



Introducing the Hyster designed E30-40HSD 3 wheel electric, stand drive, counterbalanced lift truck, available in 3000, 3500 and 4000 lb. Capacity.

Design Objective

- **Develop a Hyster designed replacement for the E30FR2 and E35-50FR currently purchased from Schaeff.**
- **The intent is to provide a reliable product that will be competitive in both performance and cost.**



- The objective of this project was to develop a Hyster designed replacement for the E30FR₂ and E35-50FR.
- The new electric cushion tire 3 wheel standup counterbalanced has a capacity range of 3000, 3500 and 4000lb. The 4500 and 5000 lb. version will not be replaced at this time.
- Contact Hyster Company for 4500/5000 lb. needs.
- The new E30-40HSD electric stand drive counterbalanced lift truck replaces the E30FR₂ and E35-50FR series.
- The E30-40HSD has excellent ergonomics with competitive features and performance, proven components, and a simple, serviceable design.

Focus

Primarily intended for use on the dock for loading and unloading trailers, including some stocking and transport use.

Focused towards retail distribution, food manufacturing and processing, general warehousing and manufacturing, storage, plastic products, and freight transportation.



- The new truck is focused toward the largest segment of the market.
- This truck will be used primarily on the dock for loading and unloading trailers. Stocking / transport use is also anticipated.
- Major competitors in this market are Crown and Raymond. Crown products are known for their ergonomics and complex mechanical design. Raymond products are known for features, performance, and proprietary controls. Our goal was to offer an ergonomic truck with good performance, simple controls, and a simple, serviceable design, at a competitive price for our customers.

E30-40HSD Standard Features

- ✓ **36 Volt**
- ✓ **Curtis SEPEX™ Transistor Traction Controls**
- ✓ **Ultima II™ Multi-Function Control Handle**
- ✓ **BDI with lift interrupt**
- ✓ **Hour Meter**
- ✓ **Dual Electric Brakes**
- ✓ **On Demand, Hydraulic Tiller Steeringx w/ brushless DC Motor**
- ✓ **Dual Traction Motors**
- ✓ **Foot Released Park Brake**
- ✓ **Padded Backrest w/ lumbar support**
- ✓ **Side Operator Stance**
- ✓ **Contactor Hydraulic Control**
- ✓ **2-Function Hydraulic Control Valve**
- ✓ **38.5" Class II Hook Type Carriage**
- ✓ **48" Load Backrest**
- ✓ **Battery Compartment Steel Rollers**
- ✓ **Positive Mechanical Battery Disconnect**
- ✓ **SB 350 Gray Battery Connector**
- ✓ **Isolated Operator's Compartment Floor**
- ✓ **88" Drive in Rack Overhead Guard**
- ✓ **Electric Horn**
- ✓ **Comfort Support Plate**
- ✓ **Operator's Manual**
- ✓ **UL Classification E**

Read Slide

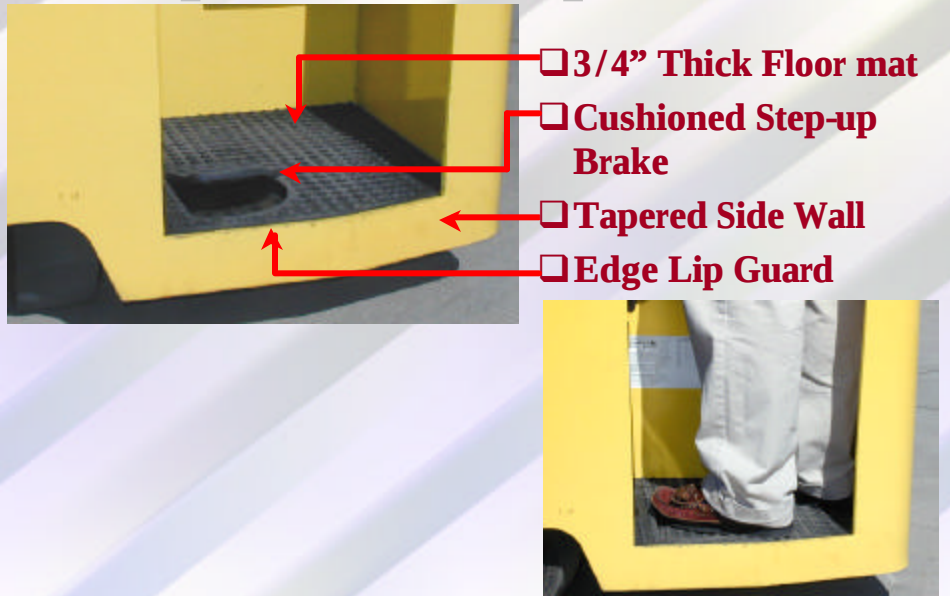
Frame

- **All welded Steel construction**
- **Finite Element Modeling (FEM)**
- **2 chassis sizes**
 - One for 18" nominal battery
 - One for 21" nominal battery
- **Shorter truck offers 3 & 3500 lb cap**
- **Longer 3500 & 4000 lb cap**
- **All frames are 42" wide**



- All welded steel construction frame provides compartment for battery power supply.
- The frame is designed to distribute loads and stress uniformly throughout the structure. The application of this design concept through finite element modeling and extensive stress testing produces a balanced design with long-term durability.
- The frame provides the mounting for major components such as the steer axle, drive units, and counterweight.
- Rear step height at 7.5" provides easy ingress and egress.
- There are 2 chassis sizes, one for 18" nominal battery, and one for the nominal 21" battery. The shorter truck offers 3000 & 3500lb capacities. The longer will offer 3500 & 4000lb capacities.
- All frames are 42" wide.

Operator Compartment



- The operator compartment floor is fully padded with a full 3/4" thick rubber mat that offers exceptional shock and vibration absorption and reduces operator fatigue.
- The cushioned step-up brake pedal has been designed for low-effort actuation. The operator can actuate the brake up and down throughout a full shift of mounting and dismounting without feeling strain. Plugging, however, is still the preferred method of stopping an electric truck.
- The truck also features a tapered side wall and an edge lip guard to help keep the left foot inside the operator compartment.

Operator Compartment

- 19 5/8" deep – 18 1/8" wide floor
- Elbow, back, hip & knee pads
- Back pad separate from lower



•The best operator orientation for this application is side stance. This truck is also occasionally used as a multi purpose unit, with some stacking required. Facing forward is more comfortable for stacking. The operator compartment is designed with both of these applications in mind. Clearly, side stance is favored. The 19 5/8" deep, 18 1/8" wide floor allows the room for natural and comfortable foot placement. The floor is sized, and the controls are positioned to allow 20 degrees forward stance.

•A combination of elbow, back, hip and knee urethane pads surround the operator. The top back pad is separate from the lower back pad so that the frame can be modified through SPED for those customers who do not want the raised section in the back.

Floor Plate

- **Suspended on polymer arches**
 - **Reduce vibration & shock transmitted to operator**
- **Impact from driving over dock boards reduced up to 25%**



- The floor is suspended on polymer arches to absorb and reduce the vibration and shock transmitted to the operator. Impact from going over dockboards is reduced by up to 25%.

Hoods & Covers

- **High impact ABS plastic**
- **Large storage compartments**
- **Clipboard**
- **Beverage holder**



- The covers are made of high impact ABS plastic. Large storage compartments and a recess for a clipboard are molded in. Covers are easily removed with a minimum of tools. Pads surrounding the operator compartment are made from a durable urethane foam.
- The cover includes a beverage holder, and another large storage area.

Instrument Panel

Standard

- ✓ **Back lighted alpha numeric LCD**
- ✓ **LED indicators for warnings**
- ✓ **Battery state of charge**
- ✓ **Total truck hours**
- ✓ **Diagnostic and fault codes**



- The standard dash display is a Curtis 840. This is the same display as used on the new orderpicker, and it performs in the same way. Output consists of battery state of charge, and truck hour meter. The dash also displays maintenance fault codes.

Instrument Panel

Premium



- ✓ Entry access codes for operators and service technicians
- ✓ Four traction performance modes
- ✓ Lift pump hours
- ✓ Traction hours
- ✓ Total truck hours
- ✓ Extended diagnostic and fault codes
- ✓ Traction and pump motor brush wear and over temp indication
- ✓ Back lighted alpha numeric LCD
- ✓ LED indicators and a beeper for warnings
- ✓ Battery state of charge

- An optional premium dash offers 4 travel modes, multiple hour meters (total truck, traction and hoist hours) and operator password options.

Serviceability

- ✓ **Easy lift-off panels provide quick access to lift pump, drive motors, electronics and power steering assembly.**



- The top and front service panels are constructed of lightweight, durable, ABS plastic. They are designed to snap off and back on with ease providing quick access to major components.

Ultima II™ Control Handle

- **Simultaneous operation of travel, hoist and one aux function**
 - **Actuation direction is intuitive**
- **Used in conjunction with display for setup and diagnostics**
 - **Built-in palm rest**
 - **Neutral braking**



*Optional Buttons
for 4th function*

- The Ultima II™ control handle is a multifunction four way joystick, with proportional travel and hoist, and button controlled tilt, sideshift, horn, and aux functions. This handle uses the same base as that on the new Narrow Aisle truck. Orientation, and number of buttons are specific for this truck.
- Travel, hoist, and one other hydraulic function can be operated simultaneously. Actuation direction is intuitive. Pushing the handle toward the forks causes forward travel. Moving the handle toward truck entry causes reverse travel. Pulling toward the operator causes lift, and pushing away causes lower. Similarly, the tilt and sideshift buttons are direction of actuation oriented.
- The flow to these functions is controlled via software by a proportional valve. Each function is programmed with a smooth ramp on and off. This provides smooth operation of the selected functions. When the button is released the proportional valve shunts flow back to the tank so that motion stops. The pump is programmed to run for a short period of time after the button is released so that the operator can easily switch from one function to another without waiting for the pump to switch off and then back on again.
- Hall effect sensors have replaced the potentiometers that were used on the previous handle allowing us to reduce the number of moving parts for enhanced reliability.
- The handle is also used in conjunction with the operator display for setup and diagnostics of traction and hydraulic functions.
- The built-in palm rest allows the hand to rest comfortably on the handle while providing support to the arm. This eliminates the need for an armrest.
- Neutral braking — When the handle is returned to neutral, the control system will apply a retarding torque to bring the truck to a stop.

Ultima II TM Control Handle

Hall Effect Sensors

- Improved reliability
- Improved speed control & acceleration
- Replace potentiometers
- No moving parts to wear out
- Sealed to prevent moisture contamination



•Hall effect accelerator input improves speed control and acceleration. This new design increases reliability by eliminating the accelerator potentiometer.

•Hall effect devices are used in applications to replace potentiometers. A potentiometer relies on an electrical connection of a moving wiper in contact with an element. This contact surface is prone to wear and contamination from vibration and moisture.

•Hall effect devices use sensors which measure magnetic fields. They use a magnet mounted on a mechanism which moves the magnet closer to or farther away from the sensor. Since there is no contact between the magnet and the sensor, there are no moving parts to wear out. Only the shaft and bushing are subject to wear, and will typically last many millions of cycles. The shaft is sealed to prevent moisture contamination.

•In a further simplified explanation, the difference between a potentiometer and a Hall effect device is like the difference between a CD player and a record player. The record player has a needle that makes direct contact with the record causing wear on both. The CD player has a non-contact device that reads data from the CD without actually touching the CD.

Overhead Guard

- ❑ **Standard 88" with higher profile bar canopy**
- ❑ **Optional 83" Low Profile OHG with flat plate canopy**

*All are compatible with drive in rack
(OHG support is 25.47" across the guard legs)*



Standard OHG



Optional OHG

- There are two basic overhead guard designs: An optional low profile 83" design with a flat plate canopy, and the standard, 88" higher profile guard with a bar on edge canopy. Both overhead guards and high visibility mast provide excellent visibility for maximum operator productivity.
- Overhead guards also vary with the wheelbase, thus there are four weldments.
- Visibility and aesthetics are emphasized in all four guards.
- The guard utilizes a three post design.

Steering System

- **On demand hydrostatic steering**
 - 5.75 turns lock to lock
 - Precise, reliable control
- **Hydraulic rack & pinion actuator**



- The hydrostatic steering system is all hydraulic, and is designed to give precise, reliable control having 5.75 turns lock to lock
- The system consists of a steering wheel, steering control unit, pump and motor, hydraulic rack and pinion actuator assembly and steer axle.

Steering System Operation

- Pressure and flow for the steering system operation is provided by the hydraulic pump and motor.
- The steering control unit directs and meters the oil to the steering actuator/cylinder as determined by the movement of the steering wheel. The steering cylinder force is directed through the gear rack and pinion and axle/yoke assembly to position the twin steer wheel tires. The control unit is an open-center, rotary actuated hand pump. When the steering wheel is rotated, the steering control unit meters a specific quantity of oil to the steering cylinder. When the steering wheel is stationary, oil flows freely through the control unit and not to the steering cylinder. If the motor stops running, the steering control unit becomes a manually operated hand pump, so the truck can be steered to a controlled stop.
- Oil pressure in steering system is limited by a relief valve in power steer hand pump.
- The steer angle pot and bracket mounted on the hydraulic rack and pinion steer actuator gives steer position to the traction system.

Steer Axle



- **Hydraulic rack and pinion**
 - **Similar to JXMT2**
- **Dual wheel assemblies**
 - **Provides 180 deg total steer angle**
- **Pre-packed tapered roller bearings**
 - **long life / minimum maintenance**
- **Extends steer component life**
- **Increases reliability**
- **Enhances operator performance**

- The steer axle assembly consists of a hydraulic rack and pinion actuator assembly, a steering yoke assembly, and dual tire and wheel assemblies.
- The basic design has been provided to many 3-wheel truck manufacturers in Europe and America for approximately 10 years. The product has very good durability and service history.
- The hydraulic rack and pinion actuator assembly consists of a cast housing, hydraulic dual ended cylinder with a center gear rack piston rod, and an output shaft with integral pinion mounted on large automotive type tapered roller bearings.
- Much of the steer axle is common with that used in the JXMT2. A new yoke and hub were created for this truck. The rest of the internal parts, including all seals and bearings are interchangeable.
- The hydraulic fluid flows to the end of the cylinder piston causing the center rack piston rod to move axially within the cylinder housing. The axial motion of the rack translates to rotary motion of the pinion and output shaft. The output shaft bearings provide smooth rotary motion and all reactions to loads transmitted through the assembly from the ground contact.
- The steering yoke assembly consists of a high strength steel forged yoke, dual ended steel spindle shaft and forged steel wheel hubs mounted on automotive type tapered roller bearings.
- The yoke translates the actuator output shaft rotation to the dual wheel assemblies providing 180 degrees of total steer angle. The yoke is designed and tested to transmit and withstand all steering and ground contact loads.
- The dual steer tires and wheel assemblies are offered in cushion tires.
- Tapered roller bearings are pre-packed for long life and minimum maintenance.
- The bearings are sealed to minimize dirt intrusion and maximize bearing grease retention.
- This design provides extended life for steering components, increased reliability and enhanced operator performance.

Power Steer Motor



- **Brushless DC permanent magnet with integral controller**
 - **No serviceable components**
- **0.8 kw rating**
- **In operation whenever traction is initiated**

Power Steering Motor

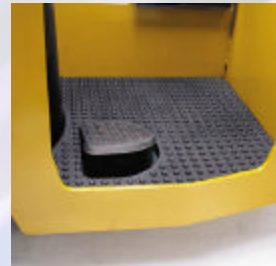
oThe power steering motor is a brushless DC permanent magnet motor with integral controller. The motor is manufactured by Iskra.

oThe motor is rated at 0.8 kw.

oThe hydraulic steer pump and motor are in operation whenever traction is initiated. This demand steer system is activated by the steer wheel rotation. A transistor control increases motor speed as steering wheel speed increases. Should the motor stop while the truck is in operation, the steering control unit is capable of manually pumping enough oil to operate the steering actuator. The truck may be manually steered, with increased effort, to a controlled stop.

Brakes

- **Electric parking brake assemblies mounted to the motors**
- **Two stage brake pedal**
 - 1st stage causes the truck to power to a stop using regen
 - 2nd stage powers the truck to a stop more aggressively, using the two spring applied, electrically released, motor mounted brakes to assist the motors



- The electric parking brake assemblies are mounted to the motors. Splines within the brake units absorb all fit-up to tolerances and wear so that no adjustment is required.
- Normal stopping of the truck is done using the traction motors. The operator simply reverses the handle direction, and the truck powers to a stop using regenerative braking, and then accelerates in the opposite direction.
- This method improves energy efficiency, and saves wear on the brakes
- The truck is also equipped with a two stage brake pedal. The first stage causes the truck to power to a stop using regen, just like that described above.
- The second stage powers the truck to a stop more aggressively, using two spring applied, electrically released, motor mounted brakes to assist the motors. These spring applied units also serve as the parking brake.
- The new electrically applied parking brake system is composed of fewer parts, which means fewer parts to service.

Brake Performance

- Tire lock-up reduced
- Reduced park-brake wear
- Regenerative braking slows to stop, then park-brake applies
- Throttle braking (plugging) – variable
- Neutral braking (coasting) – adjustable from free wheeling to a firm drag

Note: Plugging is the preferred method of stopping the truck.

- Plugging is the preferred method of stopping the truck.
- The 1243 controllers will interface with two spring applied, electrically released disk brakes mounted on the top of the traction motors. The brakes will draw approximately 1.8 amps of current at 36 volts. During normal operation, the brakes will be applied (de-energized) when the truck is stopped, brake pedal is up, or when the key switch is turned off.

Electrical System



- **Dual SEM controllers**
 - Sized to provide sufficient power
- **Soldered connections**
 - Improved reliability
- **Smooth, step-less, contactor-less control of the traction motor through the full operating range**
- **Regenerative braking**
 - Fully electronic/ no contactor
- **Auto Regen**
 - Automatic light regen brake when handle returned to neutral

SEM System Controllers

- Dual Curtis 1243 SEM controllers are sized to provide sufficient power for dock use. The controller system uses CAN communications, with the logic centrally located in a Curtis 1310 input/output controller. The Curtis 1310 contains all of the software. It tells which traction controller what to do, so there is no slave / master relationship.
- The 1310 is FLASH programmed, so the software is not a hard part of the controller, but is downloaded as part of our final assembly.
 - o All of the electrical connections in the controller are soldered, eliminating possible loose connections due to improperly tightened hardware. The microprocessor is soldered in place for high reliability.
 - o There are significantly fewer electrical wire connections, for improved system reliability.
 - o The SEM traction system has only one contactor, the line contactor.
 - o The armature and field controls are enclosed in one housing with a microprocessor logic system to control the two power systems.

SEM Control System Advantages

- o When the key is turned on, the line contactor is closed, and remains closed until the key is turned off. All the contactor noise of the old series controls is eliminated. The SEM control operates at 12 kHz, above the normal audible range, so there is no control hum. The control system is quiet.
- o The microprocessor controls the armature and field current to provide a smooth, step-less and contactor-less control of the traction motor through the full operating range.
- o Regenerative braking is fully electronic, without the need for a contactor. In addition, the control has auto regen. With auto regen, the traction control automatically goes into a light regen braking whenever the traction handle is in the release position.
- o Improved Reliability

Electrical System

- **CAN Communications (Controller Area Network)**
 - **Connects multiple control systems via 2 wires known as Canbus to form one integrated system**
- **Same base design as Orderpicker**
- **Permits significant reduction of wires & connections**
- **CAN System controlled by a Curtis 1310 Master Control Unit**
- **Robust system, allows operation in extremely harsh environments**
- **Extensively tested to ensure reliability**

- The Hyster E30-40HSD uses CAN communication (Controller Area Network) that allows the truck's multiple control systems to be connected using a pair of wires known as a CANbus to form one integrated system.
- This system uses the same base design as the Hyster orderpicker and is ideally suited for the E30-40HSD in that it permits a significant reduction in the number of independent electrical connections and wire harnesses used.
- The CAN system is controlled by a Master Control Unit: a Curtis 1310 unit located in the control compartment. The Master Control Unit (MCU) sends signals from the operator's input (i.e., lift/lower, forward/reverse, etc.) to the respective control.
- CAN is a robust system that allows operation in extremely harsh environments. Transmission errors are detected by extensive error checking mechanisms. Extensive reliability testing has been performed on the MCU.
- CAN technology allows single point diagnostics through the dash display.

The two wire twisted pair CAN bus carries the following data:

- Traction throttle
- Traction direction
- Horn
- Lift
- Lower
- Status and fault information
- Parameter change downloads
- Diagnostic information

CANbus Advantages

- **Increased reliability**
- **Substantial reduction in connections and wiring complexity**
- **Extensive function monitoring**
- **Fast data rate allows real time control**
- **Access to all controller parameters through a single CANbus port**

Read Slide

Drive Motors

Separately Excited Motor (SEM) technology



- 8 ¼" diameter motor
- Class H insulation
- Max speeds of up to 7 mph
- Independent armature and field control
- Regen braking
 - Only one contactor
 - 3-5 times longer brush life

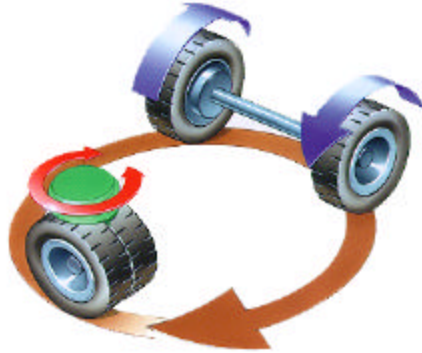
SEM Motors

oThe SEM traction system uses motors with independent armature and field control systems.

- These 8 ¼" diameter drive motors are electrically and thermally identical to those used in the JXMT2. Double brushes increase the surface contact with the commutator. Each brush is individually equipped with its own spring to keep brush pressure constant. This feature provides more even brush wear increasing brush life while reducing maintenance costs.
- The traction motors are shunt wound DC electric motors designed specifically for electric truck traction system duty. The motors have Class H insulation for long life.
- The motors are designed for maximum speeds up to 7 mph with improved thermal capabilities at lower speeds.
- The traction motor bearings are sealed and use high temperature grease.
- All traction motors will have regen braking, which will provide 3-5 times the traction motor brush life relative to a truck equipped with only plug braking.

Traction Control

- **Continuous Differential Drive**



- Dual front wheel, continuous differential drive enables both wheels to be under power at all times, but operating separately. This gives power to each drive motor as needed for greater efficiency. The motors are controlled by two controllers; one for each motor.
- Motor speed is reduced in tight turns. Instead of shutting off, the inside drive motor adjusts its speed to the radius of the turn for better control. The control logic cuts to the motor on the inside of a turn and reverses that motor in extremely tight turns for maximum maneuverability. It improves traction on slippery surfaces.

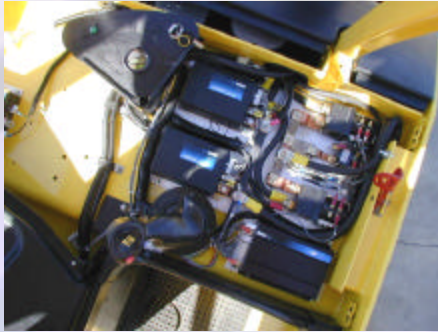
Traction Control Features

- o State-of-the-Art MOSFET technology
- o Smooth, quiet operation
- o High frequency
- o No contactor clatter
- o Eliminates traction contactors; just a line contactor.
- o No forward/reverse contactors
- o No bypass contactor
- o No field weakening contactor
- o No regen contactor
- o Regen to low speed is standard.
- o Control adjustments by trained personnel using a “hand-held” device or PC.
- o Lower maintenance
- o Fewer components
- o Simpler layout
- o No serviceable parts in the control
- o Less wiring and connections

Summary of traction control features:

- State-of-the-Art MOSFET technology designed to control Separately Excited Motors (SEM) for optimum motor efficiency and performance control.
- Smooth, quiet operation
- High frequency
- No contactor clatter
- Eliminates traction contactors; just a line contactor.
- No forward/reverse contactors
- No bypass contactor
- No field weakening contactor
- No regen contactor
- Regen to low speed is standard.
- Control adjustments by trained personnel using a “hand-held” device or PC.
- Lower maintenance
- Fewer components
- Simpler layout
- No serviceable parts in the control
- Less wiring and connections
- Control adjustments are made with a “hand-held” device that looks like a calculator or a special computer.
- The “hand-held” device limits control adjustments to trained personnel only. This provides assurance from adjustments that could cause truck mis-operation.
- The “hand-held” can be purchased by the customer’s Maintenance Department. Minimal training is required to operate the “hand-held”.

Serviceability



- **Overheat protection**
 - **Auto shut down**
- **Built-in diagnostics**
 - **Specific fault detection**
- **Calibration**
 - ✓ **Run Time Diagnostics**

- This truck has an overheat protection system, designed to automatically shut the unit down in the unlikely event that the motors should get too hot.
- Calibration of travel, lift and steer, and run time diagnostics with 74 error codes are built-in to reduce troubleshooting time.
- Input and output controls provide specific fault detection. Superior diagnostics pinpoint problems using tests to display potentiometer voltages, display brake pedal switch positions, open and close solenoid valves, and operate individual motor and display current.

Transaxle

- **Common with the JXMT2**
- **Drive motors are spline fitted to transmission,**
 - **Allows removal or replacement without affecting gear train set-up**
- **Full floating design**
 - **Weight of the truck carried by axle housing, not axle shafts**
 - **Right and left axle shafts are the same**



- Dual drive units are individually mounted in the frame with complete and separate traction motor and braking systems. The design is cost effective, compact, and allows for independent traction control for each wheel.
- The transmission is common with the JXMT2 with the exception of the brake components. These are removed in favor of motor mounted brakes on the E30-40HSD. The transaxle has a new intermediate shaft, and cap. All the other components are common.
- Drive motors are spline fitted to transmission, allowing for removal or replacement without affecting gear train set-up.
- The overall gear reduction of 15.87:1 was specified to minimize motor speeds at 36 volts. Spiral bevel and helical gears are used in the (2) gear sets to minimize noise.
- The left and right hand drive unit/transmission housings are of cast iron to withstand heavy loads and absorb shock loads.
- The drive unit assemblies mount to the frame with five M16 cap screws per side. This arrangement provides frame support and rigidity with ease of service, assembly, and removal as independent units.
- The wheels rotate on large tapered roller bearings with both bearings lubricated by transaxle oil. Lip type seals on the outside of the outer bearings seal against outside dirt and retain lubricating oil.
- Drive axle shafts are integral with wheel hubs and splined helical wheel reduction gear. The axle assembly is a "full floating" design, which means that the weight of the truck is carried by the axle housing, not the axle shafts. The right and left axle shaft are the same.

Tires

Standard: (black)

Capacity	Drive Tire	Steer Tire
3000 lb	18" x 7" rubber	10" x 5" poly (80)
3500 lb	18" x 7" rubber	10" x 5" poly (92)
4000 lb	18" x 7" poly	10" x 5" poly (92)

Option: (black)

Capacity	Rubber (drive)	Non Marking Rubber (drive)	Poly (92 duro)	Poly (80 duro)
3000 lb	Std	Opt	Opt	Opt
3500 lb	Std	Opt	Opt	Opt (drive)
4000 lb	N/A	Opt	Opt	Opt (drive)

Hydraulic System

- **All functions electronically controlled**
- **2800 psi relief / 2000 psi aux**
- **Hydraulic filter located in the tank**
- **37 degree fittings with O-ring ports**
 - **Reduce the potential for leaks**
- **Wire-braid hoses and steel tubing**
 - **Extends service life and simplifies service access**



Hydraulic System

- The hydraulic system consists of a 36 volt d.c. series wound electric motor, main hydraulic pump, main hydraulic control valve, hydraulic tank, in tank hydraulic filter, steer hydraulic pump, 36 volt d.c. brushless permanent magnet electric steer motor, steering control unit, and tilt cylinders.
- Hydraulic functions are all electrically controlled.
- A 2800 psi/19.3 mpa relief in tilt and lift hydraulic system allows the use of small hydraulic lines and components. Auxiliary systems will have 2000 psi/13.8 mpa relief in all valve variations.
- Pressure relief valves control the maximum system operating pressures. The main relief valve senses the lift system pressure. When the pressure raises to 2800 psi/19.3 mpa, the relief valve opens to protect the lift and tilt system. The secondary relief valve senses the auxiliary system pressure and is set to open at 2000 psi/13.8 mpa.
- A return line full flow main hydraulic filter located in the tank is provided for protection of the hydraulic circuit.
- Thirty-seven degree hydraulic fittings with O-ring ports are used throughout to reduce the potential for leaks.
- A combination of flexible wire-braid hoses and steel tubing is used to simplify the hydraulic plumbing. These hydraulic lines are carefully routed and held in place to reduce possible damage. This feature extends service life and simplifies service access.

Hoist Motor



- **7" diameter, 36 volt series wound**
 - **Best for frequent stop start typical in lift truck work cycle**
- **Class H insulation**
 - **Provides optimum efficiency**
- **27 minute rating**
- **Internal cooling fan**
- **Sealed, high temp ball bearings**
 - **Long, maintenance-free life**
- **All hoist motors equipped with motor temp & brush wear sensors that can be used with premium display option**

Hoist Motor

- **A single pump and DC motor will be used for lift, tilt, side shift, and auxiliary functions**
- **Series wound Class H electric motors are used for optimum efficiency. The series motor is best for frequent stop-start applications in a typical lift truck work cycle. The standard motor is open.**
- **The pump motor is 7" inch diameter with a 27 minute rating of 6.9Kw at 36 volts. The motor is manufactured by Iskra.**
- **The motors have an internal cooling fan to reduce internal temperatures and increase the motor life. The motor bearings are sealed, and high temperature ball bearings are used for long, maintenance-free life.**
- **All hoist motors are equipped with motor temperature and brush wear sensors that can be used with the premium display option.**

Pump Motor Control

Contactor Hydraulics

A contactor will connect full battery voltage to the pump motor when any hydraulic function other than lowering is commanded. No pump motor controller will be used. Proportional and solenoid valves will control flow.

Transistor Hydraulics

A pump motor controller will be used to vary the pump speed, which with the proportional valves will regulate the speed of the hydraulic movements.

Transistor Hydraulic Control

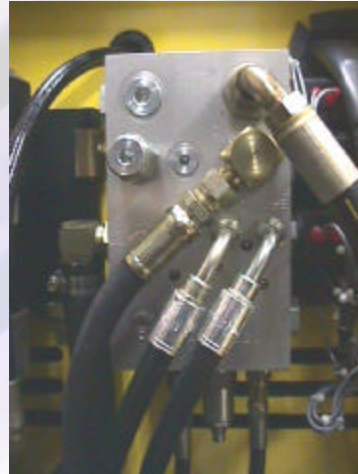
- MOSFET Series motor controller, 500 Amp max;
- CAN bus compatible

PUMP MOTOR CONTROL

- Main Pump Motor Control – One Speed Contactor(standard)
- The main pump motor delivers full flow to all hydraulic functions.
- (Optional) Transistor Control
- The controlled acceleration feature of the transistor reduces pump and motor loadings on start-up for increased system life.
- Tilt and auxiliary speeds are set to the flow requirement for maximum energy efficiency.
- The lower attachment speeds can improve the battery shift by supplying only the hydraulic energy required.
- The transistor hydraulic system is strongly recommended on any truck with high attachment usage such as a clamp. A sideshift is usually not considered a high usage attachment.

Control Valve

- **Electrically actuated, cartridge based modular design**
 - **Simplifies control system**
 - **Ease of troubleshooting & repair**
- **All functions driven from CAN based control system**
- **10 micron filter**
 - **Protects system from contaminants**
 - **Promotes reliable performance**
 - **Helps provide long life for all system components**



Main Hydraulic Control Valve

- An electrically actuated control valve provides the means of operator control of hydraulic functions.
- The control valve is a cartridge based modular design. Since individual cartridges can be easily replaced, this simplifies the hydraulic control system, and leads to ease of troubleshooting and repair.
- All functions are driven from the CAN based control system. The 1310 receives a handle input, and relays that command to the appropriate coil driver. If the command is proportional, (lift or lower) then the system is proportionally driven. If the command is on/off (tilt, sideshift, aux), then the system is ramped on/off to a specific speed. These speeds are set by software. Tilt and sideshift speeds are set to factory specifications. Auxiliary function speeds will have to be set according to the attachment requirements.

oA replaceable cartridge full flow hydraulic filter is located at the top of the hydraulic tank. It has a bypass relief valve to ensure oil flow in the event of filter clogging.

- The filter contains a 10 micron element that protects the hydraulic system from contaminants, promotes reliable performance, and helps to provide long life for all the system components.

Lift / Lower Performance

Lifting (Contactor)

- When the handle is operated the pump motor contactor will engage and the pump will run at full speed. The lift proportional lift valve will be opened proportional to the handle position. Adjustable ramp in/out of the PWM signal to the valve will be programmable to provide smooth operation regardless of the abrupt handle movements.

Lifting (Transistor)

- When the handle is operated the lift pump controller will deliver variable voltage to the lift pump and the lift valve will be opened proportionally. Adjustable ramp in/out of the PWM signal to the valve will be programmable to provide smooth operation regardless of abrupt handle movement. Current limiting will be provided in the lift motor controller and PWM duty will be adjusted to keep the current below the limit.

Lowering (All Models)

The handle controls a proportional lowering valve. The lift motor does not run during this operation unless auxiliary functions are commanded while lowering.

Lift Lockout

- When the battery state of charge becomes too low, lifting will be inhibited. If a lift is in progress, it will be allowed to finish.

Auxiliary Function Performance

Fixed speed auxiliary functions (Contactor)

When an auxiliary function is selected, the pump will run at full speed, and the proportional valve will be ramped to a predetermined flow rate setting.

Fixed speed auxiliary functions (Transistor)

When an auxiliary function is selected, the pump will run at an appropriate reduced speed. Flow rate will be controlled in the same manner as the standard system.

Simultaneous auxiliary functions (Contactor)

Lift and auxiliary functions are accomplished as follows:

The pump will run at full speed, and the proportional lift valve will control the lift speed. When an auxiliary function is selected a proportional valve will regulate the speed. Some degradation in full lifting speed will be expected during auxiliary movement.

Simultaneous auxiliary functions (Transistor)

Lift and auxiliary functions are accomplished as follows:

The pump motor speed and a proportional valve will control lift speed. When a simultaneous auxiliary function is requested, incremental RPM will be added to the pump to supplement the oil flow needed for the auxiliary function. Some degradation in full lifting speed will be expected during auxiliary movement.

Tilt Performance

- ❑ Standard: 5 degrees forward, 5 degrees back
- ❑ Option: 10 degrees forward, 5 degrees back



Counterweight

- Contained within the truck frame
- Consists of casting and slabs
- 3500 and 4000 lb trucks receive additional bolt-in slabs



- Counterweighting consists of a casting and a combination of slabs. A basic combination is welded into all trucks. 3500 and 4000 lb trucks receive additional bolt-in slabs.
- All counterweights are contained within the truck frame and under covers.
- The majority of the counterweight is located on the left hand side of the truck, directly over the steer wheel. This allows the steer wheel to be located off the centerline of the truck, so that the operator compartment floor can offer a low step height and large area.

Battery Compartment

- **Battery gates on both sides**
 - Facilitate battery removal or maintenance from either side
- **Plated Steel battery rollers**
 - Resist corrosion
 - Spring loaded design
 - Allow for easy battery removal and replacement

Note: Always stand clear of compartment when removing a battery.



- Battery rollers are common with the Narrow Aisle trucks. The battery rollers are plated to resist corrosion and wear.
- This design is spring loaded, and allows for easy removal and replacement.
- Battery gates are provided on both sides of the truck so that the battery can be removed, or maintained from either side.

Note: Always use a battery tray or other stabilizing device and stand clear of the battery compartment when rolling out a battery.

Battery Compartment Sizes

Truck Model	Capacity Lbs.	Battery Compartment Size Standard (X x Y x Z)	Battery Compartment Size Optional (X x Y x Z)
E30HSD	3,000	36.6 x 18.3 x 31.1	36.6 x 16.3 x 31.1 (With 2" spacer)
E35HSD	3,500	36.6 x 18.3 x 31.1	36.6 x 20.8 x 31.1
E40HSD	4,000	36.6 x 20.8 x 31.1	N/A

- There are 2 chassis sizes: one for the 16" & 18" batteries, and one for the 21" battery.
- To use a 16" battery, a 2" spacer must be installed inside the battery compartment.
- The shorter chassis truck offers 3000 & 3500 lb capacities. The longer chassis truck will offer 3500 & 4000 lb capacities. All frames are 42" wide.

Batteries

Nominal width (inch)	Battery Cell Type	Description	length	width	height	weight (lbs)
21	18-125C-17	GNB 36v 1000Ah	38.5	20.19	31	2735
21	E155W	Exide 36v 1240Ah	38.56	20.4	31.06	2909
18	18-130C-15	GNB 36v 910Ah	38.31	17.88	30.5	2435
18	E155	Exide 36V 1085Ah	38.56	17.83	31.06	2568
16	18-125C-13	GNB 36v 750Ah	38	15.5	31	2027
16	E155W	Exide 36V 930Ah	38.31	15.75	31	2226

BATTERY

- Two wheelbase sizes have been designed to provide competitive truck specifications for maneuverability and battery energy storage capacity.
- Battery Specifications See above
- An Anderson SB350 Gray connector on truck and battery for 36 volt operation.

Hyster Vista^Ø Mast

- **VISTA^Ø mast provides excellent visibility**
- **Small lift cylinder diameter**
- **Provide superior cushioning**



- This truck uses the cushion configuration of the Beta mast. This global mast is common with the JXMT2.
- The second generation Hyster VISTA mast is a statement of efficiency. Cross members have been formed from cast steel that eliminates heat weakening of the mast caused by extensive welding. This mast provides good visibility through engineered channel nesting and hydraulic cylinder, tube and hose placement.
- Hyster Company's innovative cylinder design provides smooth stage transitioning when lifting or lowering. The cylinders are located behind the uprights to maintain the visibility window which allows the operator a wide field of vision.

Angled Load Rollers

- **Flush face channel design**
- **Full faced load rollers**
- **Ride against web and flange**
- **Resist side-to-side movement**
- **Eliminate side rollers**
- **Simplify maintenance**



- The Hyster VISTA mast channel faces are directly aligned, eliminating channel damage caused by forward movement of the face during lowering. This more compact design also reduces the trucks right angle stacking dimension.
- The canted roller bearings are angled against the channel web and flange. Combining this with an inverted “J” inner channel allows full face roller contact resisting side to side movement and also eliminates the need for side thrust rollers.
- This design spreads the roller loading over a greater area, virtually eliminating the need for adjustment and maintenance resulting in increased roller and channel life which further enhances operator performance and productivity.
- The drive unit housings support the mast through machined and bushed trunnion mounts. The hang-on mast mounting system, with its mounting hardware accessible from below provides a convenient way to install/remove the mast. A grease fitting in the trunnion bracket is provided to lubricate the mast mounting and bushing.

Standard Mast Offering

2 stage LFL Vista

❖ 82" / 127" / 5.5"

3 stage FFL Vista

❖ 78" / 177" / 55.5

❖ 82" / 189" / 60"

❖ 94" / 218.5" / 71.5"

2 stage FFL Vista

❖ 78" / 120" / 55"

❖ 82" / 128" / 59.5"

❖ 90" / 144" / 67.2"

❖ 94" / 153" / 72"

Carriage



- **38.5" Class II Carriage**
- **New Integral Sidesift (optional)**
 - **Less lost load**
 - **Less capacity de-rating than most hang-on sideshifters**
 - **Provides better visibility**

- The previous E35-50FR integral sideshifter did not accept attachments. The E30FR₂ did accept attachments.
- The optional, newly designed integral sideshifter accepts attachments and with less capacity de-rating than most hang-on sideshifters.(For specific de-rating numbers refer to your spec sheets, or check with applications engineering.
- There is less lost load than that experienced with hang-on sideshifters. The new integral sideshifter also provides better visibility.

Forks

- 1.5" x 4" x 36", standard taper
- 1.5" x 4" x 42", standard taper
- 1.5" x 4" x 48", standard taper



Environment Conditioning

- **Standard: No environmental conditioning**
- **Sub zero (+30 to -15F)**
- **Cooler/ Corrosion(wet, to + 50 to +30 F)**

- **Both freezer & cooler packages include rubber lug drive tires.**



Options

Lights

- 2 headlights, mast mounted
- Amber strobe
- Fan and dome light (shown)



Miscellaneous

- 12 volt auxiliary power supply (10 amp) w/ terminal strip
- 12 volt, 30 amp power supply suitable for use with RF equipment
- Audible Alarm

•The optional Audible Alarm can be programmed to sound when the truck travels in reverse, forward, or in both directions. Managers should be responsible for the applications in which the E30-40HSD trucks are used and must determine whether it is appropriate for the alarm to be actuated in any mode of travel.

•Rear Door (SPED/Applications Option) – a rear door for the operator's compartment provides protection to an operator from objects intruding into the operator compartment. Doors should not be used on trucks operated on or near docks. Doors can impede the operator's ability to exit from the truck in the event of an off dock accident.

SUMMARY

The newly designed Hyster E30-40HSD provides state-of-the-art electric motor control technology. The Curtis transistor controllers along with SEM and CANbus technology are built to perform and last in the toughest applications.

The unit's simplified design will allow it to be highly competitive in performance and price, while maintaining the same level of serviceability and reliability as the premium line of trucks.

Raymond Comparison



To view Hyster E30HSD
and E30FR comparison
against Raymond click on
the truck image

630-C30TF

EASi-PACER-R30

Caterpillar / Mitsubishi Comparison

To view the Hyster E30HSD and E30FR comparison against Caterpillar or Mitsubishi click on either truck image



FBC15KS



EC15KS

Crown Comparison

**To view Hyster E30HSD
and E30FR comparison
against Crown click on
the truck image**



RC 3020-30