine functions.

The cycle stop button when selected will not stop the test in mid-testing. The test, if it is in process, will continue until the end of that test and then the cycle will stop. This will allow the control to complete a test and then stop the process.

Opening the front safety door will cause the test to stop in mid-testing. The controller will not start a test if the safety door is open. The testing will stay stopped until the front door is closed again.

<u>Warning;</u> the front safety door is to be closed at all times during testing. The front safety door has an integrated electrical interlock that tells the control when the safety door is closed.

<u>DANGER;</u> it is recommended that the safety door be close at all times during testing. Failure to do so can cause personal injury to occur.

The E-Stop button, or the emergency stop button, which is located on the main electrical panel, is used to stop the machine if an emergency occurs. Once this button is actuated, all machine function will stop in mid-process or in mid-testing. The machine will reset to a Manual Mode. Activation of the emergency stop button will cause the machine to drop out of Auto Mode and go to Manual Mode upon release of the emergency stop button. The emergency stop button is a normally closed switch that tells the control that everything is running well. Once that switch or emergency stop button is actuated, the control knows that an emergency condition has occurred and stop all functions.

<u>Warning;</u> the emergency stop button will allow the machine to stop in mid process. When it is actuated, all output power from the machine to external devices, such as the snowplows hydraulic power unit solenoids, and the distributor test stand electrical motor and solenoids is disconnected.

It is recommended to the operator that the machine be allow to run through all of the test sequentially as programmed in the Auto Mode. It is encourage that the operator note any problems that occur during each of the test, and then at the end of testing to effect repair. This allows the machine to run through its cycle and give optimum cycle time for the process. The Auto Step feature is an exception to this. The Auto Step Mode allows tests to be done repeatedly. This unique feature is used to allow maximum service and quality repeatability of the distributor hydraulic test stand.

Section II: Operation

Chapter 4 – Control

A. Structure of Control

The control of the distributor test stand is a PLC driven control with a touch screen interface for operator use. The PLC is housed in the electrical cabinet. The PLC is located in the upper portion of the electrical cabinet and is attached to the touch screen through a single RS232 communication cable. The touch screen is powered by 24V DC, which is supplied from the PLC power section and connected to the touch screen through a two-pin phoenix style connector. Please refer to maintenance section for further information.

The PLC is a single station unit with built in inputs/outputs and analog interface. The PLC also has LED indicator lights to view the status of the PLC. These lights will be either a green color or a red color depending upon the state condition of the PLC.

The PLC is commonly known in the control industry as a brick type. This means that all of the inputs/outputs are contained within one small package.

The touch screen interface is mounted on a swing out panel located on the upper right portion of the machine. The swing out panel is designed to allow the operator to adjust the panel for easy viewing and quick access to the necessary touch screen buttons that are available. The touch screen is a 6" touch screen with a monochrome display. This monochrome display is standard on base units.

The control system is a menu driven system. Each machine function has a menu that allows individual tasks to be selected. Each task is then associated through a touch button that appears on the touch screen in the appropriate menu section or on the task screens.

Some menu screens and some task screens are password protected. Password protection is for safety of operation.

Tasks are functions that the control executes when commanded. Task are completed or executed to perform a specific action on the machine. This action is typically a physical change of state of the machine such as movement of the load lift cylinder, energizing of solenoid valves, starting/stopping of motors, etc. Again, some tasks are password protected for safety reason. This password protection is in place to allow only qualified and knowledgeable personnel to gain access to some of the more critical control functions and machine actions. Passwords are typically a numeric number, which must be entered, and then verified by the machine in order to allow access to menus, sub-menus, and task screens.

<u>Warning:</u> password protection is for the good of the machine and safety of the operator. Passwords are to be given those personnel that are qualified and knowledgeable in the pursuing menus and settings of the machine. Care must be taken to ensure that passwords are securely given out and are recorded in a safe place in case of lose.

CLOSE WINDOW

Chapter 5 – Menu System

A. Menus

Menus are used to help the operator navigate through the control. Menus typically list touch buttons and instruction on their use. There are several different layers of menus that allow access to different areas of the control and to different task screens. Menus are similar to a file system where the screens are layered. The layering to these screens is to perform a specific function or action of the machine. The menus are generally arranged from general task to very specific task to specific actions. There are several menus available in the control system.

The menus available on the distributor test stand control are:

- Main Menu
- Help Menu
- Auto Full Menu
- Auto Step Menu
- Manual Menu
- Maintenance Menu
- About Menu

Menus are screens that have touch buttons on them, these touch buttons change the screens similar to turning the page in a book. When the touch button is pressed, the screen will change to a new screen. This new screen will have a direct relationship as to the label that is listed on the touch button. For example, if within the Main Menu the help menu touch button is pressed, then the Help Menu submenu comes up which allows access to other menus for help information on Auto Full, Auto Step, Manual, etc. See Fig 1-3. Some of the screens that are accessed from menus are just text screens that provide information on machine operation, a how to guide, or necessary machine information. Also available on the touch screen, are menus that allow access to specific machine information such as the machine serial number, whom to contact for service, model of machine and other engineering information that would be useful in servicing and troubleshooting the machine.

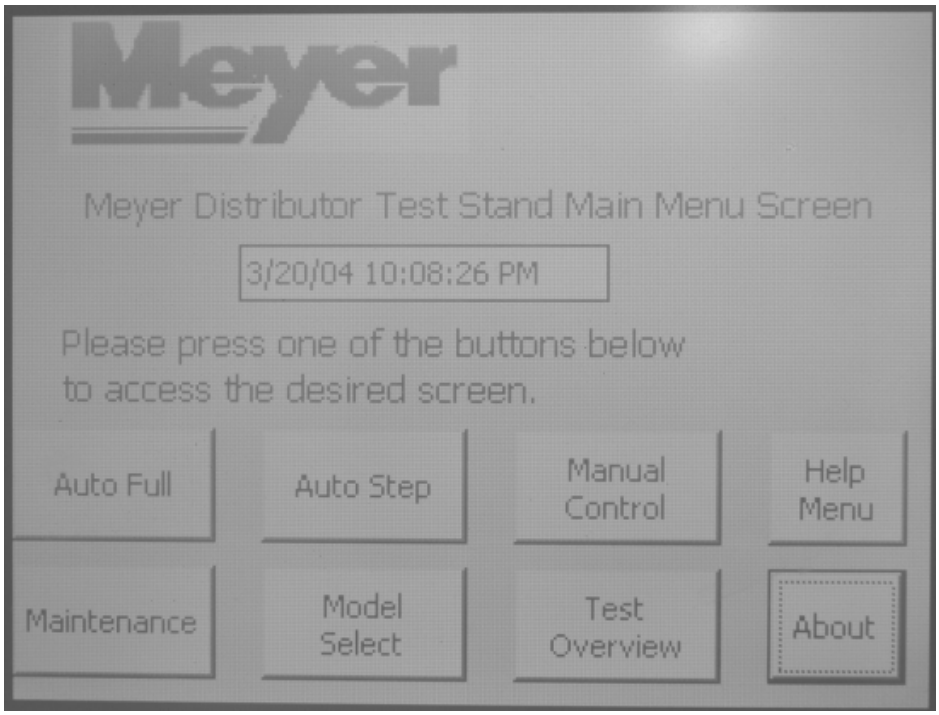


Figure 1. Main Menu Screen

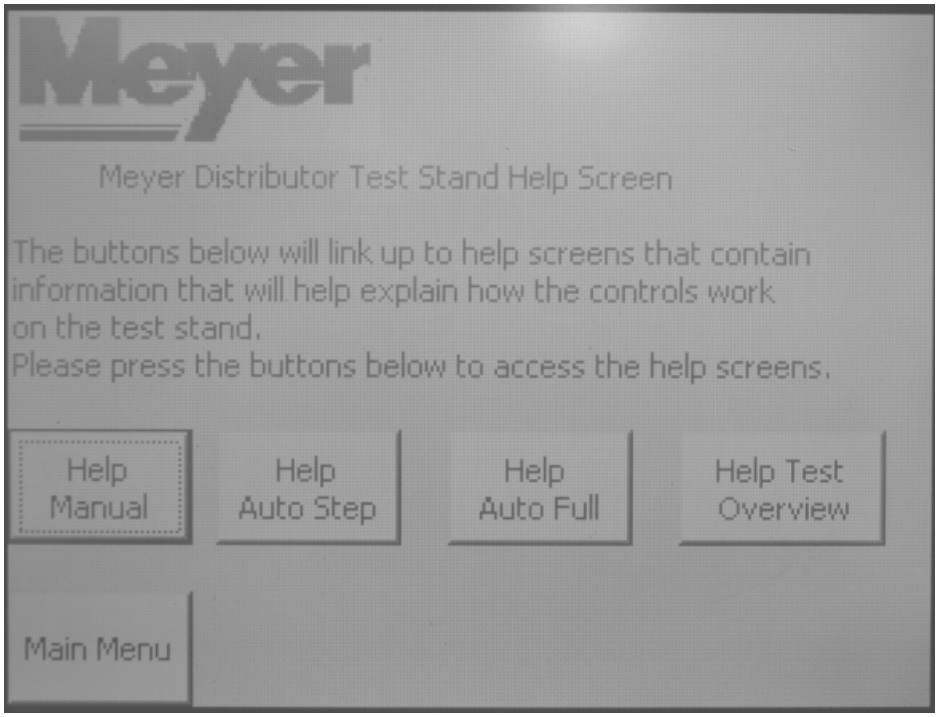


Figure 2. Help Screen

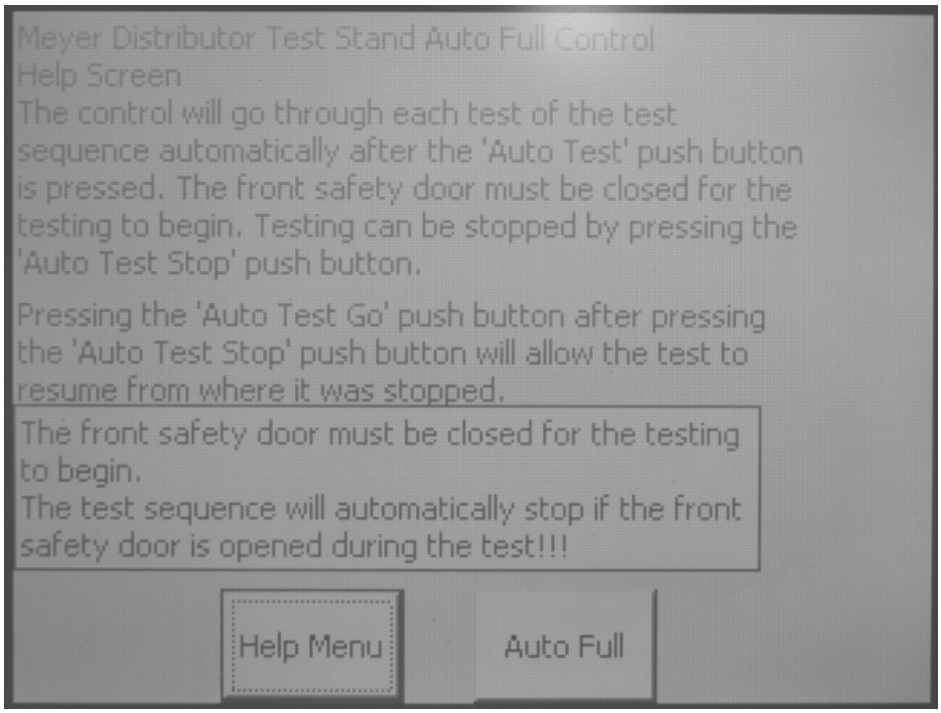


Figure 3. Auto Full Control Help Screen

A. Tasks

Tasks screens have touch buttons to allow specific control functions and/or machine actions to occur. Tasks are a combination of control functions and machine actions.

B. Control Functions

Control functions are defined as an exchange of information between the operator and the control, or within the control itself. Control functions include such things as changing data within the control, changing control modes, changing timers or set points, setting the system clock, setting the machine operating perimeters, and changing menus or tasks screens. Theses functions are performed automatically sometimes within the control or through dialog that occurs by touch buttons between the operator and the control via the touch screen.

C. Machine Actions

Machine actions are functions that cause physical movement or a physical change of state of the machine control. These actions typically are such things as running test, manually moving cylinders through the manual control screen, turning the pump off/on, or any other action that physically changes the state of the machine or control.

There are several modes available on the machine to facilitate different control functions. These modes directly affect the running and sequence of tests and other actions of the machine.

D. Control Modes

There are two control modes available in the distributor test stand control. These modes directly affect how, who, or what has the ability to cause machine actions. Indicators on some task screens and on some menu screens will display what mode the control is currently in.

Mode changes can only be cause in one of two ways. The first way is by the operator physically choosing to change the mode by selecting a touch button on the touch screen that causes the machine to change modes. The second method is during an emergency stop condition. When the emergency stop button is actuated, the control will automatically change the control mode to a Manual Mode setting. This is to allow the machine to stop execution of any and all motion and to return control to the operator.

The two modes that are available in the distributor test stand control are Manual Mode and Auto Mode.

E. Manual Mode

Manual Mode is a control function that allows operators to manually initiate machine actions. These machine actions are under direct control of the operator through touch buttons that are displayed on the touch screen. The Manual Mode is accessed from the Main Menu by depressing the Manual Mode button. This will bring up the task screen for Manual Mode.

Warning: operator is in full control of machine actions in Manual Mode. Machine control safeties are still active.

Some machine actions are time based and some machine actions are based upon touch button initiation and release. Machine actions that are time based will require the touch button to be actuated and then it can be released for these actions will continue until the timer for these actions times out. Some machine actions require the touch button to be pressed continuously for action to occur. An example of this, requiring continuous pressing of the touch button would be to jog the lift/load cylinder in extension or retraction. Upon release of the touch button the machine action will stop. Some machine actions require an "on" touch button to be pressed, and then to stop the machine action, the "stop" or "off" button must be depressed. An example of this type of machine action, would be the hydraulic pump motor starter. The hydraulic pump motor must be turned on through one touch button, which is momentarily pressed. To stop the hydraulic pump motor an "off" or "stop" button must be momentarily depressed. See Fig. 4.

Warning: operator is in control of machine actions when in Manual Mode. The operator must be sure to remember to turn on/off various machine actions when the machine action is desire to be initiated or stopped.

DANGER: failure of the operator to stop/start various machine actions, can lead to personal injury if care is not exercise when performing these machine actions. Machine safety controls such as front door safety interlock are still active, but the operator is ultimately responsible for starting and stopping any machine actions as detailed above.

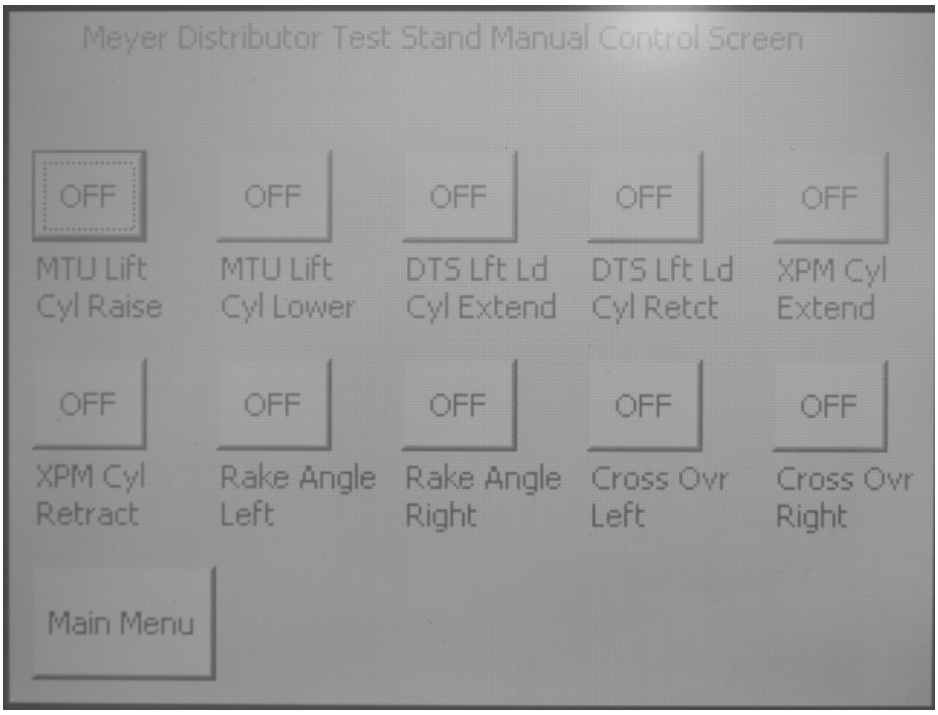


Figure 4. Manual Control Screen

F. Auto Mode

Auto Mode is a control function that allows the control to gain access to machine actions. In Auto Mode, the controller has control over machine actions. Auto Mode is active when the touch button for Auto Mode is depressed. Auto Mode disables Manual Mode.

Warning: if the control mode is set to Manual Mode and a Manual Mode control function is causing a machine action to occur, and the control mode is changed to Auto Mode then this machine action will stop.

Auto Mode allows the control to initiate test, start/stop test, and progress through a series of tests without operator intervention.

Auto Mode has two control function settings, Auto Full and Auto Step.

Warning: Auto Mode requires all machine control safety functions to be active for Auto Mode to take affect. Auto Mode will not initiate any machine actions if any of the machine safety features are defeated. For example, the front safety door must be closed, if the front safety door is left open Auto Mode is settable but no machine actions will occur.

Warning: special Auto Mode control functions are selectable for use of Meyer integrated plow control. This integrated plow control is the control that is typically used within the truck cab to control plow functions. Selection of the special Auto Mode run with the Meyer integrated control allows the operator to manually use the Meyer integrated control to cause machine action.

CLOSE WINDOW

G. Auto Full

Auto Full allows the control to run through a complete set of test. All tests are run in a predetermined order and are time based. For Meyer brand snowplow hydraulic power units, the sequencing and mapping of the solenoids used in performing machine action is automatically set by the control. Auto Full allows the control to take full control of testing from start of test 1 to the end of the tests.

Auto Full requires a cycle start touch button to be depressed by the operator to allow testing to begin. Auto Full task screens will display what test number is being run, the test timer, and the machine data that is being collected during the test run. See Fig. 5.

Under the Help Menu there is an Auto Full Help Screen which details in a short description what function the Auto Full Mode control does. See Fig. 3.

In Auto Full Mode, the control runs the test independently of operator intervention. The operator has the option to start/stop the Auto Full Mode cycle testing. The purpose of Auto Full is to allow the operator to view the necessary pressure readouts available on the distributor test stand for determination of good test/bad test results.

Warning: in Auto Full the control is in Auto Mode. The control retains full machine action, initiation, and deactivation. Start/stop of the cycle testing is available. One of three methods accomplishes stopping of the cycle testing: by depressing the cycle stop touch button, by actuation of the E-Stop button, or by opening the front safety door. Please note that the cycle stop is a conditional stop. The machine will continue to complete the test in process and then the control will stop testing.

Warning: emergency stop actuation causes the control to switch from Auto Mode to Manual Mode.

Warning: opening the front safety door will cause the test to stop in current testing time. Note that stopping the test during the middle of testing on some of the test in Auto Mode will cause the frame and the snowplow power unit to come under loading.

DANGER: opening the front safety door can lead to possible locking of the machine under load. Hydraulic pressures will be present in the hoses, and mechanical loading of machine members will also occur. Loading of machine members and hoses under hydraulic pressure when not operated in a safe manner can present to possibility of physical harm to personnel. Under no circumstances is the front safety door to be opened when the control is in Auto Mode, Auto Full, and running tests. Failure to comply can result in personal injury or harm to personnel. See Fig. 6.

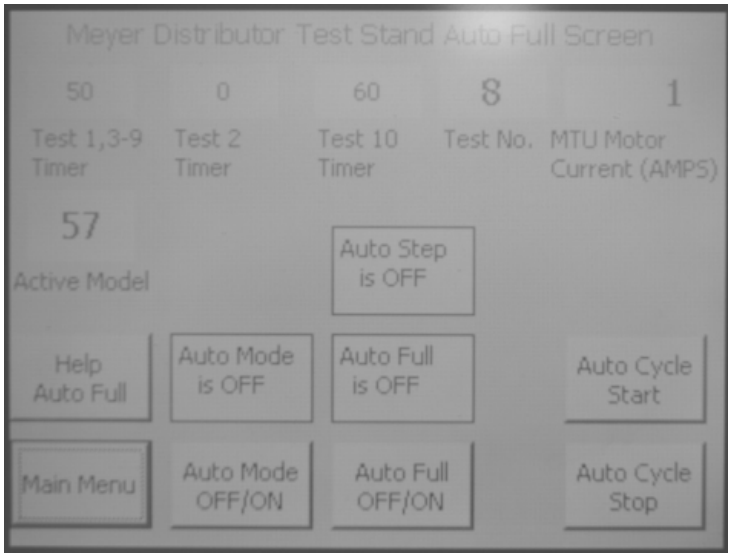


Figure 5. Auto Full Screen

Figure 6. Safety Door Interlock

H. Auto Step

Auto Step allows the control to run through a complete set of test. All tests are run in a predetermined order and are time based. Auto Step requires that a cycle start touch button be depressed to initiate Auto Step. The Auto Step task screen will display the current test number being run, the test timer, and any pertinent machine data. See the Auto Step Help Screen, under the Help Menu for a short detailed description of Auto Step Mode. Auto Step also has the unique feature of allowing each test to be stepped through.

Auto Step allows each test to be stepped though and at the end of each test the machine will pause. The control will wait for the operator to perform one of two machine functions. The operator will allow the control to proceed to the next test by depressing the touch button. The operator can choose to rerun last test in order to verify test results by depressing the Retake Test Touch Button. This unique feature allows a specific test to be run over and over again for quality analysis and repeatability of snowplow functions.
See Fig. 7.

<u>Warning;</u> control is in Auto Mode when running Auto Step Mode. One of three ways can stop testing: by selecting cycle stop, by activating the emergency stop button, or by open the front safety door.

<u>Warning;</u> emergency stop will cause machine control to switch from Auto Mode to manual.

<u>Warning;</u> opening the front safety gate will stop the test in current testing. By stopping the test in current testing or in mid-testing, some machine frame members may come under load and hydraulic hose retain high hydraulic pressure.

<u>DANGER;</u> opening the front safety door can lead to machine members being under load and/or hydraulic hoses coming under high pressure. The conditions can lead to harm to operators if not dealt with in a careful and secure manner. Failure to comply can result in personal injury or harm.

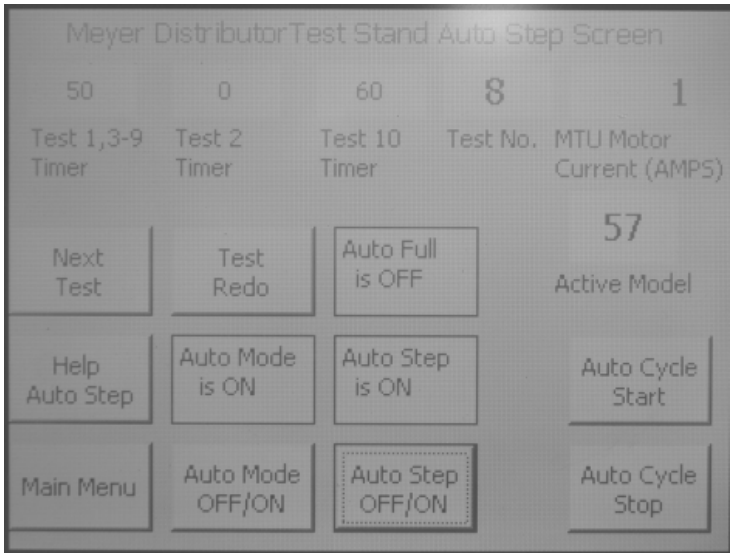


Figure 7. Auto Step Screen

CLOSE WINDOW

CHAPTER 6 – TEST

A. Definition

Tests are predefined sets of machine actions that are started and stopped by machine functions.

Tests are used to determine the operational state of the snowplow hydraulic power unit. These tests are designed to simulate real world loading of the snowplow hydraulic power unit.

Machine actions as to when and which snowplow hydraulic power unit solenoid and distributor test stand power unit solenoid are energized have been predetermined in the control functions for all Meyer brand snowplow hydraulic power units. See Fig. 8. The necessary solenoids to complete a machine action such as raising a cylinder for example, are already designated and mapped in the control for all Meyer brand snowplow hydraulic power units.

Warning: use of optional libraried solenoid mapping is to be done by knowledgeable and experienced personnel.

DANGER: solenoid mapping has a direct effect upon what solenoids are turned off/on for a particular machine action under a specific test. Setting of these solenoids by unknowledgeable or inexperienced personnel can lead to harmful or dangerous situations occurring such as excessive machine loading or high pump pressures. Only knowledgeable and experienced personnel are to be allowed access to set up solenoid mapping for libraried testing. Failure to comply can result in harm or death to personnel.

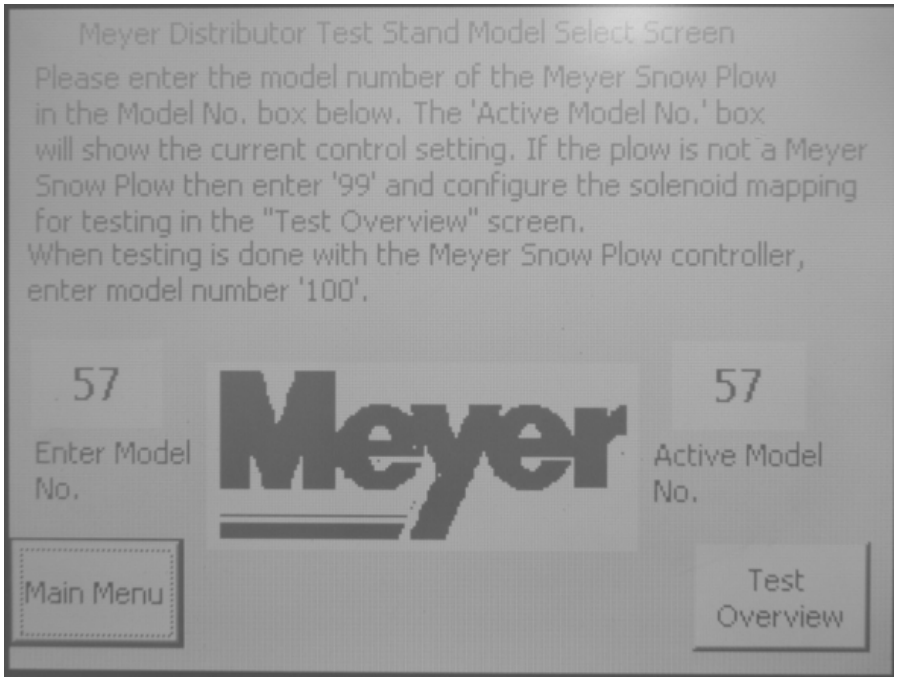


Figure 8. Model Select Screen

B. Test Schedule

In the course of running a complete cycle of testing for snowplow hydraulic power units by the distributor test stand, ten basic test are performed. These test can be initiated under two control modes. The control modes are found under the Auto Mode setting of the control. Please refer to previous sections in this manual that detail the control modes and their functionality.

The following list details the tests that are available on the distributor test stand and a brief description of what each test does in terms of machine action and the purpose of each test. The tests are as follows:

1. **Distributor test stand to test unit coupling.**
   The test unit will extend the plow lift cylinder on a timed basis. Then the distributor test stand will extend the load lift cylinder to allow the two cylinders to couple together. This is done to allow the distributor test stand to know that it has been physically connected to the snowplow lift cylinder, and as a starting point for future tests that are to occur.

2. Rake/Angle Left

This test is used to determine that the left angling hydraulic circuitry is working satisfactory in the snowplow hydraulic power unit. This test energizes the necessary solenoid to cause the plow to rake or angle left when commanded. The necessary pressures to accomplish this list can be viewed on the gauging present on the distributor test stand manifold. See Fig. 9.

3. Rake/Angle Right

This test is used to test the circuitry that allows the snowplow to rake or angle right. This test checks for good or satisfactory performance of the hydraulic circuitry necessary to cause the plow to rake or angle. The necessary solenoids are energized by the control to allow this machine action to occur. Testing results can be viewed on the gauging provided on the distributor test stand manifold. See Fig. 9.

4. **Lift Load Test**

This test is a static loading test that is done to the lift load cylinder to determine its ability to statically hold the load. The distributor test stand will load the lift load cylinder at a predetermined pressure and pound force for x amount of time. This is a visual inspection test. The operator is to determine whether the lift cylinder starts to retract or creep back into the snowplow hydraulic power unit.

5. **Lift Load Test 2**

The lift load test 2 is a dynamic test in which a known force is applied against the lift load cylinder of the distributor test stand hydraulic power unit. The lift cylinder, of the test unit, is then caused to extend against this known force. This tests the load carrying capability of the lift cylinder and its ability to actuate the plow under a given load. This machine action causes the machine frame to come under a load and to absorb this load through some deflection in order to test the lift cylinder.

6. **Lift Cylinder Retract Test**

This test is used to test the retracting capability of the lift cylinder on the snowplow hydraulic power unit. The necessary solenoids are energized which would cause the lift cylinder on the snowplow hydraulic power unit to retract. This machine is action is accomplished by the extension of the distributor test stand lift load cylinder, which still coupled to the lift cylinder of the snowplow hydraulic power unit, pushed the lift cylinder on the snowplow hydraulic power unit back into the power unit. At the completion of this test, the snowplow lift cylinder should be fully retracted. This test will determine good operation of the necessary hydraulic circuit required to retract the snowplow lift cylinder.

Each test is done on a time basis in a predetermined order; these times are settable in the machine parameter sections. Access to the machine parameter sections will be covered in other portions of this manual. Please refer to those sections for detailed information on machine perimeter setup.

C. Test Results

Test results are determined through viewable gauge readouts on the distributor test stand. See Fig. 9. These test results require a visual inspection by the operator to determine whether the resulting numbers are good or bad numbers. It is recommended that operators or technicians who are to determine the pass or failure of tests be experienced and knowledgeable in both operation of a snowplow and specific circuit operation of the snowplow hydraulics and/or electrical systems.

Warning: unfamiliarity with the operation of snowplows and lack of experience in use of snowplows can result in poor interpretation of test results and misdiagnosis. It is recommend that personnel that are used to perform the testing are familiar and experienced both with the construction of a snowplow and its operation.

DANGER: unfamiliarity with test results and misdiagnosis of the information that is offered during testing can lead to plow failure. Plow failure can lead to personal injury and/or harm to operators. Costly replacement of spare parts that are misdiagnosed as bad from misinterpretation of test results can be caused by operators who are unfamiliar and inexperienced with the construction and operation of a snowplow.

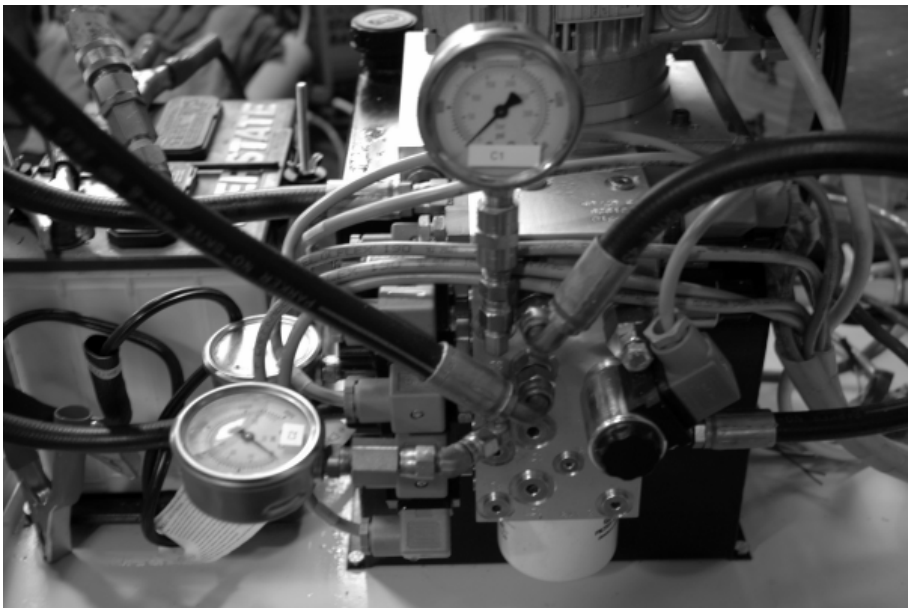


Figure 9. Pressure Guages

Section II: Operation

Chapter 7 – Physical Hookups

A. Hydraulic

There are hoses that must be physically connected from the distributor test stand to the snowplow hydraulic power unit to facilitate the testing process. These hoses are terminated in quick disconnects to allow quick attachment to the snowplow hydraulic power unit. The user is encouraged to confirm the sizing of the quick disconnects that are on the snowplow to be tested and that the quick disconnects on the hoses from the distributor test stand are adequate. Adaptation from one size quick disconnect to another can be implemented to allow the distributor test stand to be hooked up to various models. Please note that the hydraulic hoses used in the distributor test stand are rated for designed pressures during testing.

Warning; hoses come under high pressures when testing is done. Please exercise extreme caution when handling the hoses and attaching/removing the hoses from the test unit and from the snowplow hydraulic power unit.

DANGER; hydraulic hoses are under high pressures during portions of the testing. These pressures are also present at the quick disconnect connection point. The safety door should be closed during all phases of testing or machine actions that require these high pressures to be present. Extreme care and caution is to be exercised upon the completion of each test when removing/attaching the quick disconnects due to the existence of residual high pressures. Failure to comply with any of the above can result in personal injury and harm.

B. Electrical

The electrical connections to the snowplow solenoids are provided on the distributor test stand. These electrical connectors are presented in two different styles. The connectors are present on a single cable that runs from the electrical control panel out to the test area. This cable has ample length to provide easy and quick hook up to the solenoids.

The two connectors that are present with the distributor test stand as standard are a bullet style connect and a Deutsch style connector.

The bullet style connector is a single point connection in a male/female format. The female portion is located on the electrical cable from the distributor test stand and the male portion is located on the solenoid on the snowplow hydraulic power unit. This bullet style connection is modeled after the Meyer brand snowplow standard bullet connector. The bullet style connection is a single lead connection. In other words, only one wire is present and necessary for hook up for each solenoid. Grounding of the solenoid, which completes the electrical circuit, is provided through the framework of the distributor test stand. Grounding is necessary in order for the circuit to complete and allow the solenoid to be energized.

Warning; each solenoid connection is fused back at the distributor test stand electrical panel assembly. Failure of the solenoid to energize during testing may be a result of two conditions. The first condition is loss of ground, therefore, necessary maintenance steps will be required to complete the ground. The second condition is that the fuse has burned open.

DANGER: the burning open of a fuse in a solenoid circuit is an indication of an over circuit or short circuit condition. It is recommended that if this does occur, the operator stops execution of the tests and determines what is the cause of the short circuit or over circuit condition. Failure to do so will not allow the testing to be completed, or cause an incomplete test and for false test results to be misinterpreted which can lead to plow failure. Failure to comply too the above can result in personal injury and harm.

The second style of solenoid connection is a Deutsch brand connector. This styled connection requires a separate ground and power wire to be run to each solenoid. This type of routing, of both the power and ground wire, gives a better delivery of power to the solenoid for energizing of the solenoid. The Deutsch Connector snaps into a molded connector located on the solenoid. The two pin connection offers an oil resistant connection and helps to keep the contact points clean.

Warning: each solenoid connection is fused back at the distributor test stand electrical panel assembly. Failure of the solenoid to energize during testing may be a result of two conditions. The first condition is loss of ground, therefore, necessary maintenance steps will be required to complete the ground. The second condition is that the fuse has burned open.

DANGER: the burning open of a fuse in a solenoid circuit is an indication of an over circuit or short circuit condition. It is recommended that if this does occur that the operator stops execution of the tests, and determines what is the cause of the short circuit or over circuit condition. Failure to do so will not allow the testing to be completed or cause an incomplete test and for false test results to be misinterpreted which can lead to plow failure. Failure to comply too the above can result in personal injury and harm.

The distributor test stand electrical cable is labeled and color-coded according to standard Meyer brand color-coding. Each of the solenoid connectors will have the designation as listed in standard Meyer brand documentation. Color-coding for the solenoids is consistent with color-coding as listed in Meyer brand documentation. The color-coding and designation of the solenoids are as follows:

- The red wire to “B” solenoid or V-66 red wire solenoid
- The black wire to “A” solenoid or V-66 black wire solenoid
- The purple wire to “E” (E-88) solenoid or V-66 purple wire solenoid
- The yellow wire to “D” (E-88) solenoid or V-66 yellow wire solenoid
- The green wire to “C” solenoid
- The V-66 brown wire solenoid
- The V-66 tan wire solenoid

Section III: Maintenance

Chapter 1 – Definition

A. What is maintenance?

Machine upkeep is important for good and continued operation of a machine. Maintenance is the process of reviewing the machine state, identifying problem areas, repairing those areas, and recording in a log what has been done.

There are daily processes that are required to be done for maximum machine performance. These process and procedures are the responsibility of both the operator and maintenance personnel.

Good maintenance procedures amount to little more than common sense and a good knowledge of how the machine works. General household cleaning is important to keep the machine in good working order, and to provide a safe environment for personnel, which work with the machine on a day in and day out basis. Some simple household task such as keeping the stand clean and free from oil, keep connectors and cables in good working order, keep the casters in good shape, periodically review the paint on the machine, and clean or replace with touchup paint any chips or scratches that can occur. The machine has been shipped to you with a special powder coat paint that is industrial rated. This powder coat provides a good sealing to the machine frame and gives the machine a nice appearance. It is therefore recommended that the paint be periodically inspected for any defects or damage and that those defects or damages be repaired as quickly as possible.

Keep the battery charged between runs, this will allow a good and consistent power source for the snowplow hydraulic power unit to draw from.

Maintenance of the machine can roughly be divided up into three (3) basic schedules. There are daily maintenance routines that need to be followed. There are weekly maintenance routines that need to be followed. There are monthly maintenance routines that need to be followed.

B. New Machine Shipment

The distributor test stand is shipped to you via a truck or some other GTL method. The machine has been thoroughly tested at the factory to ensure good operation and that all necessary programming and downloads plus any options have been installed and are in good working order.

Shipment of the machine is accomplished in several ways. The touch screen pendant is set against the front safety door and secured in place. The casters have been removed to allow the machine to be bolted to the shipping skid. The machine will be enclosed in a special shipping container made of sturdy corrugated cardboard. Upon received of the machine please inspect for any shipping damage that can occur.

If upon receipt of the machine you find that there has been some shipping damaged that has occurred, please call your OEM immediately and report this damage to them. As in any item that you would order, please verify that the machine you received is the machine that you ordered. Please verify that the miscellaneous parts, such as the casters are received along with the machine. Carefully remove all shipping materials and containers from the machine. The container can be lifted or separated off the machine to allow access to the frame and the shipping skid, which the machine is bolted too. Carefully remove the shipping screws, which secure the machine to the shipping skid. Take care in making sure that during the removal of these screws that the shipping skid is placed on a level and sturdy surface.

Warning: the machine is shipped to you bolted to the shipping skid. The test stand is secured to the shipping skid through the bottom support rails with the necessary bolts or screws required. Take care when removing these bolts and screws for the machine can tip over if it is not placed on a level and sturdy foundation.

DANGER: Insufficient support of the machine during the removal from the shipping skid or attempted removal of the machine from the shipping skid on an unleveled or weak surface can cause the machine to tip over or fall off the skid. This can result to personal injury and/or death. Failure to comply with the above removal requirements can lead to personal harm or injury.

Once the machine has been removed unscrewed from the shipping skid, the machine can be lifted off the skid. Lifting of the machine must be accomplished by such a device that can handle the weight of the machine. Shipping weight of the machine is approximately 500 to 600 pounds, but is dependent upon options ordered. The machine is shipped without hydraulic oil in the tank.

Lifting of the machine is accomplished by a devise that is capable of supporting the machine weight. Lifting must be accomplished through the side of the machine. The sides of the machine are noted as follows: if the operator is standing in front of the machine facing the front safety door, then his left and right correspond to the left and right sides of the machine. The tow motor of lifting device must come in through the sides and support the machine under the bottom rails on the forks. Do not attempt to lift the machine by coming in the front or the rear of the machine. There is insufficient bracing to support the weight of the machine by coming in through the front or the rear.

Warning: attempting to lift the machine through the front or the rear of the machine will cause damage to the framework of the machine. Lifting can only be accomplished by coming in through the left or right side.

Prior to starting up the hydraulic system on the test stand, please be ensured that the adequate amount oil is placed into the hydraulic reservoir. The amount of oil that is put into the reservoir can be check through the filler cap dipstick. The reservoir has a 5-gallon displacement. It is not recommended that 5 gallons of oil be attempted to be put into the reservoir. Proper oil level is 3 inches below the top of the reservoir.

Section III: Maintenance

Chapter 2 – Schedule

A. Definition

Schedule maintenance is important for successful machine performance. Maintenance should be performed on regular scheduled intervals. This maintenance is critical to ensure good machine operation and continued life of the machine.

We have complied in this manual what we believe are necessary required maintenance scheduled tasks. Not all maintenance requirements can be fully addressed in this manual. It is left up to the user to review the recommended maintenance scheduled tasks and incorporated whatever they feel are additional tasks to ensure good and successful machine operation. The user has purchased this machine and must understand that this machine is now his property. As in any ownership, the user must embrace and take care of the machine in accordance with his knowledge of the existing work environment and the processes therein. The daily, weekly, and monthly task, which are listed here, are to serve as guidelines for maintenance of the machine. We are stressing the most important aspects of maintenance in order to address critical parts of the machine that need attention to ensure operation. It is recommended that the owner assign these maintenance tasks to responsible and knowledgeable people in order to ensure good machine operation and long life.

B. Daily Maintenance Tasks

The following daily maintenance tasks are recommended to be done everyday. These tasks will help to keep the machine in good operating order from day to day. The tasks are as follows:

- Inspect the front safety guarding.
- Make sure it is free from defects, is in good operation, and that the latch closes and secures the front safety guard in place.
- Check the hydraulic oil in the tank for sufficient oil. Oil level is 3 inches from the top of the reservoir.
- Clean off any oil or oil spills that are present on the machine.
- Clean the touch screen, touch face, to be free from oil or smudge marks.
- Check the battery cables and battery connectors.
- Check all hydraulic hoses.
- Check electrical connectors.

C. Weekly Maintenance Tasks

In addition to the daily maintenance task there are weekly maintenance tasks that need to be performed. These weekly tasks are to be added to the daily tasks, not to replace the daily tasks. The tasks are as follows:

- Check casters for good rotation and swivel.
- Check distributor test stand power unit for leaks at fittings and connectors.
- Check pressure gauges for smooth operation and to ensure that faces are not cracked.

D. Monthly Maintenance Tasks

The monthly maintenance tasks are tasks that are to be done in addition to the daily and weekly maintenance tasks. The monthly maintenance tasks do not replace the weekly or daily maintenance tasks, but are to be done in addition to those tasks.

- Change the oil filter located on the distributor test stand manifold. This oil filter is to be changed on a monthly basis or after 200 hours of operation. The oil filter is present to clean the oil during testing; it is not to be used as a dirty oil-cleaning filter.

  <u>Warning:</u> Distributor test stand oil filter is an operational filter. A 10-micron filter is used to help remove any wear particles or contaminants that are present during the testing cycle of the distributor test stand. This filter is not to be used as an oil cleaning filter to filter oil present in an old or currently used snowplow hydraulic power unit. It is recommended that the power unit be flushed prior to any testing being done, and then new oil be put into the unit and then the unit tested on the distributor test stand.

  <u>DANGER:</u> use of distributor test stand as an oil cleaning filter can lead to contamination of the system and premature failure of distributor test stand components. Contamination of the system can lead to component failure, which can present unsafe conditions during testing or operation of the distributor test stand. These unsafe conditions can lead to personal injury or harm.

- Remove pump, check oil inlet strainer.
- Check fuses.
- Check lift/load counter balance for proper operation.
- Check E-Stop function.
- Inspect the load lift cylinder for leakage or wear.
- Inspect hydraulic tubing for leaks and/or loose fittings.
- Inspect machine frame for cracking or damage.
- Inspect machine paint for chips or scratching.
- Inspect solenoid connectors.

It is highly recommended that all these maintenance procedures be accomplished by a qualified service technician or by a knowledgeable and experienced operator.

E. Repairs

As with any piece of equipment that is in daily service repairs will be needed from time to time. Components do wear and periodically fail and this requires these components to be identified and replaced. The designer of the test stand has done his best to ensure that quality parts that offer good life and long operation have been designed in. However, despite all the best attempts parts will fail and need replacement.

The frequency of part failure and part replacement can be drastically diminished by strict adherence to regular maintenance schedules. It is highly recommended then to the user of the test stand, that these maintenance schedules are adhered to and that qualified and knowledgeable technicians or operators are assigned to carryout the scheduled maintenance procedures.

The best prevention for machine downtime due to part failure is to know your machine. Know the operation and the layout of the machine so that quick and immediate part replacement can be identified. Should the event occur that outside technical help is required or spare parts replacement are needed, please have the following information with you when calling in and speaking to customer service for replacement parts. Note the machine model number and serial number. These numbers are located in the control by accessing the About Screen from the Main Menu.

It is recommended by the original equipment manufacture of the distributor test stand that a maintenance log be kept.

F. Maintenance Log

It is recommended that a daily, weekly, and monthly maintenance log be kept in regards to the distributor test stand. This log can be as simple as just a spiral notebook with handwritten notes and dates, or it can be as elaborate as a computer program in which this information is keypunched in and kept in a computer file.

An accurate maintenance log keeps good records of machine status. This can be used as an early identifier of repeated problems. Details what is new on the machine and what has yet to be replaced so this information can be used for regular maintenance checkups in terms of scheduled replacements. Aids in trouble shooting the machine for it keeps records on what went wrong and when for reference back by service technicians. It also serves as a warranty record of the machine for use by the end user or the original equipment manufacturer.

G. Resources

Located in this manual are resources necessary to aid in successful maintenance and trouble shooting of the machine. Technical documentation is present to assist service technicians in understanding the operation of the machine. Meyer products also have a qualified technical field service staff that can assist in providing documentation when required for servicing the machine. The documentations are contained in this manual in appendixes, which detail each area of machine construction. There is also available a training video which shows how to access different areas of machine control and the machine in operation.

H. Machine Storage

In the event that the machine must be stored for two month or longer without any use, it is recommended that the following procedures and tasks be followed prior to sending the machine into storage.

Clean the machine.
- Remove any excess oil, dirt, or debris so that it is in a clean state for storage.
- Drain hydraulic oil from the tank.
- Remove the current oil filter from the machine, and replace it with a new oil filter.
- Apply grease to the load lift cylinder rod and to the express mount cylinder rod.
- Block the load lift cylinder and the express mount cylinder.

Please note that the PLC control has a capacitive memory backup and that the program is stored on an EEPROM chip. The storage of the program will last for six months or more. In the event that the machine must be stored for periods longer than six months, it is recommended that the machine is plugged in from time to time. This will allow the PLC to refresh the backup memory charge without the possible lose of data.

Section III.

Chapter 3 – Trouble Shooting

The machine can experience problems upon startup or during operation, which will lead to some trouble shooting of the machine to be accomplished. The distributor test stand, in the control, has self-checks that will occur and that will set alarms that are visible on the touch screen to the operator when those checks determine that something has gone wrong. However, not all failures or conditions can be tested for. It is therefore the responsibility of the operator or user to know their machine and determine when a problem does exist.

A list of possible common problems with a quick checklist has been compiled in this section to assist the operator or end user in trouble shooting the machine. It is recommended that prior to any machine trouble shooting be done that the operator or user, or even the service technician, become familiar with machine construction, documentation, and operation of the machine. Only knowledgeable and experienced personnel should be allowed to work on the machine in the event that servicing needs to be done.

As in any case, if the cause of the problem cannot be determined by service personnel, maintenance personnel, or by use of this quick checklist trouble-shooting guide, then support does exist from the original equipment manufacture to aid in trouble shooting the machine.

Problem	Solution
Machine will not power up.	- Plug in the machine. - Check for power to be present on the machine plug in. - Check to make sure that the main circuit breaker in the test stand electrical cabinet has not tripped.

WARNING: in the event that the distributor test stand main circuit breaker has tripped please discontinue use of the machine. The circuit breaker tripping could be an indication of a serious problem, such as a short or a failure of the circuit breaker. The circuit breaker is present as a safety devise to keep large over currents from entering into the distributor test stand and causing damage to the electrical control. Do not run the machine or attempt power on until all the wiring and circuitry has been checked.

Problem	Solution
Distributor Test Stand Hydraulic Power Unit will not start.	- Check for power to be on to the distributor test stand. - Check fuse to the motor starter coil. - Check to be sure PLC is in run mode. - Check wiring to distributor test stand hydraulic pump motor. - If in Manual Mode, make sure that the motor start touch button has been pressed. - Check to ensure that front safety door is not open. - Check motor windings for correct resistance and for opens. - Check to ensure E-Stop button is not active.

Problem	Solution
Touch screen will not come on.	- Check to make sure that power is on to the machine. - Inspect fuses for blow fuse. - Check to ensure that touch screen power connection is not loose or missing - Check for 24VDC at screen power inputs.

Problem	Solution
No manual control	- Check to make sure PLC is in run mode. - Inspect fuses for blow fuse. - Check to make sure front safety door is closed. - Check that E-Stop button is not active. - Ensure that electrical cable connectors plugged into solenoids. - Inspect hydraulic hoses connections to make sure that the hydraulic hoses are connected and are connected to the correct ports. - Check solenoids for operation.

Problem	Solution
Distributor test stand pump comes on, but no pressure.	- Inspect oil level in reservoir. - Check relief valve setting to make sure they are not to low. - Inspect for oil leak. - Inspect coupling of hydraulic pump to electric motor.

Problem	Solution
Distributor test stand lift load cylinder will not move	- Check to make sure that distributor hydraulic test stand hydraulic pump is on and pressure is present. - Inspect fuses for blow fuse. - Inspect solenoid operation. - Inspect check valve. - Check to make sure that counter-balance setting on lift/load cylinder is not set too high.

Problem	Solution
Snow plow hydraulic power unit will not mount into clevis mount.	- Inspect plow mounting tang and through hole. - Ensure that through hole is free from obstacles and debris. - Inspect to make sure that there is not flashing on the mounting tank. Flashing is caused by the casting process of the lower manifold section on the snowplow hydraulic power unit. - Ensure that shot pin that holds snowplow hydraulic power unit, fits snuggly and without interference through clevis holes and tang hole.

Problem	Solution
Plows lift cylinder rod and distributor test stand load/lift cylinder rod will not couple.	- Increase coupling time for test in perimeter settings of machine. - Ensure that snowplow hydraulic power unit is securely fastened into mounting clevis and that the unit is vertical within the coupling adapters window of movement. - Make sure distributor test stand lift/load cylinder is vertical down, and in good operation. - Make sure distributor test stand hydraulic pump is on and pressure is present. - Inspect fuses for blow fuse.

Problem	Solution
No machine action in Auto Mode.	- Inspect distributor test stand manifold for defective valve. - Inspect solenoids for good operation. - Ensure that snowplow hydraulic power unit is in good working order and that the snowplow hydraulic power units lift cylinder will extend. - Check to make sure that in Auto Mode that either Auto Full or Auto Step have been selected. - Check to make sure that cycle start touch button has been depressed. - Inspect front safety door so that it is closed and latched in place. - Check to make sure PLC is in run mode. - Inspect fuses for blown fuse. - Check to make sure that distributor test hydraulic pump is running and pressure is present. - Check to make sure that 12V battery connections are secure in place, and that power connections to the snowplow hydraulic power unit are secure and in place. - Check to make sure that necessary hoses have been connected and they are connected to the right port. - Check to make sure that electrical solenoid connections are securely in place. - Check solenoids for proper operation.

Problem	Solution
PLC run LED is off.	- Power machine down and turn power back on and view PLC run LED to make sure that it illuminates green. - Open PLC access door and ensure PLC mode switch is set to run mode.

Problem	Solution
Distributor test stand seems okay but no plow movement or machine action.	- Inspect for blown fuses. - Ensure that correct model has be selected in model select screen. - Check to make sure that machine is in auto mode, not in Manual Mode. - Press cycle start if in Auto Full. - Press cycle start touch button, & press next next test touch button if in Auto Step.

Problem	Solution
I have tried all of the above, but the test stand still will not run.	- Power machine down, and power machine back up. - Power machine down and call Meyer Products for technical support.

SECTION IV: Documentation

Chapter 1 – Definition

A. Machine Documents

Documentation is the written representation of how the machine works and appears. Documentation describes in detail the inter-workings of the machine in terms of electrical, hydraulic and mechanical. The documentation is a tool to assist in servicing the machine. Become familiar with all documentation included in this manual, please read through at least once to get a good understand of how the machine is laid out and how the control works to make the machine do what it needs to do.

The user service log is a machine document. It is a valuable tool to be used in conjunction with the documentation contained in this manual to keep the machine running in good order and have good life. Machine drawings and schematics are located in the marked index at the rear of this manual. It is recommended that the originals, which are presented here in this manual, be kept clean and in a safe place.

When required to take documentation to the machine for servicing, it is recommended that copies be generated from the documents in this manual. This will allow the service people to have access to documentation on the shop floor at the machine sight, and allow the original copies to be kept safe. This keeps the documentation clean and in good order. The copies then can be worked from and in the event where the copies become dirty or illegible, they can be thrown away and new copies be made. This retains the integrity of the original set and allows for future reference from unmarred or damaged documents.

B. Storage

It is necessary to keep all of the documentation of this machine together in one place. This manual is provided to you with the necessary documents required for operation, maintenance, and servicing of the machine, along with safety recommendations. Keep the manual in a neat order. Store the manual in a dry place that is easily accessible. Copies of this manual are available.

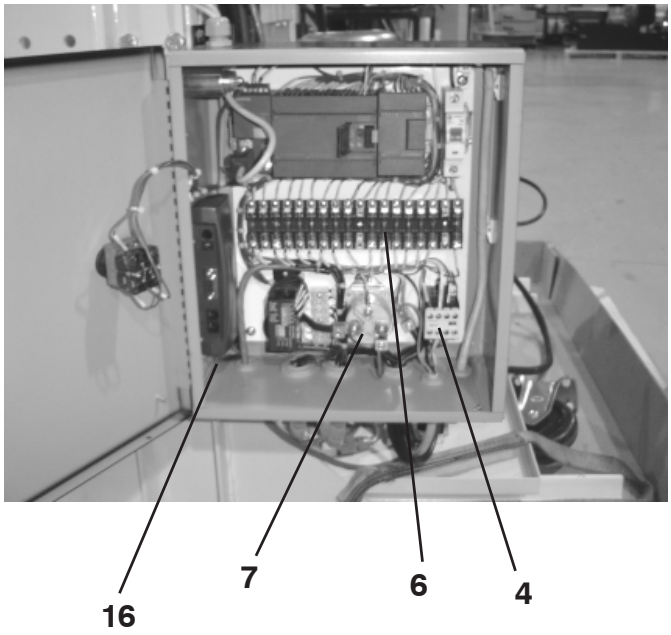
Copies of this manual are available for replacement at a price from your original manufacturer. These manuals can be provided either an electronic format, such as a CD, or in a paper format in 3-ring binder. Please note your model number and serial number when ordering replacement manuals.

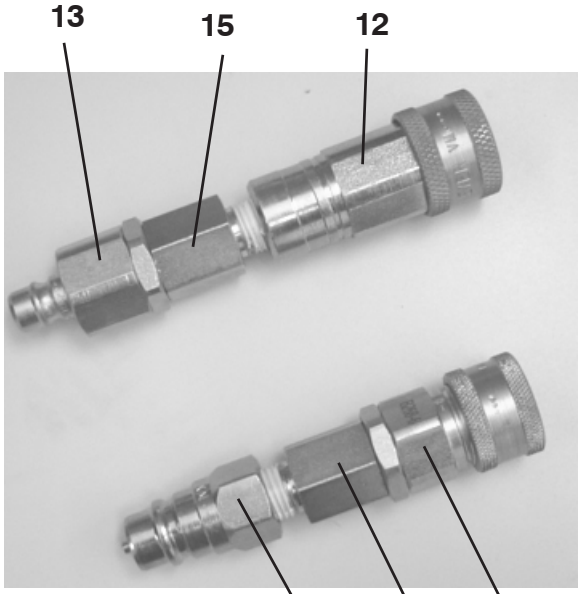
CLOSE WINDOW

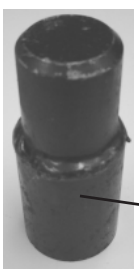
CLOSE WINDOW

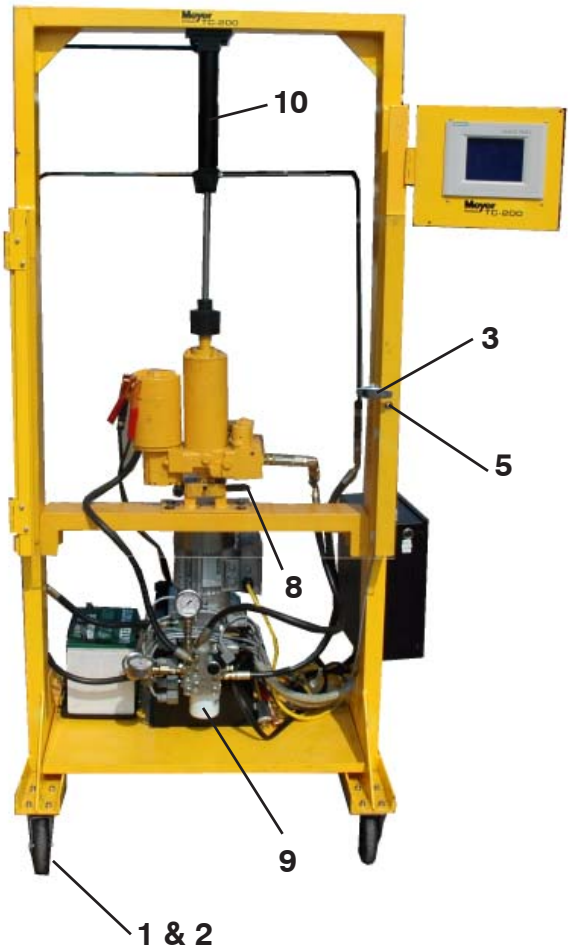
Parts List

Item	Part No.	Qty.	Description
1	47201	2	Swivel Caster
2	47202	2	Stationary Caster
3	47203	1	Safety Door
4	47205	1	Motor Starter 115 VAC
5	47206	1	Safety Door Switch
6	47207	12	Fuse AGC-2
7	15370	1	Motor Starter 12 VDC
8	47208	1	Socket Pin
	47210	6	Deutsch Connector
	47211	6	Female Bullet Connector
	47212	8	Solenoid Valve Cables
9	47213	1	Spin-on-Filter
	47214	2	Valve 2 position
	47215	4	Solenoid 115 VAC
10	47216	1	Lift Load Cylinder
	47220	1	DS Ram Hose Assy.
	47221	1	PS Ram Hose Assy.
	22443	1	SAE Female Coupler
	22244	1	SAE Male Coupler
11	22291	1	Male Coupler Adapter
12	22292	1	Female Coupler Adapter
13	22242	1	Male Coupler Adapter
14	22245	1	Female Coupler Adapter
15	22650	2	1/4 NPT Male x SAE 6 Female
16	47229	1	Phone Modem (optional)
17	47181	1	Test Stand Adapter









E-47, E-57, E-60, E-58H and E-78 & E-88 (w/o electronics) Power Units. Note: E-88 Xpress mount and dismount function cannot be tested. E-78 and E-88 (w/electronics) can be tested using the XP Controller (RCM) plugged into the receptacle located on the electric panel.

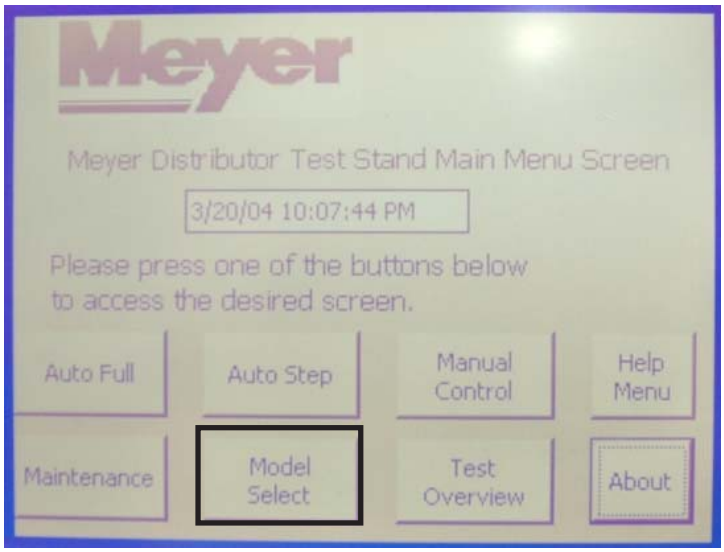
1. Place unit into test stand and insert pin.

2. Snug jam bolts to set unit so lifting ram is plumb.

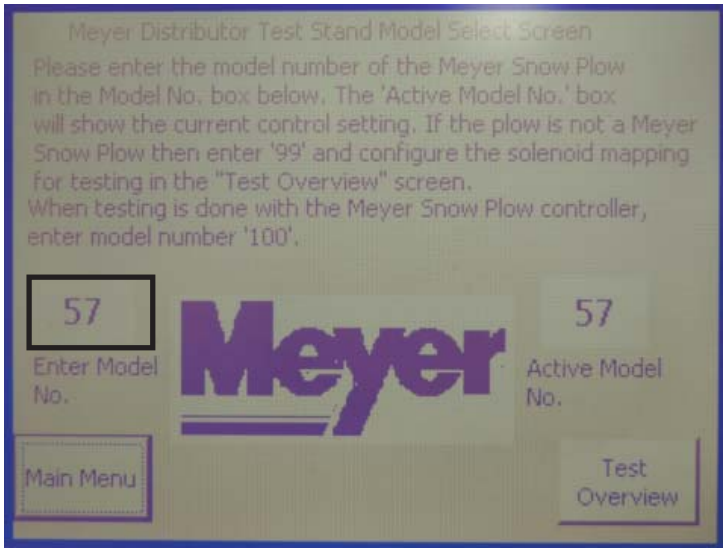
3. Plug coils wires black, red and green into test stand harness.

4. Hook up positive and negative battery cables to the battery and the hydraulic motor (if hydraulic motor only has a single stud attach ground to base casting grounding lug.

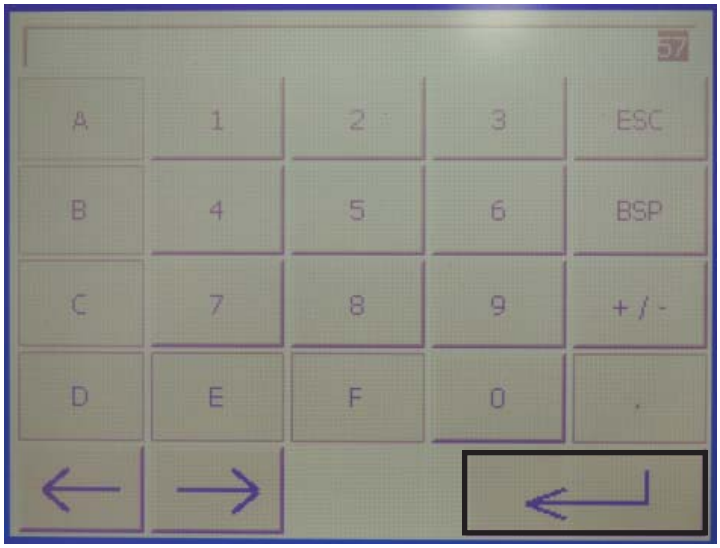
5. Press Model Select button:



6. Press button above Enter Model No:

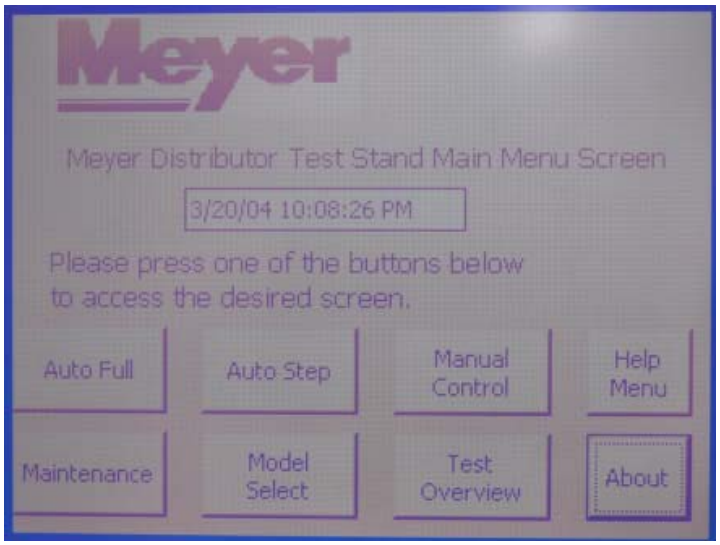


7. Enter the model number of the hydraulic unit that is being tested. (Only the number not the letter is necessary) Pres Enter when Finished.



8. Make sure model number entered displays as Active Model No. as shown in step 6.

9. Choose desired test; Auto Full, Auto Step or Manual Control

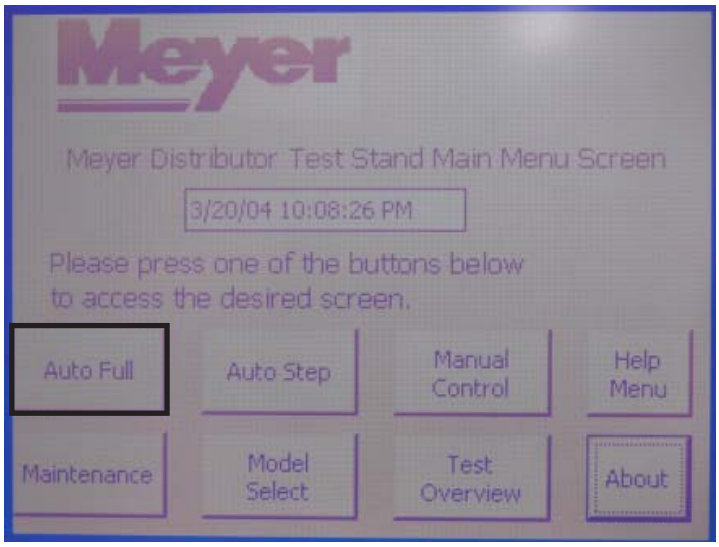


10. **DISTRIBUTOR TEST STAND WILL NOT FUNCTION WITH SAFETY DOOR OPEN.**

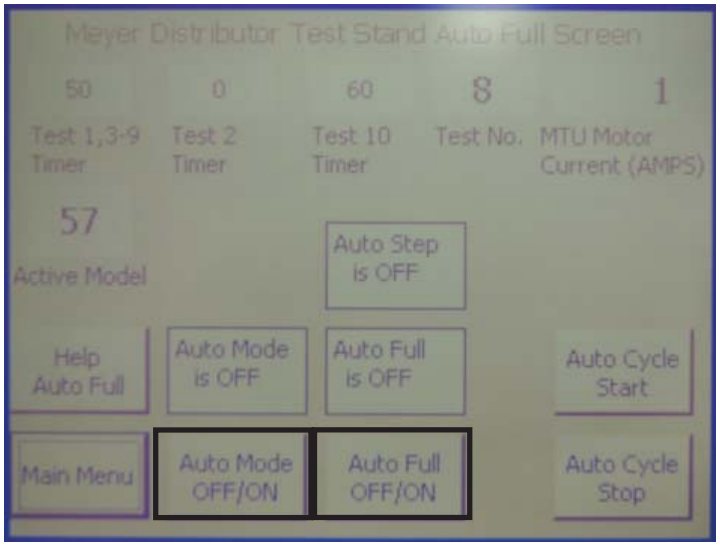
CLOSE WINDOW

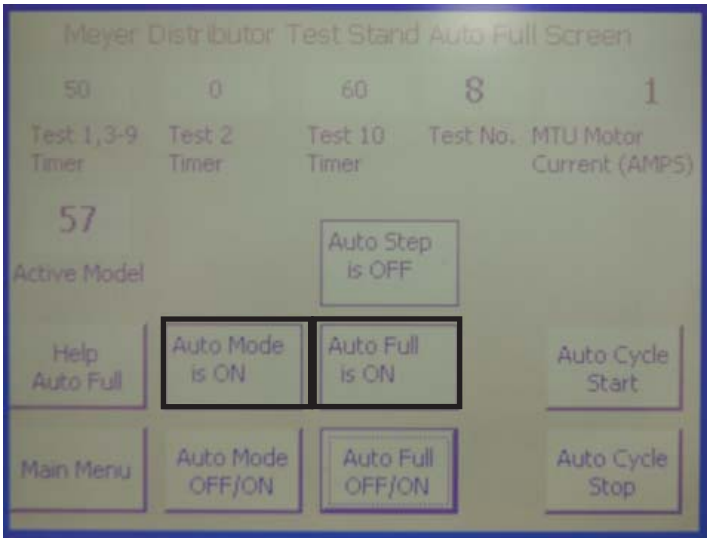
Auto Full: Performs 6 Test to the hydraulic unit automatically.

1. Press Auto Full Button.

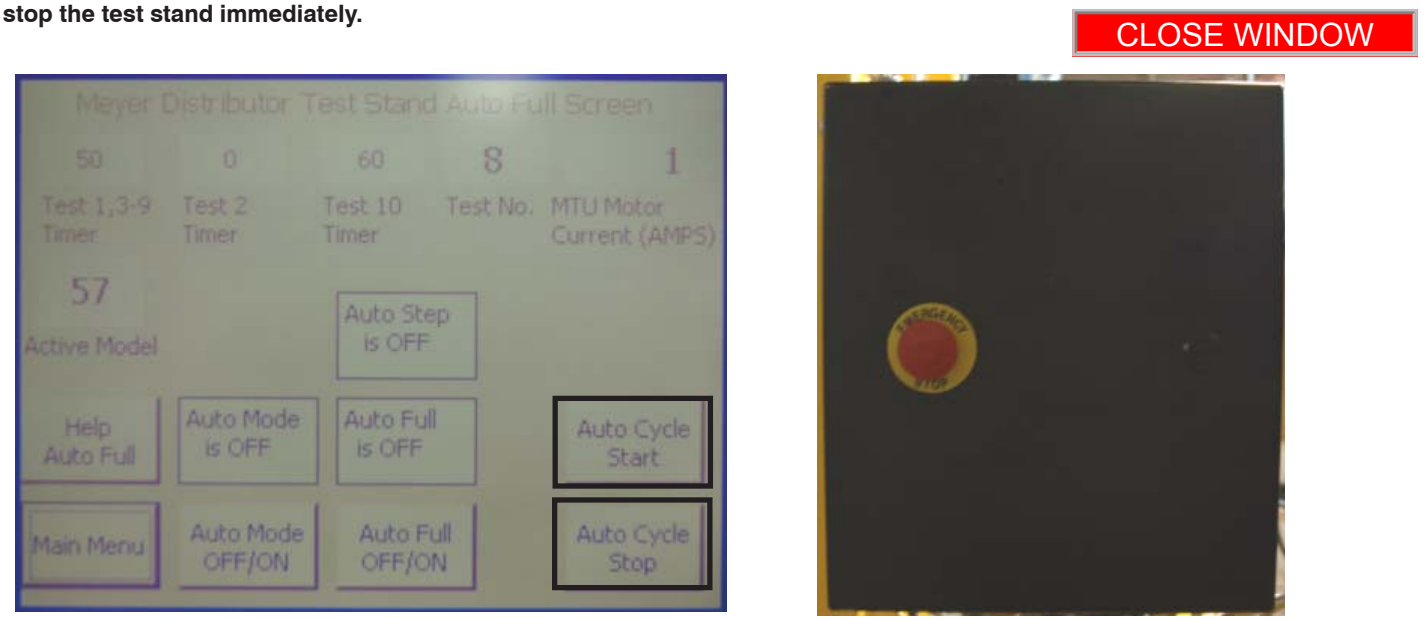


2. Press Auto Mode Off/On button and Auto Full Off/On button to turn on Auto Mode and Auto Full

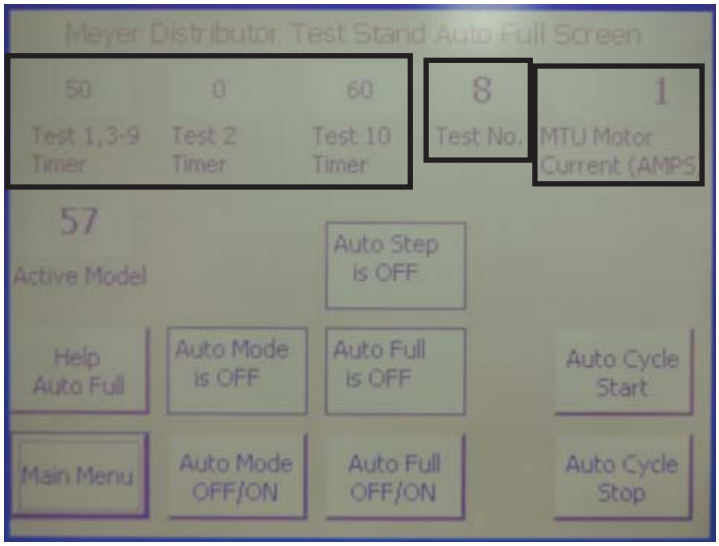




3. Press Auto Cycle Start to begin or Auto Cycle Stop to Stop. **Note: When Auto Cycle Stop is pressed the Test Stand will not stop immediately, it will first finish the test it is currently conducting. The Emergency Stop on the Electrical Panel will stop the test stand immediately.**



4. MTU Motor Current is the Amperage of the Meyer Test Unit. Test Number is the Test the Test Stand is performing. Test Timers are the allotted time duration for each test.



Test (1) Distributor test Stand Lowers Load Lift Cylinder to couple with the top of the Meyer Test Unit Lift Ram.

Test (2) This test allows the plow to rake or angle left when commanded. The Pressure guage will momentarily show the pump pressure of the unit If either of the angling pressure guages continue to show any pressure after the momentary pump pressure there is a problem with the angle left circuit,

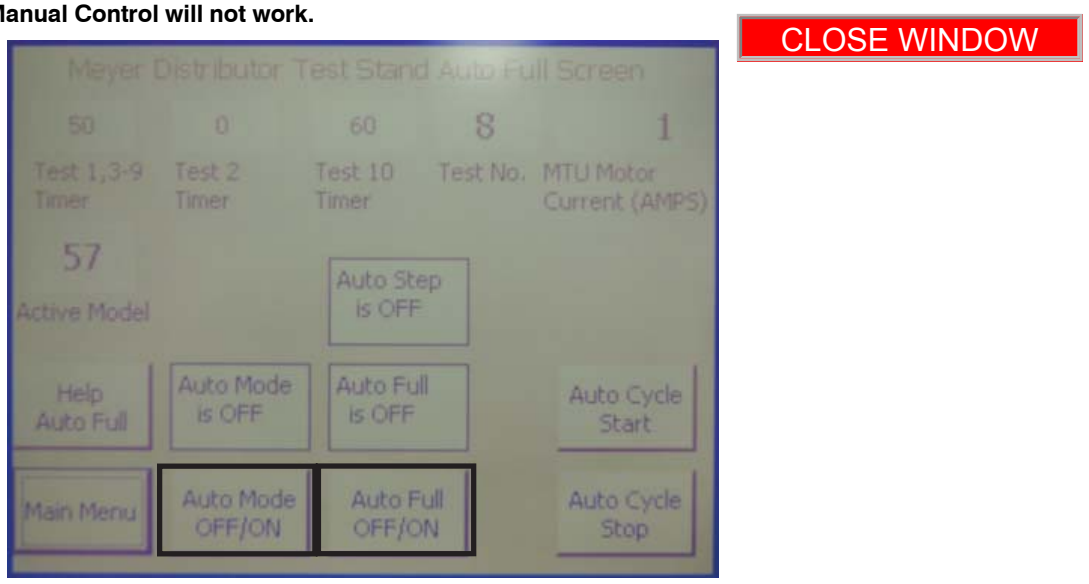
Test (3) This test energizes the necessary solenoid (C Green wire) to cause the plow to rake or angle left when commanded. The Pressure guage will momentarily show the pump pressure of the unit If either of the angling pressure guages continue to show any pressure after the momentary pump pressure there is a problem with the angle right circuit,

Test (4) The Lift Load Test is a loading test that is done to the lift load cylinder to apply force to the Lift Ram. The distributor test stand will load the lift load cylinder at a predetermined pressure and pound force for x amount of time. This is a visual inspection test that the operator is to determine whether the lift cylinder starts to retract or creep back into the snowplow hydraulic power unit.

Test (5) The lift load test 2 is a dynamic test in which a known force is applied against the lift load cylinder of the hydraulic power unit. The lift cylinder, of the hydraulic power unit, is then caused to extend against this known force. This tests the load carrying capability of the lift cylinder and its ability to actuate the plow under a given load. This machine action causes the machine frame to come under a load, and to absorb this load through some deflection in order to test the lift cylinder.

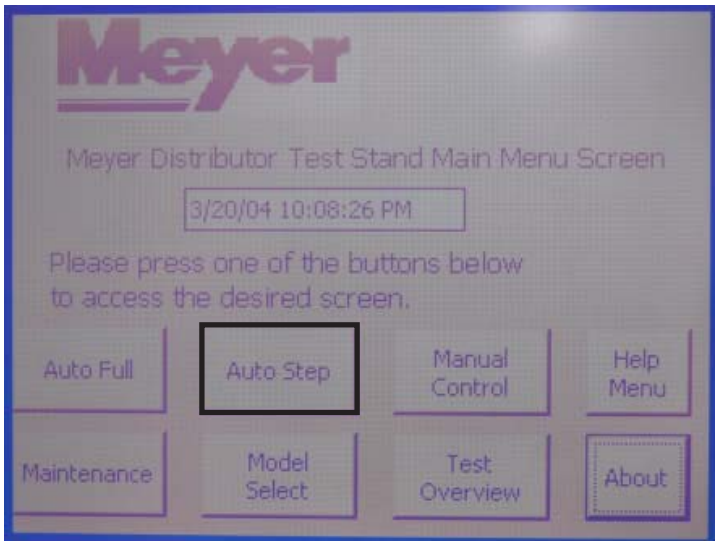
Test (6) This test is used to test the Lowering of the lift cylinder on the snowplow hydraulic power unit. The necessary solenoids are energized which would cause the lift cylinder on the snowplow hydraulic power unit to retract.

5. Press Auto Mode Off/On button and Auto Full Off/On button to turn off Auto Mode and Auto Full **Note: If these are not turned off Auto Step or Manual Control will not work.**

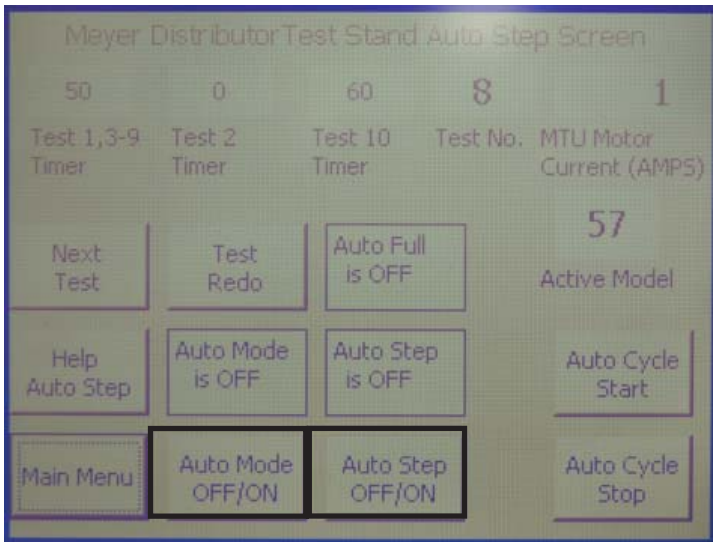


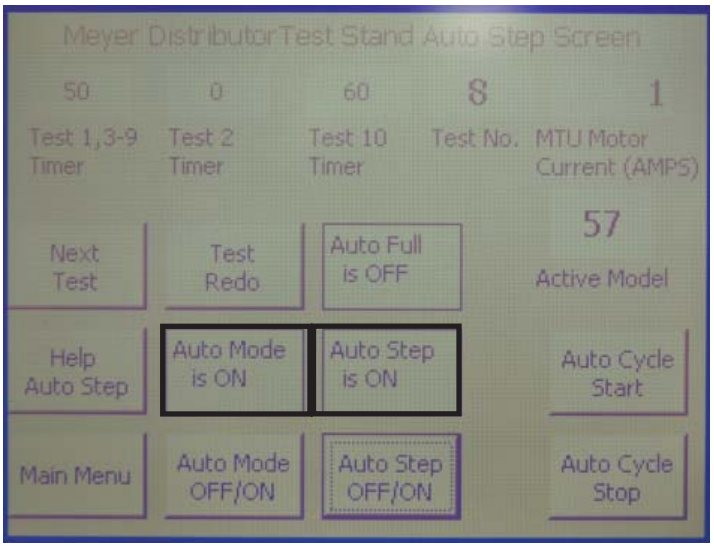
Auto Step: Performs the 6 same tests to the hydraulic unit as Auto Full however, instead of running all 10 tests automatically, the Next Test button will need to pressed to advance to the next test.

1. Press Auto Full Button.

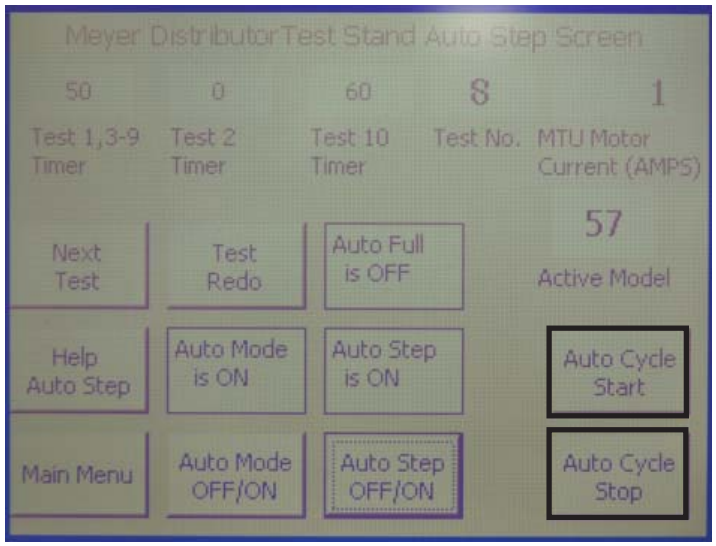


2. Press Auto Mode Off/On button and Auto Step Off/On button to turn on Auto Mode and Auto Step.

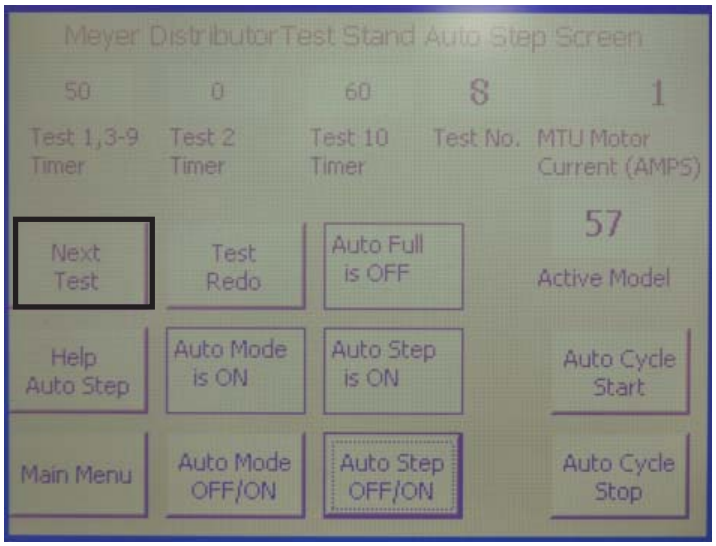




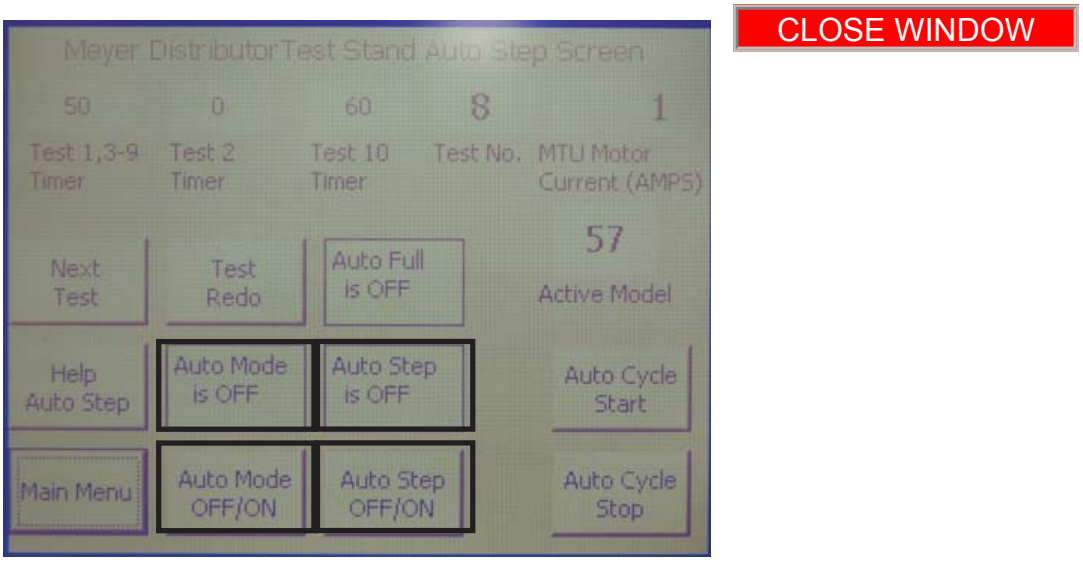
3. Press Auto Cycle Start to begin or Auto Cycle Stop to Stop. **Note: When Auto Cycle Stop is pressed the Test Stand will not stop immediately, it will first finish the test it is currently conducting. The Emergency Stop on the Electrical Panel will stop the test stand immediately.**



4. To advance to the next test press the Next Test button.

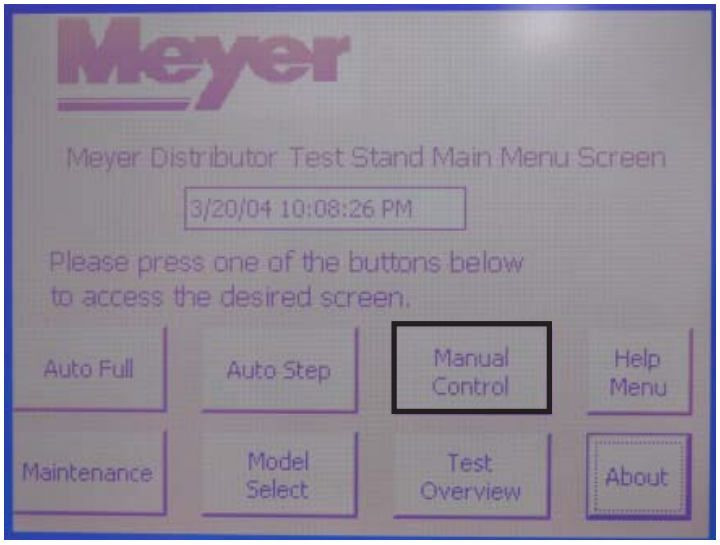


5. Press Auto Mode Off/On button and Auto Step Off/On button to turn off Auto Mode and Auto Full **Note: If these are not turned off Auto Full or Manual Control will not work.**



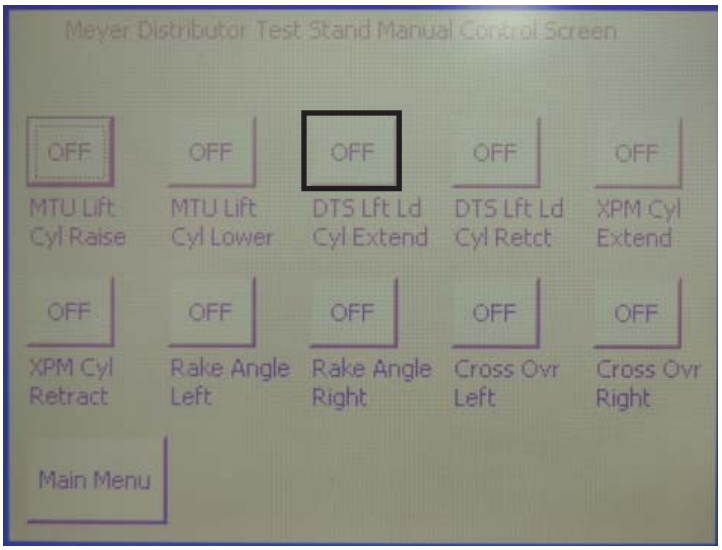
Manual Control: Performs 10 Test to the hydraulic unit manually.

1. Press Auto Full Button.



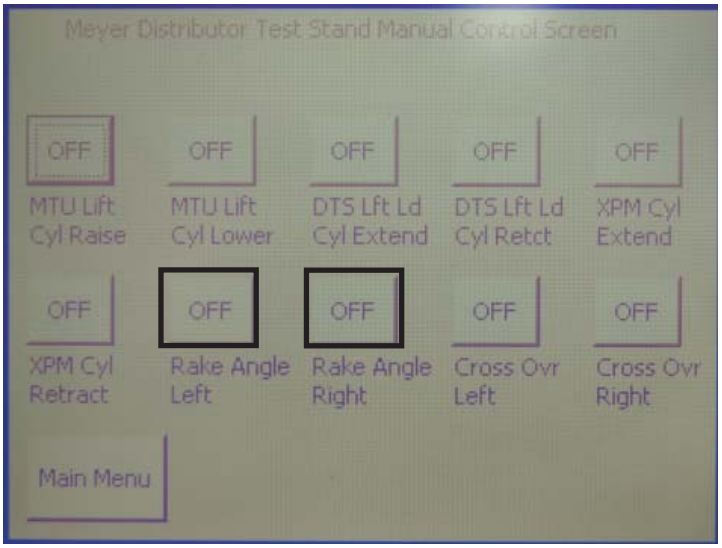
2. Press and hold Off button for each individual test performed. Once the button is released that test will stop.

DTS Lft Ld Cyl Extend: Distributor test Stand Lowers Load Lift Cylinder to couple with the top of the Meyer Test Unit Lift Ram. **Note: This should always be performed first before any other testing is conducted**



Rake Angle Left: This test allows the plow to rake or angle left when commanded. The Pressure guage will momentarily show the pump pressure of the unit If either of the angling pressure guages continue to show any pressure after the momentary pump pressure there is a problem with the angle left circuit,

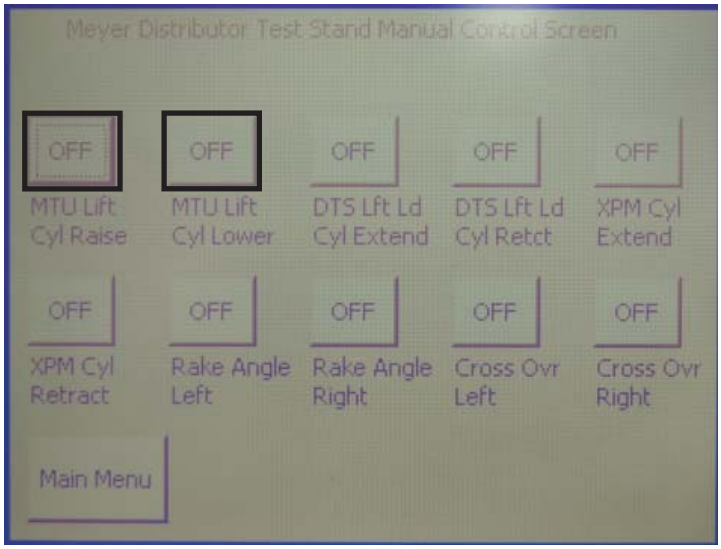
Rake Angle Right: This test energizes the necessary solenoid (C Green wire) to cause the plow to rake or angle left when commanded. The Pressure guage will momentarily show the pump pressure of the unit If either of the angling pressure guages continue to show any pressure after the momentary pump pressure there is a problem with the angle right circuit.



CLOSE WINDOW

MTU Lift Cyl Raise: This is a dynamic test in which a known force is applied against the lift load cylinder of the hydraulic power unit. The lift cylinder, of the hydraulic power unit, is then caused to extend against this known force. This tests the load carrying capability of the lift cylinder and its ability to actuate the plow under a given load. This machine action causes the machine frame to come under a load, and to absorb this load through some deflection in order to test the lift cylinder.

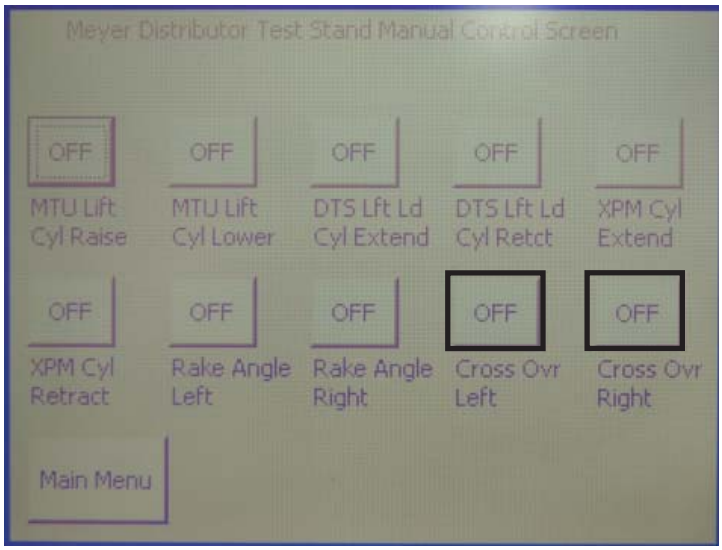
MTU Lift Cyl Lower: This test is used to test the Lowering of the lift cylinder on the snowplow hydraulic power unit. The necessary solenoids are energized which would cause the lift cylinder on the snowplow hydraulic power unit to retract.



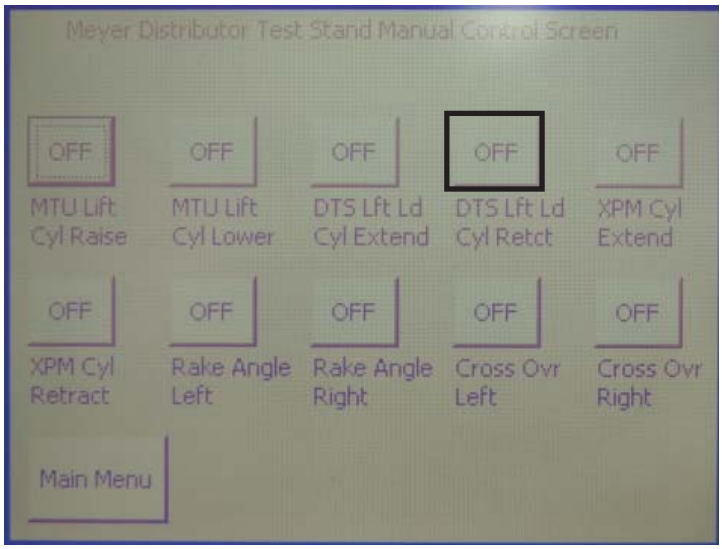
Cross Ovr Left: This test applies 4200 P.S.I. to the left angling circuit to check crossover relief valve setting. The corresponding pressure guage will show the relief valve setting.

Cross Ovr Right: This test applies 4200 P.S.I. to the right angling circuit to check crossover relief valve setting. The corresponding pressure guage will show the relief valve setting.

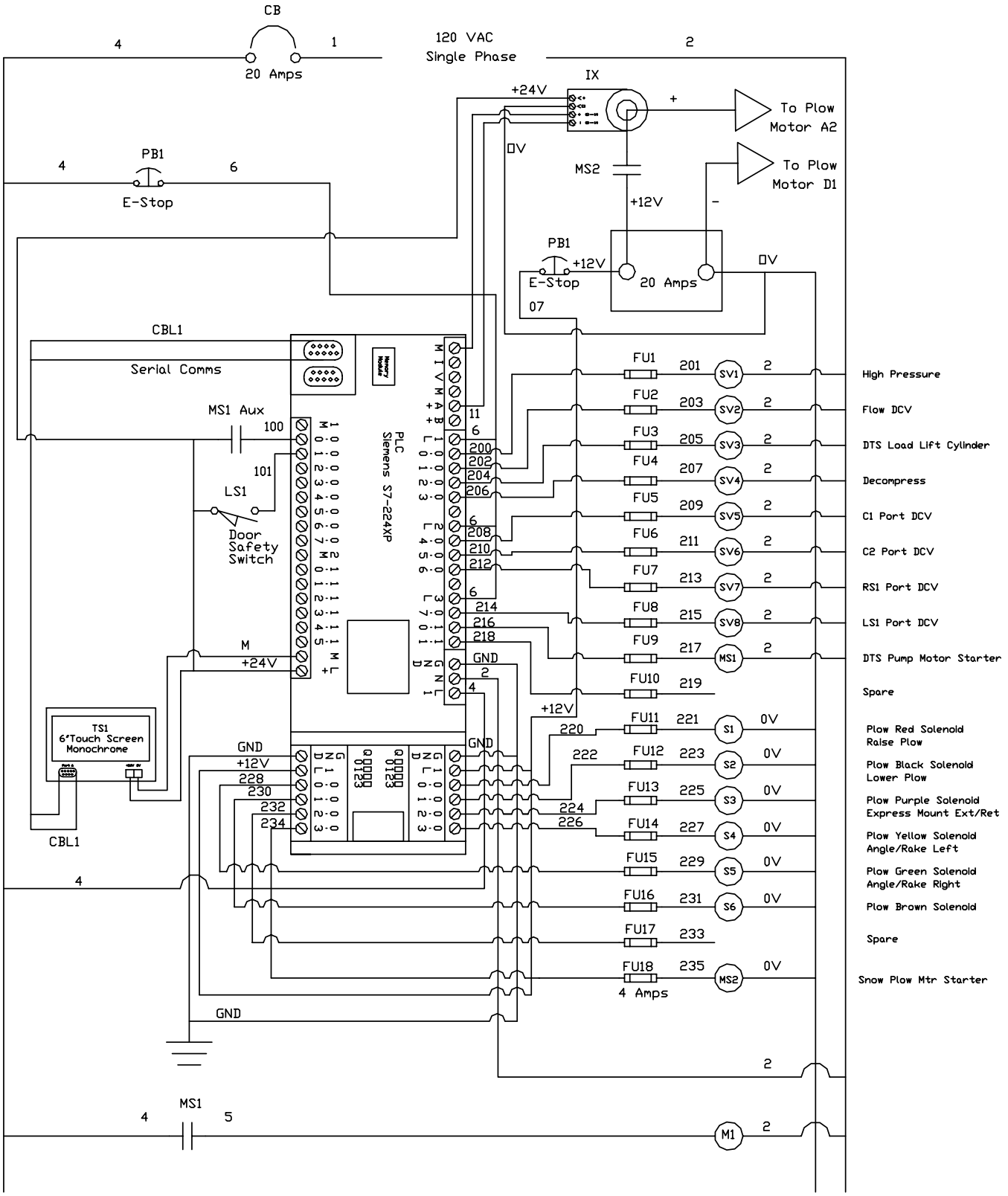
CLOSE WINDOW



DTS Lft LD Cyl Retct: The last test is to retract the Lift Load Cylinder so the Meyer Test Unit can be removed. **Note: This should only be done when all testing is completed.**



CLOSE WINDOW



Note: Bring all grounds to single point
Note: Fuses are AGC-2 2 amps UDS.