

# Equipment Manual

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# Horizontal Stacker

# Equipment Manual

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# Horizontal Stacker



*U.S. and other patents pending.*

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# Legal Notice

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U.S. 4,986,052	U.S. 5,385,339	U.S. 5,493,834	U.S. 5,568,862
U.S. 5,630,697	U.S. 5,636,494	U.S. 5,638,658	U.S. 5,640,832
U.S. 5,655,399	U.S. 5,678,395	U.S. 5,702,095	U.S. 5,707,204
U.S. 5,735,087	U.S. 5,810,341	U.S. 5,819,412	U.S. 5,833,222
U.S. 5,837,014	U.S. 5,854,747	U.S. 5,873,567	U.S. 5,884,448
U.S. 5,885,731	U.S. 5,906,264	U.S. 5,934,866	U.S. 5,947,460
U.S. 5,987,828	U.S. 5,996,303	U.S. 6,048,165	U.S. 6,112,968
U.S. 6,134,775	U.S. 6,170,688	U.S. 6,205,637	U.S. 6,212,849
U.S. 6,219,975	U.S. 6,260,263	U.S. 6,317,980	U.S. 6,389,762
U.S. 6,401,422	U.S. 6,412,246	U.S. 6,418,601	U.S. 6,539,615
U.S. 6,666,367	U.S. 6,702,269	U.S. 6,758,022	U.S. 6,817,392
U.S. 6,834,470	U.S. 6,907,820	*Other patents pending	

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# Notice of Change

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Use this page to record Service Bulletins and Notices that you receive to keep your manual updated.

## Equipment Manual Horizontal Stacker

Service Bulletin or Notice #	Dated	Title

# Safety (English)

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**For safety information in Spanish, refer to page xviii.**

**Be Careful.  
Be Safe.**



## Safety Indicators

The following safety alert symbols and signal words are used throughout this document to indicate safety hazards. Please pay careful attention when you see them. The level of severity differs for each symbol or signal word. The definitions below can also be found in ANSI z535.4-2002.

Failure to comply with the instructions accompanying each safety alert symbol may result in property damage, personal injury, or even death. Personnel must follow all safety procedures and practices to ensure the safest possible operation of this equipment. However, at no time is this document a substitute for common sense. Personnel must ensure that the work environment is safe and free of distractions.



### DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



### WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



### CAUTION

When CAUTION is used **with** the safety alert symbol shown here, it indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

When CAUTION is used **without** the safety alert symbol shown here, it indicates a potentially hazardous situation which may result in equipment damage.

NOTICE

### NOTICE

Calls attention to information that is significant to understanding the operation at hand.

ENVIRONMENTAL

### ENVIRONMENTAL

Applies to conditions that may affect the environment but do not have an immediate, direct effect on personnel or equipment.

## Safety Rules

Because it is impossible to anticipate every circumstance that might involve a hazard, the safety information provided in this equipment manual and on the machine is not all-inclusive. If this machine is operated or serviced using a procedure not specifically recommended by the manufacturer, the procedure shall be approved by a professional engineer to ensure it will not render the equipment unsafe. Use extreme caution and common sense at all times!

### Know Your Equipment

- Read this manual completely before using or maintaining the equipment. Do not operate this machine unless you have a thorough knowledge of the controls, safety devices, emergency stops, and operating procedures outlined in this manual.
- Read and follow all safety notes. Failure to comply with these instructions may result in economic loss, property damage, and/or personal injury including death.
- Refer to the lockout/tagout guidelines on the following pages to safely perform maintenance and troubleshooting of this equipment.
- Observe and obey all safety labels. Replace worn labels immediately.
- Use this equipment solely for the purpose described in this manual.
- Only qualified personnel should attempt to operate or perform maintenance on this equipment. “Qualified personnel” is defined as:

*...a person or persons who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training, or experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work—ANSI B30.2-1983*

*...one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved—NEC 2002 Handbook*

### Personal Safety

- Always wear safety glasses and hearing protection in an industrial environment.
- Utilize a filtering facepiece (dust mask) when working near sawdust.
- Wear proper clothing and appropriate personal protective equipment (e.g., safety glasses and hearing protection.) Do not wear loose clothing or jewelry. Confine long hair by tying it back.
- Use caution when lifting heavy parts or material.

### Installing the Equipment

- Follow installation instructions completely.

### Lockout/Tagout

- Before performing maintenance on the pneumatic or hydraulic systems, bleed the lines to eliminate pressure.
- Lockout/tagout all energized systems before performing maintenance on them. Refer to the *Lockout/Tagout Guidelines* section on page xi.

### Keeping a Safe Environment

- Keep children away. All visitors should be kept a safe distance from the work area. Hazards may not be apparent to individuals unfamiliar with the machine.
- Keep work areas well lit.
- Keep the work area clean and free of any trip or slip hazards.
- Do not use the equipment in damp or wet locations, or expose it to rain or snow.

### Operating and Maintaining the Equipment

- Ensure that all people, tools, and foreign objects are clear of the restricted zones before operating this equipment. The restricted zones are shown on page xvi and page xvii.
- Perform safety tests to ensure all E-stops are working properly before operating the equipment at the initial startup, after performing any maintenance, and in accordance with the maintenance schedule.
- In case of machine malfunction, stop the machine immediately using an E-stop and report the malfunction to a supervisor.
- Never leave the machine running unattended. Turn the power off! Do not leave the machine until all parts have come to a complete stop and all electrical power has been shut off.
- Check for worn or damaged parts regularly. Repair or replace them immediately.
- Keep the hydraulic, pneumatic, and electrical systems in good working order at all times. Repair leaks and loose connections immediately. Never exceed the recommended pressure or electrical power.
- Check that all safety devices are in working order before each shift starts. All protective guards and safety devices must be in place before and during use of the machine. Never disconnect or bypass any safety device or electrical interlock.
- Periodically inspect the quality of the finished product.

### Electrical Safety

- Do not use any liquids in the interior of electrical cabinets.
- When using solvents on and around the machine, remove power to the machine to eliminate the chance of sparking, resulting in explosion or fire. Wear a respirator approved for use with solvents. Wear protective clothing, gloves, and safety glasses.

## Lockout/Tagout

### Lockout/Tagout Guidelines

**All lockout/tagout guidelines must be met according to OSHA 29 CFR 1910.147.** A specific procedure should be included in your company's energy control program. This manual is not intended to replace your company's de-energizing or lockout/tagout procedure required by OSHA, but merely to provide general guidance.

The term "lockout," as used in this manual, means placing a lockout device on any and all energy sources to ensure that the energy isolating device and the equipment being controlled cannot be re-energized or operated until the lockout device is removed. The photos on the next page show where the electrical disconnects are located for this machine.



- Energy sources include electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
- In the case of electrical energy sources, the main power and control power to the machinery must be turned off and physically locked in the "off" position.
- A lockout device is usually a keyed padlock.
- If more than one person is working in a restricted zone, use a group lockout device that will allow each person to use a lock that can be removed only by the person performing the maintenance.

"Tagout" means that a prominent warning is securely fastened to an energy-isolating device to indicate that the equipment shall not be operated.

## Electrical Lockout/Tagout Procedures

### When Working on a Machine Outside the Machine’s Main Electrical Enclosure



If working on the electrical transmission line to the machine, follow the procedure on page xiv.

Before performing maintenance on any machine with electrical power, lockout/tagout the machine properly. When working on a machine outside of the machine’s main electrical enclosure, not including work on the electrical transmission line to the machine, follow your company’s approved lockout/tagout procedures which should include, but are not limited to the steps here.

1. Engage an E-stop on the machine.
2. Turn the disconnect switch handle to the “off” position. See Figure 2-1.

WARNING	
	<p><b>ELECTROCUTION HAZARD.</b></p> <p><b>When the disconnect switch is off, there is still live power within the disconnect switch’s enclosure. Always turn off power at the building’s power source to the equipment before opening this electrical enclosure!</b></p>

3. Attach a lock and tag that meet OSHA requirements for lockout/tagout.
4. Restrain or de-energize all pneumatic components, hydraulic components, and other parts that could have live or stored power.

Figure 2-1: Lockout/Tagout on the Main Electrical Enclosure



**When Working on a Machine Inside the Machine's Main Electrical Enclosure or in the Electrical Transmission Line to the Machine**

Before opening the main electrical enclosure, or attempting to repair or replace an electrical transmission line to the machine, lockout/tagout the machine properly. Follow your company's approved lockout/tagout procedures which should include, but are not limited to the steps here.

1. Engage an E-stop on the machine.
2. Shut the power to the machine off at the machine's power source which is usually an electrical service entry panel on the facility wall. One example of a locked-out power source panel is shown in Figure 2-2.
3. Attach a lock and tag that meets OSHA requirements for lockout/tagout.
4. Open the door to the enclosure in which you need access, and using a multimeter, verify that the power is off.

**Figure 2-2: Lockout/Tagout on the Power Source Panel**



## Hydraulic System Lockout/Tagout Procedure

### When Lockout/Tagout is Not Required

If working on components other than the hydraulic system, but that requires you to be near the vicinity of movable hydraulic components, you must, at a minimum, physically restrain the hydraulic components from moving. If this is not possible, lockout/tagout the entire hydraulic system.

### When Lockout/Tagout is Required

Before attempting repair or maintenance on a hydraulic line or component, lockout/tagout the machine properly. Follow your company's approved lockout/tagout procedures.

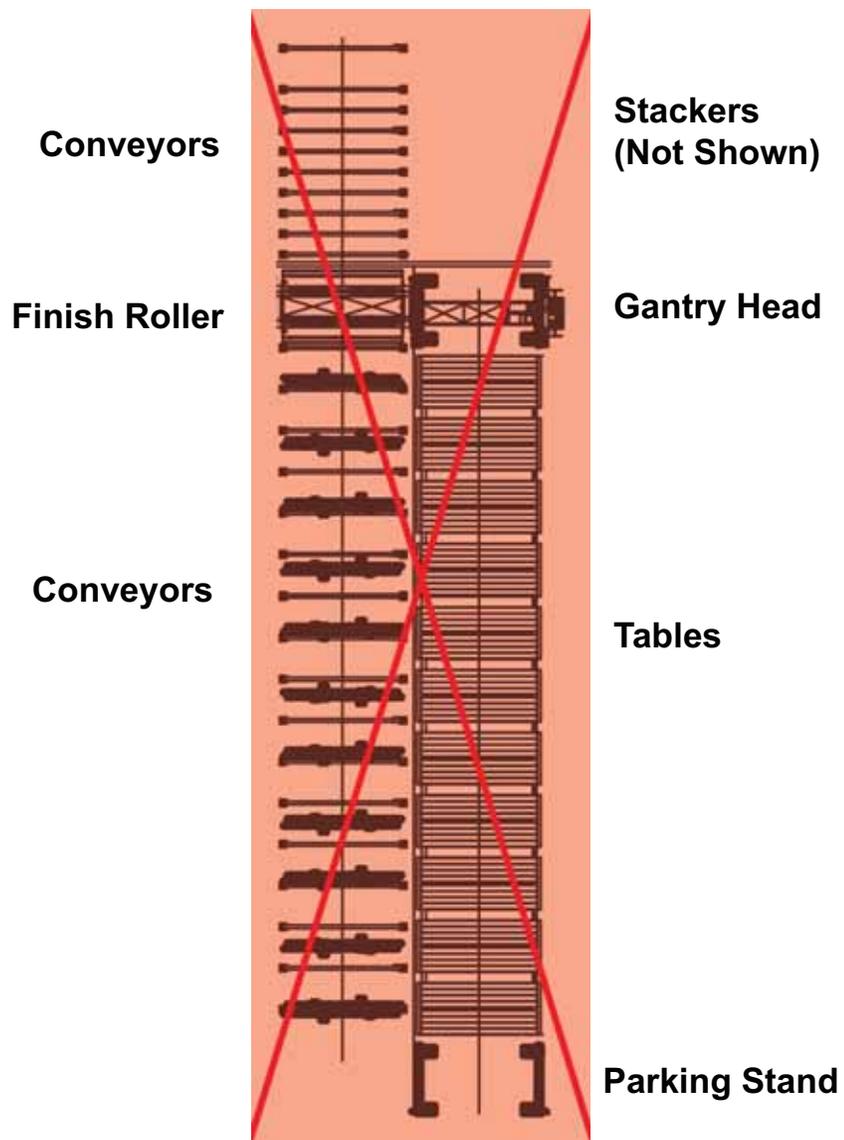
## Troubleshooting With an Energized Machine

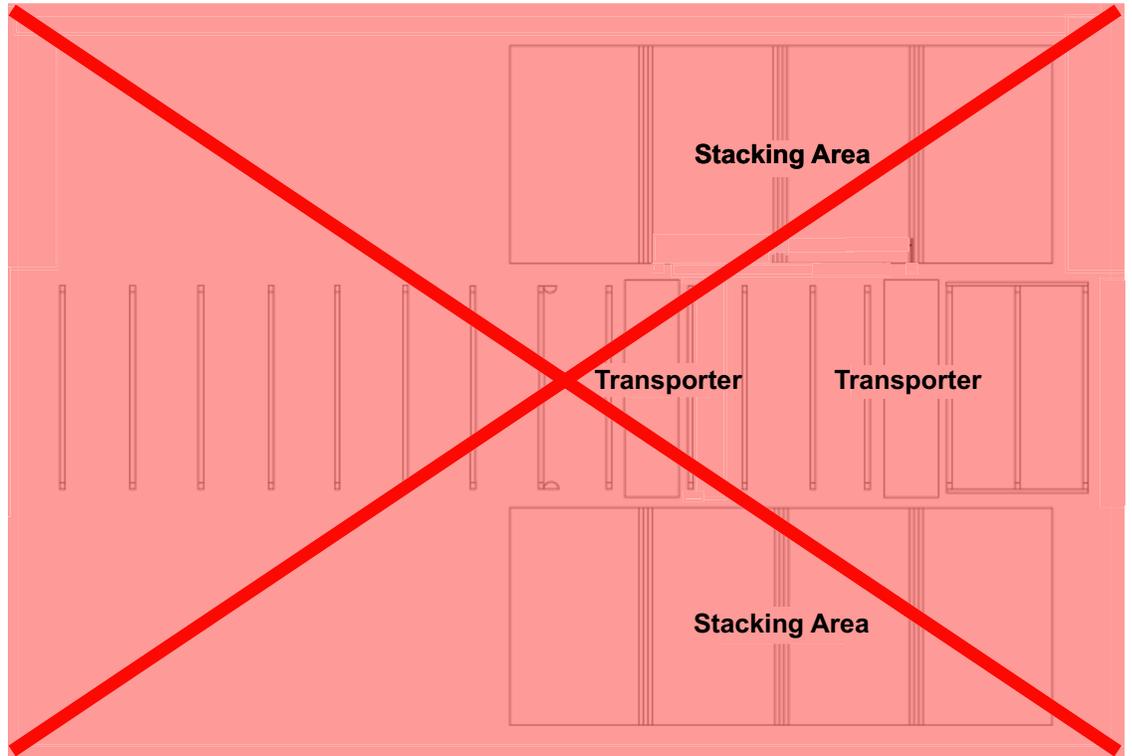
Only a qualified electrician, using the personal protective equipment and following the procedures recommended in NFPA 70E should ever attempt service or repair of or near an energized area or component of the machine.

Whenever maintenance is performed while the equipment is electrically energized, there is a potential electric arc flash hazard. Refer to NFPA 70E for the personal protective equipment required when working with electrically energized components. Pneumatic and hydraulic components may move unexpectedly if not de-energized. Physically restrain any components capable of movement when working on or near those components.

## Restricted Zone

DANGER	
	<p>Stay clear of the restricted zone when equipment is in use. Serious injury or death may result if personnel are in the restricted zone.</p>





# Seguridad (Español)

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**Sea cuidadoso.  
Protéjase.**



## Indicadores de seguridad

Los siguientes símbolos de alerta de seguridad y palabras de advertencia se utilizan a lo largo de este documento para indicar riesgos de seguridad. Preste suma atención cuando los vea. Cada símbolo o palabra indica un nivel de gravedad diferente. Las definiciones incluidas a continuación también pueden consultarse en la norma ANSI z535.4-2002.

El no cumplimiento de las instrucciones que acompañan a cada símbolo de alerta de seguridad puede producir daños a la propiedad, lesiones personales e incluso la muerte. El personal debe seguir todos los procedimientos y prácticas de seguridad establecidos para asegurar el uso más seguro posible de este equipo. No obstante, en ningún caso este documento reemplaza el sentido común. El personal debe asegurarse de que el entorno de trabajo sea seguro y esté libre de distracciones.



### PELIGRO

Indica una situación de riesgo inminente que, si no se evita, producirá la muerte o lesiones graves.



### ADVERTENCIA

Indica una situación potencialmente peligrosa que, si no se evita, podría producir la muerte o lesiones graves.



### PRECAUCIÓN

Cuando la PRECAUCIÓN se utiliza **con** el símbolo de alerta de seguridad aquí ilustrado, indica una situación potencialmente peligrosa que, si no se evita, puede producir lesiones menores o moderadas.

Cuando PRECAUCIÓN se utiliza **sin** el símbolo de alerta de seguridad aquí ilustrado, indica una situación potencialmente peligrosa que podría producir daños al equipo.

AVISO

### AVISO

Llama la atención a información importante para entender la operación que se desea realizar.

AMBIENTAL

### AMBIENTAL

Se aplica a condiciones que pueden afectar el entorno pero que no tienen un efecto inmediato o directo sobre el personal o el equipo.

## Reglas de seguridad

Debido a la imposibilidad de anticipar todas las circunstancias que podrían constituir un riesgo, la información de seguridad suministrada en este manual del equipo y sobre la máquina no es exhaustiva. Si se utiliza o realiza el mantenimiento de esta máquina utilizando un procedimiento no recomendado específicamente por el fabricante, el procedimiento deberá ser aprobado por un ingeniero profesional para asegurarse de que no afecte la seguridad del equipo. ¡Manéjese! siempre con suma precaución y sentido común!

### Conozca su equipo

- Lea este manual en su totalidad antes de utilizar o mantener el equipo. No utilice esta máquina a menos que esté perfectamente familiarizado con los controles, los dispositivos de seguridad, los frenos de emergencia y los procedimientos operativos que se describen en este manual.
- Lea y siga todas las notas de seguridad. El no cumplimiento de estas instrucciones podría producir pérdidas económicas, daños a la propiedad y lesiones personales, incluida la muerte.
- Refiérase a las pautas de bloqueo/etiquetado proporcionadas en las siguientes páginas para realizar el mantenimiento y solucionar problemas de este equipo en forma segura.
- Observe y cumpla con todas las etiquetas de seguridad. Cambie las etiquetas gastadas inmediatamente.
- Utilice este equipo únicamente para el propósito que se describe en este manual.
- Sólo personal calificado debe intentar utilizar o realizar el mantenimiento de este equipo. Por "personal calificado" se entiende:

*...una persona o personas que, por el hecho de poseer un título o certificado de capacitación profesional reconocido o que, por sus amplios conocimientos o experiencia, han demostrado con éxito estar capacitados para resolver problemas relacionados con el tema y el trabajo en cuestión  
—ANSI B30.2-1983*

*...una persona que posee habilidades y conocimientos relacionados con la construcción y uso de equipos e instalaciones eléctricas y que ha recibido capacitación en seguridad sobre los riesgos posibles—NEC 2002 Handbook*

### Seguridad personal

- Use siempre anteojos de seguridad y protección auditiva en un entorno industrial.
- Utilice una máscara protectora cuando trabaje cerca de aserrín.
- Utilice ropa adecuada y equipo de protección personal apropiado (por ejemplo, anteojos de seguridad y protección auditiva.) No use ropa suelta ni joyas. Si tiene el cabello largo, áteselo para atrás.
- Proceda con precaución cuando levante piezas o materiales pesados.

## Instalación del equipo

- Siga las instrucciones de instalación al pie de la letra.

## Procedimientos de Bloqueo/Etiquetado

- Antes de realizar el mantenimiento de los sistemas neumáticos o hidráulicos, purgue las líneas para eliminar la presión.
- Bloquee y etiquete todos los sistemas energizados antes de realizar tareas de mantenimiento en ellos. Refiérase a la sección *Pautas de bloqueo/etiquetado* en la página xxiii.

## Cómo mantener un entorno seguro

- Mantenga alejados a los niños. Todos los visitantes deben mantenerse a una distancia segura del área de trabajo. Los riesgos pueden no ser evidentes a las personas no familiarizadas con la máquina.
- Mantenga las áreas de trabajo bien iluminadas.
- Mantenga el área de trabajo limpia y libre de cualquier riesgo de tropiezo o resbalamiento.
- No utilice el equipo en lugares húmedos o mojados y no lo exponga a la lluvia o a la nieve.

## Uso y mantenimiento del equipo

- Asegúrese de que no haya personas, herramientas y objetos extraños en las zonas restringidas antes de utilizar este equipo. Las zonas restringidas se indican en la página xxix y la página xxx.
- Realice pruebas de seguridad para verificar que todos los frenos de emergencia funcionen adecuadamente antes de utilizar el equipo por primera vez, después de realizar cualquier tarea de mantenimiento y según la frecuencia de mantenimiento establecida.
- En caso de que la máquina no funcione correctamente, deténgala inmediatamente utilizando un freno de emergencia e informe el problema a un supervisor.
- No deje nunca la máquina encendida si no está junto a ella. ¡Apáguela!. No abandone la máquina hasta que todas las piezas se detengan completamente y hasta que se haya apagado la alimentación eléctrica.
- Verifique periódicamente que no haya piezas gastadas o dañadas. Repárelas o cámbielas inmediatamente.
- Mantenga los sistemas hidráulicos, neumáticos y eléctricos en buen funcionamiento en todo momento. Repare las fugas y las conexiones sueltas inmediatamente. No exceda nunca la presión ni potencia eléctrica recomendadas.

- Verifique que todos los dispositivos de seguridad estén en buen funcionamiento al comienzo de cada turno. Todos los dispositivos protectores y de seguridad deben estar en su lugar antes y durante el uso de la máquina. No desconecte ni evite nunca ningún dispositivo de seguridad ni interbloqueo eléctrico.
- Inspeccione periódicamente la calidad del producto terminado.

## **Seguridad eléctrica**

- No utilice líquidos en el interior de los gabinetes eléctricos.
- Cuando utilice disolventes sobre o alrededor de la máquina, desconecte la alimentación para eliminar las probabilidades de chispas, que pueden producir una explosión o incendio. Use un respirador aprobado para el uso con disolventes. Use ropa protectora, guantes y anteojos de seguridad.

## Bloqueo/Etiquetado

### Pautas de bloqueo/etiquetado

Deben cumplir con todas las pautas de bloqueo/etiquetado conforme a la norma OSHA 29 CFR 1910.147. El programa de control de energía de la compañía debe incluir un procedimiento específico. El objetivo de este manual no es reemplazar el procedimiento de desenergización o bloqueo/etiquetado requerido por la OSHA, sino proporcionar pautas orientativas generales.

El término "bloqueo", según se utiliza en este manual, se refiere a la colocación de un dispositivo de bloqueo en las fuentes de energía para asegurar que el dispositivo aislador de energía y el equipo controlado por éste no puedan reenergizarse o utilizarse hasta que se retire dicho dispositivo.

Las fotos de la página siguiente muestran los lugares en los que se encuentran los interruptores de desconexión eléctrica de esta máquina.

- Las fuentes de energía incluyen energía eléctrica, mecánica, hidráulica, neumática, química, térmica y otras.
- En el caso de fuentes de energía eléctrica, la alimentación principal y la alimentación de control a la maquinaria deben apagarse y bloquearse físicamente en la posición "off" (apagado).
- Por lo general, como dispositivo de bloqueo se utiliza un candado con llave.
- Si hay más de una persona trabajando en una zona restringida, utilice un dispositivo de bloqueo grupal que permita a cada persona utilizar un candado que sólo pueda ser retirado por la persona que realiza el mantenimiento.

"Etiquetado" significa que debe colocarse una advertencia fácil de ver en un dispositivo aislador de energía que indique que el equipo no debe utilizarse.



## Procedimientos de bloqueo/etiquetado eléctricos

### Cuando trabaja en una máquina fuera del gabinete eléctrico principal de la máquina



Si trabaja en la línea de transmisión eléctrica a la máquina, siga el procedimiento de la página xxvi.

Antes de realizar el mantenimiento de cualquier máquina con alimentación eléctrica, bloquee y etiquete la máquina de forma adecuada. Cuando trabaje en una máquina fuera del gabinete eléctrico principal de la máquina, salvo en el caso de trabajos en la línea de transmisión eléctrica a la máquina, siga los procedimientos de bloqueo/etiquetado aprobados por la compañía, los cuales deberían incluir, entre otros, los pasos aquí indicados.

1. Coloque un freno de emergencia sobre la máquina.
2. Coloque el mango del interruptor con fusibles en la posición "apagado/apagada". Vea la figura 2-1.

	<p><b>RIESGO DE ELECTROCUCIÓN.</b></p> <p><b>Cuando el interruptor con fusibles está apagado, sigue habiendo energía dentro del gabinete del interruptor. ¡Apague siempre la alimentación en la fuente de alimentación del edificio antes de abrir este gabinete eléctrico!</b></p>

3. Coloque un candado y una etiqueta que cumplan con los requisitos de bloqueo/etiquetado de la OSHA.
4. Trabe o desenergice todos los componente neumáticos, componentes hidráulicos y otras piezas que tengan alimentación directa o almacenada.

Figure 3-1: Bloqueo/etiquetado en el gabinete eléctrico principal



### **Cuando trabaje en una máquina dentro del gabinete eléctrico principal de la máquina o en la línea de transmisión eléctrica a la máquina**

Antes de abrir el gabinete eléctrico principal o intentar reparar o reemplazar una línea de transmisión eléctrica a la máquina, bloquee y etiqueta la máquina en forma adecuada. Siga los procedimientos de bloqueo/etiquetado aprobados por la compañía, los cuales deberían incluir, entre otros, los pasos aquí indicados.

1. Coloque un freno de emergencia sobre la máquina.
2. Apague la alimentación a la máquina en la fuente de alimentación, que, por lo general, es un panel de entrada de suministro eléctrico que se encuentra en una pared de las instalaciones. En la figura 2-2 se muestra un ejemplo de panel de fuente de alimentación bloqueado.
3. Coloque un candado y una etiqueta que cumplan con los requisitos de bloqueo/etiquetado de la OSHA.
4. Abra la puerta del gabinete al que necesita acceder y usando un multímetro verifique que la alimentación esté apagada.

**Figure 3-2: Bloqueo/Etiquetado del panel de fuente de alimentación**



## **Procedimiento de bloqueo/etiquetado de sistema hidráulico**

### **Cuando no se requiere bloqueo/etiquetado**

Si trabaja con componentes que no son del sistema hidráulico pero que requieren su presencia en la proximidad de componentes hidráulicos móviles, debe, como mínimo, trabar físicamente estos componentes para que no se muevan. Si no es posible, bloquee/etiquete todo el sistema hidráulico.

### **Cuando se requiere bloqueo/etiquetado**

Antes de intentar reparar o realizar el mantenimiento de una línea o componente hidráulico, bloquee y etiquete la máquina en forma apropiada. Siga los procedimientos de bloqueo/etiquetado aprobados por la compañía.

## Solución de problemas con una máquina energizada

Sólo un electricista calificado que utilice el equipo de protección personal y siga los procedimientos recomendados en la norma NFPA 70E debe intentar realizar tareas de reparación o mantenimiento en un área o componente energizados de la máquina o en su proximidad.

Cada vez que se realizan tareas de mantenimiento mientras el equipo está eléctricamente energizado, existe un riesgo potencial de formación de un arco eléctrico. Consulte en la norma NFPA 70E el equipo de protección personal requerido para trabajar con componentes eléctricamente energizados. Los componentes neumáticos e hidráulicos pueden moverse de manera imprevista si no se desenergizan. Trabe físicamente cualquier componente que pueda moverse cuando deba trabajar en ellos o en su proximidad.

## Zonas restringida

	<p><b>Manténgase alejado de la zona restringida cuando el equipo esté en uso. Pueden producirse lesiones graves o incluso la muerte si el personal está en la zona restringida.</b></p>

Bandas transportadoras

Rodillo de acabado

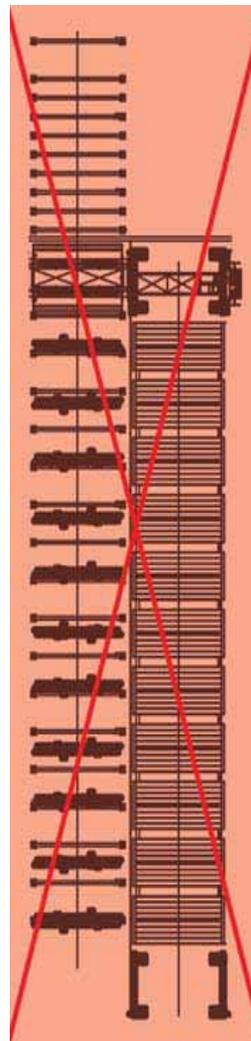
Bandas transportadoras

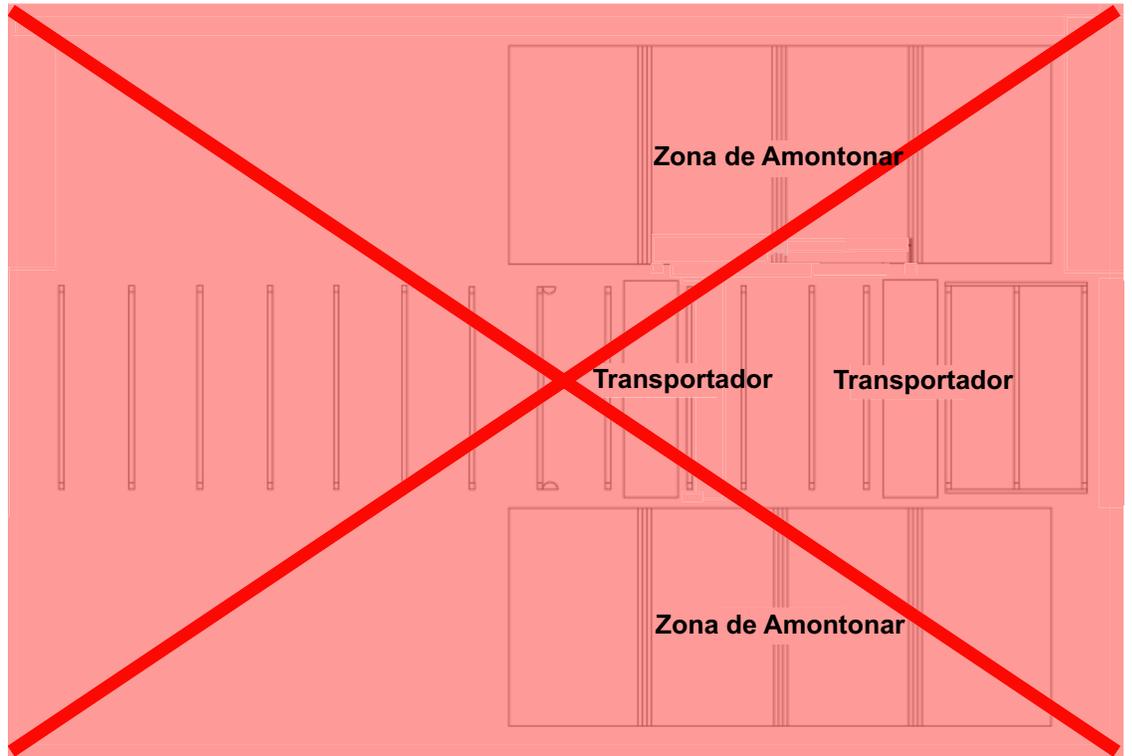
Apiladores  
(no ilustrados)

Cabeza de caballete

Tablas

Soporte de aparcamiento





### Purpose of Chapter

This chapter introduces you to this manual and provides an overview of your equipment and the means to identify it.

DANGER	
	<p><b>Read this manual completely before using this equipment!</b></p> <p><b>Do not operate this machine until you have a thorough understanding of all controls, safety devices, emergency stops, and operating procedures outlined in this manual.</b></p> <p><b>All warnings must be read and observed. Failure to do so may result in economic loss, property damage, personal injury and/or death.</b></p> <p><b>This manual must always be available to personnel operating and maintaining this equipment.</b></p>

## Introduction to This Manual

### Purpose of This Manual

This manual is prepared for the customer's information and use in establishing routine operational and maintenance procedures for optimum efficiency, production, and safety in the operation of the MiTek Horizontal Stacker. The Horizontal Stacker is designed, engineered, and precision-manufactured by MiTek, using skilled craftsmen and quality materials. Given proper care, the equipment should reward the user with many years of highly productive service.

This manual provides the information necessary to operate and maintain the Horizontal Stacker system.

In order for this manual to be useful, it must be kept with the machine so the operators and maintenance personnel have easy access to it. You can order the most recent revision of this manual by referring to the part number 001011. If you require a previous revision, talk to a Customer Service Technician.

Most questions that will arise about maintenance, troubleshooting, and part numbers are answered in this manual. If you cannot locate the answer or solution, contact the MiTek Machinery Division Customer Service Department using the contact information in Figure 1-1.

**Figure 1-1: Contacting MiTek**

**MiTek Machinery Division**

Customer Service Department  
301 Fountain Lakes Industrial Drive  
St. Charles, MO 63301

**Parts Orders (with part number)**

eStore™ at <http://estore.mii.com>  
E-mail: [mitekparts@mii.com](mailto:mitekparts@mii.com)

**Web Site**

[www.mii.com/machinery](http://www.mii.com/machinery)

**Technical Assistance**

Phone: 800-523-3380  
Fax: 636-328-9218



## Using This Manual

Review the Table of Contents to understand the organization and content of the chapters and appendices. The glossary and index are also valuable tools that will help you get the most out of your equipment.

To follow the procedures in this manual, you must first understand the formatting cues used. Table 1-1 describes how to read the cues provided in this text.

**Table 1-1: How to Read the Formatting Cues**

If Text Looks Like...	It Indicates...	Example in Text
All caps	Key on keyboard or button on touch screen	Press ENTER
Initial cap and italic	Menu or field or virtual button that you must find or select	Click on the <i>File</i> menu
Initial cap only, no italics	Menu or field or virtual button when simply referring to it	While in the Main Menu
Plus sign (+)	Hold buttons at the same time	CTRL+ALT+DELETE
Greater Than sign (>)	Next selection	<i>File&gt;Open</i>

## Introduction to This Equipment

### General Information

#### Purpose of the Equipment

The Horizontal Stacker system is designed for the fast, accurate and economical stacking of wood trusses.

#### Overview of the System

The Horizontal Stacker system stacks trusses in the horizontal or flat position, which is the way most trusses are built and delivered. This reduces the amount of truss handling and thus the chance of damage to the products.

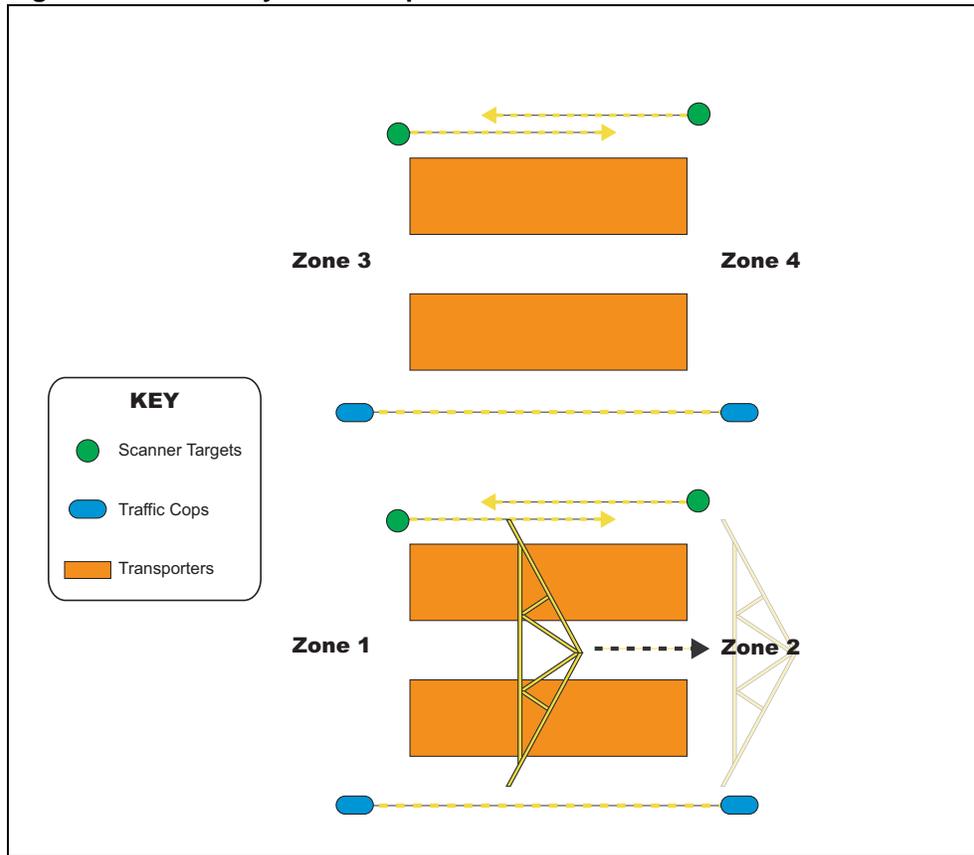
The Horizontal Stacker system is available in two versions: the *two-transporter* (2-zone) and the *four-transporter* (4-zone) systems, both of which are designed to stack trusses on both sides of the exit conveyor. The two-transporter system has two stacking areas, one on each side of the exit conveyor; the four-transporter system has four stacking areas, two on each side of the conveyor.

A 2-zone Horizontal Stacker consists of the following:

- 2 transporters with power units
- 2 scanner targets
- 1 traffic cop eye
- 8 receiver stands
- 1 radio controller

Multiply all components by two for a 4-zone Horizontal Stacker. Figure 1-2 shows the components of a 4-zone system, excluding the radio.

Figure 1-2: 4-Zone System Components



### Operation of the System

The automatic stacking sequence is controlled by a *scanner target*. Once activated, the target signals the PLC (Programmable Logic Controller) to tell the transporters to lift.

The forward travel of the truss is controlled by *traffic cops*. The traffic cop is located in front of the stacker and controls the conveyor system and finish roller (optional). If the eye is activated while the transporters are cycling, it will not allow a truss to move into the transporter area.

## Components

Table 1-2 lists the main components that comprise this system.

**Table 1-2: Main Components**

Component	Description	Part #
Transporters with power units	Mechanism that moves the truss	70300-501
Scanner targets	Show when truss is in place	75740
Traffic cop eyes	Control the forward movement of the truss	70530
Receiver stands	Receive truss from the transporter unit	70575

## System Identification

**Table 1-3: Available Models**

System Description	Part #
2-zone Horizontal Stacker	70300-501
Electrical kit for 2-zone Horizontal Stacker	90436-520-xxxV
Electrical kit for 4-zone Horizontal Stacker	90436-540-xxxV

## General Specifications

General specifications are listed in Table 1-4, Table 1-5, and Table 1-6.

**Table 1-4: General Specifications and Gearbox–Drive Chain Specifications**

<b>General</b>	
Lifting capacity	400 lb per transporter
Stacking area	40' x 16' (2-transporter system)
Cycle time	Approximately 35 seconds
Minimum height	28"
Maximum height	74"
Operating pressure (hydraulic)	1500 psi
Weight	5,000 lb
<b>Gearbox–Drive Chain</b>	
Ratio	30:1
Rpm input	1,750
Hp maximum	1/2
Frame	56



Standard motors are furnished unless otherwise specified by the customer. Nonstandard motors are subject to additional cost.

**Table 1-5: Hydraulic System Requirements**

<b>Hydraulic Pump</b>	
Performance when used with hydraulic fluid recommended in the <i>Maintenance</i> chapter	
Maximum operating pressure (psi)	2,000
Approx. delivery (GPM)	10.38 (at maximum rated speed and pressure)
<b>Hydraulic Fluid (also specified in the Maintenance chapter)</b>	
<i>Note: If operating outside the recommended temperature range, select hydraulic fluid that will operate at the proper SUS range for your temperatures.</i>	
Recommended ISO grade*	ISO 68
Recommended operating viscosity*	60-1400 SUS
Temperature*	At startup: > 68°F during operation: 86°F–120°F
Recommended fluid	DTE 26
Reservoir capacity	40 gallons
*An immersion heater is available for the hydraulic fluid reservoir.	
<b>Fluid Filter System</b>	
Filter	External filter, 10 micron
<b>Hydraulic Cylinder</b>	
Bore	3-1/4"
Stroke	14"
Rod diameter (hard chrome finish)	1-3/8"
Pressure rating	3000 psi
<b>Valve Units</b>	
Control valves	Solenoid-controlled, four-way, three-position directional control valve, spring-centered

**Table 1-6: Floor Space Requirements, and Electrical Specs and Requirements**

Floor Space Requirements			
Width - Overall (2-zone)	4', see Figure 2-1 on page 12		
Length	40', see Figure 2-1 on page 12		
Motor Specs and Requirements			
<p><i>Note: The PLC panel is not dependent on the voltage and will require a 30 amp disconnect. The stacker control panel will control two (2) transporters and is dependent on the voltage as follows:</i></p>			
Motor on Transporter	#1 Power Unit	#2 Drive Chain	
Horsepower rating	10 hp	1/2 hp	
Motor speed	1,750 rpm	1,750 rpm	
Starting switch	Full voltage (std.)	Full voltage	
Cycles	60	60	
Phase	3	3	
Voltage	208V	230V	460V
Amps requirement, motor panel:			
10 hp motor	30.8 amps	28.0 amps	14 amps
1/2 hp motor	2.4 amps	2.2 amps	1.2 amps
Amps requirement, control panel	5 amps	4 amps	2 amps
Amps requirement, heater panel	25 amps	25 amps	15 amps
Total amps	63.2 amps	59.2 amps	32.2 amps
Total amps for 2 transporters	126.4 amps	118.4 amps	64.4amps
<p><i>Note: 1 stacker consists of 2 transporters.</i></p>			

## Supplemental Documentation

In addition to this manual, supplemental documentation for some individual components is provided at the time of installation. Refer to these documents for more detailed information on the applicable topics.

### Purpose of Chapter

This chapter covers what you must consider or complete before this equipment can be installed.

## MiTek's Responsibilities

### Prior to Installation

MiTek will provide the following items and information prior to the installation date:

1. A Prior to Installation package that:
  - Outlines this chapter and requests your signature of agreement.
  - Gives dates to expect shipment, delivery, and installation.
  - Explains the number of people required to help with installation.
  - Provides guidelines on providing an electrician, welder, and other specialists.
  - Describes payment information.
2. A layout of the equipment, specifically prepared for your building.

### During Installation

Upon request, a MiTek Customer Service Technician (CST) may be present to manage the installation of your equipment.

## Customer’s Responsibilities

Before the installation of your equipment, the items and procedures in this chapter must be arranged, purchased, or assembled. Table 2-1 provides an overview of these items. Each topic listed in the table is explained in detail in the text following the table.

If these requirements are not satisfied before the scheduled installation date, it may be necessary to reschedule the installation. Any additional cost may be the customer’s responsibility.

**Table 2-1: Summary of the Customer’s Responsibility**

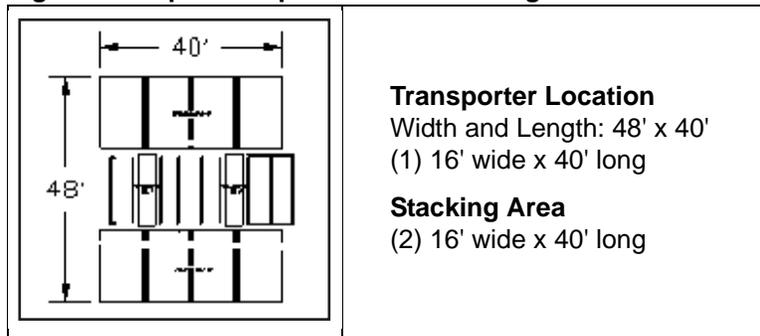
Space Requirements	This equipment requires enough space to allow for the machine dimensions listed in Figure 2-1 on page 12 or Figure 2-2 on page 12, plus additional working space for operation and maintenance. Space should have adequate lighting.
Location Requirements	Concrete, a minimum of 18 in. thick 3,500 psi, is required under the weight of the Horizontal Stacker.
Electrical Requirements	The standard electrical requirements are shown in Table 1-6 on page 9. Contact your MiTek representative immediately if custom power specifications need to be arranged.
Hydraulic System Requirements	Hydraulic fluid that meets the requirements in Table 2-2 must be on hand during the installation process.
Shipping Weights	See Table 2-3.
Customer-Supplied Items Required	The customer is responsible for having the supplies listed in Table 2-4 available at the time of installation.

## Space Requirements (General Layout)

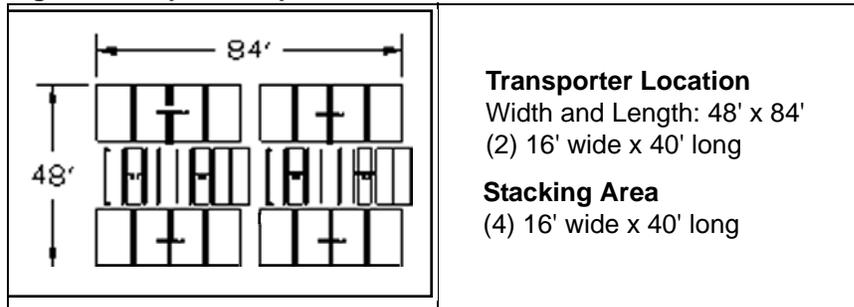
Refer to these guidelines when planning your space allocation. MiTek can provide help with plant layout and space utilization upon request.

The customer's responsibility is to provide adequate space for the installation, operation, and protection of the Horizontal Stacker system. Physical space requirements are shown in Figure 2-1 and Figure 2-2.

**Figure 2-1: Space Requirements for a Single Stacker**



**Figure 2-2: Space Requirements for a Double Stacker**



Additional space must be allocated for operation and maintenance. Operation space should provide safety, freedom of movement, storage space, and free flow of raw and finished materials. There must also be adequate space for safe handling of the raw and finished materials throughout the process.

MiTek can provide help to the customer in plant layout and space utilization if requested.

A level concrete slab must be provided for the installation of the Horizontal Stacker system. For anchoring purposes, this slab should be made out of 3,500 psi concrete (minimum). It is recommended that the slab be designed and installed in accordance with local building code requirements and, if required, under supervision of a local professional engineer.

The standard electric scanner target and traffic cop assembly mount to the MiTek conveyor and do not require footings.



The standard system layout prints detailing footing locations and dimensions are in the drawing set. These layouts may require modifications, depending upon the orientation of the plant and existing equipment.

## Location Requirements

### Floor Structure

A level and structurally sound concrete slab must be provided for the installation of the equipment. This slab should be designed and installed in accordance with local building code requirements and, if required, under supervision of a professional engineer. Concrete should be a minimum of 18 in. thick under the Horizontal Stacker. Three thousand five hundred (3,500) psi concrete is recommended. Refer to your layout drawing.

### Environment

Lighting should be adequate for safe operation and maintenance.

## Electrical Requirements

WARNING	
	<p><b>ELECTROCUTION HAZARD.</b></p> <p><b>All electrical work must be done by a qualified electrician and conform to all electrical codes.</b></p> <p><b>Failure to exercise care may result in serious injury or death.</b></p>

The customer shall pre-check voltage in his locality and notify MiTek of the type of power available so that, if necessary, revisions to motors, etc., may be made before shipment.

The Horizontal Stacker is pre-wired and all wires terminate at an electrical enclosure on the machine. Control panels are included to run the stackers and interface the stackers and conveyor system (option). These control panels are pre-wired and contain terminal strips that are numbered to match the terminals in the Stacker enclosures. A system contains one PLC panel (total) and one heater panel per Stacker system. Thus, a Single Stacker system (2-zone) has one PLC panel, one heater panel, and one motor control panel per system. A Double Stacker system (4-zone) has one PLC panel, one heater panel, and two motor control panels per system. **Due to different adopted or local electrical codes, the customer must supply the conduit, wire, and related materials to make the connections between the building power supply and any motor, heater, and PLC panels.** You may order these supplies from MiTek, separate from the standard order.

A pushbutton station to control the Stacker will be included. All electrical enclosures are to be installed inside the building. Actual control panel location and orientation may vary due to the construction of the plant. It is important that the truss line operators be able to see the flow of trusses and Stacker operation when ejecting a truss. The panel assembly should be located within 10 ft of the beginning of the exit conveyor system feeding the stackers.

If this is not possible, notify the MiTek Sales Department, as an increase in the size of wires to the Stackers may be necessary.

A radio control device that interfaces with the control system is included. The unit allows the operator the freedom to move about and control the stacking function from over 100 ft away.

The service disconnect size is dependent on the voltage and will vary from system to system. The amps drawn by the components determines the disconnect size. Your local electrician will need to verify the amps requirement and disconnect size. Refer to Table 1-6 in the *General Information* chapter for motor horsepower and total system requirements.

## **Mechanical Requirements**

The Stackers will be supplied complete with all mechanical components. The Stackers are independent stand-alone units that will be set in place.

If an existing conveyor is used with the Stacker, modifications to the conveyor may be required and need to be addressed early on in the project. The scanner target mounts may also require modification to fit the conveyor.

## Hydraulic System Requirements

80 gallons of hydraulic fluid must be available for the initial charge of the machine at startup.

- Mobile DTE 26 or an equivalent hydraulic fluid is recommended for operation within the recommended temperature range. It contains beneficial additives that other brands may not have.
- Refer to Table 2-2 for hydraulic fluid specifications. See the footnote if operating outside the recommended temperature range.

**Table 2-2: Recommended Hydraulic Fluid**

Recommended Operating Viscosity Range	60-1400 SUS
Temperature	At Startup > 68°F During Operation 86°F-120°F
ISO Grade*	ISO 68
Reservoir Capacity	40 gallons
Capacity of Hydraulic Lines	Up to 10 gallons

\*If operating outside the recommended temperature range, select a hydraulic fluid that will operate at the proper SUS range for your temperatures. Contact your fluid supplier for fluid recommendations.

## Shipping Information

When the equipment arrives, you must have the proper transport and lifting equipment available to remove it from the truck and place it in your facility. Table 2-3 lists the weight of the individual components of a typical system.

DANGER	
	<p><b>CRUSH HAZARD.</b></p> <p><b>Transport and lifting equipment such as forklifts and cranes must be designed and rated for the load and application. The weight of each major component is given in Table 2-3.</b></p> <p><b>Inadequate transport equipment will result in property damage, severe personal injury, or death.</b></p>

**Table 2-3: Shipping Information**

Contents of Shipment	Approximate Weight
Hydraulic power unit	1,200 lb each
Transporter	5,500 lb each

## Customer-Supplied Parts

The customer must supply the parts shown in Table 2-4. Some must be installed before installation occurs and some must be available for use at the time of installation.

**Table 2-4: Customer-Supplied Parts**

Item	Description
Electrical Equipment	All electrical requirements to provide power to the disconnect enclosure on the Horizontal Stacker are the customer's responsibility
Transport Equipment	A heavy-duty forklift is required to move the equipment during unloading and placement of the machine. All transport and lifting equipment must meet the requirements given in the <i>Shipping Information</i> section
Tools That May Need to be Rented	Industrial hammer-drill Welding equipment and welder
General Tools	Tape measure, at least 100' long Pry bar, 5' Allen wrench set Combination wrench set Drive ratchet Socket set Impact wrench and socket set

## Training Provided

In the case where MiTek is overseeing the installation of your equipment, the MiTek representative will ensure that your operators and maintenance personnel understand how to operate and maintain this equipment. They will explain warranty information and ensure that the equipment manual is present.

### Purpose of Chapter

The purpose of the Installation chapter is to describe the entire installation process in detail. The instructions assume that the prior-to-installation requirements are satisfied.

## Responsibilities During Installation

Upon request, MiTek can provide installation supervision to ensure that the system is installed properly and operates correctly. We can also provide operating and maintenance training at the time the equipment is installed. The customer is responsible for providing all labor and equipment needed to complete the installation. These requirements are explained in the *Prior to Installation* chapter.

## Delivery

### Unloading

It is the customer's responsibility to provide equipment and labor for unloading, uncrating, and placement of the Horizontal Stacker system and fixtures. Extreme caution must be exercised to avoid damage or misalignment during handling. Do not apply any pressure on any of the moving parts or fittings. The transporters should be supported by the bottom. A 3-ton forklift will be required to move the transporters.

### Assembly

Assembly and installation of the complete Horizontal Stacker system can be supervised by a MiTek representative, including layout, dimensioning, lining, leveling, connecting, assembling, and complete installation of the units. Pre-operational checks and final adjustments can be conducted as needed, and personnel can be instructed in the proper operation and maintenance of the equipment.

MiTek recognizes that the installation can be disruptive to the production schedule. For this reason, we request the most efficient people to assist with the installation. These people can complete their work quickly, efficiently and with a high degree of quality. The end result is a system that will operate at maximum efficiency.

## Hydraulic Fluid

The customer shall have a minimum of 80 gallons of hydraulic fluid on hand for initial charge for 2 transporters (160 gallons for 4 transporters). The hydraulic reservoir, when filled to within two in. of the top, holds 40 gallons; additional fluid is required to charge the lines, etc. The hydraulic fluid is to have a viscosity ranging between 150 and 220 SUS at 100°F. Refer to the the *Hydraulic Fluid* section on page 59 in the *Maintenance* chapter.

## Forklift

One heavy-duty forklift of not less than a 3-ton capacity is required. An operator will be required for unloading and moving the transporter assemblies to the installation site.

The Horizontal Stacker must be lifted one unit at a time. The unit must be lifted from underneath, from the middle of the unit. The red arrows in Figure 3-1 indicate the approximate lift points. If there are any questions, please contact MiTek Machinery Division Customer Service.

WARNING	
	<p><b>CRUSH HAZARD.</b></p> <p>Transport and lifting equipment such as forklifts and cranes must be designed and rated for the load and application. The weight of each major component is given in Table 2-3.</p> <p>Lift the equipment only at the lift points indicated by MiTek.</p> <p>If the equipment is transported incorrectly, equipment damage, personal injury, or death may result.</p>

Figure 3-1: Lift Points



## Unpacking

After successful unloading, remove the protective crating material from the pallets. Detach and set aside all loose parts. Move the equipment to the desired location using a forklift or crane appropriate to the weight of each unit. Lift the equipment to remove the pallet, and gently place each unit in its new location.

## Equipment Layout

Each component must be located in specific locations. Refer to your own layout during installation. Your MiTek representative will provide your layout to you before the equipment is installed.

## Hydraulic System

### Hydraulic Fluid

See Table 2-2 on page 16 for hydraulic fluid specifications. The indicated amount of hydraulic fluid must be available during installation.

Fill the reservoir until the fluid level shows in the site/thermometer gauge on the operator-end reservoir at approximately two (2) in. from the top surface of the reservoir.

CAUTION	
	<p><b>PERSONAL INJURY HAZARD.</b></p> <p><b>Do NOT overfill. Avoid spillage.</b></p> <p><b>Clean up any spillage immediately to avoid injury.</b></p>

### Connecting the Hoses

Refer to your hydraulic power unit drawing, Drawing 70440-501, for hydraulic connections.

### Electrical Connections to the HPU

Refer to your electrical schematic for proper electrical connections to the HPU.

## Electrical System

WARNING	
	<p><b>ELECTROCUTION HAZARD.</b></p> <p><b>All electrical work must be performed by a qualified electrician.</b></p> <p><b>Follow approved lockout/tagout procedures (OSHA 29 CFR 1910.147).</b></p>

### Checking Existing Wiring

Heavy gauge wire can work loose during shipping and handling. Before power is connected to the machine, conduct a pull test on all pre-wired connections inside the electrical enclosures.

### Connecting Power to the Equipment

All electrical work is the customer's responsibility and must be performed by a qualified electrician. The machine design addresses electrical components starting with the disconnect enclosure. Installation and maintenance of all electrical requirements up to the disconnect enclosure are the responsibility of the customer. Your MiTek representative can provide guidance regarding when the electrical will need to be available during the installation.

The Horizontal Stacker system has electrical enclosures on the heater panel, motor panel(s), and PLC main panel. All electrical enclosures are equipped with a disconnect that has short circuit protection (SCP) required for that panel only.

### Purpose of Chapter

This chapter describes the procedures required before operating your equipment.

## Preparing the Hydraulic System

Fill the hydraulic reservoir with hydraulic fluid that matches the specification listed in Table 2-2 on page 16. Ensure that you have the required amount of hydraulic fluid prior to planning the startup. The reservoir should be filled to within 2 in. from the top. Watch the sight gauge on the operator end of the reservoir to determine the fill level. Refer to the procedure on page 59 in the *Maintenance* chapter.

## Checking Motor Rotation

Check the motor rotation of the hydraulic system motor to ensure it is rotating in the same direction as the arrow on its housing. Refer to the electrical schematic in Drawing 90436 to remedy a motor rotating in the wrong direction.

## System Startup

1. Turn on all disconnects.
2. Select RADIO Turn the transmitter on now and press the ON button located in the lower right corner of the transmitter.
3. Press the AUTO START pushbutton located on the front cover of the stacker panel(s). This is a green illuminated pushbutton, and the light should remain on.
4. Set up receiver stands for the first truss.
5. Select a stacking area. The area is selected using the AREA # pushbuttons. These are illuminated pushbuttons. The first time the pushbutton is pressed, that area is selected and its light will blink. Pressing the same button again de-selects that area and its light will turn off.

### NOTICE

**When the RESET pushbutton is pressed, the Horizontal Stacker will stop any motion and de-select any stacking areas selected.**

**When any E-STOP is pressed, it will stop all system motion by removing power to all motor contactors and solenoids. It does this by disengaging the master control relay, which is indicated by the green POWER ON light turning off. This means the system must be restarted before any of the controls will be operational.**



If the truss is going to be stacked using Manual Mode, see the *Manual Mode* section on page 33.

6. Select PUSHBUTTON.
7. Press the AUTO START pushbutton located on the front cover of the stacker panel(s). This is a green illuminated pushbutton, and the light should remain on.
8. Set up receiver stands for the first truss.
9. Select a stacking area. The area is selected using the AREA # pushbuttons. These are illuminated pushbuttons. The first time the pushbutton is pressed, that area is

selected and its light will blink. Pressing the same button again de-selects that area and its light will turn off.

## NOTICE

**When the RESET pushbutton is pressed, the Horizontal Stacker will stop any motion and de-select any stacking areas selected.**

**When any E-STOP is pressed, it will stop all system motion by removing power to all motor contactors and solenoids. It does this by disengaging the master control relay, which is indicated by the green POWER ON light turning off. This means the system must be restarted before any of the controls will be operational.**



If the truss is going to be stacked using Manual Mode, see the *Manual Mode* section on page 33.

### Purpose of Chapter

This chapter describes the operating mechanisms on this equipment and the procedure to operate it in most circumstances.

## Safety During Operation

The MiTek Horizontal Stacker system is equipped with Emergency Stop (E-stop) controls. The operator must become familiar with the location and operation of these devices by reviewing the location and testing the function of each.

<b>WARNING</b>	
	<p><b>CRUSH, CUT, AND PERSONAL INJURY HAZARD.</b></p> <p><b>To avoid serious personal injury, never operate the Horizontal Stacker without all guards in place, and never disconnect or bypass any safety device or electrical interlock.</b></p> <p><b>Always block the transporter scissor arms with steel spacers before reaching into the transporters.</b></p> <p><b>Failure to exercise care may result in serious injury or death.</b></p>
<b>WARNING</b>	
	<p><b>PERSONAL INJURY HAZARD.</b></p> <p><b>Never remove or paint over warning labels. If labels become deteriorated or damaged, request new ones through our Customer Service Department.</b></p>
<b>WARNING</b>	
	<p><b>PERSONAL INJURY HAZARD.</b></p> <p><b>Only qualified personnel should attempt to perform installation, repair and/or maintenance. Compliance with minimum recommendations outlined through this manual is essential.</b></p> <p><b>Failure to exercise care may result in serious injury or death.</b></p>

## Controls

Each system (consisting of either one or two Horizontal Stackers) has a manual control panel, pushbutton station, and a remote radio transmitter. They are shown in Figure 5-1, Figure 5-2, and Figure 5-3. The radio transmitter allows the operator to move around as he/she controls the system.

**Figure 5-1: Manual Control Panel**

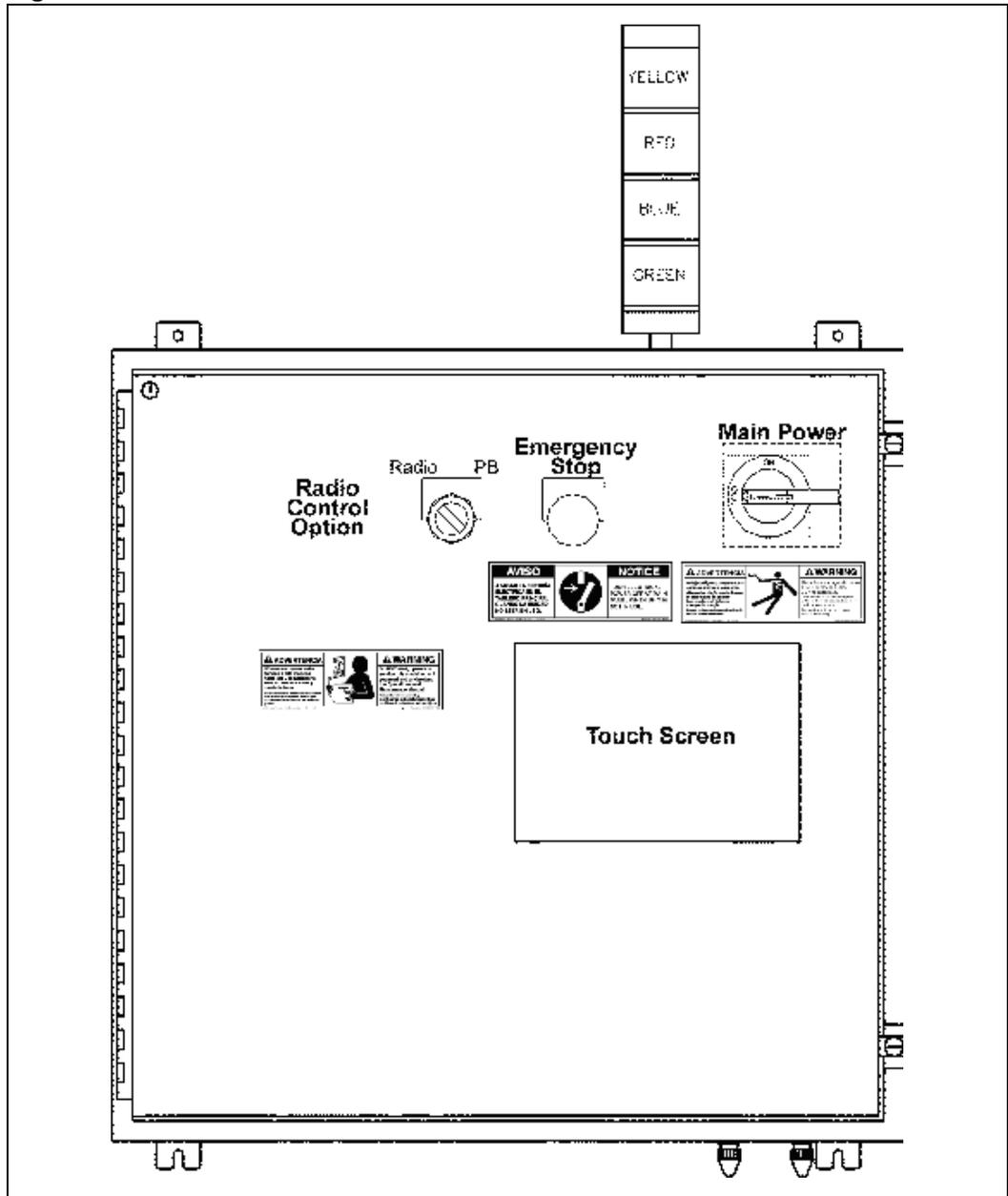


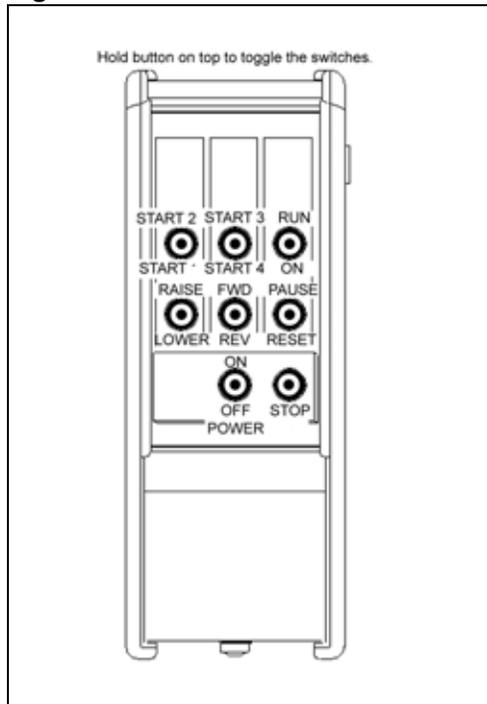
Figure 5-2: Pushbutton Station



**Pushbutton Station Controls**

POWER ON	Light that indicates disconnect handle is turned on and Auto Mode is started.
AUTO START	Begins the automatic cycle.
MAN/AUTO	Places selected stacker in Manual or Auto Mode.
E-STOP	Shuts down stacker.
AREA 1, 2, 3, 4	Selects stacking area. (scanner target light blinks when not in AUTO MODE SHORTCYCLE).
FORWARD	Extends/retracts transporters in Manual Mode.
REVERSE	Retracts/extends transporters in Manual Mode.
RAISE	Raises transporters to highest position in Manual Mode.
LOWER	Lowers transporter in Manual Mode.
RESET	Deselects any stacking areas selected (system reset).

**Figure 5-3: Remote Radio Transmitter**



**Remote Radio Transmitter Controls**



You must hold the button on the top of the unit to toggle these switches.

START 1/START 2	Toggle the switch to select zone 1 or zone 2 for the location to start stacking trusses and to turn on the hydraulic units of stackers 1 and 2 if they are off.
START 3/START 4	Toggle the switch to select zone 3 or zone 4 for the location to start stacking trusses and to turn on the hydraulic units of stackers 3 and 4 if they are off.
RUN/ON	Toggle to RUN to put the system in an automatic run cycle; toggle once to ON to pause the stacker and toggle a second time to ON to remove the pause and begin motion.
RAISE/LOWER	Toggle the switch to manually raise or lower the stacker(s).
FWD/REV	Toggle the switch to manually move the stackers forward or in reverse to move them in or out of the stacking zones.
PAUSE/RESET	Toggle the switch to PAUSE to pause the conveyors before the first stacker; toggle to RESET to reset any faults.
POWER ON/OFF	Turns power to the remote radio transmitter on or off.
STOP	A pushbutton that disables all radio transmitter outputs including RD0 which is hardwired into the E-stop circuit.

## Stopping the Machine

WARNING	
	<p><b>CRUSH, CUT, AND PERSONAL INJURY HAZARD.</b></p> <p>The operator must be in a location where all moving components are clearly visible, and must not start any sequence until all personnel are clearly out of any area where contact with moving components can occur.</p> <p>Failure to exercise care may result in serious injury or death.</p>



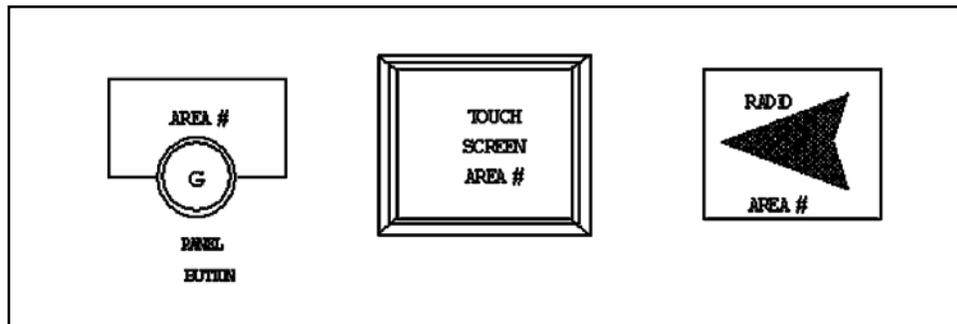
Each Horizontal Stacker has a POWER ON and an E-STOP pushbutton located on the starter panel. The E-STOP pushbuttons located on the starter panels operate on (shut down) their respective Horizontal Stacker only, while the E-STOP pushbutton located on the remote pushbutton station will shut down the entire system as a whole.

## Operating Procedures

### Operation at Startup

Figure 5-4 represents the three different methods of initiating an operation function. The operator may use any of these methods. Most functions can be performed from the remote pushbutton station, the touch screen, or the remote radio transmitter.

**Figure 5-4: Methods of Initiating an Operation Function**



To select an area zone, the operator must press the area pushbuttons. If another zone area had been previously selected, pressing an area button will reset the previously selected area and the auto run cycle.

To have trusses stacked in two zones, the operator should press AREA 1 and AREA 3 at the same time, or AREA 2 and AREA 4 at the same time. The trusses will be stacked in two areas instead of one area.

Once the area is selected, the hydraulic units associated with the selected area will be started up. The pilot light on the operator pushbutton panel, the area zone light, and the associated light on the beacon tower will be blinking until the AUTO START button is pressed. Then the light will remain illuminated.

The operator will need to re-select the area zone only when needed. If multiple trusses are going to the same area zone continuously, AREA # and AUTO START need to be selected only once.

When the area is selected, make sure the AUTO/MAN selector switch is in the Auto Mode and press the AUTO START button. This will start the auto control sequence.



Operators can only select single area zones on the touch screen.

Double area zones can only be selected on the operator remote pushbutton station or the remote radio transmitter unit.

Remember, there is a timing function related to the time the operator must hold the pushbuttons down before the system will acknowledge that an area has been selected. This timing interval is set by the user. Refer to the Quick Panel Setup screen, Figure 5-8 for more information.

The variable is the Select Area PB time. The proper values to enter are 3 to 50 tenths of a second. The minimum value is .3 seconds and the maximum value is 5 seconds. This timing interval reflects how long the operator will need to keep the area pushbuttons depressed before the system acknowledges that a area has been selected by option and not by mistake. The nominal time entered should be at least 1 second or the value 10. This will give the most protection without having to waste extra holding time. The timing value affects only the area select pushbuttons.

To enter a value press the appropriate button, and a numeric data entry screen will appear. Enter the value and press ENTER. The new value will be written to the PLC controller and will remain unchanged until changed again by an operator.

## Automatic Mode

To start the Automatic Mode the operator must select the area first, and the MAN/AUTO selector switch must be in the auto position. Once the zone area has been selected, the operator must press the AUTO START pushbutton. The pilot light on the pushbutton panel and the indicator on the touch screen will illuminate when the Automatic Mode has been engaged. If another zone area is selected, pressing an area button will reset the auto run cycle.

When the auto run cycle is engaged, the operator can begin to send the trusses out to the stackers. Remember, the bottom of the truss needs to be facing the selected stacking area. This will ensure the target scanner photo eyes will detect the truss once it has reached its targeted area. Once the truss has been detected, the stacker will automatically stack and return to home position and wait for the next truss.

1. Set the scanner target location. The scanner target is normally set so that when the transporters lift the truss, the truss will be centered on the transporters.
2. Once a stacking area has been selected, the Horizontal Stacker can be placed in Automatic Mode by pressing the AUTO START pushbutton; this will place all

areas selected in Automatic Mode. When an area is placed in Automatic Mode, its area light will stop blinking and remain on.

#### NOTICE

**Automatic Mode cannot be entered unless all the transporters required for the area selected are in the "home" position (lowered and centered).**

**Once the Stacker is placed in Automatic Mode, it will remain in Automatic Mode until one of the following conditions is met:**

- a. An Emergency Stop is operated.**
- b. The RESET pushbutton is pressed.**
- c. The area is turned off.**

**If the cycle is interrupted by a, b, or c above, the system must be restarted and the cycle finished manually.**

Once the system is placed in Automatic Mode, the system will stack the truss when the corresponding target is actuated. The system will then wait for the next truss.

## Manual Mode

1. Once the truss has reached the desired position, raise the transporters to their highest position using the RAISE pushbutton.
2. Once the transporters are raised to their highest position, fully extend the transporters using the FORWARD pushbutton.
3. After extending the transporters to full extension, lower the transporters with the LOWER pushbutton. Each transporter will only lower until either the flag switch is tripped or it reaches its lowest position.
4. Once the transporters are lowered, retract the transporters to their center position with the REVERSE pushbutton.
5. If the transporters are not at their lowest position at this time, they should be placed there now using the LOWER pushbutton.

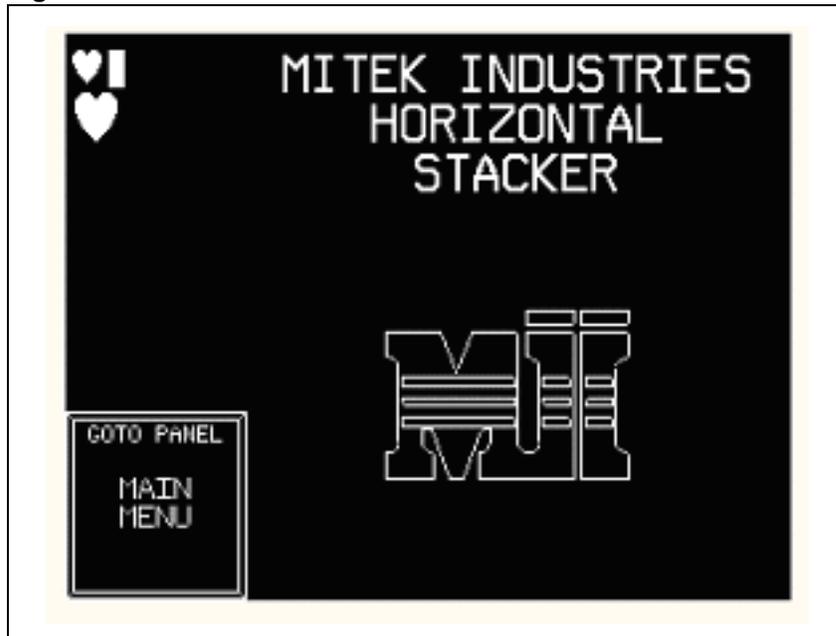
#### NOTICE

**In Manual Mode, each movement must be fully completed before the transporter will execute the next movement.**

## Software Operation

### Software Screens

Figure 5-5: Touch Screen

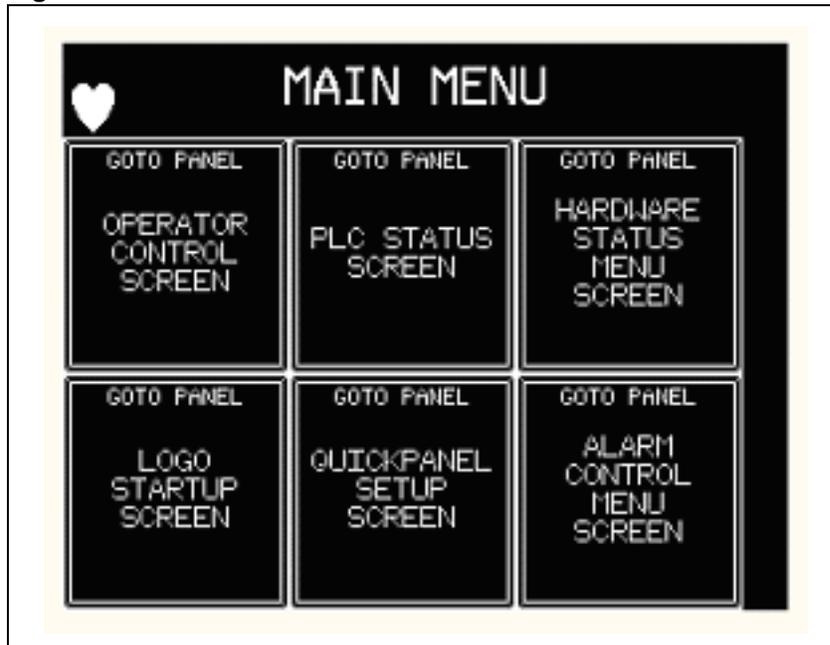


The MiTek equipment Logo screen (touch screen) is the first screen displayed when the system is started up. The operator may leave this screen displayed if no other touch screen functions or information is needed.

The operator can go to the Main Menu screen by pressing the pushbutton labeled MAIN MENU.

The heartbeat emblem in the upper left corner monitors the presence of the PLC (Programmable Logic Controller) controller. If the heartbeat stops flashing, the PLC controller is not responding to the touch screen inquiries. Check to make sure the PLC controller is powered, the cables that attach the touch screen and PLC are secure, and that the PLC controller is in Run Mode. To check these items the operator must open the main control panel where the touch screen and PLC controller are installed.

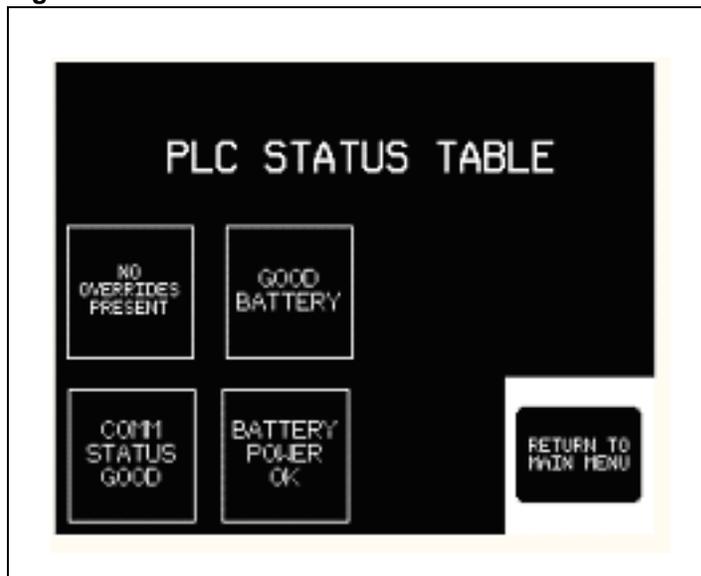
Figure 5-6: Main Menu Screen



The Main Menu screen has several screen options for the operator to choose. The following is a list of the screen options and a brief description:

- Operator Control Screen—This screen contains the AREA SELECT, the AUTO RUN, and the RAISE/LOWER/FORWARD/REVERSE pushbuttons.
- PLC Status Screen—This screen monitors information internal to the PLC controller and the communication status.
- Hardware Status Menu—This screen contains another menu that allows the operator to view the status of hardware devices.
- Logo Startup Screen—This screen returns to the MiTek default startup screen.
- QuickPanel Setup Screen—This screen allows the operator to view and change the display contrast and specific PLC timing features.
- Alarm Control Menu—This screen contains another menu that allows the operator to view the status of alarm devices.

**Figure 5-7: PLC Status Table Screen**



The PLC Status Table screen monitors three of the PLC internal status bits: presence of overrides, battery status, and battery power.

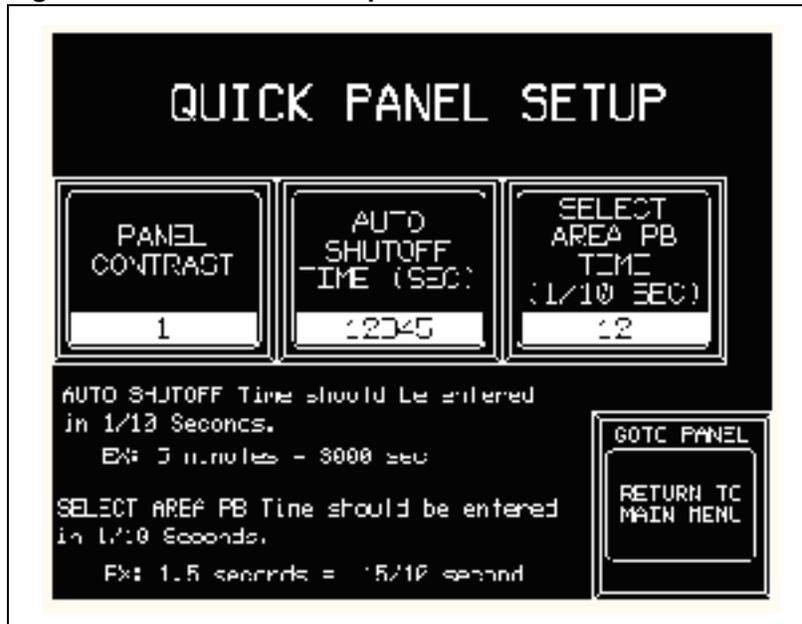
**NO OVERRIDES PRESENT**—This indicator monitors whether any internal points in the PLC program have been forced to a condition. This information is more for the benefit of MiTek personnel. It is a visual reminder to reset all forced conditions after testing.

**GOOD BATTERY**—This indicator is set ON to indicate a bad battery.

**COMM STATUS**—This indicator monitors the touch screen variable System\_Comm\_Status. It is set to ON if the touch screen loses communication with the PLC controller. If communication has been reestablished, the indicator will remain ON. This information only resets if the display touch screen is power cycled and the communication status is good at the next power cycle. This information is monitored so that the operator will know at startup whether communication between the touch screen and PLC controller was established.

**BATTERY POWER**—This indicator is set ON when a battery power fault has occurred.

Figure 5-8: Quick Panel Setup Screen



The Quick Panel Setup screen allows the operator to change certain variables within the system. These variables can be customized by users depending on how they want their system to operate. The three variables are display contrast, automatic shutoff time, and area select pushbutton timing. These variables are the only values within the system itself that the operators can customize to their needs.

The first variable is the *contrast setting* for the screen display itself. The proper values to enter are 0 to 7. Zero is the default setting every time the display is power cycled. The higher the setting value, the brighter the contrast becomes.

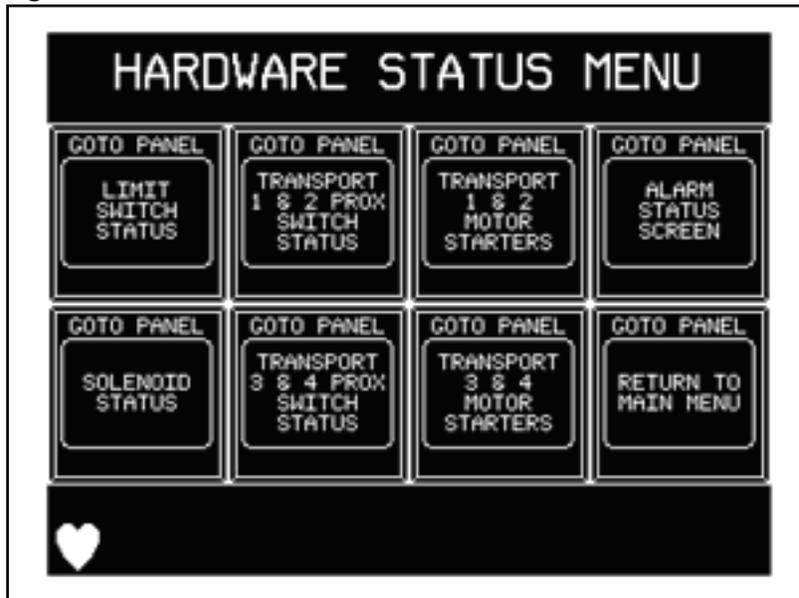
The second variable is the *auto shutoff time* resident in the PLC controller. The proper values to enter are 3000 to 32767 tenths of a second. That corresponds to 5 minutes being the least time interval and 54.5 minutes being the maximum time interval. The time set by the operator controls the interval time for auto shutdown of the hydraulic units. If there is no activity for the specified time interval, then the program will shut off the hydraulic units automatically.

The third variable is the *select area PB time* resident in the PLC controller. The proper values to enter are 3 to 50 tenths of a second. That means the minimum value is .3 seconds and the maximum value is 5 seconds. This timing interval reflects how long the operator will need to keep the area pushbuttons depressed before the system acknowledges that an area has been selected by option and not by mistake. The nominal time should be at least 1 second or the value 10 being entered. This will give the most protection without having to waste extra holding time. The timing value only affects the area select pushbuttons.

To enter a value, press the appropriate button, and a numeric data entry screen will appear. Enter the value and press ENTER. The new values will be written to the corresponding variable.

The two time intervals that reside within the PLC controller (Auto Shutoff and Area PB time) will remain unchanged from that last entered value until changed again by an operator. The contrast variable is the only one that returns to the display default value when powered.

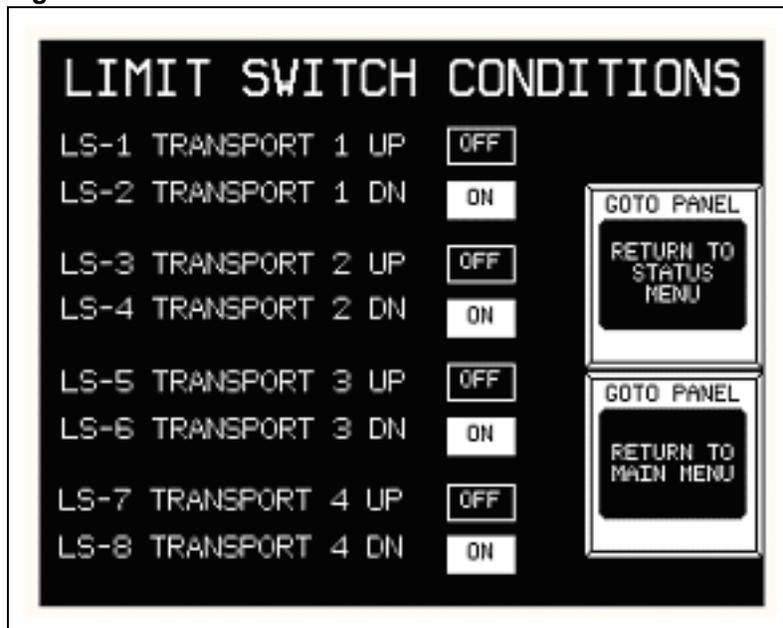
**Figure 5-9: Hardware Status Menu Screen**



The Hardware Status Menu screen has several screen options for the operator to choose. The following is a list of the screen options and a brief description of each:

- Limit Switch Status—This screen monitors the raise and lower limit switches.
- Solenoid Status—This screen monitors the raise and lower solenoids.
- Transport 1 & 2 Prox—This screen monitors the prox switches for Zones 1 and 2.
- Transport 3 & 4 Prox—This screen monitors the prox switches for Zones 3 and 4.
- Transport 1 & 2 Motors—This screen monitors the motor starters and auxiliary contacts for Zones 1 and 2.
- Transport 3 & 4 Motors—This screen monitors the motor starters and auxiliary contacts for Zones 3 and 4.
- Alarm Status Menu—This screen offers another menu for the alarm screens.
- Return to Main Menu—This option returns the operator to the Main Menu screen.

**Figure 5-10: Limit Switch Conditions Screen**

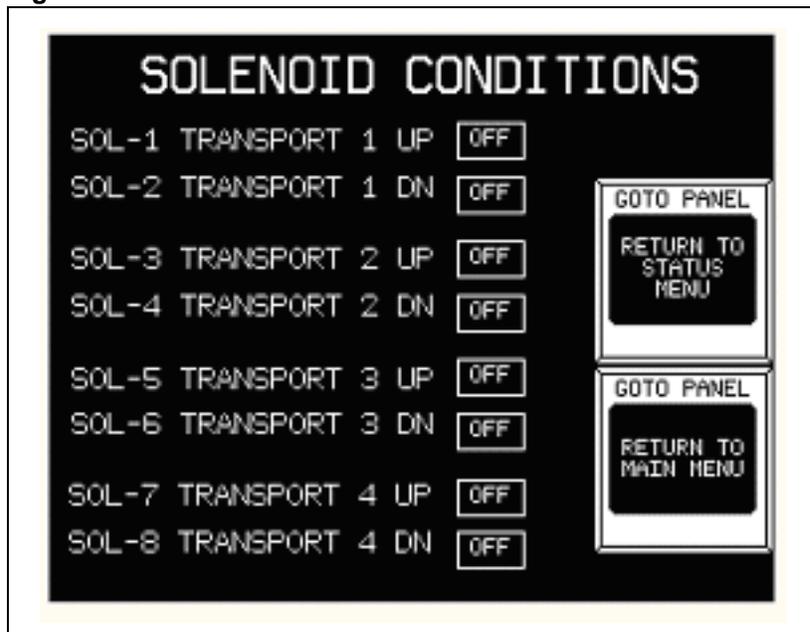


The Limit Switch Conditions screen will monitor the transport up and down limit switch condition. As shown here on the sample screen, when the limit switch is activated the indicator will be highlighted and the word ON will display. The same indicator will not be highlighted and will display OFF when the limit switch is inactive.

For those customers who purchased the 2-zone system, limit switches LS-5 through LS-8 will always be inactive.

The operator may return to the Hardware Status Menu screen or go to the Main Menu screen from this screen.

**Figure 5-11: Solenoid Conditions Screen**

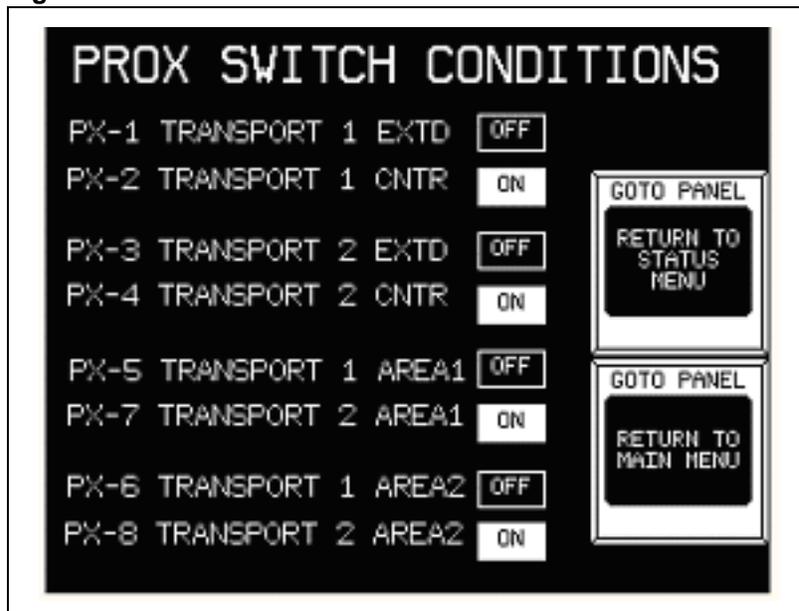


The Solenoid Conditions screen will monitor the transport up and down solenoid condition. Though not shown on the sample screen, when the solenoid is activated the indicator will be highlighted and the word ON will display. The same indicator will not be highlighted and display will be OFF when the solenoid is inactive.

For those customers who purchased the 2-zone system, limit switches SOL-5 through SOL-8 will always be inactive.

The operator may return to the Hardware Status Menu screen or go to the Main Menu screen from this screen.

**Figure 5-12: Prox Switch Conditions Screen**



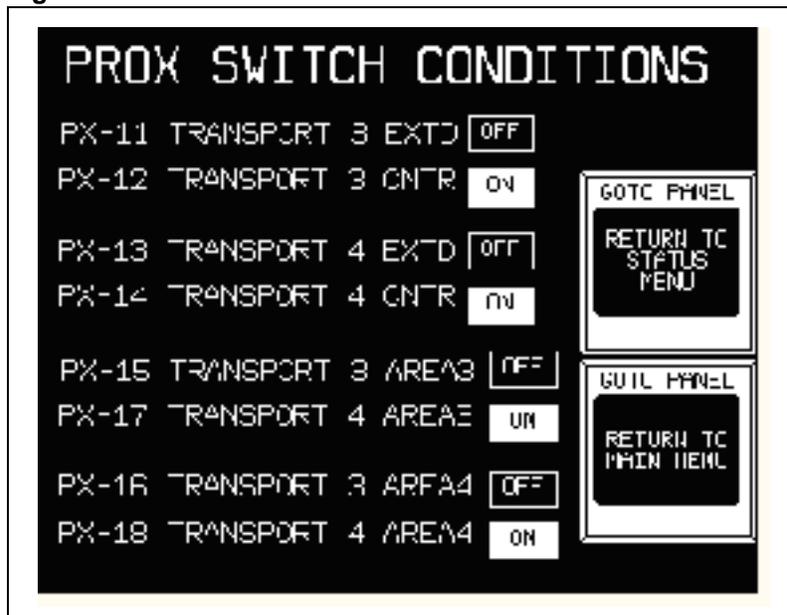
The Prox Switch Conditions screen will monitor the transport up and down prox switch condition for zones 1 & 2. As shown on the sample screen, when the prox switch is active the indicator will be highlighted and the word ON will display. The same indicator will not be highlighted and display is OFF when the prox switch is inactive.

So as to not be confusing, an explanation of the proximity switches is in order here. The prox switches are normally closed active. This means when the prox is not detecting anything, its natural state is ON. When the prox has detected the extended and centered flags, the prox will deactivate and the indicator will display OFF.

The prox switches for the zone areas are normally OFF, since the prox is always detecting the area flag. When the transporter is lowering a truss onto the stack, the area flags will be lifted and the area prox will turn ON, denoting the top of the stack has been detected because it can no longer read the area flag.

The operator may return to the Hardware Status Menu screen or go to the Main Menu screen from this screen.

**Figure 5-13: Prox Switch Conditions Screen**



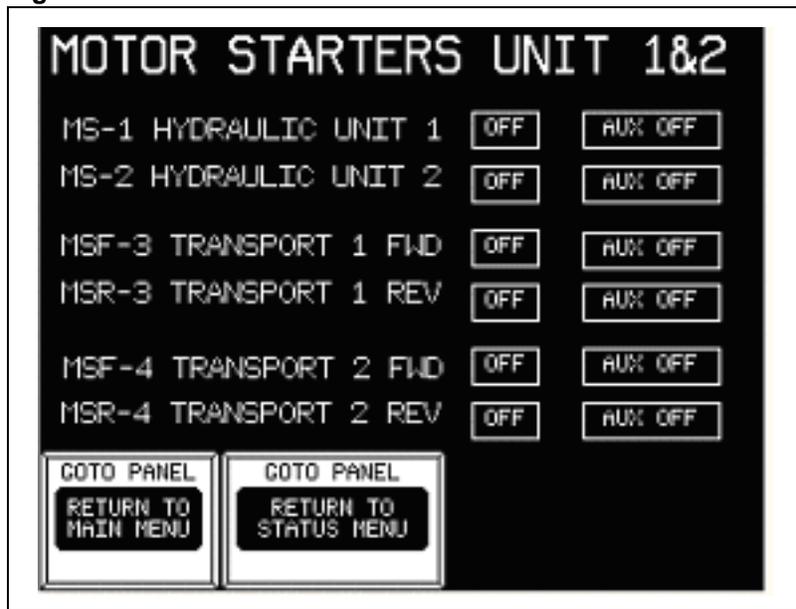
The Prox Switch Conditions screen will monitor the transport up and down prox switch condition for zones 3 & 4. For customers without a 4-zone system, this screen is not applicable and all indicators will display OFF. As shown here on the sample screen, when the prox switch is active the indicator will be highlighted and the word ON will display. The same indicator will not be highlighted and display OFF when the prox switch is inactive.

So as to not be confusing, an explanation of the proximity switches is in order here. The prox switches are normally closed active. This means when the prox is not detecting anything, its natural state is ON. When the prox has detected that it has sensed the extended and centered flags, the prox will deactivate and the indicator will display OFF.

The prox switches for the zone areas are normally OFF since the prox is always detecting the area flag. When the transporter is lowering a truss onto the stack, the area flags will be lifted and the area prox will turn ON, denoting the top of the stack has been detected because it can no longer read the area flag.

The operator may return to the Hardware Status Menu screen or go to the Main Menu screen from this screen.

Figure 5-14: Motor Starters Unit 1&2



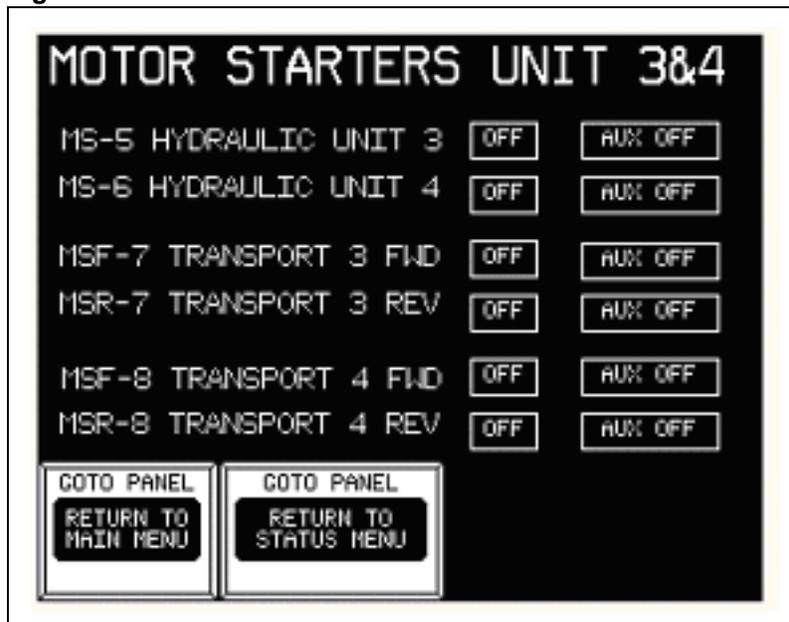
The Motor Starters Unit 1 and 2 screen will monitor the motor signals and the auxiliary contacts for transport units 1 and 2. As shown here on the sample screen, when the motor signal command from the PLC controller is given, the indicator will be highlighted and the word ON will display. The auxiliary indicator will be highlighted and display AUX ON when the motor starter has responded to the PLC signal to turn the motor on. This screen will help the operator detect hardware failure conditions such as welded contacts on the motor starter or failure of the contactor to respond.

If for any reason the PLC output signal displays OFF and the auxiliary displays ON, then the motor starter contactor has welded and is defective. The starter needs to be replaced immediately.

If the PLC signals the motor starter to turn ON and the contactor does not respond within 2 seconds, then a system fault is encountered. The PLC program has an internal timer watching for a response from the auxiliary contact when it sends the motor start signal. If this failure should happen, the program turns the output OFF and a system fault will display. The wiring needs to be checked first to see if there are any loose wires going to or from the starter or auxiliary contacts. If wiring is not the issue, then replace the starter.

The operator may return to the Hardware Status Menu screen or go to the Main Menu screen from this screen.

Figure 5-15: Motor Starters Unit 3&4



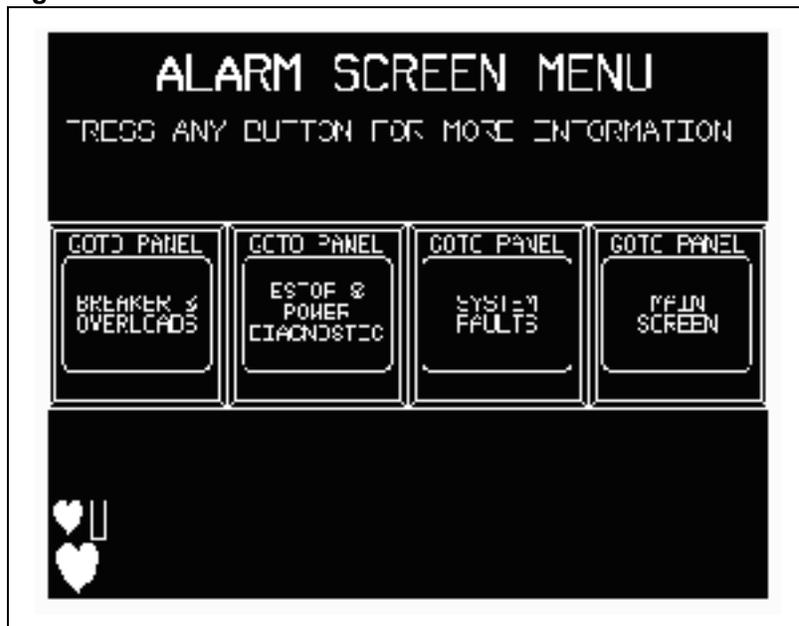
The Motor Starters Unit screen will monitor the motor signals and the auxiliary contacts for transport units 3 and 4. For customers without a 4-zone system, this screen is not applicable and all indicators will display OFF. As shown here on the sample screen, when the motor signal command from the PLC controller is given, the indicator will be highlighted and the word ON will display. The auxiliary indicator will be highlighted and display AUX ON when the motor starter has responded to the PLC signal to turn the motor on. This screen will help the operator detect hardware failure conditions such as welded contacts on the motor starter or failure of the contactor to respond.

If for any reason the PLC output signal displays OFF and the auxiliary displays ON, then the motor starter contactor has welded and is defective. The starter needs to be replaced immediately.

If the PLC signals the motor starter to turn ON and the contactor does not respond within 2 seconds, then a system fault is encountered. The PLC program has an internal timer watching for a response from the auxiliary contact when it sends the motor start signal. If this failure should happen, the program turns the output OFF and a system fault will display. Again, check the wiring first to see if there are any loose wires going to or from the starter or auxiliary contacts. If wiring is not the issue, then replace the starter.

The operator may return to the Hardware Status Menu screen or go to the Main Menu screen from this screen.

Figure 5-16: Alarm Screen Menu Screen

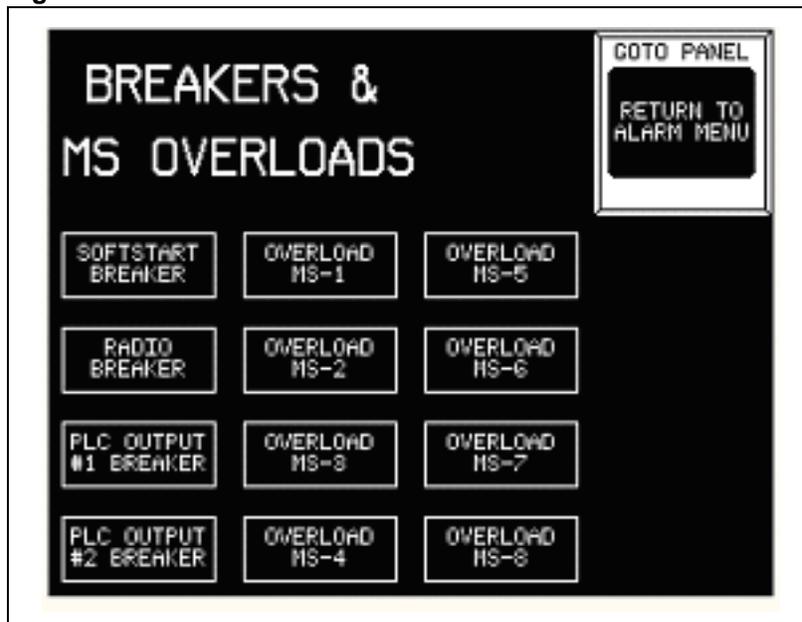


The Alarm Screen Menu screen has several screen options for the operator to choose. The following is a list of the screen options and a brief description of each:

- Breakers & Overloads—This screen monitors the breakers and overloads.
- Power Diagnostics—This screen monitors all E-stop points for power loss.
- System Faults—This screen monitors motor response for fault status.
- Main Screen—This option returns the operator to the Main Menu screen.

The heartbeat emblem in the lower left corner monitors the presence of the PLC controller. This heartbeat can be found on several screens. If the heartbeat stops flashing, the PLC controller is not responding to the touch screen inquiries. Check to make sure the PLC controller is powered, the cables that attach the touch screen and PLC are secure, and that the PLC controller is in Run Mode.

Figure 5-17: Breakers & MS Overloads Screen



The Breakers & MS Overloads screen will monitor the system circuit breakers and the overloads. When a breaker or overload is tripped, the indicator will begin to flash and will remain flashing until the condition has been fixed.

For those customers who purchased the 2-zone system, overloads MS-5 through MS-8 will always be inactive.

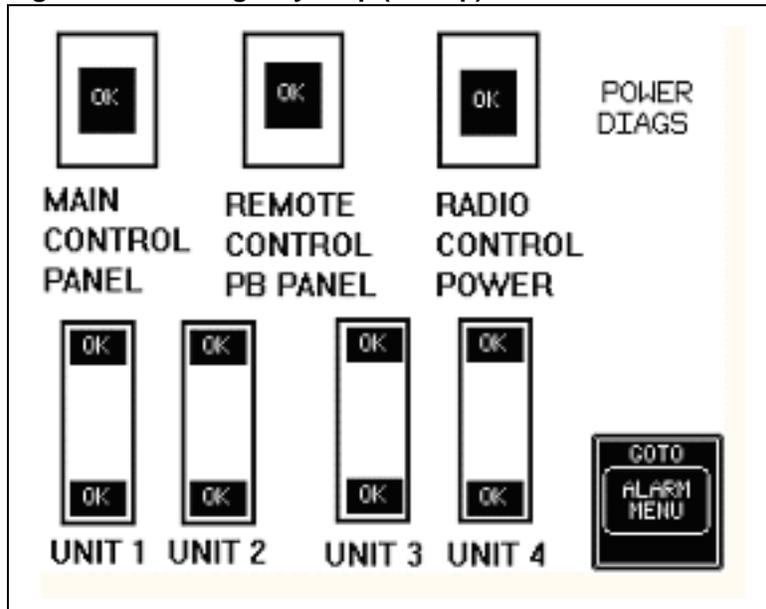
- To reset a circuit breaker, open the main control panel and reset the appropriate breaker.
- To reset an overload, open the appropriate motor control panel and reset the overload.

The indicators will return to the normal non-flashing state when the condition has been reset.

See electrical drawings for placement of circuit breakers and overloads.

The operator can return only to the Alarm Menu screen from this screen.

**Figure 5-18: Emergency Stop (E-Stop) Points Monitor Screen**



The Emergency Stop (E-stop) Points Monitor screen will monitor the system Emergency Stop (E-stop) points. The 2-zone system has 7 monitored points, and the 4-zone system has 11 monitored points. Since there are several hardware devices that can trigger an emergency stop situation, this screen was developed for ease in troubleshooting. If one of the devices triggers an emergency stop condition, the operator can easily detect which device was affected. The following devices are monitored:

- E-stop pushbutton on the main control panel
- Remote E-stop button on the pushbutton panel
- Radio timed stop when radio switch is in the ON position
- LS-11 Tip limit switch on transporter 1
- LS-12 Tip limit switch on transporter 1
- LS-13 Tip limit switch on transporter 2
- LS-14 Tip limit switch on transporter 2
- LS-15 Tip limit switch on transporter 3
- LS-16 Tip limit switch on transporter 3
- LS-17 Tip limit switch on transporter 4
- LS-18 Tip limit switch on transporter 4

For normal conditions on the screen, all device indicators should display OK. When one of the items listed above detects loss of power, a test for the location is processed. The device that tripped will flash and display ERR (error condition). The indicator will remain flashing as long as the PLC program is monitoring a loss of power.

## Managing Alarm Conditions

The two previous alarm screens are supervisory screens only. The system will watch for these conditions, but will not require the operator to deal with the condition. When any tripped breaker, overload, or power loss condition is detected by the PLC controller, the alarm screen will automatically display. The PLC program will alert the touch screen to display the appropriate screen. This is a one-shot message. If the operator chooses to change the screen while the condition is still present, the screen will not return to the alarm screen automatically. If the condition is resolved and another condition presents itself again, the PLC controller will alert the touch screen to display the new condition alarm screen.

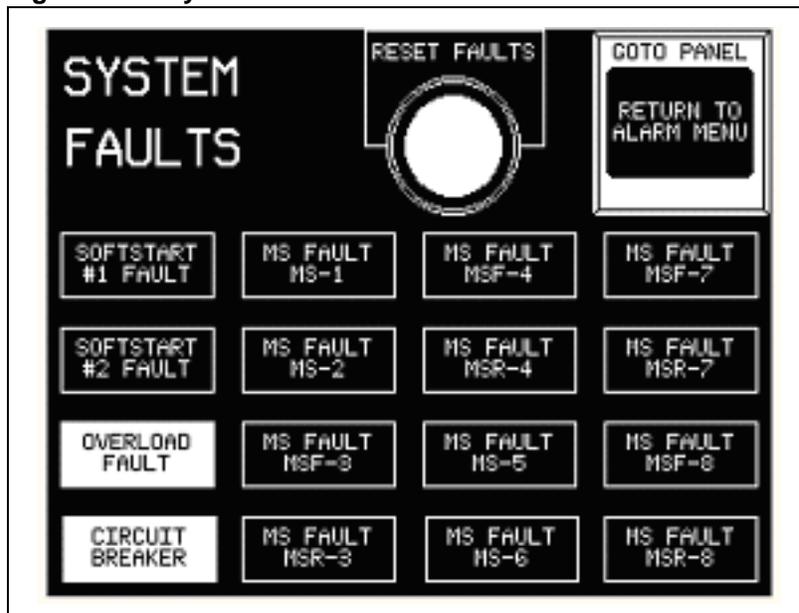
If a tripped breaker or overload alarm is present and then a power loss occurs, the display will show the last alarm screen. The Power Diagnostic screen will display. The previous breaker/overload condition still exists, so the operator can return to the Alarm Screen Menu screen and then go to the Breakers & MS Overloads screen to review which device was tripped.

The next screen to be discussed is the System Faults screen, as shown in Figure 5-19. This alarm screen overrides the two previous screens. This alarm screen requires the operator to acknowledge the fault by responding to the condition. The screen has a reset pushbutton that will reset the system fault condition. The pushbutton control panel as well as the radio control hand unit will also have a reset function. If the operator is using radio control and does not have a clear view of the screen, he will still know when a system fault occurs. All zone lights, beacon lights, and pushbutton panel pilot lights will be flashing. The system will not operate if a system fault is detected.

When a system fault condition is detected by the PLC controller, the alarm screen will automatically display. The PLC program will alert the touch screen to display the appropriate screen. This is NOT a one-shot message. The operator cannot change the screen while the condition is still present. The operator must reset the alarm before the screen will return to the Alarm Screen Menu screen.

A system fault is the failure of any of the motors to respond to a start command. The conditions of all circuit breaker and overloads in general can be seen on the screen, but they do not trigger the alarm screen. Only those indicators associated with a motor starter will trigger the System Faults screen.

Figure 5-19: System Faults



The System Faults screen will monitor the system circuit breakers and the overloads as a general group, and each motor response failure. When a motor fault condition exists, the indicator will begin to flash and will remain flashing until the condition has been reset by the RESET FAULTS pushbutton. Only the motor fault conditions need to be reset by pressing RESET FAULTS. Refer to the *Managing Alarm Conditions* section on page 48 to review details.

For those customers who purchased the 2-zone system, motors MS-5 through MS-8 will always be inactive.

To check the status of a breaker or overload, go to the Alarm Screen Menu screen and then to the Breakers & MS Overloads screen.

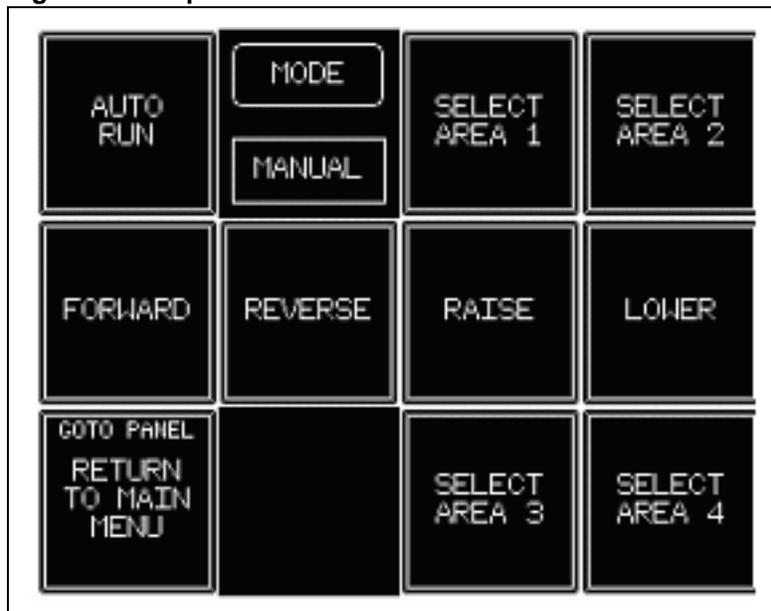
- To reset a circuit breaker, open the main control panel and reset the appropriate breaker.
- To reset an overload, open the appropriate motor control panel and reset the overload.

The indicators will return to the normal non-flashing state when the condition has been reset.

See the electrical drawings for placement of circuit breakers and overloads.

The operator can return only to the Alarm Screen Menu screen from this screen.

Figure 5-20: Operator Control Screen



The operator may use the Operator Control screen to access functions that are also accessed from the pushbutton panel and the radio transmitter unit. There are a few functions that this screen cannot perform. Selecting double zones cannot be done from the touch screen control. Refer to the the *Operating Procedures* section on page 31 for more information.

The Operator Control screen offers the following functions:

- Auto Run
- Select Area 1
- Select Area 2
- Select Area 3
- Select Area 4
- Raise transport unit (Manual Mode only)
- Lower transport unit (Manual Mode only)
- Forward transport unit (Manual Mode only)
- Monitor current mode (Auto or Manual Mode)

The operator can return only to the Main Menu screen from this screen.

### Purpose of Chapter

This chapter provides step-by-step instructions as well as information to help you understand how your equipment works to enable you to make repairs and perform preventive maintenance.

## Introduction to Maintaining Your Equipment

WARNING	
	<p><b>PERSONAL INJURY HAZARD.</b></p> <p><b>Only qualified personnel should perform any repair and/or maintenance. Compliance with minimum recommendations outlined throughout this manual is essential.</b></p> <p><b>Failure to comply with safety regulations may result in serious injury or death.</b></p>

### Performing Maintenance

Proper maintenance is essential to dependable performance of the *MiTek* Horizontal Stacker system. With today's busy production schedules and the prohibitive cost of downtime, it is vital that a company establish an effective maintenance program. A small expense incurred in following a planned maintenance program can be justified by minimized downtime to the machinery.

The Horizontal Stacker system requires maintenance, and it is important that all checks, adjustments, and lubrication procedures and schedules be strictly adhered to. Minimum preventive maintenance guides are given in this section. Certain operating environments (for example, extremely hot or dusty conditions) may necessitate maintenance in addition to that suggested in this manual or maintenance at more frequent intervals.

## Blocking Up the Stacker

Before beginning maintenance, it will be helpful to block up the edges of the Horizontal Stacker to provide a larger, safe workspace for maintenance personnel.

1. Cut four (4) pieces of 4x4 lumber into 4-ft lengths.
2. Raise the Horizontal Stacker into its extended position.
3. Place the cut lumber under each corner of the moveable zone of the Stacker.
4. Lower the Stacker onto the lumber.
5. Verify that the lumber holding the moveable portion of the Stacker is stable.
6. Lockout/tagout the machine and proceed with maintenance.

## Lubrication

### General

Proper oil levels must be maintained at all times, and parts requiring greasing are to be serviced as shown on the lubrication charts. Service life and efficiency of gears, bearings, etc., are affected by the type of lubrication used, frequency of application, oxidation, and contamination of the lubricant. Improved performance will be obtained by periodic lubrication in accordance with this manual's recommendation.

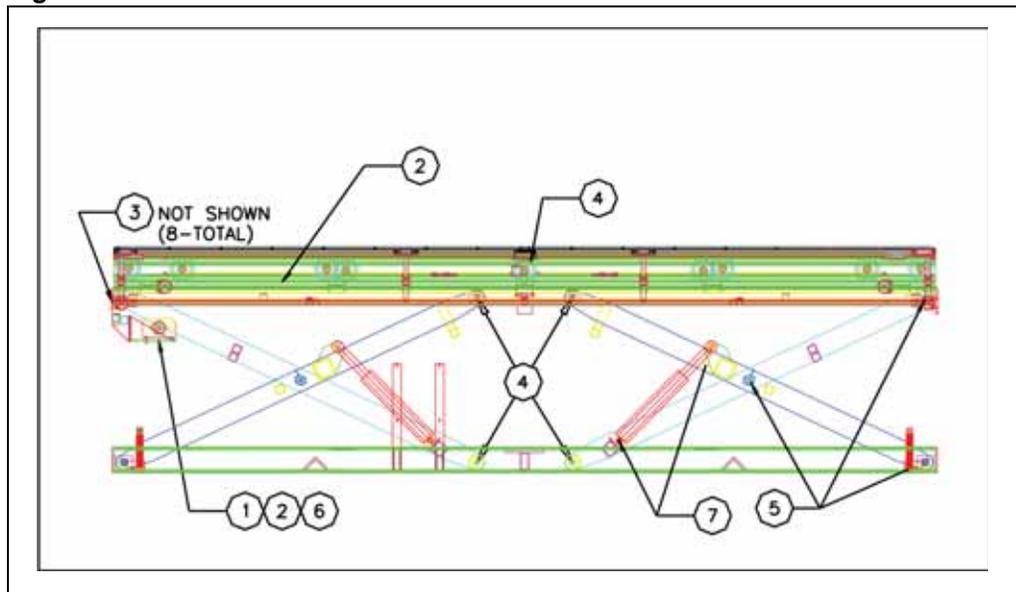
More bearing failures are caused by dirt introduced during greasing than from insufficient grease. Before beginning oiling or greasing, remove all dirt and old lubricant from the area around filler plugs and grease fittings. Filler plugs should not be removed or grease fitting connections made until cleaning is finished. After lubrication is completed, surplus oil and grease may be removed with the use of a grease solvent.

### Horizontal Stacker Lubrication Locations

Figure 6-1 shows the lubrication locations for the Horizontal Stacker system. The numbers shown correspond with the area to be lubricated as shown in Table 6-1.

Table 6-1 shows the areas to be lubricated and the lubricant.

**Figure 6-1: Horizontal Stacker Lubrication Locations**



**Table 6-1: Horizontal Stacker System Lubrication Chart**

Number in Figure 6-1	Areas to Be Lubricated	Lubricant	Mfr's Number and Grade	Hours of Operation					
				8	16	40	200	500	1,000
1	Electric Motor	(See Note)	Impact Grease	(See Note)					X
<p><i>Note: The motor is equipped with double-shield ball bearings with sufficient grease for normal operation. Where the motor is used regularly in a dirty, wet, or corrosive atmosphere, it is advisable to add 1/4 ounce of grease per bearing every 1,000 hours of operation.</i></p>									
2	Roller Chain	Oil: Manual lubrication applied by brush or spray every month	Roller Chain Lube	X					
3	Pillow Block Bearing (not shown) (8 ea.)	Grease	Lithium Based - NLGI No. 2						X
4	Wheel Bearings	Grease (one shot)	Lithium Based - NLGI No. 2						X
5	Scissors, Arm bushings	Grease	Lithium Based - NLGI No. 2					X	
6	Hydraulic Cylinder Bushings	Grease/Oil						X	
7	<p>Gearbox units are properly filled at the factory with sufficient lubrication for any catalog-approved mounting position. The break-in period and subsequent oil change ordinarily experienced with conventional reducers has been eliminated. It is not necessary to change the oil at installation or startup. It is necessary after any maintenance that required gearbox disassembly. In this case use only Mobil SHC-634.</p>								

**CAUTION**

**Do not inject excess grease into sealed bearings.**

**Injection of excess grease under pressure into sealed bearings may rupture seals.**



Movement of grease through bearings can be checked visually by the appearance of grease at the ends of the bearings. Old grease should be forced out with a shot of new grease.

## Bearing, Pin, and Bushing Lubrication

Inadequate or ineffective lubrication will result in accelerated pin and bushing wear. A clean lubricant film between moving parts will minimize wear and maximize efficiency.

## Chain Lubrication

Manual application with a brush is recommended along the upper edges of the plates, so oil can reach the important gap between the chain side plates. Chains must be lubricated at least once a week.

## Gear Oil Specifications

Use AGMA Oil Grade 4 or 3 for temperatures from +50°F to 125°F. For temperatures from 15°F to 60°F use AGMA Oil Grade 2 or 3.

Some AGMA Oil Grade 5 oils can be used for temperatures below 15°F. Consult your oil supplier to discuss oils suitable for the temperature in your area.

The typical oils shown in Table 6-2 meet AGMA recommendations:

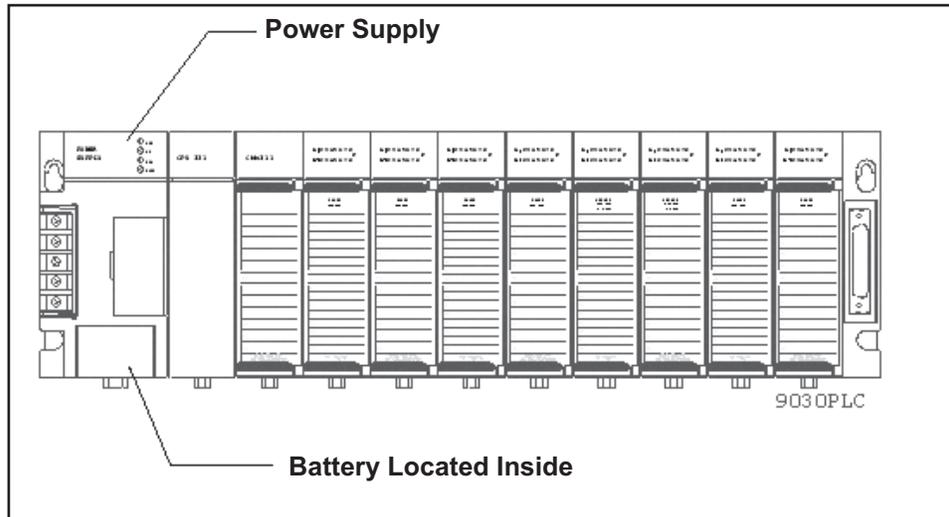
**Table 6-2: AGMA OIL Grade**

Manufacturer	2	3	4	5
Amoco	American Indus. #31	American Indus. #51	American Indus. #75	American Indus. #75
Arco	Duro S-315	Duro S-465	Duro S-700	Duro S-1000
Chevron	GST Oil 68	GST Oil 100	AW Mach. Oil EP Grade 150	AW Mach. Oil EP Grade 220
Citgo	Pacemaker 30	Pacemaker 60	Pacemaker 80	————
Exxon	Teresstic 68	Teresstic 100	Teresstic 150	Nuto 220
Gulf	Harmony 68	Harmony 90	Harmony 150d	Harmony 220
Keystone	543	49 Light	432	1790
Mobil	DTE Heavy Medium	DTE Heavy	DTE Extra Heavy	DTE BB
Shell	Turbo 33	Turbo 41	Turbo 69	Tellus 71
Sunoco	Sunvis 31	Sunvis 51	Sunvis 75	Sunvis 99
Texaco	Regal RO-68	Regal RO-100	Regal RO-150	Regal RO-220

## Electrical Maintenance

### Replacing the Battery on the PLC Controller

Figure 6-2: Power Supply in PLC Controller Rack



1. Open the manual control panel door and locate the power supply that is located on the far left of the PLC rack, as shown in Figure 6-2.
2. Remove the battery from the power supply and reconnect the new battery. The Lithium battery is accessed by removing the cover plate marked BATTERY located at the bottom of the power supply module. This battery is mounted on a plastic clip attached to the inside of this cover.
3. Re-mount the battery onto the cover plate and return cover to the power supply.

## Electric Motors

### Inspection

Periodically inspect the electric motors for excessive dirt, friction, or vibration. Dust may be blown from inaccessible locations using compressed air. Keep the ventilator openings clear to allow free passage of air.

WARNING	
	<p><b>HIGH PRESSURE AND PERSONAL INJURY HAZARD.</b></p> <p><b>Always wear safety glasses when using compressed air.</b></p> <p><b>Failure to exercise care may result in serious injury or blindness.</b></p>

### Adjustments

1. Emergency Stop Limit Switch on Transporter Base Frame
  - a) Tools required: Allen wrench set, 3/8-in. combination wrench
  - b) Adjust the switch so that when the base frame is lifted off the ground, the switch is activated and turns the stacker off.
  
2. Limit Switches
  - a) Tools required: Allen wrench set, 3/8-in. combination wrench
  - b) Adjust as required by rotating the limit switch arm and/or sliding the arm in or out to contact the appropriate bracket.
  
3. Top of Stack Proximity Switch
  - a) Tools required: Adjustable wrench
  - b) The top of the switch should be approximately 3/8 in. away from flag-switch bar when the transporter is fully extended. The switch should be sensing the bar at this point. This can be determined by examining the light emitting diodes (LEDs) on the switch itself. Adjustment is made by moving the proximity switch closer to or farther away from the flag-switch.

4. Transporter – No. 40 Chain Tension

WARNING	
	<p><b>CRUSH, CUT, AND PERSONAL INJURY HAZARD.</b></p> <p><b>Lockout/tagout the Horizontal Stacker before adjusting the chain tension.</b></p> <p><b>Failure to exercise care may result in serious injury or death.</b></p>

- a) Tools required: 3/4-in. wrench
- b) Turn the adjusting nut on the threaded rod mount to tighten or loosen the chain. Maintain a 1-in. sag in the chain over the 8 ft length.

5. Transporter – No. 60 Chain Tension

- a) Tools required: Chain breaker, chain stretcher
- b) Remove a link to adjust the chain tension. Maintain a 1-in. sag in the chain over the 8 ft length.

6. Raised Limit Switch

- a) Tools required: Allen wrench set, 3/8-in. combination wrench
- b) Adjust the contact point between the switch and the locating bracket to stop upward travel before the cylinders reach full extension.

7. Centered Proximity Switch Target

- a) Tools required: Adjustable wrench
- b) Adjust the switch target so that when the transporter is in its center position the proximity switch target will be centered on the switch.

8. Extended Proximity Switch Target

- a) Tools required: Allen wrench set
- b) Adjust the contact point between the proximity switch and the locating bracket to stop the extension of the transporter before it reaches maximum extension.

## Hydraulic Power Unit

The Horizontal Stacker transporters are raised and lowered by two double-acting hydraulic cylinders driven by a 10-hp power unit. The power unit includes:

- 40-gallon hydraulic fluid reservoir
- 10.38-gallon per minute (GPM) gear pump
- Directional control valve
- Relief valve
- Pressure indicating gauge
- Hydraulic fuel filter

The flow through each of the two cylinders is adjusted by flow control valves. A velocity fuse keeps the transporter from free-falling due to a break in a hydraulic line by stopping the hydraulic fluid flow out of the cylinder.

The directional control valve is a spring centered, solenoid controlled, tandem centered, four-way, three-position valve. The relief valve is factory set at 1500 psi, as indicated on the pressure gauge.

For parts specifications and maintenance requirements of the hydraulic power unit, see the manual provided by the power unit manufacturer.

The general references are listed following.

## Hydraulic Fluid

Fluid in the hydraulic systems is a vital factor in equipment performance and maintenance. It performs the dual function of lubrication and transmission of power. Fluid used in this power unit must conform to the following specifications:

- In order for these specs to apply, the fluid must be within the temperatures indicated in the chart.
- Synthetic fluids or fluids containing water are not recommended for the hydraulic system.
- The customer shall have a minimum of 80 gallons of hydraulic fluid on hand for initial charge (160 gallons for a 4-transporter system). The hydraulic reservoirs, when filled to within 2 in. of the top, hold 40 gallons each.

The specs listed in Table 6-3 must be followed when choosing a hydraulic fluid (also described in the general specs table):

**Table 6-3: Hydraulic Fluid Specs**

<b>Hydraulic Fluid</b>	
<i>Note: If operating outside the recommended temperature range, select a hydraulic fluid that will operate at the proper SUS range for your temperatures.</i>	
Recommended ISO grade*	ISO 68
Recommended Operating Viscosity*	60-1400 SUS
Temperature*	At startup: >68°F During operation: 86°F -120°F
Recommended Fluid	DTE 26
Reservoir Capacity	40 gallons
<i>*An immersion heater is available for the hydraulic fluid reservoir.</i>	

Operating temperature must not exceed 145°F. At startup, fluid should not be below 32°F. The fluid viscosity should be within the following ranges:

- At starting: 4,000 SUS maximum
- Nominal: 150–225 SUS at 100°F
- Running: 70–225 SUS at 100°F

## Fluid Changes

The frequency with which fluid is changed depends on both the fluid and the operating conditions involved. In general, fluid should be changed when contaminated with water or dirt. Periodic laboratory analysis is the most accurate method of determining when or how often fluid should be changed. The supplier often can run these tests or at least check the condition of used fluid and advise on its possible continued use. A trained maintenance mechanic can, at a glance, note the fluid level in the reservoir sight glass and possible water contamination.

Dirty or discolored fluid would indicate it is time to change the fluid.

For the best results, change the fluid when the system is at operating temperature. This will drain off as much of the impurities in suspension as possible. Remove the drain plug located in the bottom of the reservoir and collect the used fluid. Dispose of the used fluid in an acceptable manner. Replace and secure the drain plug. Fill the reservoir to the "full" level on the reservoir with the recommended fluid (refer to Table 6-3).

The filter element should be replaced two weeks after the hydraulic fluid is changed.

## Filter

The Horizontal Stacker has one filter on each hydraulic unit.

The return line filter is located near the manifold on the return fluid line. The filter is a disposable-type, 10-micron cellulose filter.

The filter element should be replaced two weeks after hydraulic fluid is replaced, and when the tri-color filter gauge is red.

## Hydraulic System Preventive Maintenance

Once filled with a quality fluid meeting this manual's recommended specifications, the hydraulic system should provide long, efficient, and trouble-free operation. To assure continuance of this performance, a reasonable amount of care is required.

Maintenance personnel and machine operators must be trained to recognize the signs and symptoms of impending hydraulic troubles (a local hydraulic fluid supplier will usually assist with the training). For example, the operator can listen for any unusual noises, feel excessive temperatures, sense excessive vibration, and see leaking lines, leaking fittings, or fluid deposits on or around the machine.

It is evident by the kind of problems encountered by service personnel in answering customers' requests for assistance to restore operational efficiency that most problems are primarily due to the lack of preventive maintenance.

The following are some of the causes of problems that appear with surprising frequency:

- Insufficient fluid in the reservoir
- Clogged and dirty fluid filters
- Loose intake lines
- Improper grades of fluid (too heavy or too light)

Many of these problems could have been solved (or prevented) with a basic knowledge of hydraulics and attention to simple maintenance procedures. It has been estimated that up to 70% of all hydraulic problems may be traced directly to the fluid. Sampling and testing fluid periodically is a major factor in obtaining reliable performance.

## Hydraulic Schematic

Refer to the drawing in the back of the supplemental documentation for the hydraulic power unit.

## **Troubleshooting Information**

The following Troubleshooting section may serve as a helpful guide in identifying, finding, and correcting operational malfunctions.

For troubleshooting and maintenance requirements of the hydraulic power unit, see the manual provided by the power unit manufacturer.



**Table A-1: Troubleshooting Guide**

Problem	Possible Cause	Possible Solution
Nothing operates	No power	Check power supply and fuses
Power On indicator light does not stay on	RADIO OFF PB selector switch in OFF position.	Select either RADIO or PB
	RADIO OFF PB selector switch in RADIO position and radio not turned on.	Turn radio on
	Emergency stop limit switch released	Check emergency stop limit switches on transporter base frame and adjust
Hydraulic power unit does not start once a stacking area is selected	Electrical failure: – Blown fuse(s) – Tripped overload relay	– Replace blown fuse(s) – Reset tripped overload relay
Transporters will not raise or lower	Relief valve setting too low	Set relief valve (set at factory to 1500 psi, 2000 psi maximum).
	Directional control valve not shifting – Electrical failure – Mechanical bind	Check electrical circuits, then check solenoids. Contaminants may be preventing valve spool from shifting. Burned out solenoids are frequently the result of mechanical bind.
	Worn or damaged cylinder	
	Limit switch failure	Check limit switches for proper operation and adjustment, then reset system
Transporters do not lower when extended	Top of stack proximity switch failure due to damage	Replace switch
	Top of stack proximity switch out of adjustment	Adjust switch. The top of the switch should be approximately 3/8" away from flag switch when the transporter is fully extended. The switch should be sensing the bar at this point. This can be determined by examining the LEDs on the switch itself
	Raised limit switches damaged.	Replace limit switch and/or operating arm as required
	Raised limit switches out of adjustment	Adjust switches
Transporters do not center properly when retracted	Centered proximity switch target out of adjustment	When the transporter is in its center position, the proximity switch target should be centered on the switch.
	Extension drive system chains out of adjustment, too much slack	Adjust tension on all chains
Noisy extension drive chains	Extension drive sprockets out of line	Check all sprockets for proper alignment and adjust as needed



**Should you lockout/tagout to safely perform this action?**



**Table A-1: Troubleshooting Guide**

Problem	Possible Cause	Possible Solution
Transporters tilt excessively when extended and lowered	Flow controls out of adjustment	Each transporter has a flow control valve for each cylinder, which regulates the lowering speed of the transporter. Adjust the retract flow control to slow the lowering speed.
Overheating of hydraulic system. Not starting	Fluid viscosity too high (pump noisy at startup)	Change to recommended viscosity
	Relief valve set too low	Set relief valve to 1500 psi
	Low fluid level	Fill to within 2" of top
	Worn pump (cylinder action sluggish)	A scored pump may cause galling of metal and overheating. Disassemble and evaluate for replacement
Oil leakage	Excessive oil	Check oil level and drain to proper level
Noisy pump	Low fluid level	Fill reservoir to within 2" of top
	Cavitation	Fill reservoir to within 2' of top
	Fluid temperature too low	Check immersion heater fuses and thermostat setting
	Fluid viscosity too high	Drain and replace with proper viscosity
	Worn or faulty bearings	Replace bearings
	Shaft misaligned	Realign and check coupling and mounting bolts
	Worn cam ring in pump	Replace with complete pump cartridge assembly
	Worn or sticking vanes	Replace with complete pump cartridge assembly
	Normal wear	Replace worn parts or entire pump
Reducer/gearbox overheating	Insufficient oil	Check oil level
	Improper lubrication	Too much oil causes churning effect. Heat generated by fluid friction of oil
	Wrong grade of oil	Flush and refill to proper oil level with grade specified on reducer name plate
Noise and vibration in reducer/gearbox	Loose mounting bolts	Check mounting bolts and lock washers and tighten
	Insufficient oil - low oil level reduces muffling	Flush and clean reducer and replace oil
	Failed bearings - wear of bearings can be caused by dirt in oil	Inspect reducer for broken parts, loose bolts, nuts
	Loose parts	Check oil level Replace reducer or worn bearings Check keys for proper fit



## Reports and Research

To benefit fully from maintenance experience, a good system of reports and records is essential. These reports and records, if analyzed frequently, will indicate areas that require special attention as well as recurring troubles that may be corrected before breakdown occurs. Records should include:

- The date detected and description of the symptoms.
- A description of the preliminary investigation and the conclusions drawn.
- The date of and the corrective action taken, replacement parts required, and length of downtime.
- A record of when fluid is added or changed, filters replaced, or strainer cleaned.

### Navigating the Parts List

The tables that make up this appendix is divided into sections that are presented in the order listed here. The far right column indicates if the part should be kept in stock to minimize downtime.

### Summary of the Parts List

System Requiring Parts	Table Number
Mechanical Replacement Parts	Table B-2
Electrical Replacement Parts	Table B-3

### Ordering the Parts With Your Part Number

There are several easy ways to order your part after you determine the part number. Each column in Table B-1 describes one method.

**Table B-1: How to Order Your Part Using the Part Number**

Using Our eStore™ (an account is required)	Using E-Mail	Using the Phone
Access our on-line eStore using one of the following methods:  Click the eStore link from the Web site <b>OR</b>  Click the eStore link from the Parts Guide <b>OR</b>  Type <a href="http://estore.mii.com">http://estore.mii.com</a> into your web browser	Send an e-mail to <a href="mailto:mittekparts@mii.com">mittekparts@mii.com</a> with all relevant information, including the part number.	Call 1-800-523-3380 and select "Parts Orders".



**Table B-2: Mechanical Replacement Parts**

<b><i>MiTek</i> Part #</b>	<b>Part Description</b>	<b>Refer to Drawing #</b>	<b>Keep in Stock</b>
474127	Motor	70300	1
477000	Lens, red	70560	1
515781	Weather shield	70560	1
548546	Sprocket, 1"	70305	1
70440	Hydraulic unit motor	70440	1
805222	Filter element	—	1

**Table B-3: Electrical Replacement Parts**

<b>MiTek Part #</b>	<b>Part Description</b>	<b>Refer to Drawing #</b>	<b>Keep in Stock</b>
477011	Photoeye light source	90065	1
477012	No-dark activating photoeye	90065	1
477058	Fuse, 35 amp, 208 and 230V	90064	4
477110	Fuse, 17.5 amp, 460V	90064	4
508504	Cord set, 13 ft	90288	1
509210	Motor, starter, 9 amp, reversing	90064	1
509215	Motor, starter, 17.5 amp, 460V	90064	1
509219	Motor, starter, 32 amp, 208 and 230 V	90064	1
514142	Relay, overload, 1.0-1.5 amp, 460V	90064	1
514146	Relay, overload, 1.8-2.7 amp, 208 and 230V	90064	1
514156	Relay, overload, 10-16 amp, 460V	90064	1
514166	Relay, overload, 25-32 amp, 208 and 230V	90064	1
515825	Prox, 30 mm	515825	1
516385	Fuse, 10 amp	90064	1
516389	Fuse, 4 amp	90064	2
516391	Fuse, 8 amp	90064	2
516422	Circuit breaker, 277VAC	90436	1
516492	Fuse, 30 amp, 460V	90436	3
516494	Fuse, 50 amp, 208 and 230V	90436	3



# Maintenance Checklists

## *Appendix C*

### **Checklists for Preventive Maintenance**

Use the checklists in this appendix to schedule preventive maintenance. The checklists will guide you through all preventive maintenance tasks required to keep this equipment in top working condition.

These pages are supplied with the intent that you will photocopy them and document the date that maintenance is done, leaving the original in the manual for future use.

#### **Horizontal Stacker**

<b>Checklist</b>	<b>Refer to</b>
Weekly Checklist	page 70
Monthly Checklist	page 71
Periodic Checklist	page 72

# Horizontal Stacker

## Weekly Checklist

Year: \_\_\_\_\_

Month: \_\_\_\_\_:\_\_\_\_\_

Preventive Maintenance Action (write dates at top of column)	1	2	3	4	5
Lubricate chains					
Check chain tension. Chains should have 1" sag over 8' length.					

Notes	Date

# Horizontal Stacker

## Monthly Checklist

Year: \_\_\_\_\_

MONTH (first half of year)	JAN	FEB	MAR	APRIL	MAY	JUNE
Lubricate hydraulic cylinder bearings		3 months				
Lubricate scissor and arm bushings		3 months				
Lubricate electric motor		6 months				
Lubricate pillow block bearing		6 months				
Lubricate wheel bearings		6 months				

MONTH (second half of year)	JULY	AUG	SEPT	OCT	NOV	DEC
Lubricate hydraulic cylinder bearings		3 months				
Lubricate scissor and arm bushings		3 months				
Lubricate electric motor		6 months				
Lubricate pillow block bearing		6 months				
Lubricate wheel bearings		6 months				

# Horizontal Stacker

## Periodic Checklist

Year: \_\_\_\_\_

Preventive Maintenance Action	Sign and Date When Action is Performed
Replace hydraulic filter	1 year
Replace hydraulic fluid	1 year

Notes	Date

This appendix provides general information that will help you better understand how this equipment works.

## Understanding Overloads

### Purpose and Scope

The information below has been collected to help you understand the role of an overload, how an overload works, and how to calculate the overload setting to protect the motor.

### The Importance of Protecting Your Motor

The following statement describes the importance of protecting electric motors and is a good illustration of why we need overloads.

#### Proper Motor Protection Safeguards Your Investments

With electric motors driving the majority of today's manufacturing processes, proper motor protection is critical. Not surprisingly, a significant amount of effort and resources have recently been invested in motor protection technology, resulting in cost-effective solutions to many of today's common motor problems.

Motors fail for a number of reasons—moisture and contamination, short circuits, mechanical problems and old age—but the primary reason is excessive heat, caused by excess current (greater than normal motor full load current), high ambient temperatures, and poor ventilation of the motor. If a motor is continuously overheated by only 10 degrees, its life can be reduced by as much as 50%.

Steve Zimmerman  
Control Engineering  
December 1, 1997

## What is an Overload?

So, what is an overload? The term literally means that too much load (what the motor is driving) has been placed on the motor. A motor is designed to run at a certain speed, called its synchronous speed. If the load on the motor increases, the motor draws more current to continue running at its synchronous speed.

It is quite possible to put so much load on a motor that it will draw more and more current without being able to reach synchronous speed. If this happens for a long enough period of time, the motor can melt its insulation and burn out, resulting in damage to the motor windings. This excessive load condition is called an overload.

In fact, the motor could stop turning altogether (called a locked rotor) under a large enough load. This is another example of an overload condition. Even though the motor shaft is unable to turn, the motor continues to draw current, attempting to reach its synchronous speed.

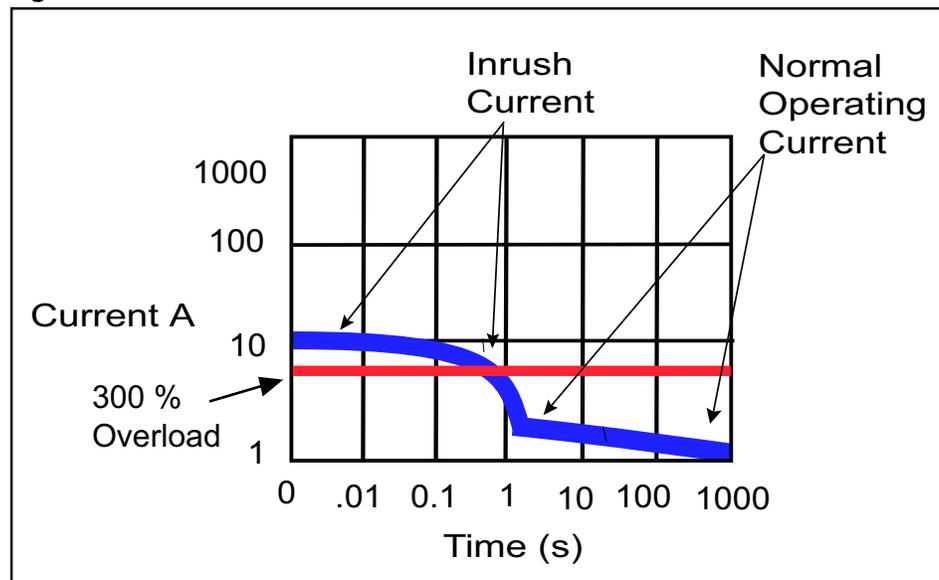
Although the running motor may not draw enough current to blow the fuses or trip circuit breakers, it can produce sufficient heat to burn up the motor. This heat, generated by excessive current in the windings, causes the insulation to fail and the motor to burn out. We use the term “locked rotor amps” to describe when the motor is in this state and is drawing the maximum amount of current.

Due to the possibility of excessive current draw, an overload protection device is required that does not open the circuit while the motor is starting, but opens the circuit if the motor gets overloaded.

## Starting Current

When a motor is started, it must perform work to overcome the inertia of the rotating portion of the motor and the attached load. The starting current measured on the incoming line is typically 600% of full-load current when rated voltage and frequency is first applied to a NEMA B motor. The stationary portion of the motor current decreases to its rated value as the rotor comes up to speed.

**Figure D-1: Motor Inrush Curve**



An overload condition will occur when the rotor has difficulty turning and draws more current than it normally would need to keep it turning. When an overload occurs the current being drawn is usually between 2 to 6 times the normal operating current.

For example if a conveyor belt becomes jammed and does not allow the rotor to turn, the motor will draw about as much amperage as it would on startup to try to get the rotor to turn. As long as the rotor does not turn, this increased current will continue to flow. The key thing to remember in an overload condition is that the current flows through the normal circuit path. Continued overload current will cause excess heating in the motor and the motor circuit. If the over current protective device does not operate in a timely manner, the motor could short out a winding, or cause insulation damage to a winding which could lead to a short circuit later.

## Overload Relays

The overload relay is the device used in starters for motor overload protection. It limits the amount of current drawn to protect the motor from overheating.

An overload relay consists of:

- A current sensing unit (connected in the circuit to the motor)
- A mechanism to break the circuit, either directly or indirectly

Overload relays have the following features:

- A time delay which ignores harmless temporary overloads caused by normal motor starting, without breaking the circuit
- A means of resetting the circuit once the overload is removed

- A design that meets the special protective needs of motor control circuits
- Allow harmless temporary overloads, such as motor starting, without disrupting the circuit
- Will trip and open a circuit if current is high enough to cause motor damage over a period of time
- Can be reset once the overload is removed

### Bimetallic Overload Relays

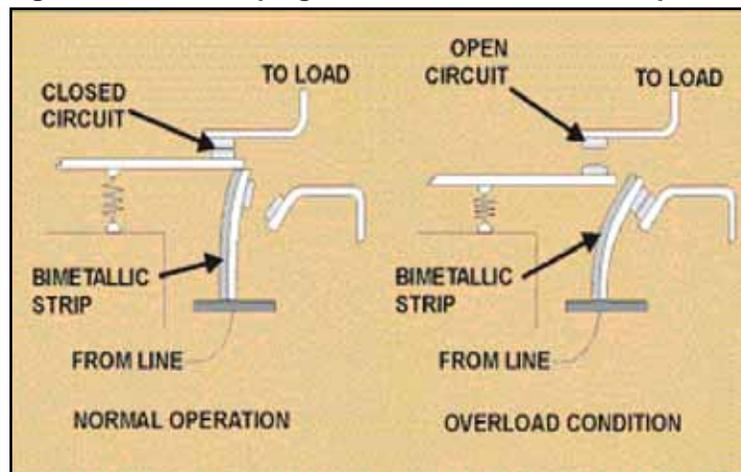
Overload protection is accomplished with the use of a bimetallic strip. This component consists of a small heater element wired in series with the motor and a bimetallic strip that can be used as a trip lever. A bimetallic strip is made of two dissimilar metals bonded together. The two metals have different thermal expansion characteristics, so the bimetallic bends at a given rate when heated.

Under normal operating conditions the heat generated by the heater element will be insufficient to cause the bimetallic strip to bend enough to trip the overload relay.

As current rises, heat also rises. The hotter the bimetallic becomes, the more it bends. In an overload condition the heat generated from the heater will cause the bimetallic strip to bend until the mechanism is tripped, stopping the motor.

If heat begins to rise, the strip bends, and the spring pulls the contacts apart, breaking the circuit, as shown in Figure D-2.

**Figure D-2: The Warping Effect of the Bimetallic Strip**



Once the tripping action has taken place, the bimetallic strip cools and reshapes itself, automatically resetting the circuit. The motor can be restarted even when the overload condition has not been cleared, and will trip and reset itself again and again. (This assumes an automatic reset and can also be equipped with a manual reset.)

## Electronic Overload Relay

Electronic overload relays are another option for motor protection. The features and benefits of electronic overload relays vary but there are a few common traits. One advantage offered by electronic overload relays is heater-less design. This reduces installation cost and the need to stock a variety of heaters to match motor ratings. Electronic overload relays can detect a phase loss and disconnect the motor from the power source. This feature is not available on mechanical types of overload relays.

## Overload Classifications

Overload relays also have an assigned trip class. The trip class is the maximum time in seconds at which the overload relay will trip when the carrying current is at 600% of its current rating. Bimetallic overload relays can be rated as Class 10, meaning that they can be counted on to break the circuit no more than ten seconds after a locked rotor condition begins. Melting alloy overload relays are generally *Class 20*.

American industry has standardized on Class 20 overload protection. The Europeans have standardized on Class 10.

Class 20 will give a nominal 590-second trip (9.83 minutes) at an overload of 125% of full load amps, a 29-second trip at a 500% overload, and a 20-second trip at a 600% overload. Thus, a motor that is stalled and drawing locked rotor amperage will be taken off-line in 20 to 29 seconds. However, a motor that draws a continuous locked rotor current can be expected to burn out before 20 seconds.

Class 10 will give a nominal 230-second trip (3.83 minutes) at 125% overload, 15 seconds at 500% overload, and 10 seconds at 600% overload.

Class 30 has a longer time delay to be used on high inertia loads that require a long acceleration or have shock loading that causes repetitive motor inrush.



The overload class that MiTek normally specifies for equipment is a Class 10. Since it is possible to burn out a motor in less than 20 seconds, we have chosen to protect the motor with the highest degree of protection.

## Codes And Standards

### NFPA 79—Electrical Standard for Industrial Machinery, 2002

**7.3.1.1 Motors.** Motor overload protection shall be provided to each motor in accordance with Article 430, Part III, of NFPA 70, *National Electrical Code*.

### NEC 2002—National Electrical Code

**430.32 (A) (1) Separate Overload Device.** A separate overload device that is responsive to motor current. This device shall be rated at no more than the percentages shown in Table D-1.

**Table D-1: Full Load Current Tolerances**

Nameplate Full Load Current Rating	% Allowed Above Full Load Current Rating
Service Factor of 1.15	125%
Motors with a marked temperature rise of 40°C or less	125%
All other motors	115%

#### Example 1

15 hp, 208V, 3 phase, induction motor, 40°C rise, *design B*, *FLA* 48 amps. Overload Protection = 48 amps times 125% = 60 amps

#### Example 2

25 hp, 208V, 3 phase, induction motor, 1.15 s.f., *design C*, *FLA* 72A. Overload Protection = 72 amps times 125% = 90 amps

### Example 3

40 hp, 208V, 3 phase, wound rotor motor, FLA 118 amps. Overload Protection = 118 amps times 115%=136 amps

The motor overloads must be calculated using the nameplate current and not from Tables 430-148 or 430-150 of the National Electrical Code.



In Example 1, the motor has a 40°C rise, the O.L. unit is sized at 125% of the full load motor current.

In Example 2, the motor has a s.f. (service factor) of 1.15. The O.L. unit is sized at 125% of the full load motor current.

In Example 3, where neither of the two conditions exists, it is sized at 115%.

## Glossary of Overload Terms

### Full Load Amps (FLA)

This is the current flow required by a motor during normal operation under normal loading to produce its designated horsepower. Motors having nothing attached to their shaft will draw less than the FLA current.

### Insulation Class

The National Electrical Manufacturers Association (NEMA) has established insulation classes to meet motor temperature requirements found in different operating environments. The four insulation classes are A, B, F, and H. Class F is commonly used. Class A is seldom used. Before a motor is started, its windings are at the temperature of the surrounding air. This is known as ambient temperature. NEMA has standardized on an ambient temperature of 104°F, or 40°C for all motor classes.

Temperature rises in the motor as soon as it is started. The combination of ambient temperature and allowed temperature rise equals the maximum winding temperature in a motor. A margin is allowed for a point at the center of the motor's windings where the temperature is higher. This is referred to as the motor's hot spot.

The operating temperature of a motor is important to efficient operation and long life. Operating a motor above the limits of the insulation class reduces the motor life expectancy. A 50°F (10°C) increase in the operating temperature can decrease the life expectancy of a motor by as much as 50%.

**Table D-2: Maximum Winding Temperature**

Class A	Class B	Class F	Class H
221°F (105°C)	266°F (130°C)	311°F (155°C)	356°F (180°C)

### Locked Rotor Amps

Also known as inrush current, locked rotor amps is the amount of current the motor can be expected to draw under starting conditions when full voltage is applied. This is the current taken from the supply line at rated voltage and frequency with the rotor at rest.

### Motor Load

A motor provides the conversion of electrical energy to mechanical energy that enables a machine to do work. The energy that a machine requires from a motor is known as the

motor load. The motor load “seen” by a motor is dependant upon how the load is connected to the motor, the dimensions of the load, and the weight of the load.

A load connected to a motor by a gearbox reduces the load by the square of the gear ratio. If a load is attached to a motor through a 3:1 gear ratio, the load is 1/9 of the load the motor would see if the load were attached directly to the motor.

A round object attached to the motor shaft has a load related to the square of the radius of the object. If a 16" saw blade is a load of weight multiplied by the radius squared, the load is  $8^2 \times \text{weight} = 64 \times \text{weight}$ . A 20" saw blade is a load of  $10^2 \times \text{weight} = 100 \times \text{weight}$ . The 20" saw blade is 56% more load than the 16" saw blade due to the dimensions.

A motor load is directly related to the weight of an object. A 16" blade weighs 9.28 pounds. A 20" blade weighs 14.61 pounds, or 5.33 pounds more. The 20" blade is 56% more load than the 16" blade due to weight. Remember, weight is the volume of an object times its density, so weight is also related to the dimensions.

In the example of the saw blades, the combined effect of the longer radius, and longer weight means the 20" saw blade is approximately 125% more load on a motor than a 16" saw blade, which partially explains why motors on quads 1 and 4 are more likely to burn out or trip an overload.

## NEMA Design Ratings

NEMA ratings refer to the torque ratings. The following ratings apply to motors:

### NEMA B

The NEMA B motor's percentage of slip ranges from 2 to 4%. It has medium values for starting or locked rotor torque, and a high value of breakdown torque.

### NEMA A

The NEMA A motor is similar in many ways to the NEMA B motor. It typically has a higher value of locked rotor torque and its slip can be higher.

### NEMA C

The NEMA C motors are well suited to starting high-inertia loads. This is because they have high locked rotor torque capability. Their slip is around 5%, and their starting current requirement is average.

### NEMA D

The NEMA D motor is found in heavy duty, high-inertia applications. It has high values of slip (up to 8%), and very high locked rotor torque capability.

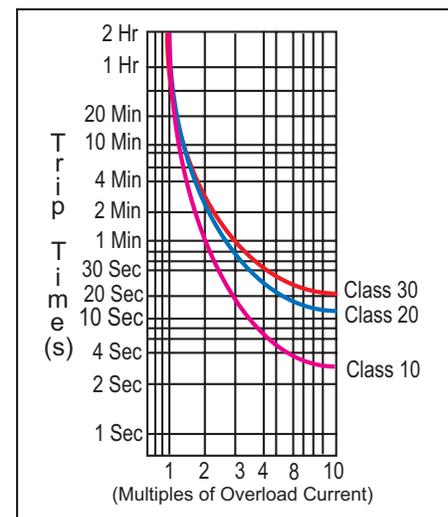
### Service Factor (s.f.)

A motor designed to operate at its nameplate horsepower rating has a service factor of 1.0. Some applications may require a motor to exceed the rated horsepower. In these cases a motor with a service factor of 1.15 can be specified. The service factor is a multiplier that may be applied to the rated power. A 1.15 service factor motor can be operated 15% higher than the motor's nameplate horsepower.

### Trip Class

Overload relays are rated by a trip class, which defines the length of time it will take for the relay to trip in an overload condition. The most common trip classes are Class 10,

**Figure D-3: Trip Times for Trip**



Class 20, and Class 30. Class 10, for example, has to trip the motor off-line in 10 seconds or less at 600% of the full load amps. This is usually sufficient time for the motor to reach full speed.

## Understanding Motor Starting Problems

There are three major sources of motor starting problems: voltage source problems, control circuit problems, and drive faults. Diagnosing and resolving these problems can be a time-consuming process, but some time can be saved by using an organized process of elimination. The following sections address the most common sources of motor starter problems.

WARNING	
	<p><b>ELECTROCUTION HAZARD.</b></p> <p><b>Always turn the power off by activating an E-stop when the equipment is not in operation.</b></p> <p><b>Always verify that all power to the machine has been turned off and follow approved lockout/tagout safety procedures (OSHA 29 CFR 1910.147) before performing any maintenance on this equipment.</b></p> <p><b>If it is absolutely necessary to troubleshoot an energized machine, follow NFPA 70E for proper procedures and personal protective equipment.</b></p>

### Voltage Source Problems

1. Check the incoming power source. Verify that all three phases of power have the proper voltage using a digital multimeter set to voltage mode. If any of the three phases of incoming power are low or missing, disconnect power at the primary disconnect switch and reset the circuit breaker or replace the fuse.
2. Before restoring power at the primary disconnect, verify that there are no phase-to-phase or phase-to-ground shorts at the motor starter line contactors. If necessary, replace starter contacts to correct shorts.
3. Check that motor thermal overloads have not been tripped. Reset the overloads by pressing the reset pushbutton.
4. Check the motor starter leads for phase-to-phase and phase-to-ground shorts. Check for discoloration, hot spots, melted wire or damaged fuses. Correct the motor lead wiring if necessary.

5. Check the motor leads for phase-to-phase and phase-to-ground shorts. Check for discoloration, hot spots, melted wire or damaged fuses. Replace the motor if necessary.
6. Determine if motor windings are breaking down by testing the motor insulation with an insulation tester or taking the motor to a repair shop for testing.
7. Disconnect the motor from its load. Start the motor. If it runs correctly, the problem is associated with the mechanical drive train. If it does not run correctly, replace the motor bearings.

## Control Circuit Problems

1. If the incoming power source has all three phases of power, check the motor starter overloads. Reset the motor starter overloads by pressing the reset button.
2. Verify that the control voltage transformer fuse is operating correctly using a digital multimeter set to Ohms. The multimeter should have a low reading. If the multimeter registers no reading or an infinite reading, replace the fuse.
3. Disconnect the motor starter contactor coil. Check for a short or ground. If necessary, replace the motor starter coil.
4. Check the control circuit wiring to the contactor coil while the coil is still disconnected. If a short or ground is present, disconnect the field wiring circuit to the motor starter. Determine whether the problem is with the motor contactor overload circuit or the field control wiring.
5. If a ground is found in the motor starter overloads circuit, replace the overloads. Reconnect the starter coil and control field wiring.
6. If a ground is found in the field wiring circuit, clear the ground. Reconnect the starter coil and control field wiring.
7. Check for an open circuit in the motor overloads or control circuit by using a digital multimeter set for Ohms to verify the motor overloads control circuit is working correctly.
8. Check the PLC contact closure, relay contact closure or start/stop pushbutton circuit that supplies the start signal to the motor starter.

## Drive Faults

Before troubleshooting a drive fault, determine whether the fault is a motor, drive, or application fault. Use the fault codes of the drive. If you are unable to locate the source of the fault, contact MiTek Customer Service.

### Drawings are inserted at the back of the manual.

Use the attached drawings to locate the part and part number that you need.

**Table E-1: Attached Drawings**

Description	Drawing Number
Horizontal Stacker assembly	70300-501
Top/Middle/Bottom drive assembly	70305-501
Top drive weldment	70310-501
Middle drive weldment	70330-501
Bottom drive weldment	70355-501
Base frame weldment	70405-501
Scissors arms assembly	70435-501
Hydraulic power unit	70440-501
Traffic Cop assembly	70530
Scanner target assembly	70560
Dual rail system - scanner target	75740
Horizontal Stacker 2-Zone scheme field wiring	90013
Horizontal Stacker 4-Zone scheme field wiring	90014
Horizontal Stacker 4-Zone electrical	90064
Horizontal Stacker 2-Zone electrical	90065
Horizontal Stacker electrical assembly	90288
Horizontal Stacker (2-4)-Zone add-on B.O.M. 230V	90403
Horizontal 4-Zone	90436
Layout 2-Zone	99003-501



# Document Evaluation

## *Appendix F*

A form is included in this appendix so you can provide MiTek with feedback on the usefulness of this manual. We make an ongoing effort to improve the value of our documentation, and your views are important to us.

Please follow the instructions on the form to provide us with comments or suggestions that will help us improve the quality of our documentation services.

# Document Evaluation Form

We appreciate your comments on how we can make this document more useful.

*Document Identification:*

Horizontal Stacker	Equipment Manual	001011
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**General Ratings:**

	Poor	Fair	Good	Excellent
Content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accuracy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clarity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Completeness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Examples/Illustrations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Readability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Compared to other truss machinery manufacturers' documentation, how would you rate this document?**

Poor       Fair       Good       Excellent

**Rate the quality of service you were given on the following topics:**

	Poor	Fair	Good	Excellent
Delivered on time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Installation process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service technician	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the machine work as promised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does it handle the production load?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**General Comments:**

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# Document Evaluation Form (cont'd)

<b>Instructions</b> Please provide as much information as possible. Identify the page and paragraph, and include a proposed rewrite if possible. Attach extra sheets as needed.	<b>Identification Information</b>
	Horizontal Stacker
	Equipment Manual
001011	
<h2>Recommendation</h2>	
<h2>Reason for Recommendation</h2>	
Your Name:	Date:
Company Name:	Address:
Phone:	Email:
<b>Please mail this form to:</b> MiTek Machinery Operations 301 Fountain Lakes Industrial Dr. St. Charles, MO 63301 Attn: Engineering Manager	<b>Or fax this form to:</b> 636-298-9218 Attn: Engineering Manager

*If you do not receive a reply within 45 days, please call our Customer Service Department and ask for the Documentation Specialist or Engineering Manager: 800-523-3380.*

# Glossary

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<b>amperage</b>	the strength of an electric current, expressed in amperes
<b>connector plate</b>	the nail-plate that is embedded into the ends of the tie
<b>cushion</b>	an attribute of a hydraulic cylinder that allows adjustment of the pressure in each cylinder
<b>layout</b>	a scaled diagram of the location of components and the space that they occupy
<b>leveling screws</b>	large cap head screws that thread into the table legs and allow the table height to be adjusted and leveled
<b>lockout/tagout</b>	a means of isolating a piece of equipment from its energy source so maintenance can safely occur; guidelines provided in OSHA 29 CFR 1910.147
<b>lubricator</b>	a device that allows controlled amounts of lubricants into the pneumatic system
<b>pilot valve</b>	a pneumatic valve that operates the setup valve to control the release or cessation of air in each setup; it is located on the bottom-chord end of one table in each setup
<b>plate</b>	see <i>connector plate</i>
<b>PLC</b>	Programmable Logic Controller; a solid-state control device that can be programmed to control process or machine operations. It consists of five basic components: processor, memory, input/output module, the power supply, and the programming device.
<b>port</b>	a connection point for a peripheral device
<b>proximity switch</b>	a switch that uses an electromagnetic field to detect when an object is near, there is no physical contact between the object and the switch; inductive proximity switches detect only metal objects, capacitive proximity switches can sense both metallic and non-metallic objects

# Glossary

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<b>qualified person</b>	a person or persons who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training, or experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work—ANSI B30.2-1983; one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved—NEC2002 Handbook
<b>regulator</b>	a component of the pneumatic system that connects to the main air source and regulates the air pressure allowed into the system
<b>setup valve</b>	a component of the pneumatic system that control the flow of air to the rest of the setup
<b>solenoid</b>	an assembly used as a switch consisting of a coil and a metal core free to slide along the coil axis under the influence of the magnetic field
<b>stand-alone conveyor</b>	the conveyor system that carries the truss from the tables to the Finish Roller and out to the stacker
<b>torque</b>	a turning or twisting force
<b>VFD</b>	Variable Frequency Device; controls the speed of the cycle
<b>voltage</b>	Equal to the difference of electric potential between two point on a conducting wire carrying a constant current of one ampere when the power between the points is one watt

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