

COMPETITIVE PRESENTATION

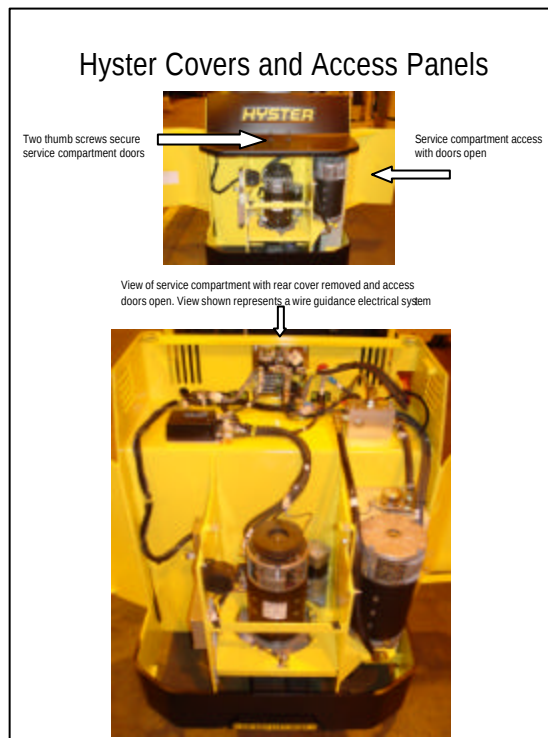


HYSTER R30XM₂

VS



CROWN SP3020-30

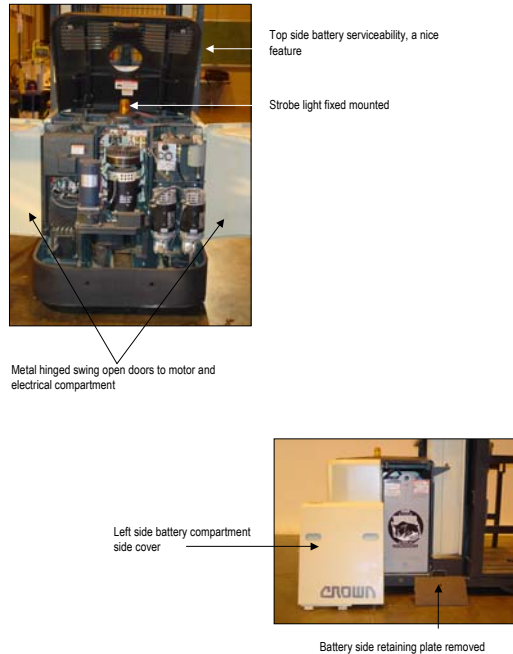


The Hyster R30XM₂ service compartment features swing open metal doors and a U.L. approved rear cover.

The doors are hinged for easy swing open access and are secured with two thumb screws, which require no tools to remove. Metal doors protect the motors and electrical compartment in the event the truck is backed into a rack. Additionally, raised forks from another lift truck will be prevented from protruding into the motor compartment.

The rear top cover is made of an ABS plastic. Four spring loaded quarter-turn fasteners secure the top cover. These screws are spring loaded for quick, easy removal and installation. The fasteners are secured to the cover with a small retaining clip so the fasteners are actually a part of the cover assembly, eliminating the chance of misplacing hardware.

Crown Covers and Access Panels



Crown does a very good job on cosmetics. They go to great effort to cover and hide things. When someone walks up to a Crown order picker they see a clean, smooth, stylish looking truck. However, once the covers are removed, an older generation of electronics is exposed. The G.E. modified transistor control system, compared to the Hyster R30XM₂ series, has a more complicated, maintenance intense electrical system.

The rear access doors are held on by two screws (require tools to remove). The rear doors swing open very much in the same manner as the Hyster R30XM₂, and provide good access to the motor and electrical compartment. The battery is hidden by a left hand and a right hand battery side cover. The battery side covers require no tools to remove.

The battery cover is vented and can be raised easily with no tools required. This feature allows battery topside access for quick and easy water/ acid level checks.

The strobe light is fixed mounted. The battery top cover is cut out to allow for the strobe light.

Hyster Electric Foot Switch



Flush mounted electric foot switch



Ergonomically positioned foot switch

View of operator activating the foot switch and pallet clamp release pedal

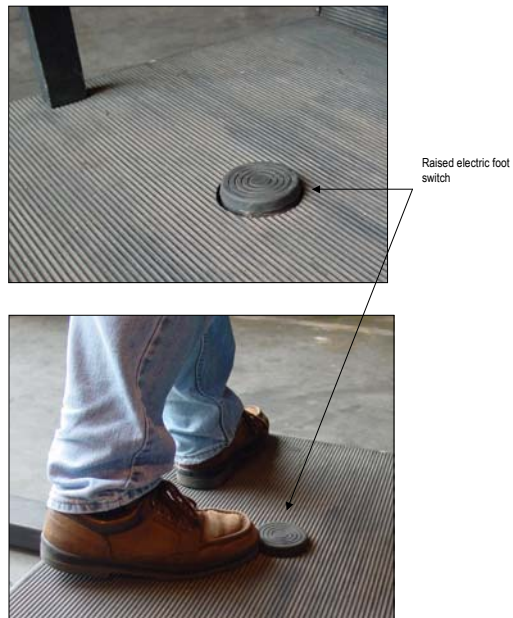


The Hyster R30XM₂ electric foot switch is ergonomically positioned on the operator platform. The operator can stand in his/her natural position and comfortably activate the foot switch.

The switch is counter-sunk into the platform's anti-slip floor mat. When the foot switch is activated, the operator's foot is cushioned by the rubber floor mat. The one inch thick rubber floor mat cushions the operator for a smooth, more comfortable ride.

This innovative design by Hyster Company enhances operator comfort and productivity, while reducing operator foot and leg fatigue.

Crown Electric Foot Switch

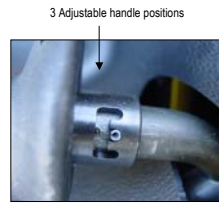
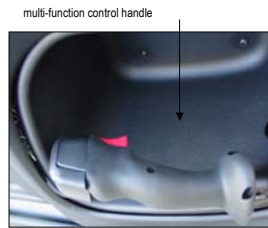


The Crown electric foot switch is located on the operator platform floorboard as is the R30XM₂. However, Crown's foot switch is a raised design. The switch mounted above the surface of the floor mat contributes to foot and leg fatigue and becomes quite uncomfortable to the bottom of one's foot throughout an entire shift.

Hyster Accelerator Control Handle and Hydraulic Control Functions



Ergonomically positioned multi-function control handle



The Hyster multi-function control handle is ergonomically designed and positioned. The angle of the handle provides the operator the opportunity to drive the truck comfortably either MDU end first or fork end first. The handle is designed to fit in the palm. The slender handle body is shaped and contoured to comfortably fit in various hand sizes. The handle is scalloped at the bottom allowing the hand to stay in position and to provide a hand rest.

The multi-function handle is designed with three adjustable locking positions, or angles. This feature allows the operator to adjust the handle to a position that is the most comfortable and productive to them.

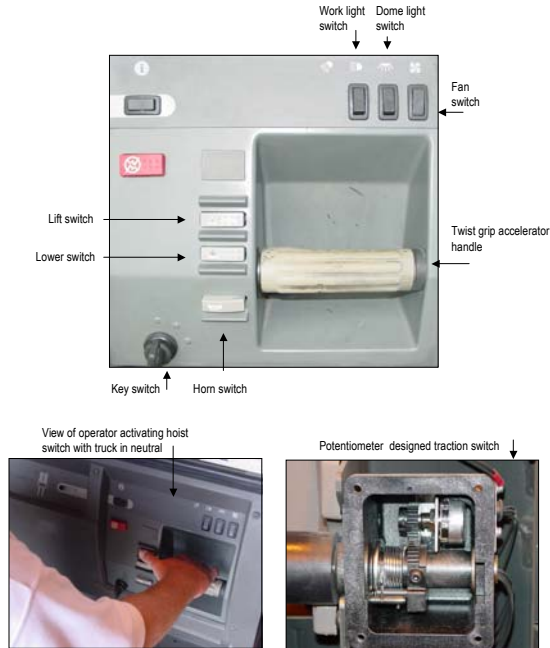
The multi-function handle is used in conjunction with the alphanumeric display during setup and/or to set or adjust truck performance parameters.

The accelerator switch is a hall effect sensor, an electrical solid state device. Hall effect sensors have fewer wearable parts, require much less adjustment, and are not as vibration sensitive as potentiometers.

Additionally, the adjustable console (optional) further enhances operator comfort and productivity by allowing six inches of vertical travel of the entire console assembly. This feature puts the controls and instrument panel in the position that works best for each individual.

These state-of-the art designs of the Hyster R30XM₂ provide the operator the opportunity to become one with the truck. Various size operators will enjoy the modern ergonomic advantages of this truck over the competition.

Crown Accelerator Control Handle and Hydraulic Control Functions



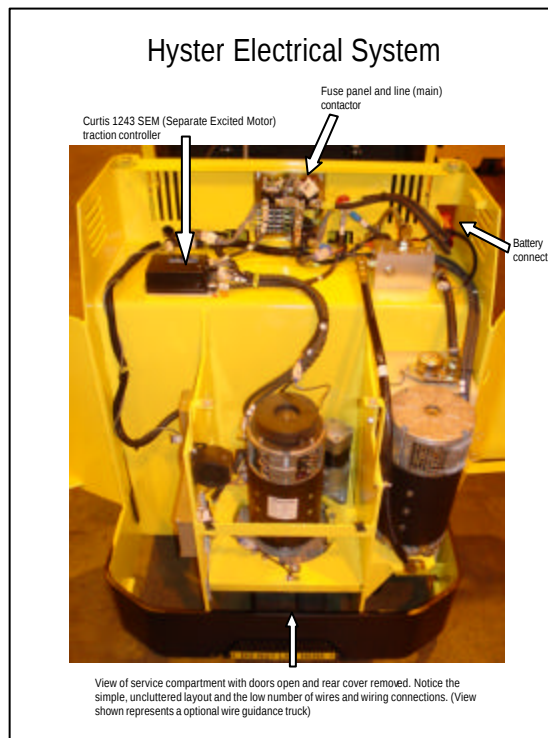
The Crown SP3020-30 order picker features a twist grip accelerator handle. This style accelerator handle design has several short-comings:

- Twist grip contributes to operator hand and wrist fatigue
- The accelerator handle is secured in a fixed position and is non-adjustable
- Difficult to accelerate in either direction and activate hydraulic functions

Crown uses a potentiometer to control and regulate accelerator speeds. Potentiometers have several short comings:

- They are vibration sensitive
- Potentiometers have more moving and wearable parts as compared to the Hall-effect sensor found on the R30XM₂.
- Require more adjustments

The hydraulic functions are push buttons located just to the left of the accelerator handle. As mentioned above, it is difficult to activate the hydraulic functions and engage the accelerator handle at the same time, especially in reverse.



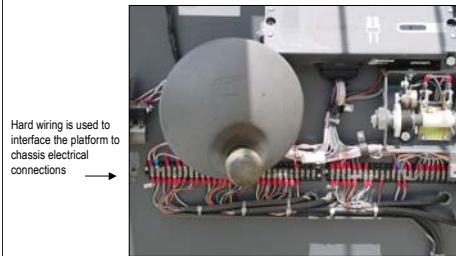
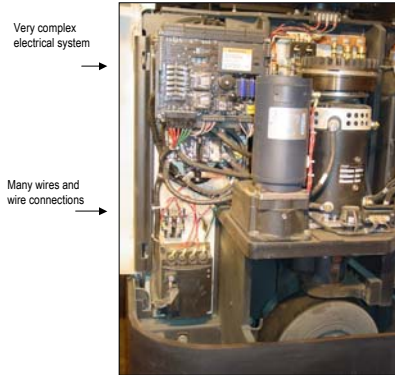
The Hyster Electrical control system features the Curtis 1310 Master Control Unit (MCU, the brains of the truck) and Controller Area Network (CAN bus) communications. This state of the art technology provides the R30XM₂ series with one of the industry's most advanced electrical systems.

The CANbus communication system reduces the number of, over the mast electrical conductors, from 27 'strands' down to 8, which greatly improves durability and reliability. The following solid state devices are connected by the CANbus link; the Curtis 1310 MCU and the Curtis 1243 traction controller, the Inmotion APS (Advanced Power Steering) and the Inmotion Wire Guidance (optional) unit.

The traction system is controlled by a Curtis 1243 transistor controller which utilizes MOSFET (Metal Oxide Semiconductor Field Effect Transistor) technology. The 1243 controller changes direction of the current to the traction motor in response to directional changes via the operator through the multi-function control handle. The transistor traction controller eliminates the need for forward and reverse contactors, improving performance, reliability and reducing maintenance costs.

Curtis and Inmotion (formerly Atlas Copco) are manufacturers of electrical solid state devices used throughout the lift truck industry here in North America, as well as in Europe.

Crown Electrical System



Crown utilizes a GE EVT 100 FL modified transistor control system. This is an older technology and has many more parts and components than the Hyster R30XM₂ electrical system. Crown utilizes color coded and numbered wires throughout the electrical system.

The Crown SP3020-30 order picker features hard wiring in lieu of plastic wire plug connectors to connect / secure the platform and chassis wire harnesses.

The Crown order pickers do not feature SEM technology or a CANbus type communication system. This is evident by the number of over the mast electrical cables (4 eight conductor electrical cables = 32 individual wire strands running over the mast) and the number of wires and wire harnesses used to interface the electrical components between the platform and chassis.

There are five contactors to maintain in the Crown electrical system: main / line contactor, forward and reverse contactors, hoist contactor and steering contactor. The main / line contactor is the only contactor used on the Hyster R30XM₂ advanced electrical system; reducing maintenance costs and increasing reliability.



The R30XM² features an Inmotion Technology's (formerly Atlas Copco) steer motor and transistor steer controller. The steer motor is an electric three-phase brushless DC motor with an integral gear box assembly and an integral gear encoder. The steer controller is a solid state transistor controller which is linked to the CANbus communication system link. The brushless steer motor means there are no brushes to service (maintenance free), resulting in reduced maintenance costs and increased reliability. Further, the steer motor is a direct drive design, eliminating the chain and sprocket utilized previously. The direct drive design eliminates the adjustments required to maintain proper chain tension, while enhancing steer response and reliability. In addition, the direct drive steer system is quieter than chain driven systems.

This steer system is equipped with a proximity switch that works in conjunction with the steer motor and the steer controller to automatically center the steer-wheel at each start up. This assures the operator of straight ahead travel each and every time the key switch is turned on, regardless of the steer tire position when the truck was turned off.

RTC (Return To Center) steering is standard on the R30XM₂. This unique electric steering design allows the steer tire to return-to-center whenever the operator releases the steer handle. Optional multi-turn steering is also available on the R30XM₂ at no charge for those individuals that prefer this style of steering.

Crown Steer System



Multi-turn steering is the only steer option available. Crown does not offer RTC (Return To Center) steering



Crown utilizes Electric Power Steering (EPS) as does the Hyster R30XM₂. However, the Crown steer motor requires motor brush inspection and replacement. As compared to the brushless / maintenance free electric steer motor used on the Hyster R30XM₂ the Crown SP3020-30 steer motor is more expensive to maintain and increases truck down time.

The Crown steer system features a gear driven steer motor to MDU (master drive unit) relationship. This is a quiet and reliable design.

Crown does not offer RTC (Return To Center) steer. With no RTC offering, the Crown SP 3020-30 will be more difficult to drive fork end first. Steering in a rail guided application also will prove to be more difficult and time consuming as compared to RTC steering.

Hyster Operator Platform



The Hyster R30XM₂ operator compartment is full of operator and ergonomic amenities.

Standard is the overhead guard mounted light and fan package. Each light and fan package includes a fixed work light, a dome light and a 2 speed fan. The fan cover features adjustable louvers to provide ventilation to the operator.

The rubber coated gas-cylinder-assist retractable sidegates (standard) enhance operator safety and comfort while reducing operator fatigue.

The 2 speed full ventilation body fan (optional) provides maximum ventilation directed toward the operator's mid-section. This is especially beneficial for applications requiring the safety glass windshield in place of the standard wire mesh screen.

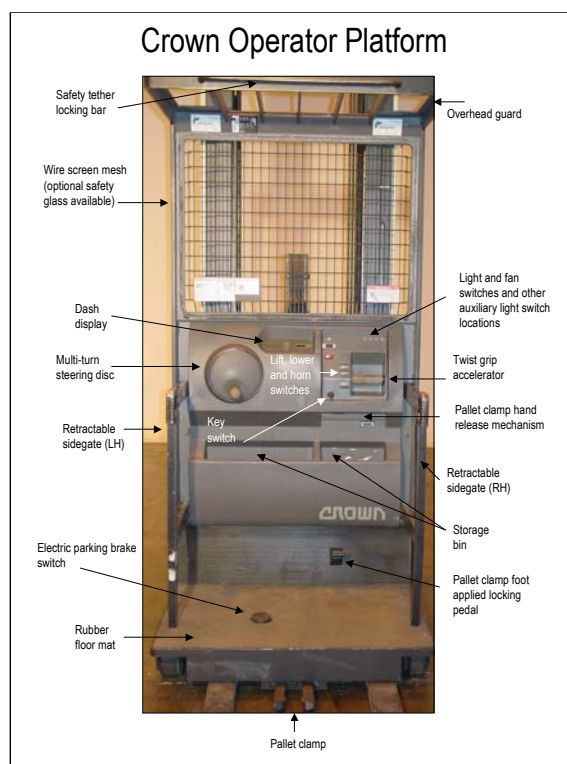
The adjustable console (optional) provides six inches of vertical travel to enhance operator comfort and put the controls just where each individual operator feels the most comfortable and productive. NOTE: The adjustable console option is strongly recommended when specifying a truck in which the operator drives the truck in the fork first direction as the primary direction of travel.

The adjustable 3 position multi-function control handle (standard) further enhances operator comfort.

The one inch thick floor mat provides a shock absorbent rubber that is ribbed for anti-slip protection as well as comfort.

The console cover features storage pockets, a removable trash bin, pencil tray and a cup holder.

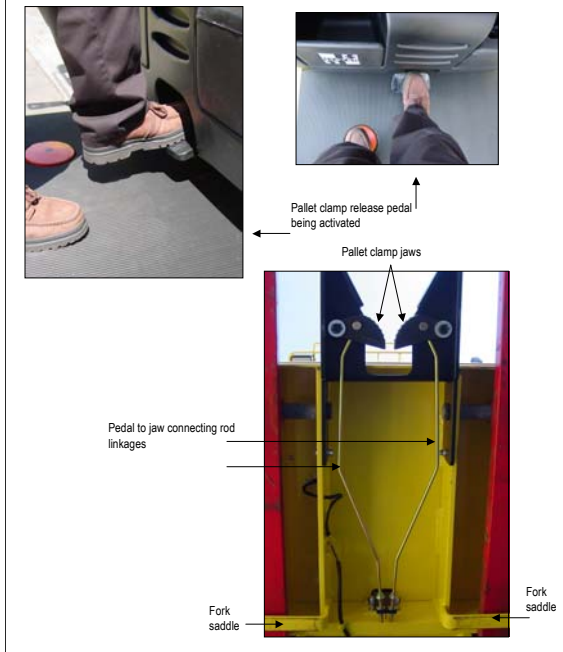
Corner posts are available through the Application Engineering department, and offer the operator added protection. The corner post option is required in applications where the truck may be used in right angle stacking situations.



The Crown operator platform features many of the same amenities as the Hyster R30XM₂. The Crown operator platform consists of the following features:

- Instrument Panel - The dash features a MDU (Master Drive Unit) wheel position gauge, built in BDI(Battery Discharge Indicator) and a Diagnostic window.
- The standard steering system for the Crown is the multi-turn steer. Therefore, the steering disk is standard for the Crown. Return To Center steer is not available.
- The accelerator handle is a twist grip design. There is no ergonomic shape or design on the accelerator handle.
- There is no angle adjustment on the accelerator handle provided for operator preference.
- The Horn, lift and lower switches are not a part of the handle. The switches are mounted just to the left of the twist grip handle and are difficult to activate while engaging the accelerator handle in either direction.
- There is a pencil tray and storage compartment molded into the console cover which is standard. There is no cup holder.
- The electric parking brake switch is a dome type which is similar to but smaller than the Hyster parking brake switch. This Crown brake switch is not flush mounted. This design contributes to operator foot and leg fatigue.
- The pallet clamp mechanism must be manually engaged and manually released.
- An anti-slip rubber floor mat is only .75 inches thick as compared the Hyster floor mat that measures 1 inch thick. The Hyster R30XM₂ provides more cushion for a more comfortable ride while reducing operator fatigue.

Hyster Pallet Clamp and Fork Adjustment



The Hyster pallet clamp is automatically activated and manually released. The pallet clamp jaws automatically grip the pallet runner when the pallet clamp is engaged to the pallet. To release the pallet clamp, simply step on the release pedal.

The pallet clamp jaws are connected to the release pedal with connecting linkage rods. These connecting rods are tucked up under the operator platform for protection. Connecting rods are used in lieu of the typical cable and pulley design for the pallet clamp because the connecting rods do not stretch like the cables will; minimizing adjustment requirements while maximizing reliability.

Fork adjustment on the Hyster R30XM₂ requires no tools. Simply push up on the fork tip. This will cause the fork to pivot on the mounting shaft-pin. The fork can be slid within the fork saddle easily to the left or to the right. When the desired fork position is obtained, lower the fork tip back down.

Crown Pallet Clamp

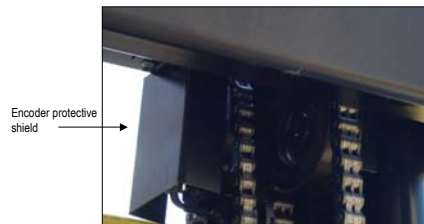
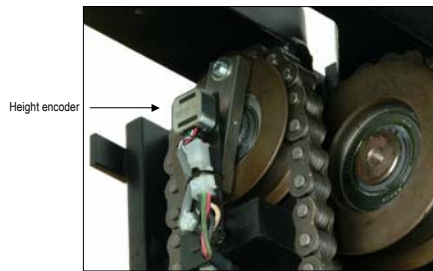


The Crown pallet clamp assembly is manually activated and manually released. Once the pallet is grasped by the pallet clamp, the pedal is applied. Pushing the foot pedal locks the pallet clamp jaws to the pallet runner. When the pallet has reached its destination, the release mechanism must be activated (top right photo from top) to unlock the pallet clamp jaws. The pallet release pedal is 7.5 inches off the platform floor mat. For applications requiring frequent pallet drop offs (which is frequent for order pickers) this activity contributes to operator fatigue and reduced productivity levels.

The pallet clamp is controlled by a series of cables and pulleys. Cables stretch and require frequent adjustments to maintain proper gripping of the pallet clamp. There are a lot of moving parts and pulley alignment is critical.

The locking mechanism pedal is not ergonomically positioned and proves to be uncomfortable to apply. The pedal has no flat plate or pedal pad for foot comfort.

Hyster Height Sensing



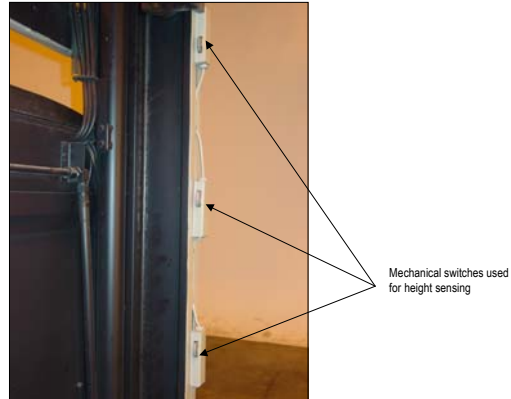
The R30XM₂ features a continuous height sensing system, referred to as HySense™. An optical encoder is used in conjunction with the software logic contained in the Curtis 1310 master control unit (MCU) to regulate travel speeds.

The encoder shaft is attached directly to the left hand side mast chain pulley. The encoder counts the number of pulley rotations, which is directly proportional to the platform motion (up and down).

The encoder has a sealed shaft and ball bearings to assure durability and requires no adjustments.

The continuous height sensing system eliminates stepped travel speeds and provides linear travel speeds in relation to platform height. Specifically, as the platform is raised above sixty inches the traction speeds are gradually reduced at various platform heights instead of certain designated (pre-determined) heights. This allows maximum speeds at various platform heights.

Crown Height Sensing and Speed Reduction

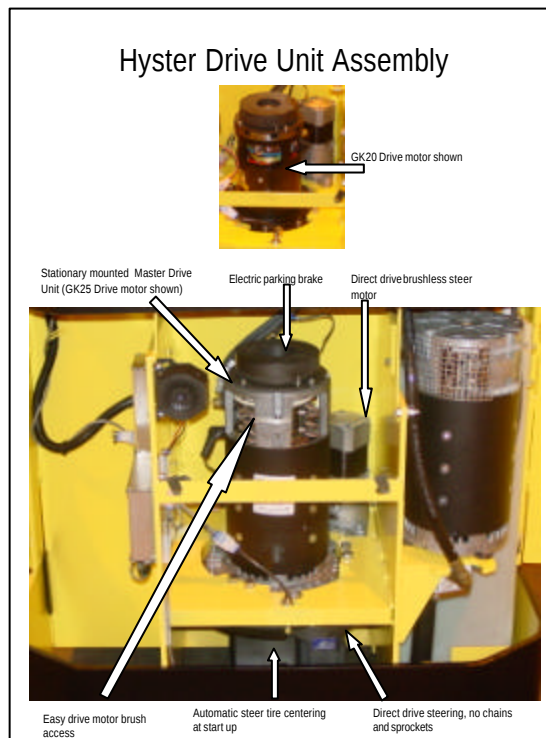


Crown height sensing on the SP3020-30 order picker is done through the use of mechanical switches. Mechanical switches have several issues that can be identified as disadvantages - compared to the Height Encoder used on the Hyster R30XM₂.

- Mechanical switches are less reliable
- Mechanical switches are more vibration sensitive
- Mechanical switches require more adjustments
- Mechanical switches are also more susceptible to physical damage

The main topic of discussion with this design is that when the mechanical switches are used the speed reduction is done in steps or stages. When the switch is activated, at the point of activation the speed is reduced or increased, depending on if the platform is being raised or being lowered. The truck maintains that speed until the next switch is activated.

The advantage of the height encoder speed reduction system (Hyster design) is that the speed is reduced or increased in a linear (gradual) fashion as the platform is being raised or lowered. This system optimizes travel speeds. This permits more picks at higher heights, increasing productivity levels.



The R30XM₂ features Separately Excited Motor (SEM) technology, which improves reliability and performance. SEM traction control systems provide control of the traction motor field current independent from the armature current, providing superb traction control.

Another feature of SEM is the Auto Deceleration System (ADS). The Auto Deceleration System is activated when the operator reduces accelerator input (decelerates). The energy (heat) generated through the traction motor is transferred to the battery, which acts like a large heat-sink, minimizing motor heating.

Furthermore, SEM requires less current through the motor brushes, thus increasing motor brush life.

The SEM drive motors, in conjunction with the MOSFET traction controller, eliminates the forward and reverse contactors which increase reliability, durability and simplify servicing. SEM technology provides better battery shift life, smooth acceleration, adjustable plugging and an Auto Deceleration System as compared to non-SEM traction systems.

The R30XM₂ drive motor is fixed-mounted. The drive motor is stationary, resulting in fewer loose connections and less cable and wire harness fatigue and failure as compared to rotating drive motor designs.

Crown Drive Unit Assembly

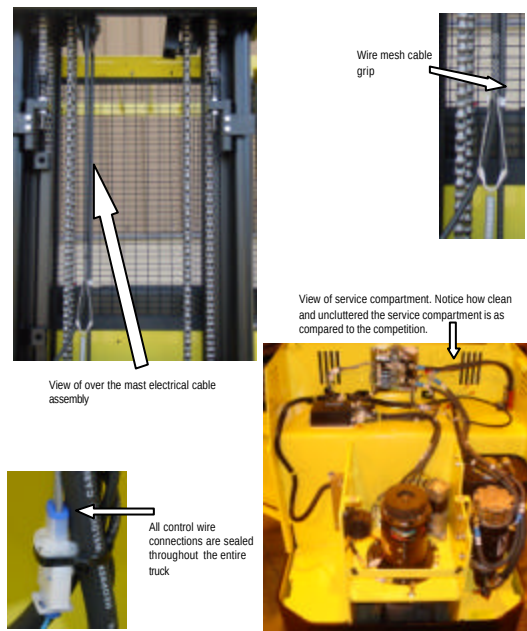


Master Drive unit (MDU) assembly

The Crown SP3020-30 drive unit assembly is an older generation of electronics featuring a series wound drive motor. Crown **DOES NOT** feature SEM technology. Without SEM technology, there are several issues that can be discussed:

- The series wound drive motor does not provide the same level of speed control as shunt wound motors nor the acceleration.
- The series wound drive motor does not provide regenerative plugging. Therefore, the kinetic energy generated when plugging (directional changes with truck in motion) is transferred to the motor as heat build up which contributes to reduced motor performance and decreases motor brush life.
- Directional contactors (forward and reverse) are used in the Crown traction system increasing maintenance and component costs as well as being much noisier.
- Not CANbus compatible.
- More wires and cables required, increasing potential loose wire connections and potentially higher maintenance costs.
- There is more wear and tear on the electric parking brake.

Hyster Wire Harness and Cables



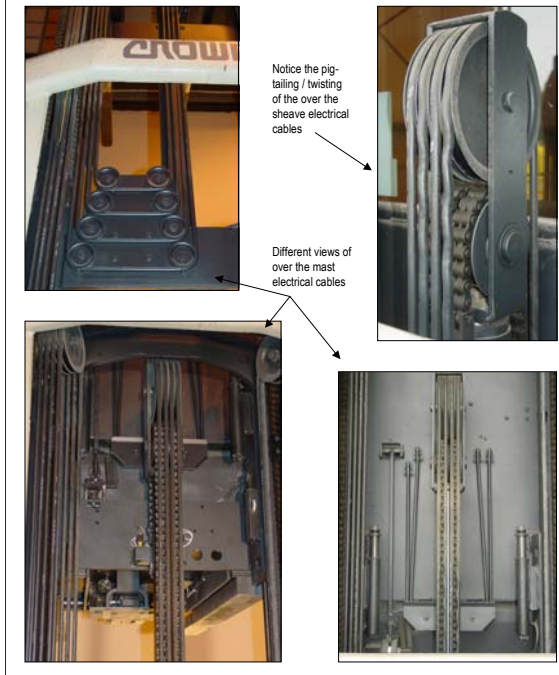
With the innovative electrical system, the over the mast cable assembly has been reduced to a single 8 conductor (8'strands') cable, no matter what combination of options are configured on the truck. The smaller conductor cables do not pigtail (twist) like the larger cables typically do. This alone reduces truck downtime and maintenance cost.

The over the mast cable is properly tensioned by a wire mesh cable grip. Having the proper tension on the cable assures the cable will track properly on the cable sheave preventing pig tailing (twisting) which will eventually cause the wires to pull apart resulting in truck down time, and diagnostic and repair time.

Wires are color coded and numbered for ease of identification and reduced trouble shooting time in the event of a fault.

All wire connectors are sealed for a positive connection and for moisture protection.

Crown Wire Harnesses and Cables



The Crown truck **DOES NOT** utilize a CANbus communications system as the Hyster truck. This is evident by the number of cables required to interface the platform to the chassis (4 eight conductor cables = 32 individual strands of wire).

Notice the pig tailing (twisting) of the over the mast cables. This causes the wires to eventually pull apart. Typically, this will start as an intermittent electrical problem. The wires will separate and short together, usually only at a certain point going over the cable sheaves. The rest of the way up or down the electrical system will function fine. Typically, this situation takes a technician several attempts to find and resolve the problem. With the large number of cable assemblies and pulleys on the Crown SP 3000 series, this can be a very expensive machine to maintain.

As with a lot of Crown products, at first glance the truck looks good with a lot of covers and cosmetics. However, removing the covers and taking a closer look reveals a lot of expensive maintenance issues.

Hyster Load Wheels and Base Arms



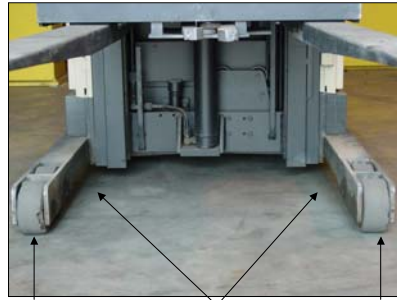
The Hyster Load wheel and base arm assembly provide several distinct advantages over the competition:

- The Hyster load wheels are designed to articulate. The articulation provides a smoother ride for the operator, especially on uneven floor surfaces.
- Articulated load wheels tend to wear more evenly than non-articulated load wheels.
- Typically with non-articulated load wheel designs, when a single load wheel needs replacing, both are replaced due to uneven floor surface contact. Uneven floor surface contact can result in truck wobble and cause uneven weight / load distribution on the load wheels. Additionally, uneven floor contact can result in tracking problems, especially in rail guided and wire guidance applications. Because the Hyster load wheel design provides articulation, the load wheels will find their position independently, minimizing load wheel replacement.

The Hyster basearm assembly has two distinct advantages over the competition.

- The Hyster designed basearm assemblies consist of a basearm with wheel hanger weldments welded to the end of the basearms. This design allows the replacement of the wheel hanger and not the entire base arm in the event the truck is run into a rack or damaged. With the R30XM₂ design, the wheel hanger can be cut off the base arm and a new wheel hanger assembly welded back to the basearm.
- The wheel hanger weldment assembly features end caps to protect the load wheels from becoming damaged.

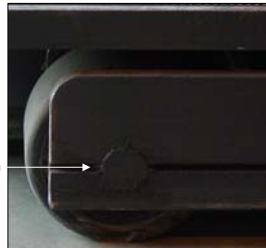
Crown Load Wheels and Base Arms



Notice the exposed load wheels and the chunk of load wheel missing

Base arms

Notice the exposed load wheels and the chunk of load wheel missing



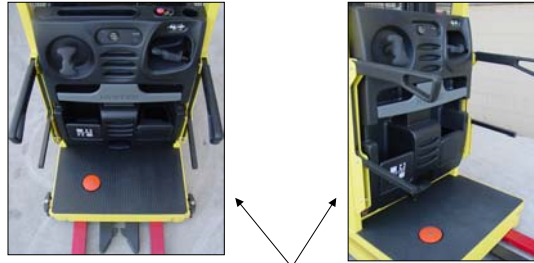
Fixed load wheel design

The Crown load wheels are exposed and unprotected. As can be seen from the top photo, wheel damage is inevitable.

The Load wheels are fixed-mounted to the base arms and do not articulate like the R30XM₂. Several issues can be discussed:

- Load wheels tend to wear unevenly
- A rougher ride is experienced, especially on rough or uneven floor surfaces.
- Typically, when a single load wheel on a tandem load wheel design needs replacing, both are replaced due to uneven floor surface contact. Uneven floor surface contact can result in truck wobble and cause excessive wheel loading due to uneven weight / load distribution. Additionally, uneven floor surface contact can contribute to truck tracking problems, especially in rail guided applications.

Hyster Retractable Side Gates



View of retractable side gates and operator compartment. Double arm design.



Soft touch-sure grip retractable side gates



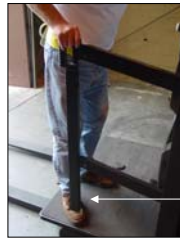
View of side gates in fully retracted position

The retractable side gates are standard on the R30XM₂. Fixed side gates are also available on the R30XM₂.

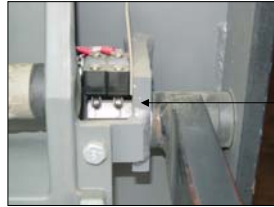
The R30XM₂ retractable side gate design features a soft touch sure grip rubber coating, with a gas cylinder assist. Order picking requires the side gates to be raised and lowered many times throughout the work shift. The rubber coating provides increased operator comfort and reduced hand fatigue, while the gas assist cylinder reduces shoulder and arm fatigue.

When the side gates are raised, interlock switches are activated causing the traction circuit and lift/lower circuit are interrupted. Only with the side gates fully lowered will traction, hoisting and lowering functions be enabled.

Crown Retractable Side Gates



Retractable sidegate design allows a foot pinch point when lowering to fully lowered position



Micro-switches are cam activated by the side gates when raised or lowered

Retractable side gates are standard on the SP 3000 series. The Crown side gate design lacks ergonomic consideration.

- No soft touch – sure grip rubber coating on hand grip
- The side gates present a pinch point when fully lowered
- There are no gas assist cylinders, rather the side gates are spring assist.

With no soft touch–sure grip rubber coating on the side gate hand grip, the side gates can easily slip out of an operator's hand, especially in freezer or intermittent freezer applications. Also, no rubber coating, contributes to operator hand fatigue.

The side gates are designed to stay in the raised position by the angle of the side gates once in the raised position. However, with no gas assist cylinder, there is nothing to prevent the side gates from falling if bumped by an operator while picking from the rack. There is a pinch-point presented when the side gates are being lowered. Furthermore, with no gas assist cylinder to control the side gates while lowering, the operator must manually lower the side gate all the way to the lowered position for a controlled function. Over time, the side gate assist springs stretch and loose tension. The side gates are heavy, and as the assist springs loose tension they will fall to the lowered position very quickly. With the operator having to manually control the lowering of the side gates, increased operator arm and shoulder fatigue is the end result.

Micro switches are used to relay electrical signals to indicate when the side gates are raised and lowered. The traction system and hydraulic system are interrupted when either of the side gates are in the raised position. Traction functions and hydraulic functions will resume when the side gates are lowered.

Competitive Presentation Summary

There is no doubt that Crown is a strong force in the Class II market place. There is no doubt Crown has a good order picker. But have no fear, the Hyster R30XM₂ stands head to head with the Crown SP3020-30 in every way.

The Hyster R30XM₂ features an ergonomically designed operator platform, which includes a multi-function control handle that is adjustable in three different angles, six inch vertical adjustable console (optional), thick rubber floor mat, dual overhead guard mounted light and fan package, RTC (return to center) steer or optional multi-turn steer (no charge option), and a full view wire mesh screen.

The Electrical system found on the R30XM₂ features state-of-the-art technology (SEM traction system, CANbus communication system, Hall effect sensors) for a simple, yet very reliable design. The electrical system features components from top electrical manufacturers such as, Inmotion (formerly Atlas Copco), and Curtis. The electrical system found on the R30XM₂ reflects the latest technical advances in the industry, unlike the Crown SP3020-30, which reflects an older less reliable designed electrical system. Crown's electrical system features General Electric controls; however, this electrical system is generations behind the current transistor control system found on the R30XM₂.

The competitive presentation section is designed to provide the salesperson with valuable information depicting the designs and features of both the Hyster R30XM₂ and the Crown SP3020-30. From this section, one will understand why the Hyster R30XM₂ can be positioned as the best order picker in the industry.

For detailed test data on performance and energy consumption between the R30XM₂ and Crown SP3020-30, refer to section five (Key Specification Comparison) and look under the Comparative Evaluation data.

COMPETITIVE PRESENTATION

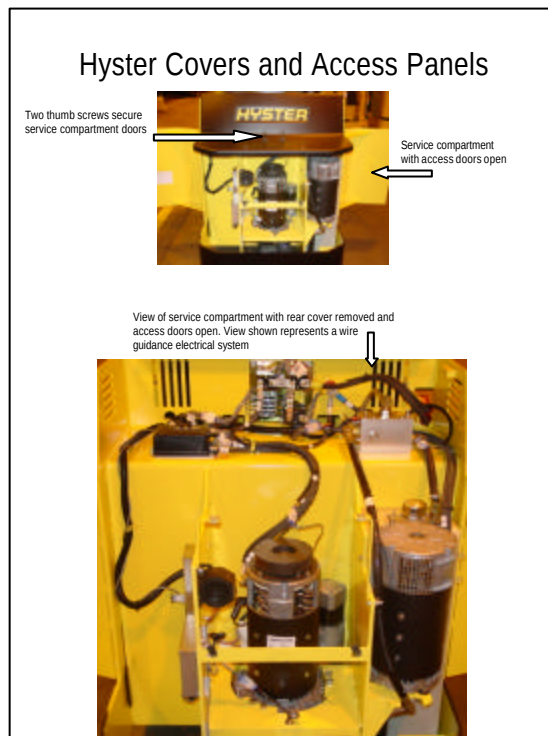


HYSTER R30XM₂

VS



RAYMOND OPC30TT

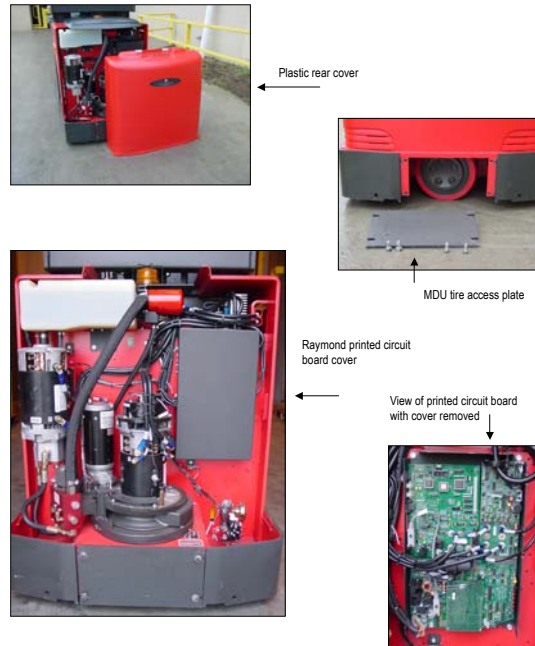


The Hyster R30XM₂ service compartment features swing open metal doors and a U.L. approved rear cover.

The doors are hinged for easy swing open access and are secured with two thumb screws, which require no tools to remove. Metal doors protect the motors and electrical compartment in the event the truck is backed into a rack. Additionally, raised forks from another lift truck will be prevented from protruding into the motor compartment.

The rear top cover is made of an ABS plastic. Four spring loaded quarter-turn fasteners secure the top cover. These screws are spring loaded for quick, easy removal and installation. The fasteners are secured to the cover with a small retaining clip so the fasteners are actually a part of the cover assembly, eliminating the chance of misplacing hardware.

Raymond Covers and Access Panels



Raymond does a good job on cover removal and installation on the order picker. Much like the Crown SP3020-30 order picker, at first glance, the Raymond OPC030TT order picker appears to be a sleek, stylish, clean looking truck; that is until the covers are removed and the very expensive and complex electrical system is exposed.

The Raymond OPC030TT features a plastic polymer lift off (no tools required) service compartment cover. The plastic cover does not offer the same level of protection as the Hyster R30XM₂'s swing open metal doors. Sharp or protruding objects hanging off a rack could possibly penetrate through the plastic rear cover of the OPC030TT into the service compartment, and cause component damage resulting in major repair expenses.

The printed circuit boards are protected by a clip on (no tools required) metal cover. This cover must be removed before wire identification, wire tracing or trouble shooting can begin.

The MDU (Master Drive Unit) tire has a steel access plate. The access plate must be removed in order to inspect or change the steer tire (4 bolts secure the drive tire access plate). The MDU tire access plate can be easily damaged and bent. Damage to the access plate will cause problems in removal and installation.

The Hyster order pickers feature a MDU tire cut out for quick, easy inspection and servicing. There is no access plate or mounting hardware to remove and install.

Hyster Electric Foot Switch



Flush mounted electric foot switch



Ergonomically positioned foot switch

View of operator activating the foot switch and pallet clamp release pedal



The Hyster R30XM₂ electric foot switch is ergonomically positioned on the operator platform. The operator can stand in his/her natural position and comfortably activate the foot switch.

The switch is counter-sunk into the platform's anti-slip floor mat. When the foot switch is activated, the operator's foot is cushioned by the rubber floor mat. The one inch thick rubber floor mat cushions the operator for a smooth, more comfortable ride.

This innovative design by Hyster Company enhances operator comfort and productivity, while reducing operator foot and leg fatigue.

Raymond Electric Foot Switch



The Raymond electric foot switch is a pedal type design. This design causes the operator to lift his/her leg each and every time in order to activate the foot switch, which contributes to operator leg fatigue.

The foot switch has the same rubber covering as the floor mat. The foot switch, when activated, becomes flush with the floor mat which provides a comfortable position and stance for the operator.

The floor mat is .5 inches thick and has round raised bubbles for cushioning and to act as a anti-slip mat. The Hyster R30XM₂ floor mat is a full 1 inch thick. Therefore, the R30XM₂ provides twice the cushion as compared to the Raymond floor mat, resulting in a smoother, more comfortable ride.

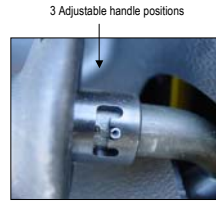
Hyster Accelerator Control Handle and Hydraulic Control Functions



Ergonomically positioned multi-function control handle



multi-function control handle



3 Adjustable handle positions

The Hyster multi-function control handle is ergonomically designed and positioned. The angle of the handle provides the operator the opportunity to drive the truck comfortably either MDU end first or fork end first. The handle is designed to fit in the palm. The slender handle body is shaped and contoured to comfortably fit in various hand sizes. The handle is scalloped at the bottom allowing the hand to stay in position and to provide a hand rest.

The multi-function handle is designed with three adjustable locking positions, or angles. This feature allows the operator to adjust the handle to a position that is the most comfortable and productive to them.

The multi-function handle is used in conjunction with the alphanumeric display during setup and/or to set or adjust truck performance parameters.

The accelerator switch is a hall effect sensor, an electrical solid state device. Hall effect sensors have fewer wearable parts, require much less adjustment, and are not as vibration sensitive as potentiometers.

Additionally, the adjustable console (optional) further enhances operator comfort and productivity by allowing six inches of vertical travel of the entire console assembly. This feature puts the controls and instrument panel in the position that works best for each individual.

These state-of-the art designs of the Hyster R30XM₂ provide the operator the opportunity to become one with the truck. Various size operators will enjoy the modern ergonomic advantages of this truck over the competition.

Raymond Accelerator Control Handle and Hydraulic Control Functions



The Raymond multi-function accelerator handle is similar to the Hyster design. The handle design is intuitive like that of the Hyster multi-function accelerator handle. The rotary thumb lift/lower controls are located at the end of the handle and can be easily activated. However, there are several disadvantages to the Raymond design as compared to the Hyster accelerator design.

1. The handle position on the Raymond truck is not as ergonomically positioned / angled to allow the operator's hand to be in it's natural position and activate the handle controls.
2. The Raymond handle is not equipped with a palm rest or scalloped at the bottom of the handle to assure proper hand positioning and hand support.
3. The Raymond handle does not have adjustable handle angle positions.
4. Raymond does not offer an adjustable console, therefore, operators driving in applications where the primary means of travel is in the fork first direction may find it difficult to operate.

The Raymond multi-function control handle uses a potentiometer (variable resistor) as the accelerator switch, unlike the Hyster R30XM₂ which utilizes a hall effect sensor for the accelerator switch. Potentiometers have several disadvantages as compared to a hall effect sensor:

1. Potentiometers(variable resistors) have more wearable parts
2. Potentiometers require more adjustments to maintain proper voltage outputs
3. Potentiometers are more vibration sensitive
4. Potentiometers are less efficient, less reliable and less durable



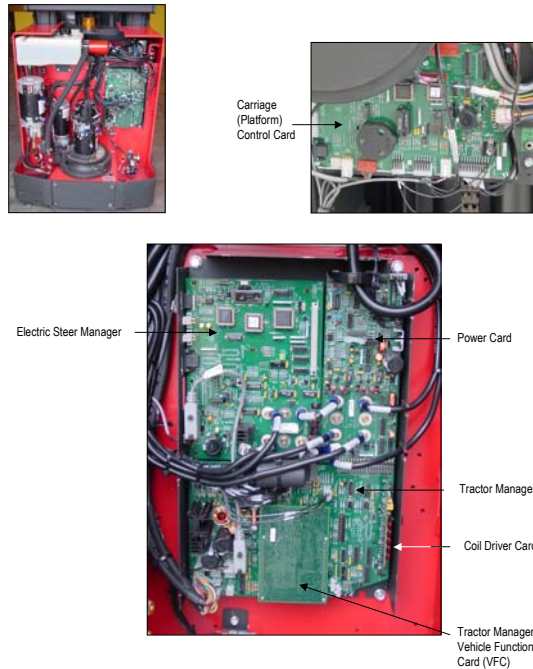
The Hyster Electrical control system features the Curtis 1310 Master Control Unit (MCU, the brains of the truck) and Controller Area Network (CAN bus) communications. This state of the art technology provides the R30XM₂ series with one of the industry's most advanced electrical systems.

The CANbus communication system reduces the number of, over the mast electrical conductors, from 27 'strands' down to 8, which greatly improves durability and reliability. The following solid state devices are connected by the CANbus link; the Curtis 1310 MCU and the Curtis 1243 traction controller, the Inmotion APS (Advanced Power Steering) and the Inmotion Wire Guidance (optional) unit.

The traction system is controlled by a Curtis 1243 transistor controller which utilizes MOSFET (Metal Oxide Semiconductor Field Effect Transistor) technology. The 1243 controller changes direction of the current to the traction motor in response to directional changes via the operator through the multi-function control handle. The transistor traction controller eliminates the need for forward and reverse contactors, improving performance, reliability and reducing maintenance costs.

Curtis and Inmotion (formerly Atlas Copco) are manufacturers of electrical solid state devices used throughout the lift truck industry here in North America, as well as in Europe.

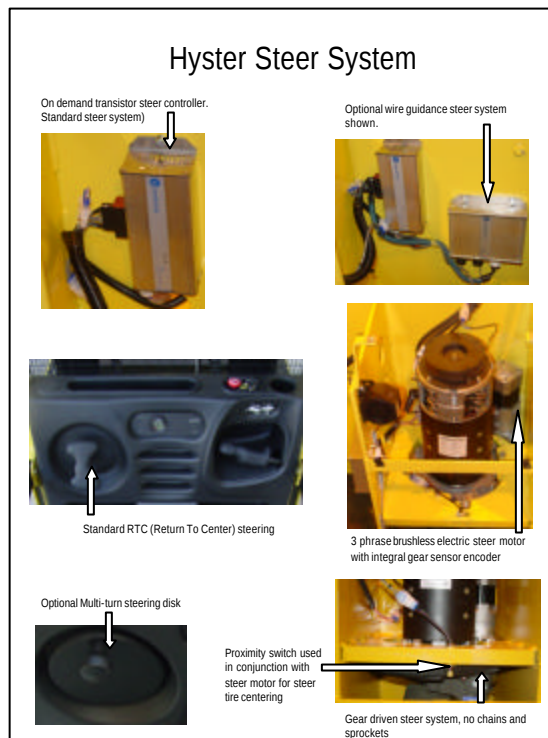
Raymond Electrical System



The Raymond electrical system consists of a lot of proprietary parts. Proprietary parts are very expensive.

The Raymond Corporation designed and developed this electrical system. Therefore, the customer is limited to Raymond service technicians working on the equipment (or the customer is responsible for his service technician). The technician is required to purchase a Raymond handset in order to communicate / interface with the electrical system when trouble shooting. In addition, there is a serial port for PC interface, but the customer must purchase the software in order to communicate to the electrical system.

As can be seen, this is a much more complex electrical system compared to the Hyster electrical system. It is estimated that each of these cards are around \$1,800 each, excluding labor to remove or install. In addition, there is troubleshooting time to determine which one of the components are bad or causing the malfunction.



The R30XM² features an Inmotion Technology's (formerly Atlas Copco) steer motor and transistor steer controller. The steer motor is an electric three-phase brushless DC motor with an integral gear box assembly and an integral gear encoder. The steer controller is a solid state transistor controller which is linked to the CANbus communication system link. The brushless steer motor means there are no brushes to service (maintenance free), resulting in reduced maintenance costs and increased reliability. Further, the steer motor is a direct drive design, eliminating the chain and sprocket utilized previously. The direct drive design eliminates the adjustments required to maintain proper chain tension, while enhancing steer response and reliability. In addition, the direct drive steer system is quieter than the chain driven systems.

This steer system is equipped with a proximity switch that works in conjunction with the steer motor and the steer controller to automatically center the steer-wheel at each start up. This assures the operator of straight ahead travel each and every time the key switch is turned on, regardless of the steer tire position when the truck was turned off.

RTC (Return To Center) steering is standard on the R30XM₂. This unique electric steering design allows the steer tire to return-to-center whenever the operator releases the steer handle. Optional multi-turn steering is also available on the R30XM₂ at no charge for those individuals that prefer this style of steering.

Raymond Steer System



Multi-turn steering disk



Electric steer motor

The Raymond steer system features multi-turn steering. Raymond does not offer an RTC (Return To Center) steering. The multi-turn steer system is similar to the optional Hyster multi-turn steer system in that the steer disc and spinner knob are located to the left of the operator (Tractor end first).

The Raymond steer motor will require brush inspection and / or replacement to maintain proper performance, resulting in increased maintenance costs and truck downtime. The Hyster R30XM₂ features a brushless steer motor and requires no maintenance.

The Raymond steer system features a gear driven MDU (master drive unit) in lieu of the chain driven design. This is a good and reliable design and not much can be noted as a disadvantage other than to adjust or repair this system may be more involved and time consuming than the Hyster chain driven design. The chain driven design on the Hyster R30XM₂ is easily accessible and can be adjusted in just a matter of minutes.

Hyster Operator Platform



The Hyster R30XM₂ operator compartment is full of operator and ergonomic amenities.

Standard is the overhead guard mounted light and fan package. Each light and fan package includes a fixed work light, a dome light and a 2 speed fan. The fan cover features adjustable louvers to provide ventilation to the operator.

The rubber coated gas-cylinder-assist retractable sidegates (standard) enhance operator safety and comfort while reducing operator fatigue.

The 2 speed full ventilation body fan (optional) provides maximum ventilation directed toward the operator's mid-section. This is especially beneficial for applications requiring the safety glass windshield in place of the standard wire mesh screen.

The adjustable console (optional) provides six inches of vertical travel to enhance operator comfort and put the controls just where each individual operator feels the most comfortable and productive. NOTE: The adjustable console option is strongly recommended when specifying a truck in which the operator drives the truck in the fork first direction as the primary direction of travel.

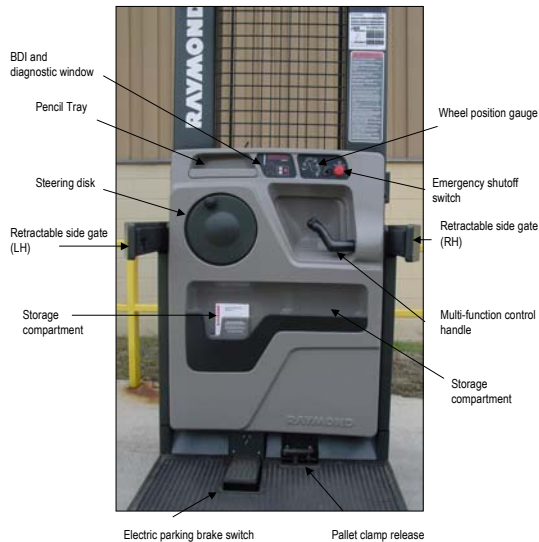
The adjustable 3 position multi-function control handle (standard) further enhances operator comfort.

The one inch thick floor mat provides a shock absorbent rubber that is ribbed for anti-slip protection as well as comfort.

The console cover features storage pockets, a removable trash bin, pencil tray and a cup holder.

Corner posts are available through the Application Engineering department, and offer the operator added protection. The corner post option is required in applications where the truck may be used in right angle stacking situations.

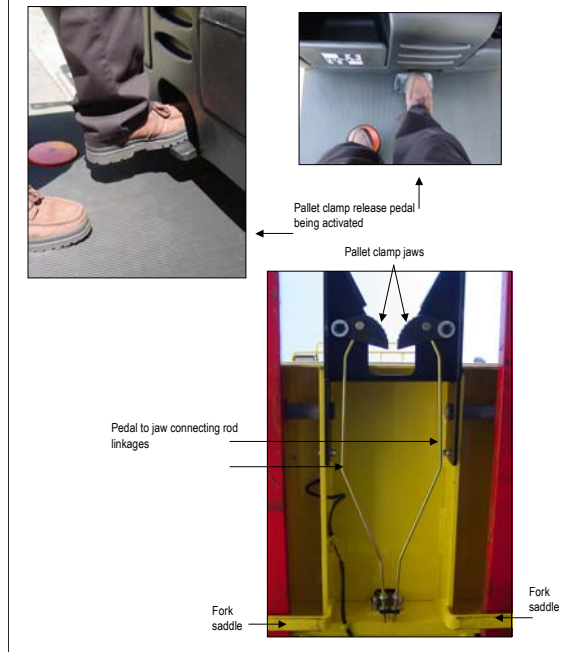
Raymond Operator Platform



The Raymond operator platform features many of the same amenities as the Hyster R30XM₂. The Raymond operator platform consists of the following features:

- Instrument Panel - The dash panel has push buttons for programmable performance settings (password or code protected). The dash also has an MDU (Master Drive Unit) wheel position gauge. The key switch and emergency disconnect button is also a part of the dash panel. In addition, there is a BDI(Battery Discharge Indicator) and a diagnostic window.
- Raymond offers multi-turn steer only. There is no RTC option available.
- The accelerator handle is a multi-function control handle that features variable lift / lower, forward and reverse functions, and a horn.
- There is a pencil tray and storage compartment molded into the console cover which is standard, like the R30XM₂ series.
- The electric parking brake switch is a pedal design.
- Automatic pallet clamping jaws are standard. There is a pallet clamp release pedal located at the floorboard area, similar to the R30XM₂ design.
- An anti-slip rubber floor mat is only .5 inches thick as compared to the Hyster floor mat that measures 1 inch thick. The Hyster R30XM₂ provides more cushion for a more comfortable ride and reduced operator fatigue.

Hyster Pallet Clamp and Fork Adjustment

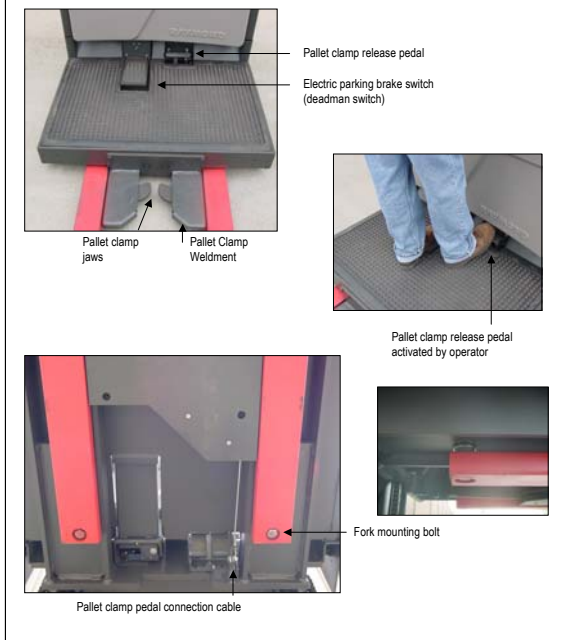


The Hyster pallet clamp is automatically activated and manually released. The pallet clamp jaws automatically grip the pallet runner when the pallet clamp is engaged to the pallet. To release the pallet clamp, simply step on the release pedal.

The pallet clamp jaws are connected to the release pedal with connecting linkage rods. These connecting rods are tucked up under the operator platform for protection. Connecting rods are used in lieu of the typical cable and pulley design for the pallet clamp because the connecting rods do not stretch like the cables will; minimizing adjustment requirements while maximizing reliability.

Fork adjustment on the Hyster R30XM₂ requires no tools. Simply push up on the fork tip. This will cause the fork to pivot on the mounting shaft-pin. The fork can be slid within the fork saddle easily to the left or to the right. When the desired fork position is obtained, lower the fork tip back down.

Raymond Pallet Clamp and Fork Adjustment

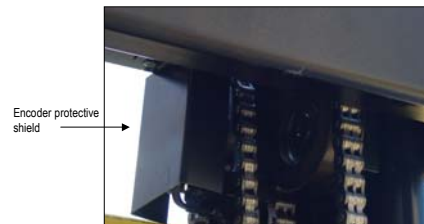
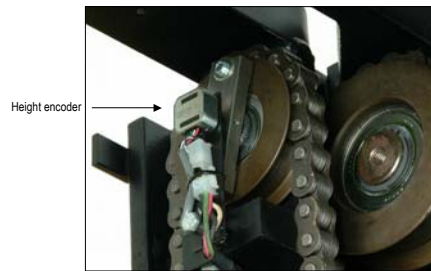


The Raymond pallet clamp design features a self clamping and manual release pedal. The pallet clamp has automatic clamping jaws, and clamp on to the pallet runner when engaging a pallet. The pallet clamp jaws are released by a release pedal located on the platform floorboard similar to the R30XM₂.

Raymond chooses to use a cable and pulley design to activate the pallet clamp jaws. Unlike the Hyster R30XM₂ which uses steel connecting rods to connect the pallet clamp jaws to the release pedal. The cable designed pallet clamps require more maintenance than do the connecting rod design due to the fact the cables will stretch and require adjustment where as the metal connecting rods will not stretch. In short, the connecting rod type pallet clamp is more durable / reliable than cable designs and also require less adjustments than the typical cable and pulley design.

The Raymond fork design requires tools to adjust the fork spread. The locking bolt must be removed from the rear of the fork assembly and the fork slid over until aligned with the additional bolt hole pattern. This procedure is very difficult for one person to perform. Care must be taken when sliding the forks over the additional mounting holes so that the threads are not crossed when reinstalling the locking bolt. Fork adjustment on the Hyster R30XM₂ requires no tools and no hardware to remove and install.

Hyster Height Sensing



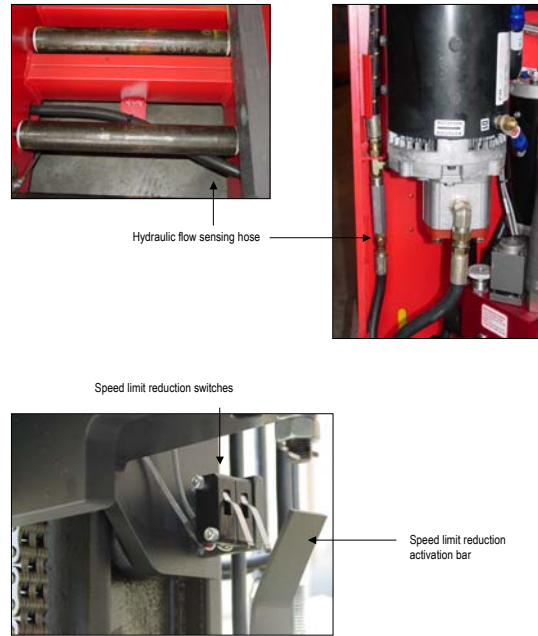
The R30XM₂ features a continuous height sensing system, referred to as HySense™. An optical encoder is used in conjunction with the software logic contained in the Curtis 1310 master control unit (MCU) to regulate travel speeds.

The encoder shaft is attached directly to the left hand side mast chain pulley. The encoder counts the number of pulley rotations, which is directly proportional to the platform motion (up and down).

The encoder has a sealed shaft and ball bearings to assure durability and requires no adjustments.

The continuous height sensing system eliminates stepped travel speeds and provides linear travel speeds in relation to platform height. Specifically, as the platform is raised above sixty inches the traction speeds are gradually reduced at various platform heights instead of certain designated (pre-determined) heights. This allows maximum speeds at various platform heights.

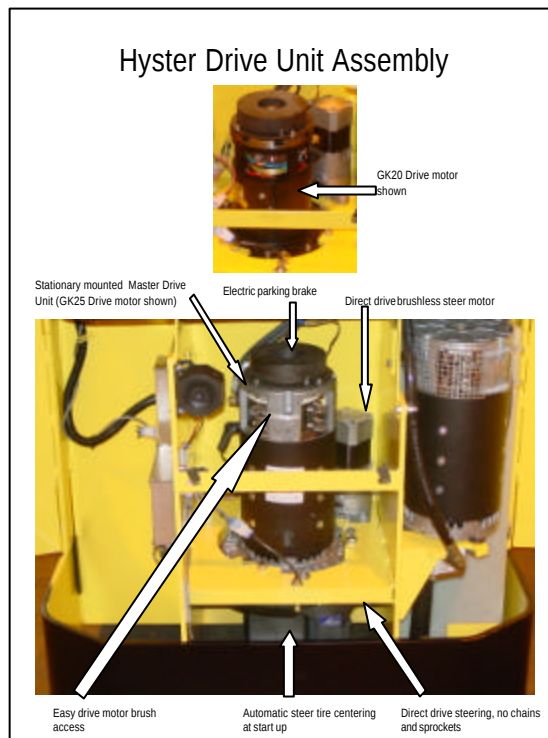
Raymond Height Sensing and Speed Reduction



The Raymond height sensing is done either electrically or hydraulically. When performed hydraulically, it is referred to as advanced intellispeed. A flow sensor is placed in the hydraulic system that senses the amount of fluid flowing to the lift cylinders. A positive flow indicates the platform is being raised and a negative flow indicates the platform is being lowered. The electronics in the flow sensor relay information to the truck control system electronically to indicate truck height. Based on platform height, direction the truck is traveling in, and steer angle, the speed is either gradually increased or decreased for a smooth step-less activation. However, there are several short comings with this design:

1. The advanced Intellispeed option is a \$1,295 price book option.
2. This design does not work with the cold storage option or the cold storage with wire guidance option. Since the height sensing is done hydraulically, and cold storage hydraulic oil is thinner than standard hydraulic oil, the flow sensor will not calculate the oil flow accurately.
3. The hydraulic flow sensor is very sensitive to contamination and static
4. The flow sensor does not work properly at low lift / lower speeds.
5. The electronics in the flow sensor are very sensitive. The flow sensor cannot be repaired or modified. When there is a problem with the flow sensor the part must be replaced and it is expensive.

Standard height sensing consists of micro-switches that relay platform height information electrically (as can be seen from the bottom photo). As the platform is raised the activation bar trips the micro-switch to reduce the speed. This design reduces the speed in steps every so many inches (steps), unlike the intellispeed option, which gradually reduces truck speeds in a linear fashion as the platform is raised allowing faster travel speeds at various platform heights.



The R30XM₂ features Separately Excited Motor (SEM) technology, which improves reliability and performance. SEM traction control systems provide control of the traction motor field current independent from the armature current, providing superb traction control.

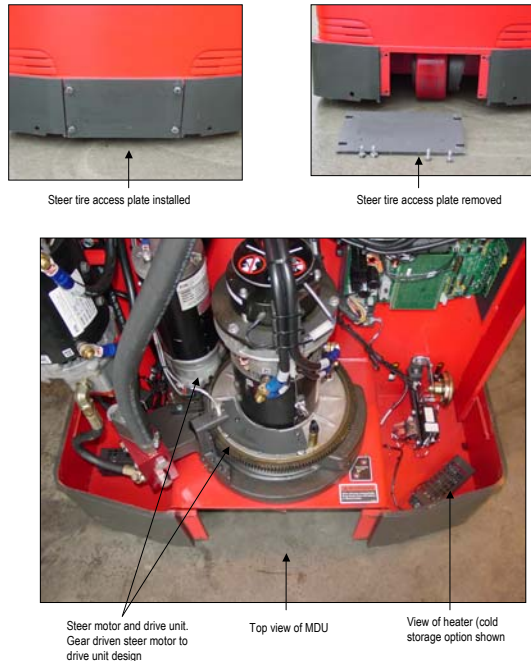
Auto Deceleration System (ADS) is also a part of the SEM traction system. The Auto Deceleration System (ADS) is activated when the operator reduces accelerator input (decelerates). The energy (heat) generated through the motor is transferred to the battery, which acts like a large heat-sink, minimizing motor heating.

Furthermore, SEM requires less current through the motor brushes, thus increasing motor brush life.

The SEM drive motors, in conjunction with the MOSFET traction controller, eliminates the forward and reverse contactors which increase reliability, durability and simplify servicing. SEM technology provides better battery shift life, smooth acceleration, adjustable plugging and an Auto Deceleration System as compared to non-SEM traction systems.

The R30XM₂ drive motor is fixed-mounted. The drive motor is stationary, resulting in fewer loose connections and less cable and wire harness fatigue and failure as compared to rotating drive motor designs.

Raymond Drive Unit Assembly



The Raymond drive unit assembly features SEM (separately excited motor) technology as does the Hyster R30XM₂. There are many benefits to the SEM system.

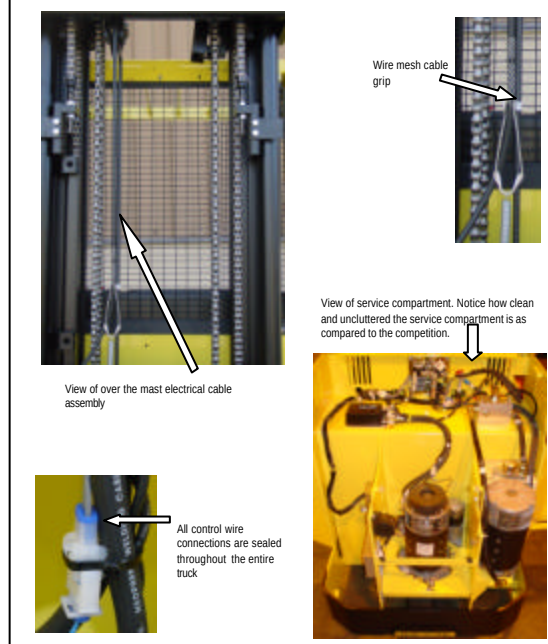
However, the Raymond design permits the drive unit to turn in response to operator steering input. There are disadvantages to this type of design:

1. The power cables tend to become loose much quicker on this design as compared to a fix mounted drive unit. Loose connections cause performance degradation, motor and / or cable overheating.
2. The power cables have a much greater chance of getting chaffed or cut leading to a short or grounded situation. A shorted power cable can lead to an electrical fire, intermittent electrical malfunctions, or cause critical electrical components to fail. A grounded power cable can lead to many intermittent electrical problems as well as excessive battery amperage drainage.

Both of these situations lead to expensive repairs and truck downtime.

Another design related issue on the MDU is the drive tire access plate. This plate is secured with four mounting bolts and must be removed each time the drive tire needs inspection or servicing.

Hyster Wire Harness and Cables



With the innovative electrical system, the over the mast cable assembly has been reduced to a single 8 conductor (8‘strands’) cable, no matter what combination of options are configured on the truck. The smaller conductor cables do not pigtail (twist) like the larger cables typically do. This alone reduces truck downtime and maintenance cost.

The over the mast cable is properly tensioned by a wire mesh cable grip. Having the proper tension on the cable assures the cable will track properly on the cable sheave preventing pig tailing (twisting) which will eventually cause the wires to pull apart resulting in truck down time, and diagnostic and repair time.

Wires are color coded and numbered for ease of identification and reduced trouble shooting time in the event of a fault.

All wire connectors are sealed for a positive connection and for moisture protection.

Raymond Wire Harnesses and Cables



Two 6 conductor over the mast wire cables

Metal tension spring clips used on electrical cables



The OPC30TT order picker utilizes Raymond's own designed CANbus style electrical system. This is evident by only requiring two six conductor electrical cables to interface the trucks electrical system between the chassis and the platform. The Hyster CANbus system only requires a single eight conductor electrical cable interface between the platform and chassis.

The Raymond electrical cables are properly tensioned by springs and metal retaining clips. The metal retaining clips tend to cut into the electrical cable insulation over time. This can contribute to intermittent electrical problems such as false fault codes and component failure; both of which are expensive to troubleshoot.

The cable sheaves are the circular groove style which have a tendency to cause the electrical cables to track out of the sheaves and / or cause pig-tailing (twisting) of the cables, which lead to the wire strands within the cable to break over time.

The Hyster R30XM₂ utilizes a flat bottom groove cable sheave. The flat bottom grooved style cable sheaves reduce cable pig-tailing and keeps the electrical cables tracking straight.

Hyster Load Wheels and Base Arms



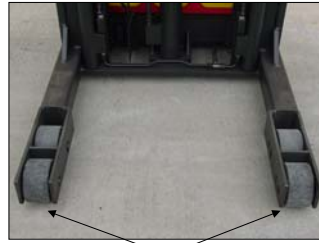
The Hyster Load wheel and base arm assembly provide several distinct advantages over the competition:

- The Hyster load wheels are designed to articulate. The articulation provides a smoother ride for the operator, especially on uneven floor surfaces.
- Articulated load wheels tend to wear more evenly than non-articulated load wheels.
- Typically with non-articulated load wheel designs, when a single load wheel needs replacing, both are replaced due to uneven floor surface contact. Uneven floor surface contact can result in truck wobble and cause uneven weight / load distribution on the load wheels. Additionally, uneven floor contact can result in tracking problems, especially in rail guided and wire guidance applications. Because the Hyster load wheel design provides articulation, the load wheels will find their position independently, minimizing load wheel replacement.

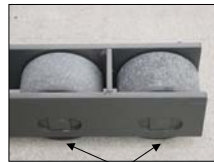
The Hyster basearm assembly has two distinct advantages over the competition.

- The Hyster designed basearm assemblies consist of a basearm with wheel hanger weldments welded to the end of the basearms. This design allows the replacement of the wheel hanger and not the entire base arm in the event the truck is run into a rack or damaged. With the R30XM₂ design, the wheel hanger can be cut off the base arm and a new wheel hanger assembly welded back to the basearm.
- The wheel hanger weldment assembly features end caps to protect the load wheels from becoming damaged.

Raymond Load Wheels and Base Arms



Unprotected load wheel design



Fixed load wheels. Flag pin type axle shafts



Grease fitting and retaining (snap) ring

The Raymond load wheels are exposed and unprotected, wheel damage is inevitable.

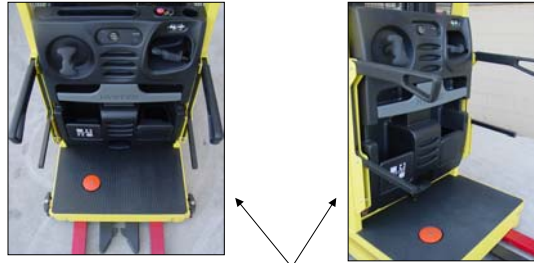
The Load wheels are fixed-mounted to the base arms and do not articulate like the R30XM₂. Several issues can be discussed:

- Load wheels tend to wear unevenly
- A rougher ride is experienced
- Typically, when a load wheel needs replacing, both are replaced due to uneven floor surface contact.

The Raymond order picker mast and base arm assembly is one part. The base arm assemblies are a part of the welded mast structure, and mounted independently to the tractor part of the truck. There is no rolling chassis as on the Hyster R30XM₂. With the mast removed, there is no way to move the tractor part of the truck without picking it up with another lift truck or lifting device. The R30XM₂ base arm design is part of the chassis/or tractor part of the truck.

With the base arms being a part of the mast assembly, if rack height changes and / or application changes are required, the customer must purchase another mast and base arm assembly; very expensive. The Hyster R30XM₂ can have the mast easily removed independently and another installed.

Hyster Retractable Side Gates



View of retractable side gates and operator compartment. Double arm design.



Soft touch-sure grip retractable side gates



View of side gates in fully retracted position

The retractable side gates are standard on the R30XM₂. Fixed side gates are also available on the R30XM₂.

The R30XM₂ retractable side gate design features a soft touch sure grip rubber coating, with a gas cylinder assist. Order picking requires the side gates to be raised and lowered many times throughout the work shift. The rubber coating provides increased operator comfort and reduced hand fatigue, while the gas assist cylinder reduces shoulder and arm fatigue.

When the side gates are raised, interlock switches are activated causing the traction circuit and lift/lower circuit are interrupted. Only with the side gates fully lowered will traction, hoisting and lowering functions be enabled.

Raymond Retractable Side Gates



Recessed hand grip



Single arm design

The Raymond side gate assembly design is similar to the Hyster side gate design in that there are gas assist cylinders to keep the side gates up when they are in the fully raised position. In addition, the gas cylinders help bring the side gates to a controlled lowered position when the side gates are released for travel.

The side gates however are a one piece design and offer only upper body protection; no lower body protection. The Hyster side gate is a two piece design with an upper and lower gate. The two piece design provides upper and lower body protection.

The two piece design can also make the operator feel more secure in the operator compartment, especially while in upper rack picking applications.

Interlock switches are not a part of the Raymond standard truck construction. Interlock switches and traction cutout when side gates are raised are price book options. The Hyster order picker includes interlock switches and traction cutout as a part of the standard truck construction.

Competitive Presentation Summary

There is no doubt that Raymond is a strong force in the Class II market place. There is no doubt Raymond has a good order picker. But have no fear, the Hyster R30XM₂ stands head to head with the Raymond OPC30TT in every way. It should be noted that the Caterpillar NOR30/P, Mitsubishi EOP 15-24/P, and the Toyota 6BPU15 order pickers are all versions of the Raymond model.

The Hyster R30XM₂ features an ergonomically designed operator platform, which includes a multi-function control handle that is adjustable in three different angles, six inch vertical adjustable console (optional), thick rubber floor mat, dual overhead guard mounted light and fan package, RTC (return to center) steer or optional multi-turn steer (no charge option), and a full view wire mesh screen.

The electrical system found on the R30XM₂ features state-of-the-art technology (SEM traction system, CANbus communication system, Hall effect sensors) for a simple, yet very reliable, design. The electrical system features components from top electrical manufacturers such as Inmotion (formerly Atlas Copco), and Curtis. The major electrical components found on the R30XM₂ do not reflect proprietary costs like the electrical components found on the Raymond OPC30TT. In addition, to perform service work on the OPC30TT, one must either purchase the Raymond software for PC interface access or get a certified Raymond handset; again, proprietary expenses.

The competitive presentation section is designed to provide the salesperson with valuable information depicting the designs and features of both the Hyster R30XM₂ and the Raymond OPC30TT. From this section, one will understand why the Hyster R30XM₂ can be positioned as the best order picker in the industry.

For detailed test data on performance and energy consumption between the R30XM₂ and Raymond OPC30TT, refer to section five (Key Specification Comparison) and look in the Comparative Evaluation data.