Part No: **1458307**

Service Manual for Man-Up Turret Trucks

V30XMU
V35XMU
V40XMU

HYSTER

SERVICE WARNINGS

NEVER CARRY OUT ANY CLEANING, LUBRICATION OR MAINTENANCE WITH THE BATTERY CONNECTED.

DO NOT WEAR RINGS, WRIST WATCHES, JEWELERY, LOOSE OR DANGLING CLOTHES SUCH AS SCARVES, UNBUTTONED JACKETS OR OVERALLS WITH OPEN ZIP FASTENERS THAT CAN TANGLE IN MOVING PARTS. IT IS RECOMMENDED TO WEAR PROTECTIVE CLOTHING, SUCH AS, STEEL TOED SKID RESISTANT SHOES, SAFETY GLASSES AND GLOVES.

NEVER USE GASOLINE, DIESEL FUEL, OR OTHER INFLAMMABLE MATERIALS AS CLEANING AGENTS. USE INSTEAD NON-INFLAMMABLE, NON-TOXIC COMMERCIAL SOLVENTS.

DO NOT SMOKE, DO NOT USE FLAMES, DO NOT CAUSE SPARKS, WHEN EASILY INFLAMMABLE MATERIALS ARE HANDLED.

- In case of service outside the workshop, position the truck on a flat surface if possible and block it. If work on a slope is unavoidable, block the truck first and then move it to a level area as soon as possible.
- Disconnect the batteries and label all the controls to signal that service is taking place. Block the truck as well as any attachment that has to be lifted.
- Use only the prescribed attachment points when towing and make sure the pins and/or bolts are locked tightly before pulling. Lift and handle all heavy parts by means of a lifting device with the suitable capacity. Use the lifting eyes provided for the lifting. Do not lift over other people or permit them near a lifted load.
- Avoid twisting chains or wire ropes.
- Do not used damaged chanins or wire ropes while lifting or pulling. When handling chains or wire ropes always use goves.
- Handle all parts carefully. Never put your hands or fingers in between parts.
- Wear the special-purpose clothes, such as, safety glasses, gloves and steel toesd skid resistant shoes.
- The area where maintenance operations are carried out must be always kept clean and dry. Clean up any water, oi, or fuel spills immediately.
- Do not pile grease or oil-covered clothes. They represent a fire risk. Always put them in a closed metal container.
  Never carry out any service operation on the machine with anyone in the operator position, unless the operator is fully trained and involved in the operation to be carried out.

Welding

When welding operations are required, use appropriate protective clothing, such as, dark glasses, helmets, overalls, gioves and steel toed skid resistant shoes.
Dark glasses should also be worn by anyone in the vicinity during a welding operation, even if they are not performing the work.
Never look at the welding arc without properly protecting your eyes.

Battery

If you have to use batteries, remember the cables should be connected to the terminals as specified:(+) with (+) and (-) with (-)
Avoid short circuiting the (+) and (-) battery terminals together.
The gas released from the batteries is highiy infiammabie. During recharging, leave the battery compartment uncovered to ensure more effective ventilation and remove the caps.

AVOID SPARKS OR FIAMES IN THE BATTERY AREA!

Never check the state of charge of the batteries using "bridges" by placing metal objects on the battery terminals.
Before any service operation, check that no parts are short circuited. Eliminate short circuits before proceeding with work.
Always disconnect the batteries before carrying out any electrical or mechanical service on the truck.
For the battery chargers and similar equipment use only power sources having an effective earth connection to minimized possible electrical shocks.

Hydraulic System

High pressure hydraulic fluid coming from a very small hole may be almost invisible and be sufficiently powerful enough to penetrate the skin causing serious injury. Never use your hands or any part of your body to search for hydraulic leaks. Us a piece of paper or wood to for leaks.
Use the special-purpose equipment to check hydraulic system pressures.

Note: This manual does not replace the Owner and Operator manual.

SERVICE MANUAL CONTENTS

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ELECTRICAL SYSTEM

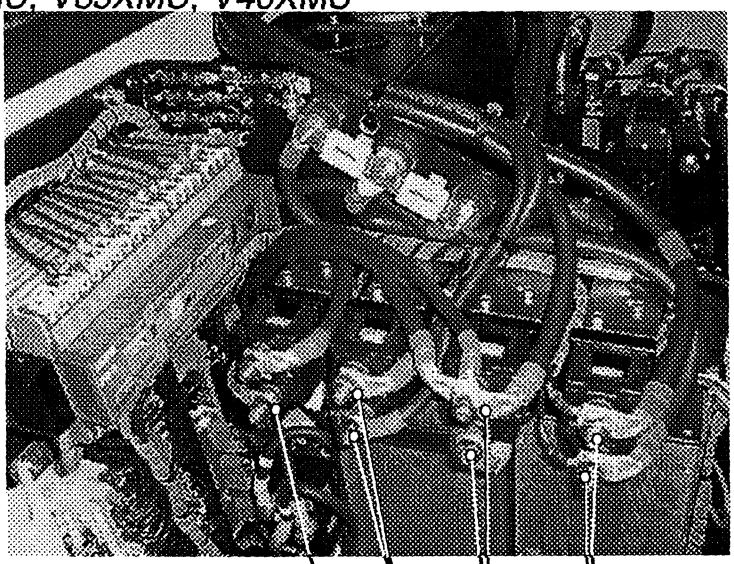
ELECTRIC DIAGRAMS (A3 PAGES)

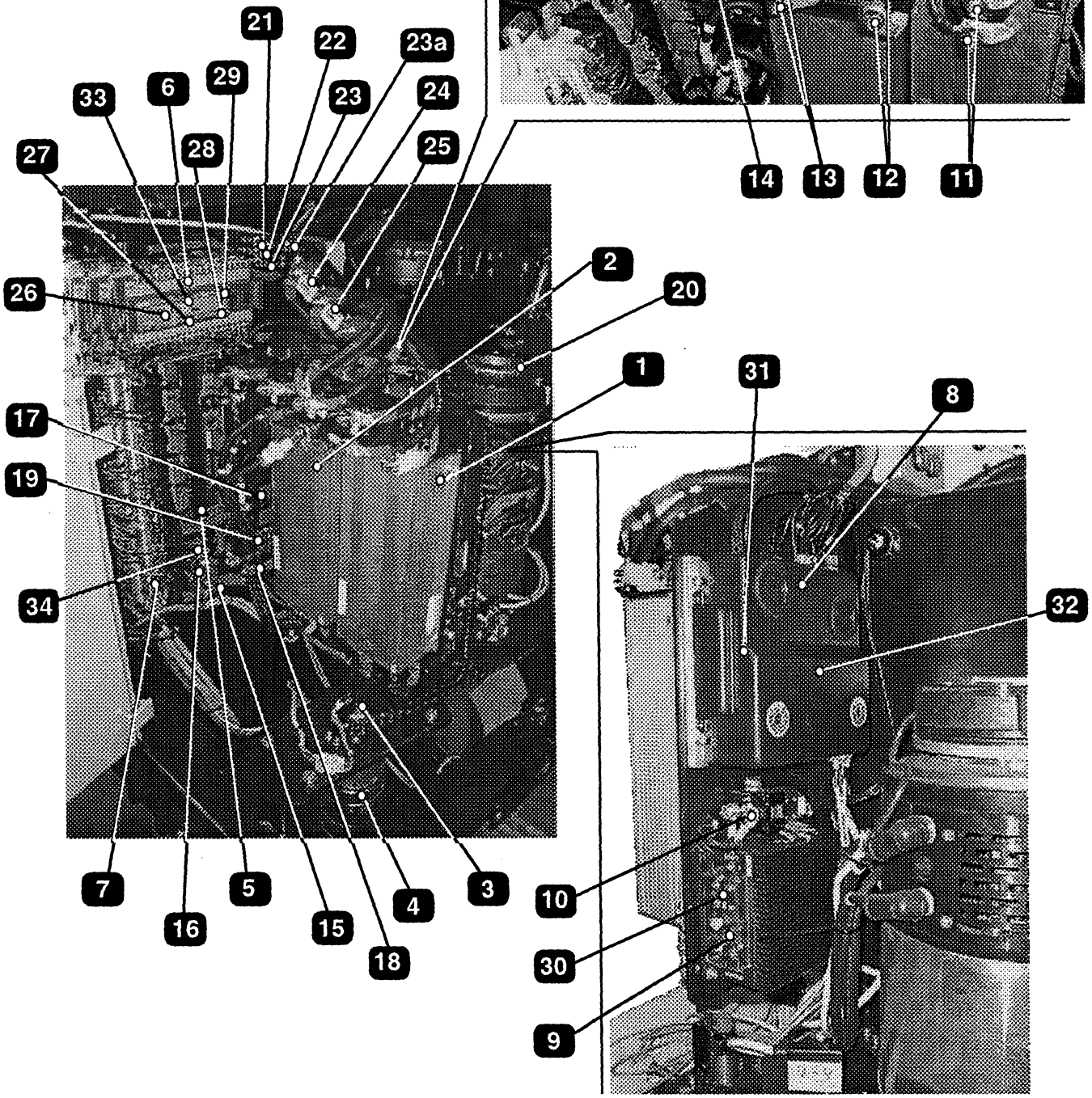
SEE ATTACHED SCHEMATICS

ELECTRIC DIAGRAMS (A3 PAGES)

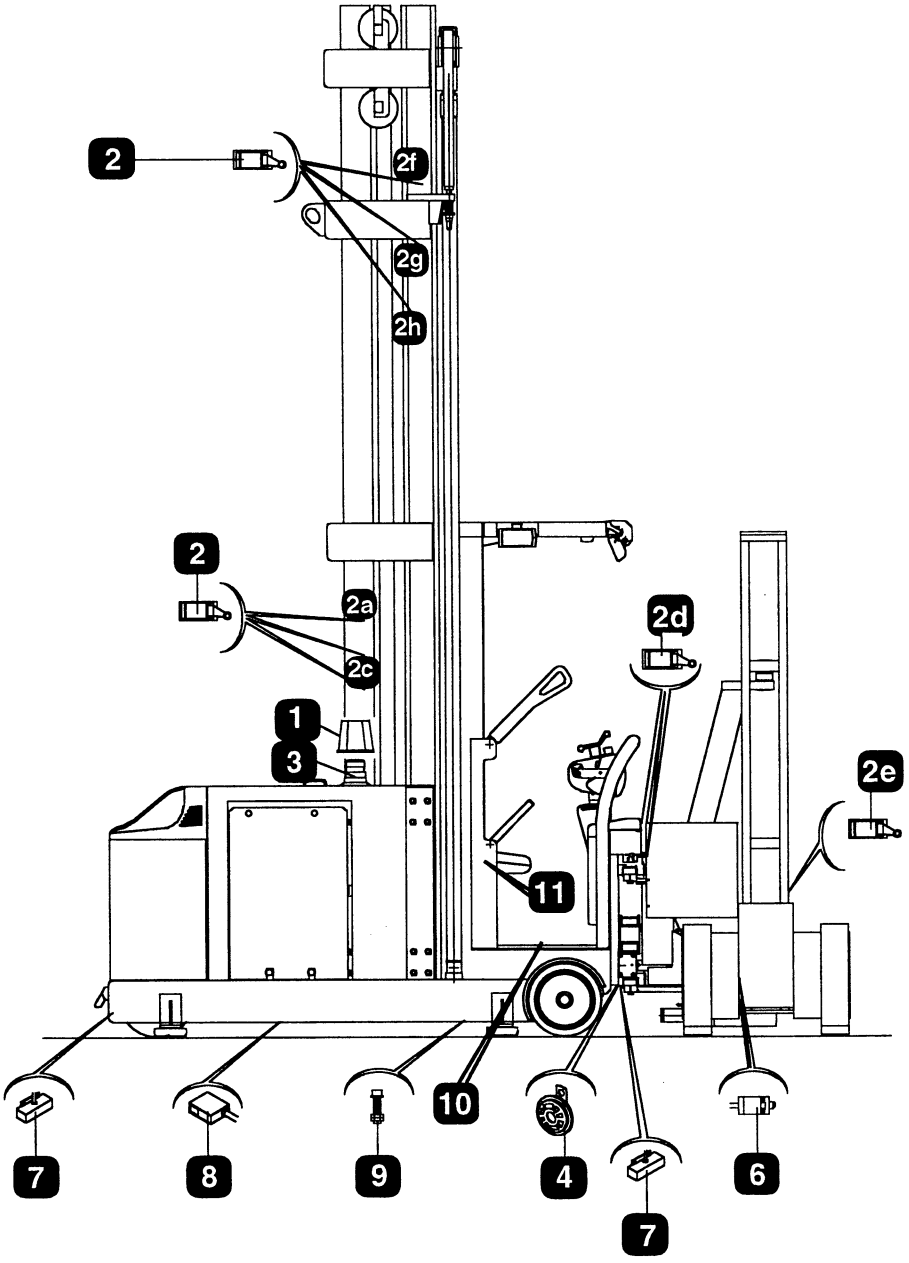
SEE ATTACHED SCHEMATICS

ELECTRICAL COMPARTMENT ARRANGEMENT MODEL V30XMU AND V35XMU





Drwg. Ref.	Schematic Ref.	Part Description	Specification	V30XMU	V35XMU
1	u1	H2 Pump Controller	48V - 600A	X	
1	u1	H2 Pump Controller	72V - 600A		X
2	u2	H2 Traction Controller	48V - 600A	X	
2	u2	H2 Traction Controller	72V - 600A		X
3	r1	Potentiometer steering position	5 Kohm	X	X
4	m9	Steering motor	0,4 Kw 1/44,4	X	X
5	u8	Interface card - PLC	relays 24V	X	X
6	u7	PLC - Programmable Logic Controller	24V supply	X	X
7	Hood	Hood Connector	100 Pins	X	X
8	u6	Electric pow er steering controller	24/80V - 35A	X	X
9	u4	DC - DC Converter	48V ð 24V	X	
9	u4	DC - DC Converter	72/80V ð 24V		X
10	c9	Steering contactor	24V coil	X	X
11	c1	Main disconnect contactor	24V coil	X	X
12	c4	Lift bypass contactor	48V coil	X	
12	c4	Lift bypass contactor	72V coil		X
13	c3	Primary pump motor contactor	48V coil	X	
13	c3	Primary pump motor contactor	72V coil		X
14	c2	Main pump control contactor	48V coil	X	
14	c2	Main pump control contactor	72V coil		X
15	d1	Main relay	24V coil	X	X
16	d2	Electromagnetic brake relay	24V coil	X	X
17	c8	Field w eakening contactor	48V coil	X	
17	c8	Field w eakening contactor	72V coil		X
18	c5	Regenerative braking contactor	48V coil	X	X
18	c5	Regenerative braking contactor	72V coil		X
19	c6/c7	Forw ard/reverse contactors	48V coil	X	
19	c6/c7	Forw ard/reverse contactors	72V coil		X
20	s1	Electromagnetic brake coil	24V coil	X	X
21	e3	Fuse - Pump & traction control logic	10A	X	X
22	e4	Fuse - PLC Pow er & minimum speed limit	15A	X	X
23	e5	Fuse - Flashing beacon	6.3A	X	X
24	e1	Fuse - Pump motors	500A	X	X
25	d2	Fuse - Traction motor	425A	X	X
23A	d7	Fuse - 24 volt auxiliary pow er	10A	X	X
26	F1	Fuse - PLC internal	1.6A	X	X
27	F3	Fuse - PLC internal	1.6A	X	X
28	F4	Fuse - PLC Internal	0.7A	X	X
29	F2	Fuse - PLC Internal	1.0A	X	X
30	e6	Fuse - Pow er supply	15A	X	X
31	F5	Fuse - Steering internal	32A	X	X
32	F6	Fuse - Steering internal	2A	X	X
33		PLC Batteries - Inside		X	X
34	dMAN	Wire guided steering on (Aisle Detect) relay	24V coil	X	X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1.2 TABLE OF ELECTRICAL SYSTEM COMPONENTS

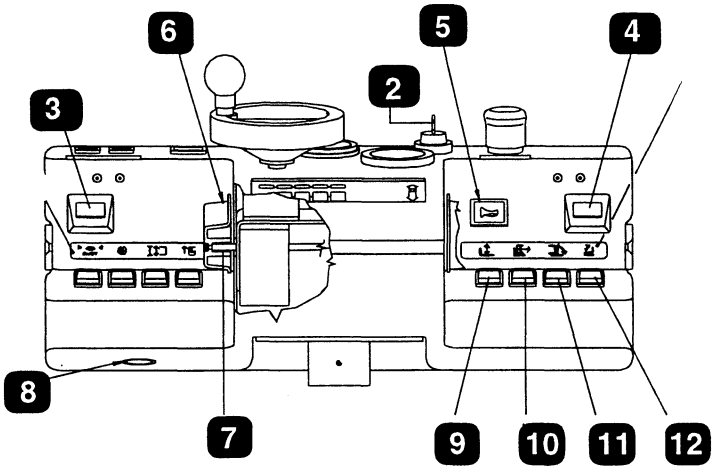
The electrical system components illustrated in the previous page are described in the Table below:

Key:

Drwg. Ref. Part reference on the exploded drwg.
Schematic Ref. Part reference on the electrical schematic
Part Description Task assigned to part

Drwg. Ref	Schematic Ref.	Part Description	V30XMU	V35XMU	V40XMU
1		Flashing Light Guard	X	X	X
2		Switches	X	X	X
2a	b25	Above 2575 mm Cab Lift Travel Speed Reduction In Aisle Limit Switch	X		
2a	b25	Above 3800 mm Cab Lift Travel Speed Reduction In Aisle Limit Switch		X	X
2c	b19	Above 300 mm Cab Lift Outside Aisle Travel Speed Reduction and Cab Lowering Slow Down Limit Switch	X	X	X
2d	b4/b5	Traverse Full Right and Left Limit Switches	X	X	X
2e	b1	Above 750 mm Auxiliary Lift Travel Speed Reduction Limit Switch	X	X	X
2f	b23	Top of Cab Lift Slow Down Limit Switch	X	X	X
2g	b26/b27	Slack Chain Limit Switches	X	X	X
2h	b6	6800 mm Limit Switch	X	X	X
3	h2	Flashing Light	X	X	X
4	h3	Horn	X	X	X
6	b2/b3	Rotate Right and Left Limit Switches	X	X	X
7		Front and Rear Wire Guidance Sensors (included with wire guidance option)	X	X	X
8	b11/b12	Right and Left Guide Rail Detection Photoswitches (included with rail guidance option)	X	X	X
9	b13/b14	Right and Left End of Aisle Stop Magnet Detection (reed switches)	X	X	X
10	b16	Foot Switch	X	X	X
11	b9/b10	Side Gate Switches	X	X	X

Table 1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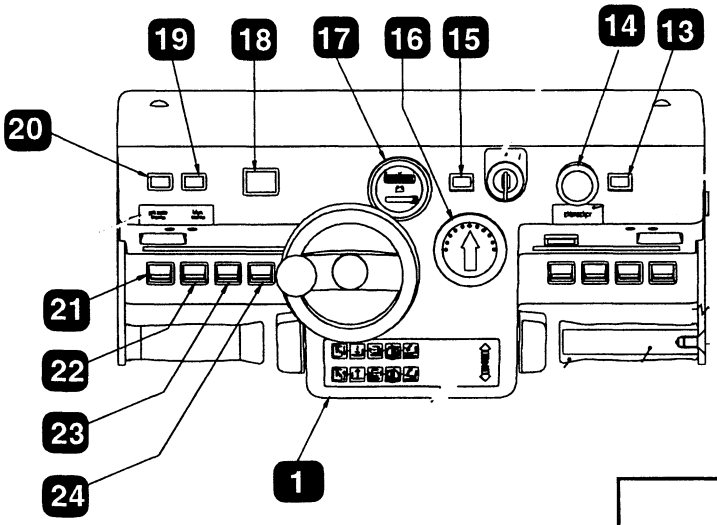
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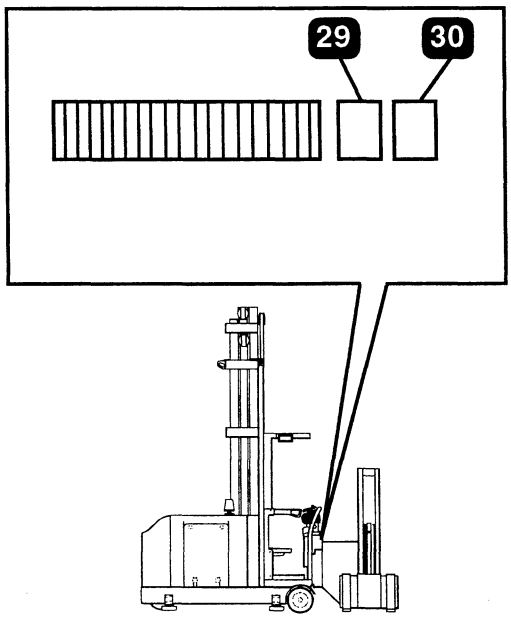
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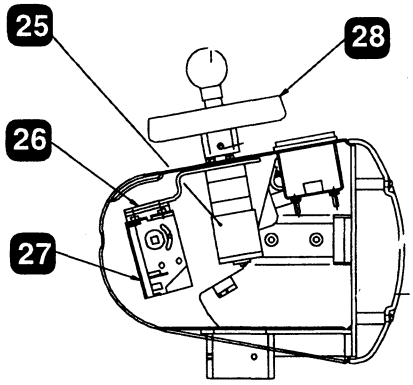
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Key:

Drwg. Ref. Part reference on the exploded drwg.
Schematic Ref. Part reference on the electrical schematic
Control Description Task assigned to part

Drwg. Ref.	Schematic Ref.	CONTROL DESCRIPTION
1		Console
2	b7	Key switch
3	b18	Left Hand Sensor (Europe only)
4	b17	Right Hand Sensor (Europe only)
5	b15	Horn Button
6		Hydraulic Control Switch (Left Butterfly)
7		Control Switch Pin
8	Alarm	Buzzer (Included with wire guidance option)
9	b20	Auxiliary Lift/Lower Enable Switch
10	b31	Traverse Forks + (telescopic forks optional) Enable Switch
11	b34	Rotate Forks Enable Switch
12	b44	Tilt Forks Enable Switch (Included with special tilt forks)
13	h4	Motor Brush Wear Warning Lamp
14	b8	Emergency Stop Button
15	h1	Power On Indicator Lamp
16	g1	Steer Angle Indicator (Included with multi-turn steering only)
17	g2	Battery Discharge Indicator/Hour Meter/Lift Interrupt
18	Manual Lamp	Steering Mode Switch: Manual/Automatic (Included with wire guidance.)
19	Automatic Lamp	Manual Steering Mode Indicator Lamp (Included with wire guidance)
20		Automatic (Wire Guided) Mode Indicator Lamp (Included with wire guidance)
21	b37	Cab Light Switch
22	b36	Fan Switch
23	b43	Fork Positioner Enable Switch (Included with special fork positioner)
24	b22	Lifting reset button
25	m8	Tacho-Generator (r2 - Steering Potentiometer for pot steering)
26		Support
27	U4-U5	Traction (right) and Hydraulic (left) Controls
28		Steering wheel (Tach-generator steering wheel shown)
29	d3	Extending forks return relay
30	d4	Extending forks out relay

Table 2

2.0 TRACTION MOTOR ELECTRONIC CONTROL

2.0.1 INTRODUCTION

The traction controller (***H2B - 600A)***, used to control the traction motor, makes use of a microprocessor controlling power MOSFETs. Microprocessor control permits adjustment of acceleration, dynamic braking, top speed, etc.

High frequency control of the motor provides a wider range of settings than lower frequency controls.

Since the Controller provides the traction motor with a high-frequency (18KHz) filtered voltage, it ensures a more uniform absorption than low-frequency controls for the same average delivered current, and considerably reduces the peak currents(as shown in Fig. 1). This improves operations and increases the average life of the battery and the motor.

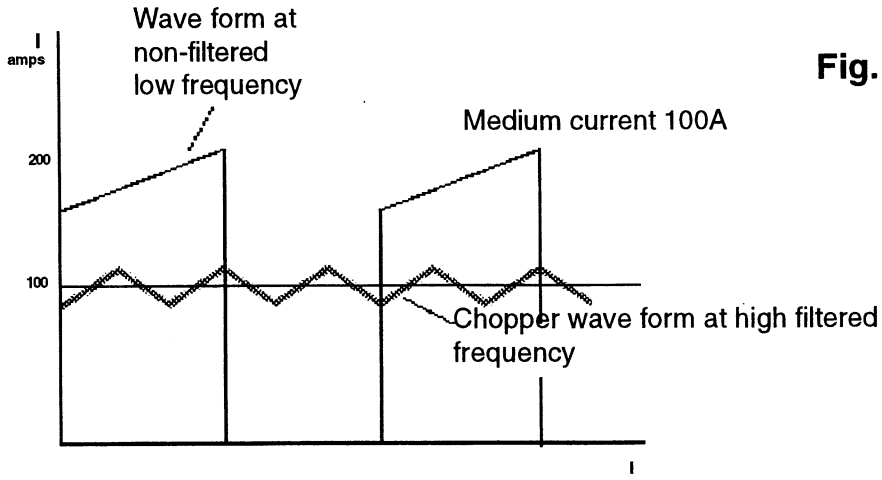

Fig. 1

The Traction Controller optimizes power delivery to the motor at low speed. Motor power, corresponding to accelerator pot input, is applied according to the Controller curve shown (see Fig. 2). This provides a greater range of slow speed traction and then good high speed acceleration.

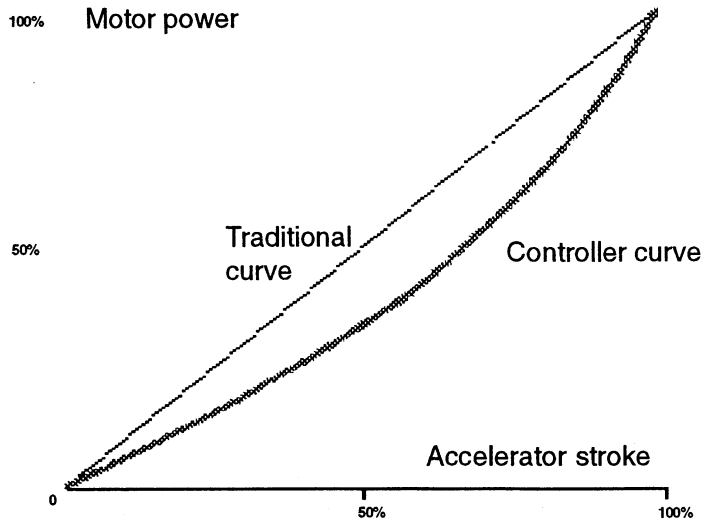

Fig. 2

2.1 DEFINITION OF THE TRUCK DIRECTION OF TRAVEL

The direction of truck travel used in this service manual is shown in Fig. 3 below.

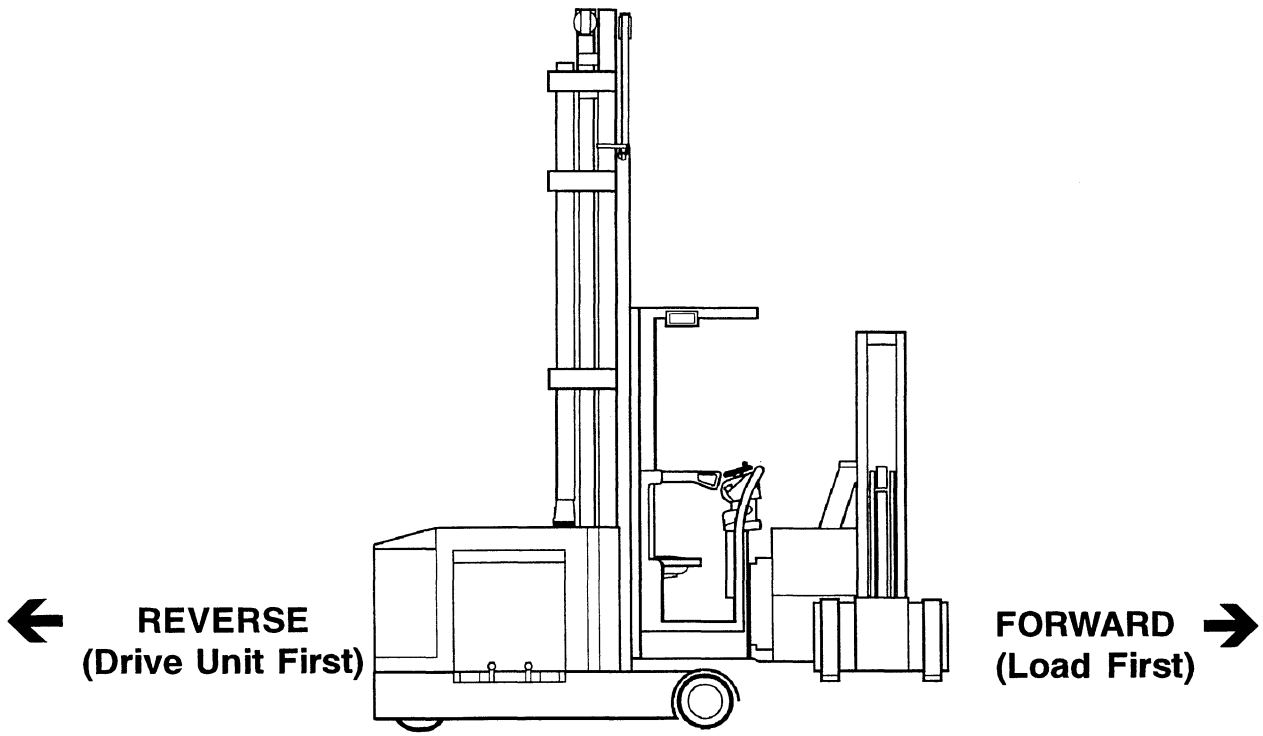

Fig. 3

GENERAL INSTRUCTIONS AND PRECAUTIONS

- DO NOT CONNECT THE CONTROLLER TO A BATTERY WITH A VOLTAGE RATING DIFFERENT FROM THE ONE SHOWN ON THE CONTROLLER DATA PLATE.
- A HIGHER BATTERY VOLTAGE CAN DAMAGE THE MOSFETS. THE CONTROLLER WILL NOT OPERATE WITH A LOWER VOLTAGE, THE MODULE WILL NOT START.

- IF YOU CHANGE THE CONTROLLER, TEST THE TRACTION FUNCTIONS WITH THE TRACTION WHEEL RAISED FROM THE GROUND TO PREVENT HAZARDOUS SITUATIONS FROM BEING CAUSED BY CONNECTION OR SET UP ERRORS.

- DO NOT REVERSE THE POLARITY OF THE CONTROLLER POWER SUPPLY. THE TRUCK WILL NOT OPERATE.

2.2 CONTROLLER GENERAL FEATURES

The Controllers used for traction and hoist have different voltage and current ratings.

Controller Data Plate Voltage	Voltage Range Permitted	Maximum Rated Current
36/40/48 V	22 - 55 V	600 A
60/72/80 V	36 - 90 V	500 A
60/72/80 V	36 - 90 V	600 A

MOSFET working frequency	18 KHz
Motors (feature)	Excitation motors in series, 4 terminals direct current.
Working place temperature	-30° to +40° C
Maximum Controller temperature	+85° C

The Controller is always supplied directly by a battery voltage and does not require a voltage reducer.

The Controller can be set in 4 different working configurations:
1. Traction control with energy regeneration (REGENERATIVE.TR.);
2. Standard traction control (STANDARD TRACT.);
3. Five-speed pump control (STANDARD PUMP);
4. Four-speed pump control + power steering contactor control (PUMP + HYDRO).

All traction controllers on VNA (Very Narrow Aisle) trucks are always set to (REGENERATIVE TR.) option. All pump controllers on VNA trucks are always set to (STANDARD PUMP) option.

Truck Model and Battery	V30XMU 48 Volt Battery	V35XMU 72 Volt Battery	V40XMU 72 Volt Battery
Traction Controller Voltage & Current Rating	36/40/48 V 600 A	60/72/80 V 500 A	60/72/80 V 500 A
Pump Controller Voltage & Current Rating	36/40/48 V 600 A	60/72/80 V 600A	60/72/80 V 600 A

NOTE: You may use the 600A rated pump controller in place of the 500A rated controller.

2.3 CONTROLLER FUNCTIONAL FEATURES

4 POSSIBLE CONFIGURATION MODES

REGENERATIVE TR
When the accelerator is released, the truck automatically performs regenerative braking

STANDARD TR.
When the accelerator is released, the truck coasts without braking. Regen braking not available.

STANDARD PUMP
Control of pump motor with five maximum speeds. Pump speed is variable.

PUMP + HIDRO
Control of the pump motor with four maximum speeds plus power steering contactor control. Pump speed is variable.

Always set up the traction controller as REGENERATIVE TR. for VNA trucks.

ADJUSTABLE MAXIMUM DYNAMIC BRAKING RATE
CONTACTOR TURNS ON AND OFF WITH ZERO CURRENT
START SEQUENCE
SELF-DIAGNOSTICS
DIAGNOSTIC LED
FILTERED INPUT VOLTAGE FROM BATTERY
QUIET OPERATION (NON-AUDIBLE FREQUENCIES)
ADJUSTABLE ACCELERATOR DEMAND SENSITIVITY
SEPARATE FORWARD AND REVERSE TRAVEL SPEEDS ADJUSTMENT
3 ADJUSTABLE TRACTION SPEED REDUCTIONS
AUTOMATIC BRAKING WHEN THROTTLE RELEASED (REGENERATIVE TR. ONLY)
EMPTY-LADEN COMPENSATION ON TRACTION
MOTOR PROTECTED FROM CURRENT PEAKS
CURRENT CONTROL DURING TRACTION WITH BOOSTER I MAX + 20 % FOR 3 SECONDS
ANTIROLLBACK
INTERNAL SUPPRESSION ON THE CONTACTOR COILS
STORAGE OF THE LAST 5 ALARMS

2.4 CONTROLLER DIAGNOSTICS

SELF-DIAGNOSTICS OF COMPONENTS

The microprocessor performs diagnostics for the main parts of the controller in four conditions:

1) Diagnostics during key start, including:
   Watch dog test, current sensor test, power MOSFET test, contactor driver test, travel power preset test, accelerator connection test, EEPROM test.
2) Diagnostics at rest, including:
   watch dog test, power MOSFET test, current test, contactor driver test, accelerator connection test.
3) Diagnostics during travel, including:
   watch dog test, power mosfet test, current test, contactor driver test, contactor opening and closing test, accelerator connection test.
4) Continuous diagnostics, including:
   temperature control, battery voltage control.

The message signaling the detection of a fault can be decoded by counting the number of times the diagnostics LED on connector A flashes (see Section 5.0).
The active alarm message can also be viewed using the Hand Set (see section 4.1.8).